

Participants' power asymmetry in public infrastructure projects

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Abstract

Many large infrastructure projects around the world significantly exceed their budgets and take longer than expected to complete. The cost overruns and delays in such projects cause significant economic and social challenges around the world and in Australia. This research focuses on seven large infrastructure projects in Victoria, Australia to better understand why these projects fail to deliver what government and the public expected. This thesis answers the question; “why did the projects fail to meet expectations” and “how could this be avoided in future”?

The explanations on infrastructure project delivery failure have been covered by many studies, some decades old. These include, among other things, exaggerating benefits, overlooking risks, and unrealistic assumptions promising benefits that fail to materialise. These explanations do not explain the reasons why large infrastructure projects continue to fail. Large infrastructure projects are complex and contain many stakeholders, including central agencies, delivery agencies, government departments, construction companies and contractors.

Based on thorough analysis of a Parliamentary inquiry of the Committee of the Public Accounts and Estimates the research identified the notion of power as an important factor in investigated infrastructure projects. The analysis found that the interplay between the stakeholders involved in a project is affected by the power distribution among the stakeholders.

A new concept of informal authority is postulated to provide a consistent explanation of how a delivery agency’s self-interest in the presence of an asymmetric distribution of power may result in project failure. The research concludes that power asymmetry is a critical success factor in public infrastructure and makes suggestions for its management and control that would improve project outcomes.

Keywords: Infrastructure projects, project decision making, project management, power asymmetry.

Declaration

This thesis comprises only my original work towards the PhD except where indicated in the preface.

The thesis is less than 80,000 words in length, exclusive of tables, figures, bibliography and appendices. It complies with the stipulations set out for the degree of Doctor of Philosophy by Research Higher Degrees Committee at the University of Melbourne.

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Preface

In the process of undertaking this study, the support of many individuals and organisations has been received. This support has helped in gaining access to invaluable data around the practice of infrastructure delivery in Victoria. These individuals and organisations have been duly acknowledged unless their identity should remain confidential.

The views expressed in this study are the candidate's and do not necessarily indicate the views held by any other entity who provided support to this study.

This research benefits from external knowledge received from two major assemblies of experts.

- a) The public inquiry of Victorian Parliament that is investigating decision-making processes in infrastructure projects is attended, and its transcripts are included as evidence. The inquiry holds public hearings that host delegates from the public and the private sector.
- b) A workshop of senior managers and executives from the public and private sector was organised. The senior managers and executives were invited to validate the findings of the research.

Two journal papers, one book chapter, and four conference proceedings have been produced in the course of this research.

Chapter 2 has in part, been presented in the following publications:

- Critical success factors in public infrastructures: A Victorian insight; H. Zarei, C. Duffield, G. Atmo. In 12th Management in Construction Research Association (MiCRA), Kuala Lumpur. September 2013.

Chapter 3 and 4 have in part, been presented in the following publications:

- An Enhanced Mapping Technique to Understand Complex Project Systems; H. Zarei, C. Duffield, F. Hui. International Journal of Project Management. Under the revision, first submitted in April 2017.
- Using inquiry-based visual tools to aid inclusiveness in vocational education. F. Hui, H. Zarei. In 25th National Vocational Education and Training Research Conference. 2016.

Chapter 5 has in part, been presented in the following publication:

- Critical Decision-Making Skills Required to Govern Mega Projects: The Case for A Victorian Infrastructure Center of Excellence, H. Zarei, C. Duffield, F. Hui, in preparation for submission to the International Journal of Strategic Engineering Asset Management.
<http://www.inderscience.com/jhome.php?jcode=ijseam>

Chapter 6 has in part, been presented in the following publication:

- Financing and Procuring Major Infrastructure: A Comparison of Three International PPP Style Projects; C. Duffield, G. Atmo, H. Zarei. In M. Young (Ed.), *People and Places in Project Management Research* (pp. 165–186). Cambridge Scholars Publishing. 2017.

Chapter 7 and 8 have in part, been presented in the following publications:

- Why May Public Infrastructure Projects Over-Promise Likely Outcomes? H. Zarei, C. Duffield, F. Hui. In *AIPM Inaugural Regional Conference* (pp. 44–51). Sydney: AIPM. 2016.
- The Risk of Power Imbalance in Project Delivery: A Study of Large Victorian Public; H Zarei, F. Hui, C. Duffield, G. Wang. In *Journal of Risk Analysis and Crisis Response (JRACR)*, Atlantis Press, Volume 7, Issue 2. 2017.

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In the name of God, the essence of every mass and mind.

Now, at the end of my study, I reckon the most valuable outcome of a PhD is the researcher. Learning is in progress while facing the research challenges. The journey educates the researcher and informs the potentials and weaknesses. It provides the student with the key to self-development. That is why getting a PhD is a milestone of becoming a better character.

Nonetheless, PhD is a bumpy road full of surprises. Alone, this trip is packed with danger. Supervision is necessary to help the student keep going. Supervision also provides hindsight and assistance when needed most by the student.

I am blessed for having a remarkable supervision team.

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Abbreviations and Acronyms

Academic

D/B	Design Build
D/C	Design Construct
ICT	Information Communication Technology
PLC	Project Life Cycle
PPA	Participants' Power Asymmetry
PPP	Public Private Partnership
PSC	Public Sector Comparator
VfM	Value for Money

Organisations / Projects

AIPM	Australian Institute of Project Management
APESMA	Association of Professional Engineers, Scientists and Managers Australia
APM	Association for Project Management
AustinH	Austin Health
BER TF	Building the Education Revolution Implementation Taskforce
BLDSTNE	Boulderstone Ltd.
CAPA M	Capability Management International Pty Ltd.
CfM	Committee for Melbourne
CSC	CSC Australia Pty Ltd
DEECD	Department of Education and Early Childhood Development
DBI	Department of Business and Innovation
DoJ	Department of Justice
DoT	Department of Transport
DoH	Department of Health
DPC	Department of Premier and Cabinet
DPCD	Department of Planning and Community Development
DSE	Department of Sustainability and Environment
DTF	Department of Treasury and Finance
EA	Engineers Australia
ENSMBL	Ensemble Partners
IA	Infrastructure Australia
IPA	Infrastructure Partnerships Australia
IPMA	International Project Management Association
KAMCO	Keane Australia Micropayment Consortium
LMA	Linking Melbourne Authority
MCEC	Melbourne Convention and Exhibition Centre
MMRP	Melbourne Market Relocation Project
MMA	Melbourne Market Authority
MPV	Major Project Victoria
NTT	Asia Pacific NTT Data Inc.
Ombudsman	Victorian Ombudsman's Office

PAEC	Public Account and Estimate Committee
Plenary	Plenary Group
PMI	Project Management Institute
RRLA	Regional Rail Link Authority
RRLP	Regional Rail Link Project
RCH	Royal Children Hospital
REEH	Royal Victorian Eye and Ear Hospital
SSA	State Service Authority
TCV	Treasury Corporation of Victoria
TTA	Transport Ticketing Authority
UNI	The University of Melbourne/Monash University
VAGO	Victorian Auditor-General Office
VDP	Victorian Desalination Plant

1. Introduction

1.1. Background

Managing large projects has always been a challenge. The records of large project delivery reveal the fact that only a portion of those projects could escape from performance imperfection such as time delays or cost overruns, and some end up with unexpected outcomes to the extent that the project is abandoned.

Large infrastructure projects are complex and face challenges that lead to imperfections that are often discovered too late in project delivery. Despite all the existing literature and guidelines for a better outcome of infrastructure projects, the practice still disappoints the community in many instances.

From a global perspective, infrastructure projects do not show a very high level of achievement in term of project management performance. The extensive nature of these poor project outcomes demands urgent research to identify and correct the reasons behind these poor outcomes and to assist large infrastructure projects deliver on their promises.

Governments normally respond to the unsatisfactory performance of public infrastructure projects by either reducing the funding or changing the process of delivery.

Project success is a common dream. Success criteria have been widely proposed in the literature to achieve success. However, success criteria are passive indicators when they are measured after project completion.

1.2. The problem

Despite all the advances in procurement strategies, many infrastructure projects fail to meet the terms of their promises. The shortcomings manifest as a failure to satisfy time, cost or quality requirements or to offer the expected utility for the stakeholders. A project that fails to produce value for the money brings about community frustration eventually.

The problem is a pervasive situation for infrastructure projects where the project process does not necessarily bring about the expected outcome. It happens when people following a given process fail to produce the expected outcome in either performance, e.g. planned time and cost or functionality, e.g. lack of demand for the project product. The former is recognised as a failure in project management while the latter is known as a weakness of project product.

The process of decision-making has been identified as a critical factor that influences the quality of decisions that determines where the project will end

up. Procurement research shows the importance of early decisions affecting the project outcome. Among the project decisions, the project business case and approval process are critical in shaping the expectations of stakeholders and defining success. There is evidence that the approval process if effectively applied, would improve project outcomes but some projects do not go through a rigorous review. Moreover, the planning phase of many infrastructure projects is affected by optimism bias in the business case (and frequently the actual lack of a business case). In many of these cases, the approval process fails to identify the planning fallacy (an unrealistic plan) and so funds are allocated to unreliable or ambitious business cases. It is important to know why plans are sometimes optimistic in public infrastructure projects. There are other reasons besides optimism bias for poor project outcomes that include organisational, technical, socio-psychological and political explanations.

Public infrastructure projects are complex systems with compound decision structures that include multiple stakeholders. Community and social involvement in public projects make them a complex social system. The planning problem of public infrastructure becomes a wicked problem entailing many agencies with different objectives and interests that may conflict.

1.3. Objectives

This thesis aims to identify the root cause of why large public infrastructure projects frequently fail to produce the anticipated value for the money as detailed in the initial stages of a projects life cycle. It proposes a refined process for project initiation. The new process recognises the role of various agencies and assists in structuring necessary resources that collectively can make a project successful.

Objectives of the thesis are:

1. Redefine success that incorporates public project wider benefits for the community.
2. Identify the main issues confronted during public infrastructure delivery.
3. Re-explain the early issues in public infrastructure projects through cross-pollinating the relevant theories from the literature.
4. Develop a new theory (the theory of power asymmetry) to explain the identified issues in infrastructure projects.
5. Validate and refine the proposed theory and assess its breadth of applicability.

A summary of research steps and data sources are shown in Figure 1.

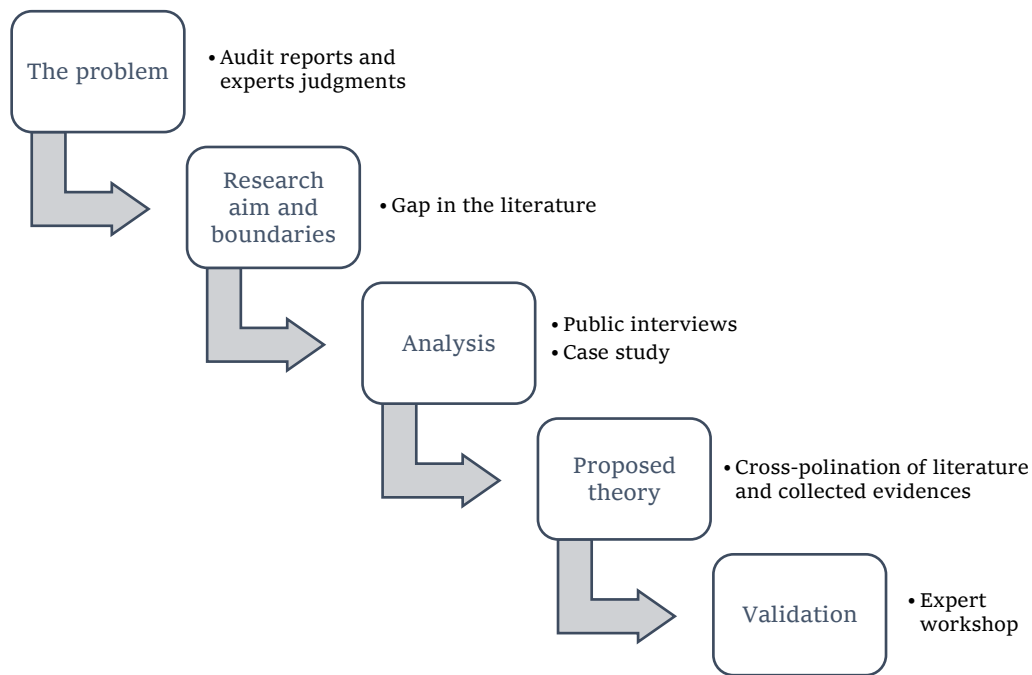


Figure 1. Research flowchart

1.4. Method

Triangulation is implemented wherever possible by using diversity of data sources in order to achieve the research objectives. This was accomplished by utilising secondary reports, literature reviews, expert interviews, public hearings, case studies, and an expert workshop.

Through a review of project reports and interviews with project experts, the significance of the problem was ascertained and the research objectives defined. Stakeholder perspectives were obtained through expert interviews and analysing the reports of public hearings, and case studies to identify the key issues in the delivery of public infrastructure projects in Victoria between the periods of 2013 to 2014. The literature was studied to find the existing theories behind the current challenges and explanations to overcome the problem of poor project outcomes. Some of these theories were drawn from a wider domain including sociology, politics, psychology, and management science. In this thesis, the theories from these disciplines are applied and adapted to the context of delivering public infrastructure projects and then cross-pollinated for a simple yet comprehensive explanation of project behaviour and outcomes. Stakeholder perspectives and the case study observations are analysed through a tool specifically developed for this thesis. The analysis of the data uses abductive reasoning to visualise the relationships among the main concepts and develops a causal network. A more effective and comprehensive explanation is offered, and a new theory is proposed to uncover the complexity of early

decision processes and the root cause of the problem in public infrastructure delivery.

1.5. Thesis structure

The thesis is written in nine chapters; Table 1 summarises the structure of the thesis. This chapter has introduced the problem being studied and the specific objectives of the research. The next chapter reviews the literature on the existing theories and practices to explain and tackle the problem. In chapter 3, based on the theories reviewed in the literature a method is selected and justified to investigate a complex system of large public infrastructure projects. In the next chapter, chapter 4, an ad-hoc visual method is developed to analyse the qualitative data drawn from the interviews and government reports to find the relationship among concepts. Chapter 5 presents the results including the visual maps of concepts and causality. The findings are analysed and interpreted in chapter 6 and implications discussed in the presence of existing theories from the literature and the introduction of power as a prevailing concept in decision-making processes in organisations. The new theory of power asymmetry is defined and substantiated in chapter 7. It is new in the context of project delivery. The theory aims to explain the behaviour of agencies in the public sector within the approval process. Chapter 8 discusses the theory against the evidence received from the selected case studies and the stakeholder judgement obtained from an organised workshop and the proposed recommendations from the workshop. In the last chapter (chapter 9), the major outcomes are summarised, the contribution of the research and its application are discussed.

Table 1. Thesis chapter structure

Ch.	Title	Summary
	Preface	
1	Introduction	In this chapter, the research background is presented, and its significance is justified. The research objectives are outlined with a brief summary of the method to tackle the problem. A summary of thesis structure is presented.
2	Literature Review	In this chapter, the literature on project management in is reviewed. It describes and evaluates the field of research. The definition of success in the literature is critically reviewed. The major problem of project delivery in the public sector is identified. The governance strategies, procurement strategies, and control strategies of the governments for realising success are reviewed. The literature that explains the shortcomings of the aforementioned strategies are reviewed, i.e. technical, organisational, behavioural and political explanations. The concept of power is revisited, and the classic definition of power is adopted in the project arena.
3	Research Method	This chapter appraises the existing methodologies for investigating a complex problem. Strengths and limitations of quantitative and qualitative methods are studied. Induction, deduction and abduction as

Ch.	Title	Summary
		the three ways of reasoning are explained, and their merits are discussed in the context of project management research. A qualitative abductive method of research is proposed to understand a complex public infrastructure project. Research sources of data, the method of analysis and expected outcomes are presented.
4	An Enhanced Mapping Technique to Understand Complex Project Systems	This chapter proposes a novel method of research to make sense of incomplete data obtained through stakeholder perspectives. Visualisation as a technique is justified to explain a complex system through extraction of main concepts and the relationships among them. Thematic mapping, Dialogue mapping and Causality mapping are employed to explain the behaviour of a complex system, e.g. decision processes in public infrastructure project delivery.
5	Infrastructure Delivery Themes Developed from The Victorian Parliamentary Inquiry	The findings from the analysis of stakeholder opinions are presented and then summarised into themes. Visual maps are generated to explore the current issues in infrastructure delivery. The findings are discussed in relation to current theories in the literature.
6	Case Study Analysis of Causes Driving Project Outcomes	This chapter revisits the findings through the case studies. The role of power bases is examined in the case studies to complement the literature in explaining the behaviour of project actors in the early stages of a project. The findings are discussed and evaluated under the new paradigm of power.
7	The Theory of Participants' Power Asymmetry	A hypothesis is formed in line with the critical review of the literature that supports the observation. The participants' power asymmetry theory (PPA) is presented in this chapter. The theory is proposed as an abductive explanation to the behaviour of project actors in the early decision processes such as in the approval stage. The theory looks forward to exploring and theorising the way that participants' power asymmetry goes through a decision-making process and influences the project outcome. This emerges from public hearing data, cases studies and audit reports. The theory uncovers new aspects of the planning fallacy, which remains a problem in public project delivery. Definitions, assumptions and fundamentals of this theory are presented and discussed in the context of infrastructure delivery.
8	Recommendations and Validation	The results of a professionally moderated workshop of project experts that was held to verify the findings and validate the proposed theory are presented and discussed.
9	Conclusions	The contribution of research to the current body of knowledge is presented. Future ideas as an extension of this research are contemplated and advised.
	References	References are listed.
	Appendices	The title and dates of the public hearings that fed the analysis process are listed. Ethics approval documentations are annexed. Details of the expert workshop are presented. The link to the cloud-based repository that includes the generated coded data is listed.

Sensible research should review the literature to discover the existing body of knowledge in the domain, before any endeavour to hypothesise a new understanding. The early study of large infrastructure projects shows that many projects face severe problems in achieving the terms of their plans or satisfying their stakeholders. The fact that any shortcoming in the initial stages of a project will invariably become a larger issue with a higher cost of rectification turns our attention to the planning stage for a solution that might help projects produce a better outcome. In this sense, success is a keyword that requires more elaboration. Furthermore, a detailed review of the literature (including any guidelines or standards in the domain of project delivery) has been undertaken to explore any identified problems in project planning or any mechanisms that have been proposed or applied to address those problems.

The next chapter provides a critical review of the literature and gaps in the literature that might also help in the development of a tool to improve project outcomes.

2. Literature Review

This chapter reviews the literature to identify the issues that projects may face in realising success, their strategies to overcome failure and the shortcomings of those strategies. The aim of this chapter is to gain a comprehensive understanding of what has already been done to address the difficulties of projects not delivering on their expectations.

The chapter clarifies what is working and what is not working in project management and delivery. It also addresses what may need refinement and explores what else could/should be considered to improve infrastructure delivery.

This chapter studies the literature of global knowledge of project delivery. Theories from the areas of project management, decision science, and politics enrich the discussion. The structure of this chapter covers three major sections:

1. The context and process of project delivery, its main constituencies and the challenges;
2. The strategies that project practitioners and researchers may apply to improve project delivery processes;
3. Explanation of the shortcomings of the strategies, i.e. why do they not fully work on a complex project delivery system.

This chapter paves the way for a new insight toward understanding the complexity of infrastructure delivery.

2.1. Public infrastructure delivery

It is essential to understand the context of project delivery before reviewing the existing issues. To grasp the context of public infrastructure delivery, the constituencies and the incentives of people working in this context are studied. The definition of success is reviewed. The literature on the processes of public infrastructure delivery, the agencies that make decisions, their role are described. The common practices of business case proposals and project reviews as they run in the delivery of public infrastructure are reviewed. Then the performance of projects is analysed to find out the major issues in infrastructure delivery.

2.1.1. The context of public infrastructure delivery

This section presents the context of infrastructure delivery in Australia. It reiterates the role of infrastructure for the community's standard of living and quality of life and highlights the duty of governments in the delivery of projects that achieve value for money. Communities need infrastructure to survive. A government should manage the existing assets but also must allocate funds for

new assets. In the presence of numerous opportunities for funding, a government is challenged to deliver a project with not only positive value for money (often considered as a benefit-cost ratio > 1) but the highest value for money. Resources are always limited. Resource constraints are embedded in the structure of any organisation including a government. Hence, resources are carefully allocated by the central agencies, such as cabinet and treasury to other government agencies such as functional departments (health, transport, justice and education are examples). In this arrangement, delivery agencies are expected to identify needs or opportunities. They inform the central agencies through a business case that packages the need and opportunity in an investment appraisal proposal. Central agencies receive, analyse and allocate funds to the most deserving projects according to the merit of their business case.

Fitzgerald produced a report on Victorian infrastructure investment and noted that it had been continually decreasing. It was at its lowest level since the 1940s (Fitzgerald 2004) Later studies confirmed the need for an increased level of infrastructure funding from both public and private sectors (C. F. Duffield, 2001, p. 23). As of 2005, the Victorian government had entered sixteen contracts valued at about \$10 billion with another \$10 billion in the pipeline (Public Accounts and Estimates Committee, 2006). After the global financial crisis, infrastructure funding faced difficulties, and the private sector became risk-averse. While smaller Public Private Partnerships (PPPs) or those with a higher security of provisions could access private finance, there was a reduction in the number of PPP projects thereafter. However, Victoria remained a pioneer in running PPPs. In 2011, PPP contracts accounted for almost 10% of state capital expenditure, more than other states in Australia. (Regan, Smith, & Love, 2011, p. 7).

2.1.2. Successful infrastructure delivery

Everyone tries to define project success, but until now no agreement on the elements necessary for success exists between practitioners and academicians (Prabhakar, 2008). A very simple definition based on a reading of the literature suggests that it could be as simple as “success of a project can be defined as a project embracing and achieving its goals”.

There needs to be a distinction between project success and project management success. Project success concerns the utility or usefulness of a project, but project management success is more or less about performance, e.g. time and cost (de Wit, 1988). The difference is also identified as project success versus product success (Baccarini, 1999).

Cost, time and quality are known as the ‘Iron triangle’, and they were the key measurements of success for half a century (Atkinson, 1999) yet there are

researchers who see time and cost as the easiest but not the most effective ways to measure it (Prabhakar, 2008). Many observe the iron triangle as shallow and insufficient criteria for success (Prabhakar, 2008). Time and cost are estimated when we know least about the project, and they are finally measured when the project is over. This restrains their influence over the performance during a project lifetime.

Techniques such as Earned Value Analysis (EVA) aim to overcome this problem and measure time and cost performance of the project during the project implementation (Nagrecha, 2002). However, EVA real-world benefit is to provide a more accurate estimation of cost and time during implementation and provide a recommendation on how to expedite it. Moreover, EVA has at least three assumptions that constrain its application in realising success. First, it relies too much on the original or updated plan (baseline), second it assumes measurement of value is easily possible by observing the progress of work packages, and third, it assumes project direction will change according to EVA. EVA is unable to prevent a project from disappointment if the plan is flawed, the project is overly optimistic, or the project requirements are not appropriately identified (Lukas, 2008). These kinds of quantitative techniques are also powerless with the soft side of project management such as stakeholder management.

On the other hand, time and cost fail to measure the utility of a project product. Despite a reasonable performance of time, cost and quality, the Sydney Cross City Tunnel raised anger in the community, partly due to the high toll (\$3.65 each way), and the disruption caused by changes in local street access to feed more cars to the tunnel (Parliament of New South Wales, 2006). Measuring success requires a broader framework that includes not only time and cost but also the project product.

Although there are criteria to measure success, it is also a matter of perception that is hardly in consensus among all of the stakeholders (Baccarini, 1999). Definition of success may change over time; a perceived failure may become a landmark success in the next decade. A classic Australian example is the Sydney Opera House. We should note that success and failure are not absolute terms, there is a continuum in which success and failure can be defined, i.e. success could be partially realised (Baccarini, 1999).

Nevertheless, the complication of the concept of success did not stop researchers investigating its definition, driving factors and criteria. Researchers have different classifications of success criteria (Al-Tmeemy, Abdul-Rahman, & Harun, 2011; Chan, Lam, Chan, Cheung, & Ke, 2010; de Wit, 1988; Shatz, 2006; Shenhar & Levy, 1997), but according to the prevailing insight success is more than just project management performance reflected in measurable outcomes but also includes project function and utility that is

mirrored in stakeholder satisfaction. The definition of success is still under discussion in the literature. In general, the definition has been expanding in the past decades by including more elements that have been overlooked previously. Success has been defined in various dimensions such as the level of effectiveness (Baccarini, 1999), minimum opportunity lost, and utility of the product. In the broad sense, success means a project embracing its goal. However, this definition loses its clarity when people try to define value. Figure 2 depicts the elements of comprehensive success measurement.

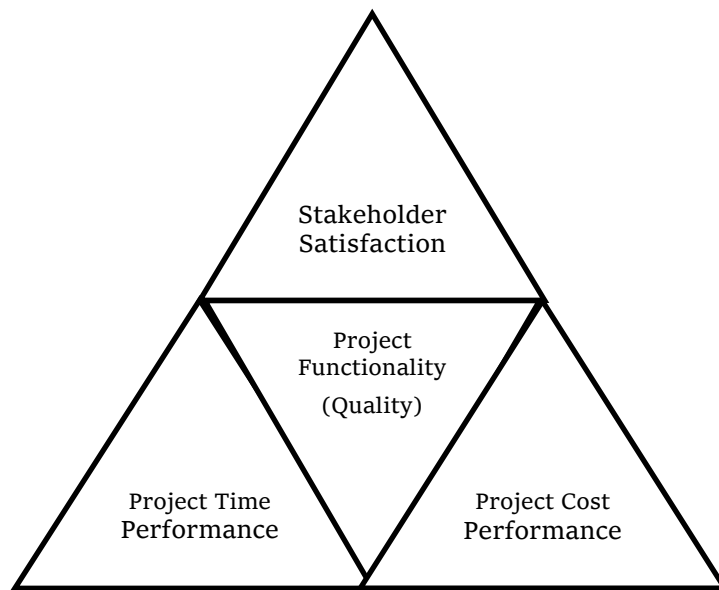


Figure 2. Project success criteria

Success is a matter of perception and the perception of success changes over time (Pinto & Mantel, 1990; Shenhar & Levy, 1997). Success is meaningless in isolation. A comparison, benchmark, opportunity or alternative provides a basis for ascertaining success. Perception of success changes over time since these contextual variables change and because those who perceive the ups and downs of a project, e.g. cost overruns and delays become less significant with time (Shenhar & Levy, 1997) because there are factors that become more important such as project efficiency, product utility and customer satisfaction.

A list of success criteria given by Kerzner (2001) includes elements of cost, time, organisational consistency and customer satisfaction. The Logical Framework Method (LFM) extends the definition of success to the complete spectrum of project goal, purpose, output and input (Baccarini, 1999). Success has two components in this framework, product success and project management success. While a project team focuses on project management success, the success of the project product depends on the project being able to fulfil its anticipated purpose. Product success oversees management success although it is influenced by the performance of project management. The Project Management Institute also acknowledges the difference between project

success and product success by issuing two separate standards, i.e. PMBOK for project management and PfMP for portfolio management (Project Management Institute, 2006, 2009). The former expects to help to do a project right; the latter helps to do the right project. Pinto and Mantel (1990) identified three dimensions of the performance largely contributing to success or failure of a project, the implementation process, the value of project product, and customer satisfaction. Another classification of project success suggested by Shenhar and Levy used four distinct measurements of project efficiency, impact on the customer, business flexibility, and future horizon (Shenhar & Levy, 1997). Any criteria for success should be mindful of the long-term and broader outcomes of a project for the wider community (Engineers Australia, 2010).

The endeavour for a better outcome in projects uses success factors to realise successful outcomes. The Association for Project Management defines project success factors as “management practices that, when implemented, will increase the likelihood of success of a project” (APM, 2012, p. 32). Project success factors actively try to improve the project outcome up front when the possibility of change still exists, and the cost of change is rather low.

There have been significant efforts by researchers identifying, analysing and categorizing success factors in projects (Sayles & Candler, 1971; Martin, 1976; Baker Murphy & Fisher, 1983; Cleland & King, 1983; Lock, 1984; Morris and Hough, 1987; De Wit, 1988; Pinto & Slevin, 1989; Shenhar & Levy, 1997; Jamali, 2004; Bryde & Robinson, 2005; Trafford & Proctor, 2006; Jacobson & Choi, 2008; Xu & Duffield, 2011; Cheung, Chan, & Kajewski, 2012). Table 2 summarises the overlapping success factors derived from the literature and shows that the majority of success factors are concerned with project processes or project people who make decisions and contribute to the project.

Table 2. The literature of project success factors

Success factor	Sayles & Chandler (1971)	Martin (1976)	Baker, Murphy and Fisher (1983)	Cleland & King (1983)	Lock (1984)	Morris & Hough (1987)	De Wit (1988)	Pinto & Slevin (1989)	Jamali (2004)	Bryde & Robinson (2005)	Trafford & Proctor (2006)	Jacobson & Choi (2008)	Cheung (2012)
Clarity of project goal		+	+	+		+	+		+			+	
Effective planning and estimations	+		+	+		+	*				+		
Risk management						+			+			+	+
Control and monitoring	*	*	+	+	*		+	*	+				
Resource management		+	+	+			+		+				
Communication				+	+			+		+	+	+	
Organization		*		+			+	+					
Politics				+		+	+	+				+	
Appropriate contractual framework						+	+		+				+
Legal framework			+										+
Responsibilities and delegations		+							+			+	
Competent project manager	+		+	+	+		+	+					
Competent project team			+	+			+						+
Top management support		+		*	+			+				+	
Culture and collaborative attitude								+	+	+	*	+	
Stakeholder involvement				+		+		+				+	
Commitment and ethics	+		+		+					*		+	+
Others			1	2			3	4	5		6	7	8
+ listed as a success factor (in exact word or affiliated terms)													
* listed repeatedly													
1 Minimum start-up difficulties 2 Acquisition 3 Human factors 4 Environmental events 5 Avoid monopolistic situation 6 Direction 7 Expert Advice 8 Stable macroeconomic conditions													

A reading of the project literature shows that there has been relatively little research on how project people behave and influence a project. Research is required to investigate areas of process and people and their interactions in the early stages of a project that are deemed primary and more influential. While there have been attempts to highlight the critical role of decision-makers in projects through emphasizing the competency of project parties, communication, collaboration and commitment, so far, the theory behind people's conduct needs to be explored further as much as a new theory is required to explain project participants' behaviour in making early-stage decisions.

2.1.3. Infrastructure delivery processes

Cleland and Ireland define a 'process' to be "a series of steps that bring a result". In a project, it is 'all the steps required to achieve the outcome' (Cleland & Ireland, 2007). Project processes have been the core focus of developing success factors (Patel & Robinson, 2010; Xu & Duffield, 2011).

Project processes imply two processes in parallel, one with regards to project governance and the other to the project life cycle (Department of Infrastructure and Transport, 2011). Project governance is the ruling process that organises the decision-making and authority of people in the projects. Life cycle processes, however, deal with the flow of project activities in a series, parallel or spiral delivery process.

The proper interaction of project, people and process is a vital element in achieving what is expected. The international guidelines in project management emphasise that three attributes of a project are process, people and organization (Crawford, 2004). There, process implies life cycle processes, the organisation is related to project governance, and people is concerned with competency. PMBOK focuses on project process (Project Management Institute, 2009), PRINCE2 on the organisation (Office of Government Commerce (OGC), 2009b) and IPMA-ICB on project people (Association for Project Management, 2015); see Figure 3. The Project Management Institute (PMI) identifies five project processes i.e. initiation, planning, execution, monitoring/controlling and closing as well as forty-two project management sub-processes grouped into nine knowledge areas of integration, scope, time, cost, quality, human resource, communication, risk and procurement (Project Management Institute, 2009). The International Project Management Association (IPMA) introduced its competency baseline known as ICB to equip project people with required qualifications in four dimensions of knowledge, attitude, skills and experience that could be measured in three ranges of technical, behavioural and contextual competencies (International Project Management Association, 2006). The Office of Government Commerce (OGC) in its PRINCE2 guide distinguishes project steps to be pre-project, initiation, executions (in multilayer rotary procedure), and closing (Office of Government Commerce (OGC), 2009a). The competency of project, people and process are amplified in those guidelines. It is understood that people and organisations require certain capabilities and must follow a prescribed routine to ascertain expected outcomes.

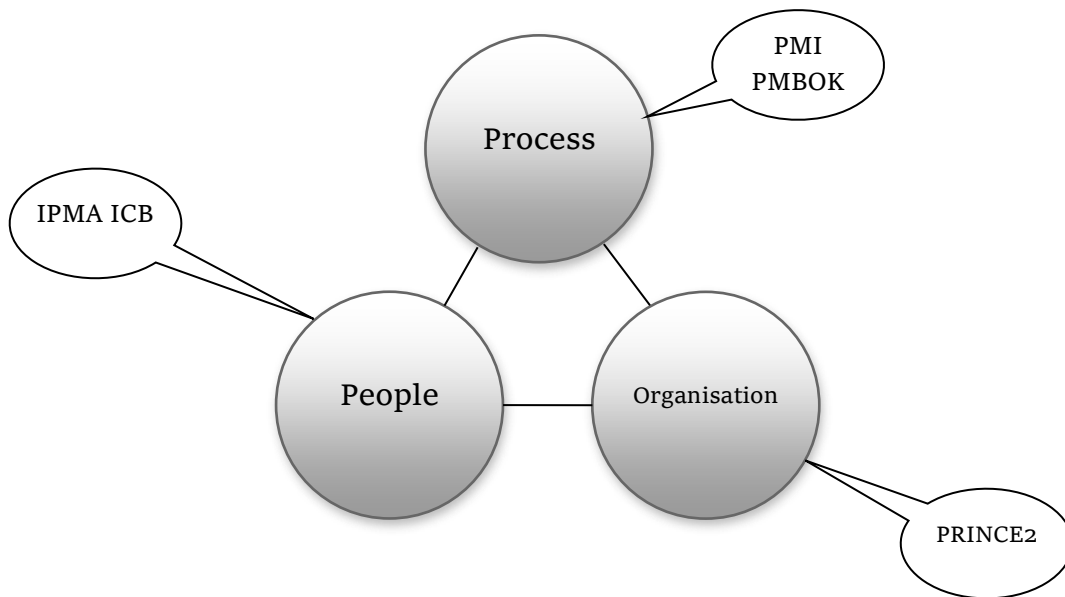


Figure 3. Classification of project management guidelines based on Crawford (2004)

The Project Life Cycle (PLC) is the cycle of project stages from concept to development and finally implementation. PLC addresses the acquisition strategy of a project, i.e. how a project plans to deliver the product. The prevailing acquisition strategy in infrastructure projects uses a waterfall or cascade model of development that is suitable when the cost of rework or change is high. Each stage comes after the other with all the necessary preparation.

The current processes in infrastructure such as those in the Australian National PPP Guideline (Australian Government, 2008), National Alliance Contracting (Department of Infrastructure and Transport, 2011), Gateway Review Process (Department of Treasury and Finance, 2009), Approval processes for major infrastructure (Infrastructure Australia, 2009), and Investment Evaluation Process (Department of Treasury and Finance, 1996) put forward guidelines that elaborate a sequence of stages. An authority makes a review point gate at each stage before moving to the next stage. Although each stage might have a cyclical flow internally, the whole process is a linear one-way stream.

Another theme in the development models is the spiral model in which a prototype is continuously improved until the satisfactory product is developed. In ICT projects, the agile development model is more popular. Agile is a spiral acquisition strategy more common in large defence projects. It is optimised for smaller teams with lots of overlapping and less certainty of the requirements and scope. Management Life Cycle, on the other hand, refers to the processes that repeat in every phase, i.e. Plan, Do, Check, Act (Srivannaboon, 2008). It is a continuous effort by a project team to keep a project on track. PLC and other processes should work in harmony for a project to deliver a successful outcome.

It requires efforts from project people working in the processes to produce a successful outcome.

No single acquisition strategy is deemed the best for all projects. A project should carefully follow the most appropriate strategy while a tailor-made strategy may suit a unique, one-of-a-time, project. Table 3 lists the merits of the Waterfall, Spiral and Agile acquisition strategies.

Table 3. PLC acquisition models (Adel & Abdullah, 2015; Barry, 2012; McCormick, 2012; Sureshchandra & Shrinivasavadhani, 2008)

Acquisition	Progress model	Control measures	Risks	Best for
Waterfall	Systematic progress according to the initial plan. Project stages end and prepare for the next stage until the final product is delivered.	Gateway review evaluates and controls the progress in comparison with baseline requirements.	High cost of change when this happens	Large projects with well-defined scope of WBS with known requirements, e.g. less technology sensitive infrastructures
Spiral	A prototype is developed and repeatedly improved in harmony with the initial plan until the expected requirements are realised.	The project prototype is compared with the final requirements to measure and control the progress.	Less certainty in time and cost	Large or small size projects with uncertainty in the scope of work but confidence in the final requirements, e.g. Defence, ICT
Agile	An attractive product is followed and progressively improved until it satisfies the stakeholders.	A progressive baseline is developed based on a benchmark and updated according to the early performance of the project. The project is evaluated based on the competency of the project team and benchmark with other products.	Uncertainty in time and cost	Small to medium size projects with high uncertainty in scope and requirements, e.g. ICT

In the public sector, the acquisition is an ongoing process to deliver asset-based enablers that serve the community. Hence, governments tend to review and improve this process to increase the value of their investment. This process is a continuous cycle of planning, implementation, monitoring and improvement (Victorian Auditor-General's Office (VAGO), 2007). The need for a change in the process explains the regular updates in the process of infrastructure delivery by the government and the need for a tailor-made process for some projects. The need for change has urged governments to establish and update acquisition processes to face the unusual challenges in the delivery of public infrastructures. In December 2010, Australia began using a revised approval process for large infrastructure projects named high value/high risk (HV/HR).

The new process responded to the previous shortcomings in the approval regime and added extra control measures including active monitoring throughout project lifetime (Department of Treasury & Finance, 2012).

Within an individual project, however, the opportunity for enhancement of the acquisition process is reduced or narrowed when the contract is signed. Contracts are customarily written considering the worst-case scenario if the interests of parties disagree. Although no contract is theoretically complete (Hart, 2003; Tirole, 1999), they aim to leave no room for ambiguity when the contract is active. That means improvement or change in an acquisition process is extremely hard when a contract is effective. The application of any lessons learnt is only practical in the next project. As a result, the planning stage of an acquisition process is a critical step in getting the best outcome in that project. Planning for procurement requires applying lessons learnt from previous acquisitions to improve the process accordingly.

Project processes in large infrastructure projects usually follow a waterfall model. Figure 4 exhibits the steps that an infrastructure project should follow from concept to realisation. The one-way waterfall model emphasises the role of early decisions in the process.

	CONCEPTUALISE	PROVE	PROCURE	IMPLEMENT	REALISE
	<i>Establish a clear need, define likely benefits and explore strategic interventions</i>	<i>Explore project options and estimate costs to validate value-for-money and solution viability</i>	<i>Finalise procurement plan, specify requirements, engage the market and award contract</i>	<i>Implement solution and transition to normal business</i>	<i>Measure the success of the investment</i>
	<i>Confirm the need</i>	<i>Recommend an investment</i>	<i>Award a contract</i>	<i>Deliver the solution</i>	<i>Deliver the benefits</i>
Outputs	Strategic assessment (non-High Value/High Risk) Preliminary business case (if High Value/High Risk)	Full business case	Expression of interest Request for tender Contract Project status reports	Project status reports	Project wrap-up report Investment evaluation report
Guidelines	Investment lifecycle overview Conceptualise guideline	Prove guideline	Procure guideline	Implement guideline	Realise guideline
Tools	Project profile model IMS tools Investment decision-maker's checklist	Project profile model IMS tools Investment decision-maker's checklist	Procurement tool		Benefits realisation tool
Gateway	Gate 1: Concept and feasibility	Gate 2: Full business case	Gate 3: Readiness for market Gate 4: Tender decision	Gate 5: Readiness for service	Gate 6: Benefits realisation
	<i>Government filtering</i> →	<i>Government funding</i> →	<i>Government approval</i> →	<i>Government monitoring</i> →	<i>Government evaluation</i>
<small>*High Value/High Risk (HVHR) investments include some further specific requirements. To find out more about HVHR investments, read the <i>Investment lifecycle and high value/high risk guidelines</i> at www.lifecycleguidance.dtf.vic.gov.au</small>					

Figure 4. The Victorian investment lifecycle framework (Department of Treasury and Finance, 2012)

The Victorian Auditor-General (2007) mentions several principles that should be considered when the public acquisition is carried out. The list includes value for money, open and fair competition, risk management, transparency, probity, and accountability (Victorian Auditor-General’s Office (VAGO), 2007, p. 3)

2.1.4. Infrastructure approval processes

The approval regime is believed to be a key factor in achieving project success. The approval regime includes decision points that decide if a project should progress, be revised, or discontinued. Approval processes are structured decisions in the form of decision points that carry the project from one stage to the next (Department of Infrastructure and Transport, 2011).

Gateway review is a method of project governance that has been embedded in project processes by the Australian state governments from the early 90s to mitigate unexpected outcomes in public works. The UK Office of Government Commerce (OGC) inspired the gateway process. The Australian Commonwealth government defines gateway review as “a structured process whereby reviews are carried out at key decision points in a program or project’s life cycle” (Commonwealth of Australia, 2010, p. 10). It also specifies the aim for such a review is to support the project team, stakeholder involvement, and apply any required corrections before it is too late.

Figure 5 depicts the project life cycle in parallel to the corresponding gateways. As the project progresses like a waterfall, the inertia and cost of change are amplified. Consequently, early project reviews including tendering (Xu & Duffield, 2011) are noteworthy decisions project faces which can significantly influence the final outcome.

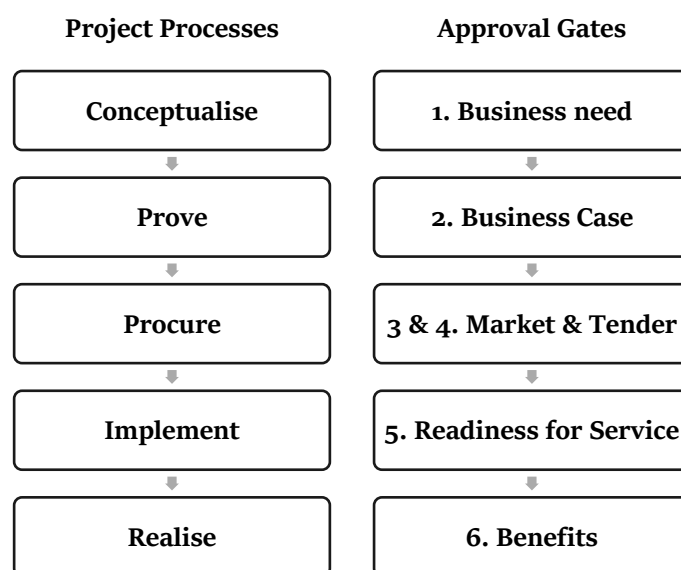


Figure 5. Project life cycle framework based on (Commonwealth of Australia, 2010; Department of Treasury and Finance, 2012)

The process of decision making and organising project teams has been nominated as one of the research areas that need more investigation (C. Duffield, 2011, p. 4). Reviewing the current approval process in major projects suggests room for improvement (Public Account and Estimate Committee (PAEC), 2012; Victorian Auditor-General's Office (VAGO), 2012). The early processes in projects demonstrate that they can have a high impact on project outcome and deserve more attention.

2.1.5. Infrastructure project business case

Governments may have many alternative investments, but their single objective of maintaining value for money prevents them from wasting money on sub-optimal opportunities. Before a government commits to investment, a plan is needed to assess its value. This investment plan is a business case. This section explores the content of a good business case and reiterates the importance of a reliable one in realising success and maintaining value for money.

The business case provides government (or the investor) with the information needed to make an informed decision based on the merits of an investment proposal (Department of Treasury and Finance, 2008, p. 1). An important part of strategically managing a business is ensuring that adequate resources are available for initiatives and developments, e.g. when the usual budget is not sufficient to fund a need, external resources should be mobilised. Senior executives should be informed of the requirements and then approve any additional funding.

The Victorian Department of Treasury and Finance defines a business case to be "A document that forms the basis of advice for executive decision-making for an asset investment" (Department of Treasury and Finance, 2008, p. 15). A business case is a documented proposal to meet a clearly established service requirement. It considers alternative solutions and identifies assumptions, benefits, costs and risks.

A business case is developed when funding is required in addition to the usual department-operating budget. This is usually due to an opportunity or need for a major project or initiative. The driver behind a business case might be political, functional, social or economic.

Benefits of a business case are many, including those listed in DTF guideline for a business case (Department of Treasury and Finance, 2008):

- Confirming the service need, including how it aligns with government policy objectives
- Evaluating the costs and benefits of alternative proposals for meeting an identified service need (including non-asset solutions)

- Clarifying the key assumptions, risks, timeframes and costs on which the initiative is based
- Evaluating project progress by continuously referring back to the business case and benchmarking actual versus planned performance
- Tracking and evaluating benefits
- Identifying funding sources for the proposal
- Improving accountability for the proposal and increasing management's ability to monitor whether it achieves set milestones and key outcome

At a minimum, a business case should cover the need or requirements, options that address the need or requirements, analysis of options for their cost and benefits and recommendations regarding the preferred option, risk identification and mitigation strategies, and implementation strategy (State of Victoria, 2010). A business case should also include strategic assessment. A more informed decision is likely by an investor if the scope of work fits wider departmental and government strategic objectives.

The stated benefits, opportunities and options that are presented in a business case should be reliable and include realistic assumptions. Assumptions and constraints in a business case underly the analysis and so essential to establish the credibility and rigour of the business case (Department of Treasury and Finance, 2008). In Victoria, the development of a business case should be based on the logic in the investment logic map that sensibly connects investment drivers, objectives, benefits, changes and enabling assets (Department of Treasury and Finance, 2010).

Some delivery agencies may have very specific criteria for determining the need for a business case. Other agencies may have a less formal method for obtaining additional resources. Nevertheless, when a central agency such as DTF (Department of Treasury and Finance) is expected to fund an initiative, a business case is required to support and substantiate the project boundaries and stakeholder expectations.

2.1.6. Project appraisal

A need is the beginning point of a project. The need for a project has roots in economic, social or political drivers. A minimum level of attraction is required in each driver. In public projects, the weight of social and political drivers is higher, but the economics of the project is also an imperative, which is measured in terms of value for money. DTF expects that a project should be evaluated and appraised for its merits to create value for money. Governments apply a pre-decided regime known as an evaluation process or appraisal regime to assess the project business cases for their merits and compare them against

each other for a successful portfolio of projects that contribute to the strategic objectives of the government.

The Victorian government follows strict principles in the evaluation of public project delivery. One of these processes is an investment evaluation process published by DTF. In response to the low investment levels since the 1940s, in 1991 the Victorian infrastructure investment guidelines were updated (Fitzgerald, 2004). The DTF has published a new process of evaluation in 1996 that consists of three main consecutive steps, i.e. make a clear objective, and then make the decision to proceed, and finally manage the implementation. Among them, 'decision to proceed' has five sub-activities. First, the possible options must be contemplated, i.e. assets versus non-asset options need to be considered to assess the presence of the private sector. Second, financial analysis of the project needs to be done, e.g. selection of a discount rate is important since it has a key effect on public sector comparison, revenue or non-revenue investment, cash flow analysis and scenario analysis are all in this section. The third step is a socio-economic assessment that assesses project impact on household, business and other stakeholders. The fourth step integrates socio-economic measures with financial ones. The last step involves risk management. It includes non-project and projects risks, i.e. if the private sector is yet to be involved, private risk, the risk of private sector default or failure in project objectives (Department of Treasury and Finance, 1996).

Within the evaluation process, systems analysis and system thinking are required when alternatives are analysed in the early stage of a project. Frameworks such as multi-criteria analysis (MCA) or multi-objective decision-making (MODM) are used to provide a structured comparison of alternative criteria or objectives. Although this process looks straightforward and free of confusion, in a large project it can be a tedious long-term process with many surprises (Priemus, 2008, p. 115).

2.2. Existing strategies to achieve success

Project decision makers deploy a variety of strategies in preventing projects facing the difficulties or handling project issues when they occur. This section identifies and reviews four strategies: governance, stakeholder management, procurement, and upskilling strategies used by the public sector to improve the quality of decision making particularly in the early stage decisions in infrastructure projects.

2.2.1. Governance strategies

The definition of project governance sits under the concept of corporate governance. Although the term governance shows a long trail of theory and application in corporations, it is rather new to the project domain, e.g. project

managers hardly recall project governance when they are asked to list project success factors (Wilson, Pelham, & Duffield, 2010b, p. 209). A survey in Australia from experts and project practitioners has identified that nearly 70% of respondents believe that organisations don't understand the differences and/or the linkage between corporate and project Governance (Caravel, 2013, p. 10).

APM (2012) applies the term governance in corporations with portfolios, programmes and projects and defines governance as a set of policies, regulations, functions, processes, procedures and responsibilities that define the establishment, management and control of portfolios, programmes and projects (APM, 2012, p. 8). In APM's definition, project management is a part of corporate governance. Shannon (2004) believes that project governance is a result of corporate governance overlapping with project management within organisational perimeters (Shannon, 2006). In this view, governance acts as a powerful "magnetic field" that corrects project management processes from deflection. Bekker and Steyn (2009) try to find a common definition of governance in large capital projects by questioning a panel of experts across different jurisdictions (Bekker & Steyn, 2009). Their study found project governance as a subset of corporate governance. They defined governance "as 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." (Bekker & Steyn, 2009, p. 91).

The term governance is the missing link between the processes and decision makers by focusing on authority and responsibility of project people (decision makers) who follow the processes to produce an expected outcome. Project governance has been identified as a critical success factor (APM, 2012; Wilson, Pelham, & Duffield, 2010a) in implementing a successful project. Project governance deals with organising project people, applying best processes and maintaining the project and people on the right track. In doing so, project governance keeps project decision-makers accountable for their actions and achievements.

It is critical to have effective governance to manage an effective approval process in the early stages of a project to select the right project among investment options. Good governance features effective review processes and a competent and committed project team (Mott MacDonald, 2002, p. 27).

In the Victorian public sector, around 300,000 people in more than 550 entities such as departments, statutory bodies and local government are involved in public project deliveries. Public sector project delivery is Australia's third largest business with a revenue of \$60 billion and existing assets of over \$200 billion (Pearson, 2013). According to Figure 6, in Victoria, the parliament,

auditor general and Ombudsmen (as representative of the public) oversee project delivery performance.

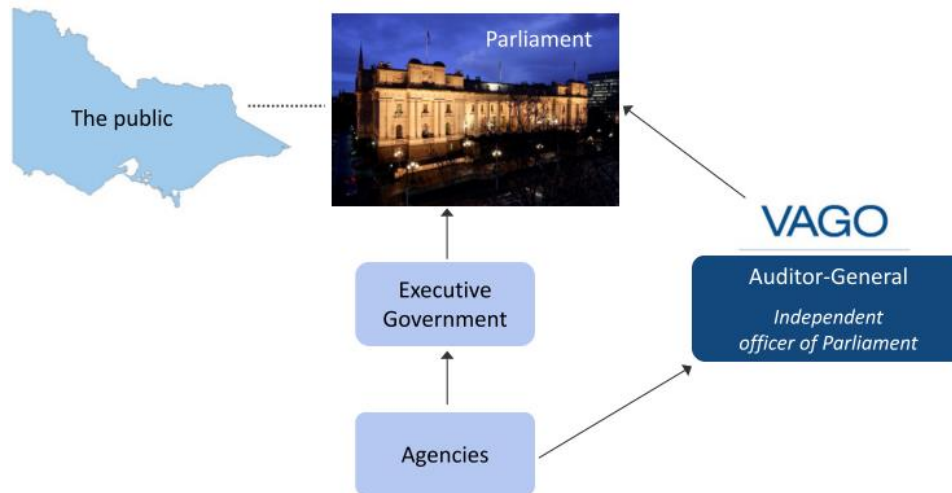


Figure 6 External independent auditor of the public sector (Pearson, 2013)

Despite the importance of project governance in project success, an approved governance plan only exists in 13% of the observed project cases in Caravel’s study (Caravel, 2013, p. 4). It shows that project governance as practised today does not currently support the effective execution of projects (Caravel, 2013, p. 19). It also appears that the delivery systems of project governance in Australia are generally dysfunctional (Caravel, 2013, p. 5). The failure of project governance in Australia is likely to be having a major impact on the economy as measured by GDP and Corporate Shareholder value (Caravel, 2013, p. 19).

The reliability of a business case has been a frequent appeal by auditors in Victoria (Victorian Auditor-General’s Office (VAGO), 2010, 2011). Caravel notes that 76% of governance decisions fail to attain the right balance between the project and business needs (Caravel, 2013, p. 12).

In large infrastructure projects, the magnitude of investment, long-term impacts on the community and the uncertainty of wider impacts escalate the importance of the decision-making process. On the other hand, ex-ante evaluation of a project is vital to maintaining the quality of decision-making in mega projects (Wee & Tavasszy, 2008, p. 40).

The quality of decisions in each stage of a project depends on accurate estimation of project impacts and ramifications. Flyvbjerg’s study of 258 projects concludes that cost overruns are very common that implies inaccurate estimation of cost. Moreover, the estimation of project impacts has remained constantly and remarkably inaccurate for decades (Flyvbjerg, 2006). In addition to the inaccuracy of cost estimation, erroneous estimation of benefits such as demand and wider economic benefits is also an issue. SGS’s study of four major infrastructure projects in Melbourne shows that they all outperform

the initially expected benefit for the community (SGS Economics & Planning, 2012). Despite all efforts, the improvement in forecasting accuracy seems insignificant.

In Victoria, the government introduced the Gateway Review Process (GRP) in 2003 to improve project selection, management and delivery (Victorian Auditor-General's Office (VAGO) 2013). Department of Treasury and Finance is a central agency with major responsibility to implement GRP by selecting, funding and supervising appropriate business cases in public delivery.

In December 2010, Australian authorities began to use a revised approval process for large infrastructure projects named high value/high risk (HV/HR). The new process responded to previous shortcomings adding extra controls including active monitoring throughout project lifetime (Department of Treasury & Finance 2012).

Since 2011, the gateway review process mandated that all high-risk projects had to follow specific processes. The HV/HR process applies to all public sector infrastructure investments that are likely to draw on budget funding, have a total estimated investment greater than \$100 million, considered high risk using an approved risk assessment tool, or determined by the government as warranting the rigour of increased oversight (Victorian Auditor-General's Office (VAGO) 2014a).

But according to the Victorian Auditor General (VAGO), although GRP (Gateway Review Process) is a valuable concept capable of assisting better performance in project delivery, its implementation in Victoria identified a number of missed opportunities (Victorian Auditor-General's Office (VAGO) 2013, p. vii). VAGO identified 62 projects valued at \$4.3 billion that was not included in the GRP between 2005 and 2012. DTF's management of the GRP prior to the introduction of the HV/HR process did not adequately recognise that some agencies might seek to avoid the GRP. VAGO observed that none of the projects commencing the GRP had completed all of the six Gates. The opt-in nature of the process also allowed agencies to withdraw, and many withdrew after completing only the first two Gates. According to the statistics until May 2013, nearly 70 percent of the projects have completed two or fewer Gates (Victorian Auditor-General's Office (VAGO) 2013, p. ix). As a result, the potential benefits of the GRP have not been realised.

VAGO demands a proactive role of DTF in running GRP in Victoria by applying the following recommendations (Victorian Auditor-General's Office (VAGO), 2013b, p. xi):

- Verify the inclusion of projects for GPR more rigorously,
- Re-establish an oversight committee and report to government,
- Strengthen GRP quality assurance processes,

- Track and report GPR improvement in the outcomes of completed projects,
- Actively monitor delivery agencies' action,
- Complete the database and build case studies for sharing lessons learned.

In June 2014, VAGO issued similar even more comprehensive recommendations for DTF to undertake in implementing the Gateway review process implying that the expected improvement had not been realised (Victorian Auditor-General's Office (VAGO), 2014).

2.2.2. Stakeholder management

According to some researchers, success is a product of proper management of stakeholder expectations. Stakeholders' engagement and collaboration in a project were repeatedly mentioned as a lead factor in project success (Cleland & Ireland, 2007; Song, Li, & Wu, 2009; Yang, Shen, Ho, Drew, & Chan, 2009). One effective strategy to achieve success is to manage stakeholders interest and influence over a project.

Among definitions for 'stakeholder' that are reported by Mitchel et al. (1997), Freeman's 1951 definition is the most comprehensive; "any group or individual who can affect or is affected by the achievements" (Freeman, 1951, p. 46). In projects, the definition of a stakeholder encompasses any group or individual influenced by the project or which may influence the project. The circle of stakeholders is broad and includes, while not limited to, governments, clients, contractors, consultants, lenders, communities, environment and market.

Among the theories of stakeholder management, Mitchel et al. (1997) were the first to adopt a theory of stakeholder salience in projects with multifaceted, dynamic sources of stakeholder influence. The theory of stakeholder salience explains the attributes of stakeholders and relates the level of influence they might have. It identifies three attributes of power, legitimacy and urgency to be the foundation of stakeholders' influence (Mitchell et al., 1997). These attributes are socially constructed and are unstable. The theory builds a typology that provides seven distinct types of stakeholders (See Figure 7).

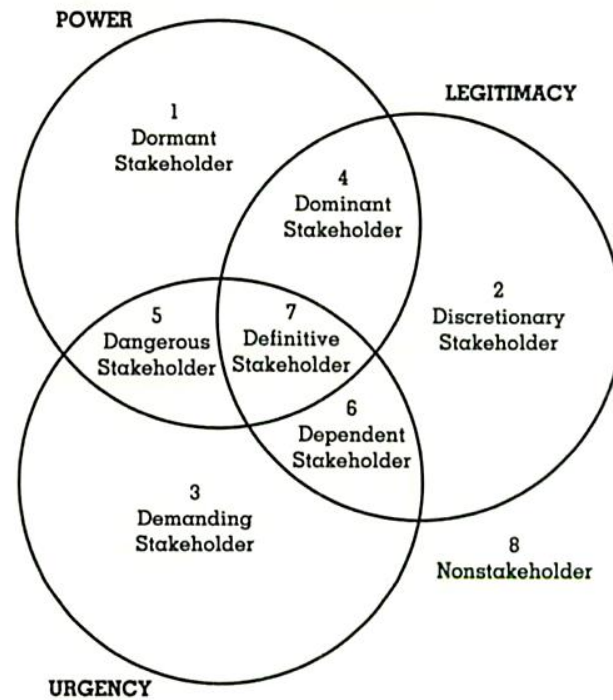


Figure 7. Stakeholder Saliency (Mitchell et al., 1997)

Primary Stakeholders are those with a legal obligation and higher influence on the decision process of a project (Cleland & Ireland, 2007). Primary stakeholders in public infrastructure projects with a prime role in the decision process are delivery agencies, central agencies, and private contractors. Table 4 describes their influence over project decisions.

Table 4. Influence of project participants on decision process of public infrastructure projects

<i>Project participant</i>	<i>Influence over decision process</i>
<i>Central Agency(s)</i>	Push forward a strategic need, Approve business case, Gateway reviews
<i>Delivery Agency(s)</i>	Identify the need and develop business case including selection of procurement strategies, govern the tender and project, and manage the contract
<i>Private Contractors</i>	Participate in tender, Implement the project to fulfil the contract obligations

Stakeholders are either primary, who have a legal obligation and higher influence, or secondary, who have less ability to affect a project (Cleland & Ireland, 2007). Stakeholders' power and interest play a great role in project outcome through their effect on communications and collaboration (Ayas, 1996; Nagadevara, 2012).

The influence of project participants on success is large. Excessive permission given to an incompetent project team ruins the effectiveness of project early decisions. The urge to get better outcomes necessitates a new project process

that manages power imbalance through decision-making and governance processes.

The next section reviews the literature on different procurement strategies that can be used to deliver a project. There is an extensive and growing literature on these strategies and methods.

2.2.3. Procurement strategies

One of the early decisions with significant impact on project outcome is the selection of a procurement strategy. A procurement strategy is a pre-defined method under which the project is delivered. Strategies used differ depending on the attitudes of decision-makers to sharing risk, responsibility, delegation and authority.

Governments sometimes need the private sector to deliver large infrastructure projects. Whether it is through traditional means of delivery or a formal partnership with the private sector, a considerable level of collaboration between project constituencies is required.

Examining the factors for a good partnership indicates the importance of early-stage decisions in a project. Success in partnerships are deemed important and discussed in the literature (Angelides & Xenidis, 2009; Chan et al., 2010; Cheung, 2009; Ibbs, Kwak, Chih, & Ibbs, 2009; Jacobson & Choi, 2008; Jamali, 2004; Li, Akintoye, Edwards, & Hardcastle, 2005; P. Osborne & P. Osborne, 2000; Wilson et al., 2010a; Xu & Duffield, 2011). A summary of success factors in projects in partnership between public and private are summarised in Table 5.

Table 5. Success factors in partnerships

<ul style="list-style-type: none"> • Clear vision, goal and plan of partnership • Strong central administrative agency in host country providing legal framework for partnership • Political support and facilitative regulation of host country • Stability of host government. • Stable macroeconomic condition • Competent, collaborative and active public sector • Clear and measurable deliverables, roles, responsibilities and boundaries of all parties • Front-End reliable and transparent feasibility study, economic evaluation and cash flow estimation • Transparent and realistic risk management and risk allocation • Getting community support 	<ul style="list-style-type: none"> • Selection of appropriate private sector(s) • Open communication at all levels • Giving identity to the project team recognized by all parties • Rigorous financial package • Trust and respect • Innovative behaviour of the private party is welcome by the public sector. • Provision of contract renegotiation and contract adjustment • Consideration of social and environmental responsibilities • Monitoring the project by public sector to avoid monopoly situation • Trust, openness and fairness asserted by all participants • Partnership is viewed as opportunity by all parties to be fulfilled together
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The choice of the delivery model between the private and public sectors needs to match the functional, political and social drivers of the public sector. Choice of delivery model is a significant decision in a project that comes within or after the development of the business case. Clients and contractors are best served when the project delivery system best suits the project requirements (Australian Constructors Association, 1999, p. 12). The process produces an agreement between project constituencies called a procurement contract. The process of selection is a delicate task and requires a well-written business case to help a client choose the most appropriate procurement model and the best private party to undertake the task.

In essence, every contract is unique and peculiar to the relationship between contract parties. However, there are similarities among contracts that help to classify them according to the resemblances they show in authority, incentives and risk allocation. Strategies for procurement vary according to the risk allocation and obligation of project parties ranging from a long-term full engagement model such as a PPP to a narrow scope of work in a construct only contract.

There are factors that influence the selection of an appropriate procurement strategy. In the UK, Deloitte(2008) suggests focusing on project characteristics such as size, divisibility, risks and residual value (Deloitte, 2008). Duffield (2010) believes that guidelines do not specify exactly how to choose the ‘best’ procurement strategy but instead give general principles as to what may be most appropriate. Duffield prescribes a generic set of criteria to choose the appropriate procurement strategy; it includes: project complexity, size, scope and design requirements, scope for innovation, future flexibility in design and operation, attitude to risk, timeliness, client organisational structure, budget certainty, market condition, stakeholder considerations, and public interest (C. F. Duffield, 2010). Table 6 presents the characteristics of different procurement strategies.

Table 6. Performance evaluation of different Procurement models (C. F. Duffield, 2001)

Criteria	PPP	Alliance	Managing Contractor	Design Build	In-house
Scope and design requirements	Good integration but hard to define	Defined collectively	Full control by the owner	Need to be well defined	Tendency for over specification
Ongoing fitness for purpose	Long-term certainty	High level of control but dependent on future budget constraints	High level of control but dependent on future budget constraints	Dependent on design and future budgets	High level of control but dependent on future budget constraints
Scope of innovation	Strong incentive for innovative design and implementation	Incentives for savings	Innovation only at the direction of the owner	Little requirement for innovation	Little incentive

Criteria	PPP	Alliance	Managing Contractor	Design Build	In-house
Future flexibility	Based on process rather than specification (limited changes)	Significant initial consideration but long-term based on future management	Based on future management	Based on future management	Lack of focus on whole of life of the project
Long term consideration	Strong focus on long-term outcome	Strong focus on best for the project. Not always long-term view unless decided	Often limited consideration of long-term issues	limited consideration of long-term issues	Often limited consideration of long-term issues

Traditional contracts such as ‘Construct only’ and ‘Design and Construct’ are well known for their straightforward governance. The contractor has almost no role in developing the project concept, and its liability in the project literally ends (usually the date of completion is some time after the provisional completion to give time to observe defects and quality of operation) when the project starts operation.

An Alliance is a scheme of delivery mostly known for relationship contracting where the risk and return are shared in a cooperative effort of parties pursuing a common outcome (C. F. Duffield, 2010). The main share/pain share mechanism is a significant motivator for both the client and contractor to achieve outstanding performance (Australian Constructors Association, 1999, p. 19). Typically the projects are complex and have numerous unpredictable risks. Alliances involve an integrated high-performance team, sharing all project risks and opportunities. A key factor in an alliance is a ‘no blame’ culture, and thus no disputes as participants are, by definition, endeavouring to achieve ‘best for project’ outcomes.

An alliance can take considerable time and effort to establish as, done well, an alignment of cultures is important for project success. High early development costs are involved with this approach as project teams build a mutual project culture and then undertake an in-depth assessment of project risks. There appears to be less commercial tension in an Alliance than traditional bidding and thus 'Value for Money' on the basis of competitive pricing can be questioned; the counter-argument to this is that the alignment of the parties and the desire for open communication makes it counterproductive to engage in the competitive behaviour. The engagement process is frequently a two-stage process. The first stage typically involves selection of parties on the basis of their expertise and fit to the project requirements, the second stage involves commercial alignment of the parties and results in an agree risk-adjusted

target price. A client carries significant risk for project outcomes under this strategy.

Coined in 1982 by UK government as private finance initiative (PFI), PPP is a long-term contract between the public and the private sector where the public sector pays a private contractor for the delivery of services, or in support, of the government’s broader service responsibilities (Australian Government, 2008). PPPs were employed in many areas including Australia, Europe, China, Middle-East and South Africa, as a vehicle to design, finance, procure and operate infrastructure facilities (Yescombe, 2002). In a PPP, the key features are long-term consideration, a holistic view instead of a construction focus, integrated responsibility of the private sector, value for money enshrined through a risk-adjusted public sector comparator, and well-thought risk allocation. PPPs offer private capital, expertise and competitive practices to increase the efficiency and effectiveness of the public sector. The public sector has been typically hindered by its bureaucratic, mechanistic and politicized method of operation (Adams, Young, & Zhihong, 2006).

Procurement strategies differ in the level of engagement they require from the contractor and the risk allocation. In in-house delivery, the client bears total responsibility and all the risks. But in models such as PPP, the contractor (usually a consortium) is in charge of design, implementation and operation. Figure 8 shows the spectrum of procurement models along with the level of engagement from the contractor.

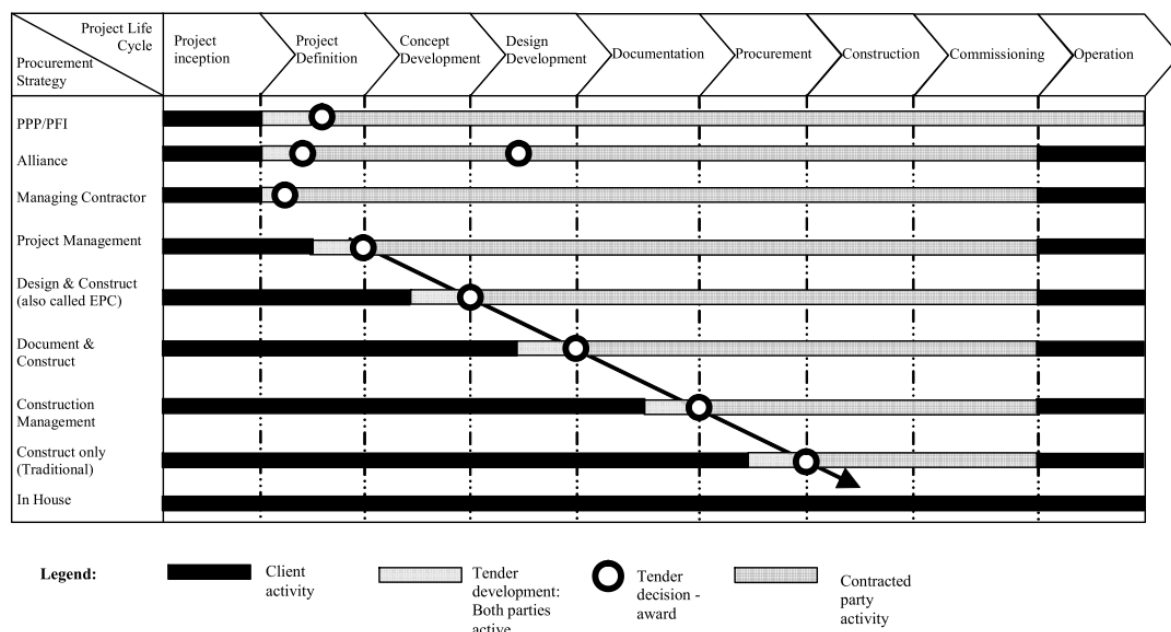


Figure 8. Alternative project delivery models (Australian Constructors Association, 1999; C. F. Duffield, 2010)

The Victorian Department of Treasury and Finance specifies a detailed process for common procurement strategies. Figure 9 shows the flowchart of project

gateway reviews for traditional (Standard), alliance, or PPP (Partnership Victoria) projects.

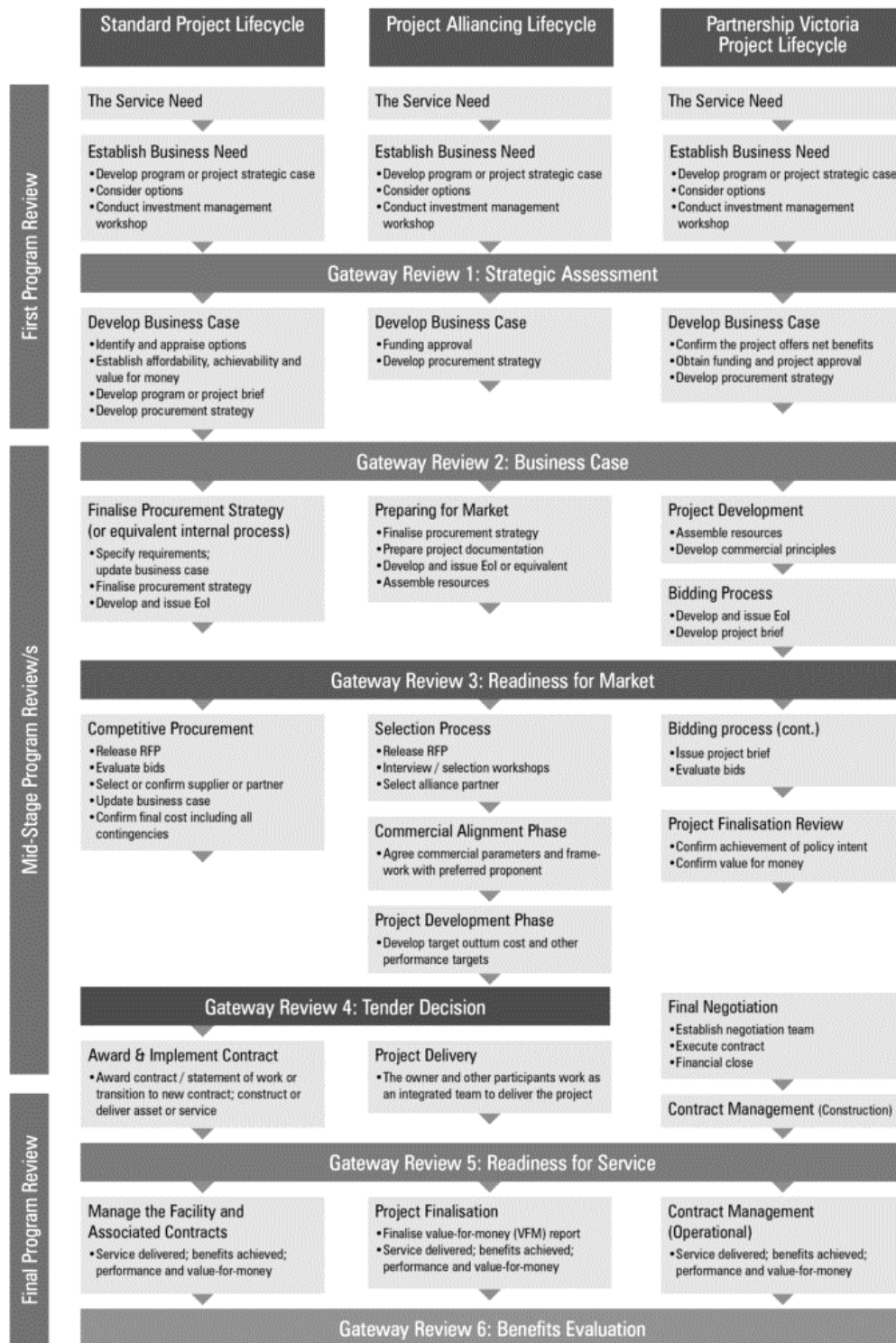


Figure 9. Project lifecycle in different procurement strategies in Australia (Department of Treasury and Finance, 2009)

In Australia PPP are estimated to have a slice of 10-15% of \$400 billion that is estimated to be spent on infrastructure from 2007-2017 (Allen Consulting Group, Duffield, & Raisbeck, 2007, p. 1). However, PPPs are not flawless.

Studies also show that PPP projects suffered 12% cost overruns in addition to 13% delay (Allen Consulting Group et al., 2007). Alliances gained significant popularity in the recent years in the public sector (C. Duffield & Wood, 2009, p. 8). In a dedicated study by the Department of Treasury of Finance in 2009, the performance of 14 alliances was compared with other traditional and PPPs; see Figure 10, the results show Alliances have higher cost uncertainty.

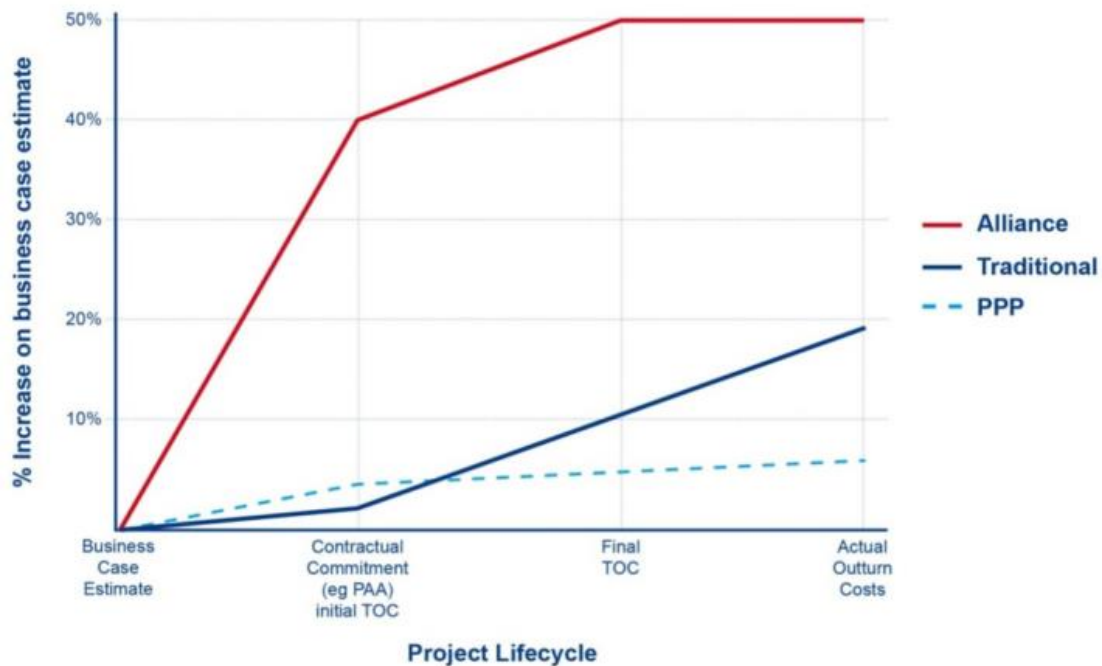


Figure 10. Cost performance of project procurement strategies (C. Duffield & Wood, 2009, p. 47). TOC=Total Outturn Cost

The findings of research by ‘Infrastructure Partnerships Australia’ comparing twenty-one PPPs with thirty-three traditional procurements demonstrates PPPs to be more transparent, significantly cost-efficient, and timely even when size is large (Infrastructure Partnerships Australia, Duffield, & Raisbeck, 2007). Although there is no evidence that one procurement strategy is always superior to others, different procurement strategies show differences in their performance. There is no single best delivery model that fits all projects, so it is the project, contextual variables and project people that determine the ground for an appropriate procurement strategy.

2.2.4. Upskilling strategies

The Victorian Auditor-General identified a lack of project management competence in the public sector. Because of the lack of public sector managers competent in project management – the DTF relied on external consultants to conduct Gateway Reviews. In 2011–12, only 17 percent of Gateway reviewers were public sector employees (Victorian Auditor-General’s Office (VAGO), 2013b, p. x). Adequacy of governance teams having project governance skills is doubted (Caravel, 2013, p. 13). Lack of in-house knowledge in the public sector

was a serious problem that contributes to time and cost overrun (Patel & Robinson, 2010).

A competent client is expected to deliver a good project outcome. Governments as infrastructure project clients have always found the need to keep some skills internally to assist in governing projects (Caravel, 2013, p. 6). Whether the government delivers the project in-house or via a PPP, there is a range of skillsets required by the government to be maintained and kept up to date. The project skills should help the government to identify the need, prepare reliable business cases, understand the strategic preferences, assess project impacts, measure value for money and appraise investment for the best project pipeline.

It is suggested that knowledge and experience are the two dimensions to assess the level of competency (Association for Project Management, 2008). The term 'experience' is interchangeable with 'application' and emphasises the importance of applied knowledge in project delivery (Association for Project Management, 2015). A framework has been developed by APM to measure the level of competency according to the complexity of projects.

Competence is a collection of knowledge, attitude, skills, and experience needed to successfully perform a function (International Project Management Association, 2006). Having the right people on board raises the chance of success. APM has developed a competency framework for project managers that lists 47 elements in three categories of technical, behavioural and contextual (Association for Project Management, 2008). The framework was updated by consolidating the competency elements that cover the required expertise for managing complex projects (Association for Project Management, 2015).

2.3. Challenges in public infrastructure delivery

Managing large projects has always been a challenge. The records of large project delivery reveal the fact that only a portion of those efforts has escaped performance shortcomings (Bekker & Steyn, 2009; Merrow, 2011; Mott MacDonald, 2002, sec. 1; National Audit Office, 2003; Victorian Ombudsmen, 2012, pp. 2-6).

A study of sixty mega projects in the 1980s and 1990s with an average value of one billion shows almost 40% were abandoned or restructured due to cost overruns (Bekker & Steyn, 2009). Flyvbjerg (2014) claims that nine out of ten infrastructure projects fail to fully deliver their original objectives (Flyvbjerg, 2014, p. 9). Merrow (2011) also reports that too many large projects fail to do what they were promised; while smaller projects show significantly better outcomes (Merrow, 2011). In 2002, Mott MacDonald reviewed large public projects of the past two decades in the UK. The report shows that traditionally procured projects had large performance deficits as reflected in overruns in forecast time, capital expenditure and operation cost by 17%, 47% and 41%

respectively (Mott MacDonald, 2002, sec. 1). Furthermore, Private Finance Initiative (PFI) style projects appear to have performed better but they often also recorded unexpected levels of unitary payments and benefits (Mott MacDonald, 2002, p. 14). The UK National Audit Office in 2003 made reference to a 1999 government survey that found 70% of projects faced delays and up to 73% of projects had cost overruns (National Audit Office, 2003). The report also provided 2002/2003 results where project performance had considerably improved for PFIs but remained unacceptable where almost a quarter of projects (24% and 21%) suffered from time or cost overruns. A longitudinal study of 111 infrastructure projects from 1920 to 2000 shows that cost overruns have not been resolved, and is still are a prevailing issue in projects, see Figure 11.

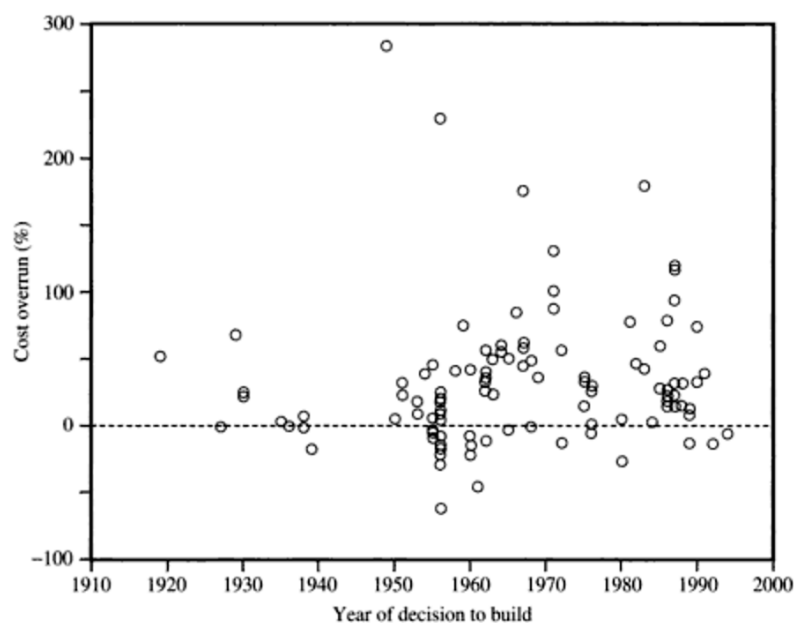


Figure 11. Cost overrun in 111 projects (Flyvbjerg, Bruzelius, & Rothengatter, 2003, p. 18)

In Victoria, despite all the achievements that show some procurement methods have demonstrated better performance, a review of the large infrastructure projects demonstrates room for improvement.

In Defence, out of twenty-two major projects in 2009-2010, thirteen have experienced average schedule slippage of 31%, and CAPEX exceeds by 24%, equal to \$7.8 billion (Australian National Audit Office, 2010). The problem though is not restricted to one sector or one delivery agency. The Victorian Auditor General audited MPV (Major Project Victoria) a distinct agency in charge of major infrastructure projects; while acknowledging its potential to improve delivery, deficits in managing its sub-projects was observed. “On average, contracts exceed the expected cost by around eighteen percent and exceed the planned end date by around 37%” (Victorian Auditor-General’s Office, 2012, p. xii). They concluded that MPV did not effectively govern the

projects (Victorian Auditor-General’s Office, 2012, p. 10). In another investigation of ten ICT projects, the Victorian Ombudsmen observed large cost and time overruns while a few projects had been abandoned after a large investment. A recent inquiry of the Victorian parliament involved a PPP project in Victoria; the desalination plant project. The inquiry reported that the problem of mega infrastructure might not be solely project management performance but also the utility of the project product for the public (Committee of Public Accounts and Estimates, 2012). In addition to cost overruns and delays, the function of the project product may not satisfy the community. A recent survey of industry and government senior executives found that on average 48% of projects failed to meet their baseline time, cost and quality objectives (Caravel, 2013, p. 4). Many large infrastructure projects suffer from inadequate performance measures such as time and cost and from unexpected project outcomes for the community.

Infrastructure delivery in Victoria is sub-optimal according to various audit reports (Committee of Public Accounts and Estimates, 2012; Victorian Ombudsmen, 2012) and public infrastructure projects have been criticised by government audits such as VAGO and the Ombudsman. The Australian construction industry shows a record of adversarial behaviour that has delivered sub-optimum results to clients and contractors (Australian Constructors Association, 1999, p. 6). The flaw manifests in poor performance or imperfect product that ultimately causes stakeholders dissatisfaction. The records of project performance disclose unendurable failures in promises by project parties. In some cases, the utility of the project is disputed. Community discontent has pushed authorities to seek improvement.

Table 7 is a selected list of recommendations from major reports on infrastructure projects in Australia and globally.

Table 7. Reflections on the current issues in infrastructure delivery and proposed recommendations extracted from expert project reviews (Date sorted)

Context	Recommendations	Reference
Review of Australian large public projects	Applying modified business processes where the project is unique, complex or innovative. Better collaboration among public and private parties.	(Mott MacDonald, 2002, p. 25)
Review of Global infrastructure delivery	Reforming the institutional arrangements of decision-making and establishing accountability through transparency, stakeholders communicated performance specifications, and early risk assessment and allocation including policy risks before decisions are taken.	(Flyvbjerg et al., 2003)
Review of eight PPP projects in Victoria	A more competent public sector that resourcefully govern the project. A more simplified bidding process, as it is costly in PPP projects, can deflect bidders.	(Fitzgerald, 2004, pp. 36-37)

Context	Recommendations	Reference
Review of Sydney Cross Tunnel project in NSW	Enhancing the current process of decision-making. Better evaluation of public interest.	(Parliament of New South Wales, 2006, p. xix)
Review of large infrastructure projects in Victoria	Update “The Partnerships Victoria Policy” and other guidelines to reflect recent experiences with public-private partnership/private finance initiative projects in Australia, particularly in relation to the public sector comparator, valuing risk, and the discount rate.	(Public Accounts and Estimates Committee, 2006, p. 24)
Review the performance of infrastructure in Australia	Highlighted role of collaboration among parties.	(PricewaterhouseCoopers, 2008, p. 4)
Listing the challenges facing the Victorian public sector	Transparent decisions to be made by right persons.	(Deputy Ombudsman Victoria, 2010, p. 1)
Audit of Australian defence projects	Employing and maintaining an appropriately skilled workforce and managing the expectations of the customers are mentioned to be major challenges.	(Australian National Audit Office, 2010, p. 104)
Research related to Australian transport PPPs	Refine the process and structuring of early project decisions, the efficient structuring of PPPs, and the quantification of the whole of life value.	(C. Duffield, 2011, p. 4)
Investigation on ten ICT-enabled projects	Having an ad-hoc project process including the internal process of the agencies, role of DTF, dedicated gateway reviews for the project.	(Victorian Ombudsmen, 2012, pp. 2-6)
Review of design and construction projects in Victoria	More competent project people. More appropriate processes. More collaboration among the participants.	(Department of Infrastructure and Transport, 2012)
Parliamentary inquiry of Victorian infrastructures	Effective decision-making and better governance.	(Committee of Public Accounts and Estimates, 2012)

The list of recommendations in Table 7 covers a broad range of proposals to improve project delivery. These recommendations come from public enquiries and reviews into the delivery failure of large infrastructure projects. In general, these reviews do not study the fundamental reasons or root causes behind the poor results. The next section uses three different lenses to provide possible explanations.

2.4. Theoretical explanations behind the shortcomings

The significance of a project plan including the early decisions that are mostly reflected in the business case is undeniable. These critical decisions essentially determine the projected fate. In Victoria, there are tools and techniques to assure projects make the right decisions at the outset. Table 8 lists these techniques and check upon their performance in infrastructure delivery. The ultimate goal of these techniques is to protect value for money.

Table 8. Common techniques in dealing with planning fallacy and provide value for money

Technique	Extent of application	Implications
Gateway reviews Range of procurement model	Applied with rigorous measures in HV/HR Applied widely, e.g. Traditional, PPP, alliance and other combinations of the three	Requires progressive improvements in review systems or become less effective Procurement strategies come after the business case and therefore usually too late to respond to the mismatch of expectations. Different incentives in private and public sector make it less effective
Investment logic map Transparency	Applied Embedded in the processes and jurisdiction	Although it is a good structure for decision making, it can't prevent optimism bias and scope creep Limitations and red tape exist among auditors and government, e.g. Cabinet reports. Probity is perceived a concern to communications, intellectual properties and private sector incentive
Reference class forecasting	Occasionally applied (for transport projects)	When the forecasting multipliers are known to the agency, it becomes predictable and so ineffective

Despite all of the proposed measures and processes to improve the performance of infrastructure delivery in public sector, the extent in which projects follow the national guidelines is less than expected. It is questioned whether the vision and considerations, such as value for money, given by national guidelines are fully adopted in infrastructure delivery (Committee of Public Accounts and Estimates, 2012; Victorian Ombudsmen, 2012). The processes of public delivery such as approval regime, business case, appraisal and evaluation processes, governance and decision-making are responsible for the outcome of the projects. This section of the literature review investigates four different reasons why projects fail to deliver.

The shortcoming in public infrastructure projects can be explained via various theories in technical, organisational, behavioural, and political literature. Although there is no hard line between the four categories, classification of the literature into these four categories may provide some explanations for project failure. This classification helps to compare theories within and between categories for their merits and common ideas.

2.4.1. Technical explanations

Technical explanations address the deficiency of the existing processes in the delivery of public infrastructure projects from a technical point of view. The technical explanations are concerned with deterministic elements usually outside the control of the project constituencies. These explanations exclude the complexity of human behaviour and the interaction of organisations. These factors can arise in any project and are largely independent of the clients and the project delivery team. They are external factors to a project.

Table 9 describes technical explanations for project difficulties and its implications for public infrastructure projects. Six explanations are listed in this table. These explanations are extracted from the literature according to a theory(s) that might relate to the situation of public infrastructure projects. Even if the original theory is proposed in domains other than infrastructure delivery, the implication of these theories can be applied in public infrastructure delivery.

Because of their complexity large infrastructure, projects could be described as having the properties of a wicked problem. The complexity of the project and the level of uncertainty are high. The diversity of stakeholders makes any consensus far away. Time and its effects on valuing monetary values and opportunity loss add to the pressure. The planner, as an individual, is susceptible to the planning fallacy. The table also reviews the effect of sunk cost as a pressure to ignore the shortcomings and push the project forward despite likely chance of failure.

Table 9. Technical explanations that address the shortcomings of the existing delivery strategies

Explanation	Description	Implications for Public Infrastructure	Reference
Imperfect Predictor	Laplace's demon says if complete knowledge available, the prediction is possible and certain. However, in the real-world uncertainty is embedded in every system that limits the accuracy of any prediction. Limitations on the predictability of a behaviour are caused by factors such as the lack of information or excessive complexity.	Many aspects of a project are bound with uncertainty; some are dealt with as a risk and some as contingencies in the plan. Nonetheless, any plan has a level of confidence. The actuals may deviate from the planned due to the inherited uncertainty. No matter how complete a plan is, it is still inadequate to eliminate the risk of error. Projects may face unexpected levels of required resources, market demand, technical difficulties, technology compatibility, changes, or new opportunities. The unexpected events may affect the project for unsatisfactory performance. Hence, the project is received by the stakeholders badly.	(Busch, Heinonen, & Lahti, 2007)
Payment Depreciation	Time value of money means money today is more valuable compared to future money. As a result, the value of expenditures fades out gradually as a project progresses.	Infrastructure is for the long term. Projects typically consume resources when they start up and then produce value for the rest of the project lifetime. If a project misjudges the value of the expected benefits, its appraisal may sway or discourage its value for money.	(Gourville & Soman, 1998)
Transaction Decoupling	If a cost is visible and associated with a tangible loss, the impact is much higher and cause more effort to prevent it or justify it. On the other hand, if the sunk cost is hidden or hard to attribute to a source, the aversion toward sunk cost fades.	When project expenditures are approved and dedicated to the project from a pool of money, the appraisal process becomes more sensitive to the value for money compares to a project where the funding is hard to trace such as a PPP project with private finance.	(Soman & Gourville, 2001)
Planning Fallacy	During planning, the planner tends to underestimate the resources required to undertake the task. The fallacy in planning occurs due to optimism, and it is regardless of the individual's knowledge that previously similar tasks are predicted optimistically. However, planning fallacy is an internal issue that is to say the bias only affects planning about one's own tasks. When outsiders observe the same task, a more reliable prediction or even a pessimistic bias is probable.	Government appraises, approves and allocates resources according to the merits of project proposals received from delivery agencies. If the project planner, overestimates the benefits of a project, it will raise the chance of approval but endangers the value for money. The recipe for failure is an exaggeration of benefits and discounting the costs, e.g. Eurofighter in Europe, Union Pacific railroad in North America. Inaccurate estimation is not always in favour of project approval though. There is evidence that a project planner could be pessimistic about a project and hinder a project to proceed [Flyvbjerg's Malevolent planning]. The planner is too wary. That may tend to undervalue project benefits and overvalue project cost and risks. This would be a problem especially for projects with benefits such as wider economic benefits that may surpass the early estimation.	(Kahneman & Tversky, 1977; Lovallo & Kahneman, 2003)
Wicked Problem/ Social Mess	Many social problems are hard to tackle mostly due to the problem being ill-formulated, complex, and varying. It may also be associated with confusing information and conflicting stakeholders. Decision makers might even have opposing objectives and values, while the ramifications in the whole system are painstakingly puzzling.	Large infrastructures are complex projects. The settings and structure of delivering public infrastructure projects might make it a complex social system with wicked problems facing the client, i.e. the government. Due to the complexity of the system and the conflict of stakeholders' perspective, it is hard to even identify the main problem, prioritise or find a relationship between cause and effects. Every perception is a myopic one, without the required view of the big picture. As a result, any attempt to tackle the problem has a low chance of addressing the root cause.	(Australian Public Service Commission, 2007; Churchman, 1967)

Explanation	Description	Implications for Public Infrastructure	Reference
Sunk Cost Effect	Opportunity loss is a grave motivator for human beings and organisations. The fear of incurring waste cost may push people to fall into a recurring expenditure in hope for a final pay off that might never happen. The higher the initial payment, the stronger the push to proceed.	Projects cash flow normally takes heavy initial expenditure known as Capital cost (CAPEX) and gradually starts to generate revenue (the revenue might be monetary income or a valuable product or service). Since the cost of change escalates as a project progresses, infrastructure projects rely on a grand design to provide an accurate plan that reduces the chance of change. Nonetheless, change happens in projects, and occasionally projects have to stop or change directions due to unforeseeable risks. In some cases, the initial plan is not reliable, but its looseness becomes more evident as project proceeds. The fear of sunk cost pushes projects forward in the hope that it might justify all of the expenses. Projects with overrun costs tend to ask for more money, or the project will stop unfinished and end up with huge sunk costs. The effect of sunk cost may make projects less tentative toward risks when the project is at the halfway mark.	(Arkes & Blumer, 1985)

The category of technical problems gathers concepts from the literature on problem types, time value of money, transactions and planning. The concept of contested information is studied in the literature. According to the level of certainty of information and the level of agreement on the expected outcome, a problem may lie in four categories (Bruijn & Leijten, 2008).

- Tamed problem: Problems with access to reliable data and a consensus on the expected outcome. These problems are solvable surely.
- Ethical problem: Problems with access to reliable data but no agreement on the expected outcome or the method of compensation of outcome criteria. These problems are only solvable if some expectations are given up or a consensus is achieved through more discussion.
- Scientific problem: Problems with lack or no agreement on the information, but consensus on the expected outcome or the method to analyse data. These problems need more research to collect sufficient agreed upon information.
- Political problem: Problems with neither reliable information nor agreed outcome criteria. These problems have the high uncertainty of available data and little consensus on standards and outcome. No solution exists until the information and the outcome criteria become an agreement.

Many infrastructure projects contain all of these characteristics. Perhaps the hardest to tackle is the so-called “wicked problem” which may contain elements of the political as well as the scientific.

The assumption that there exist correct and complete information in project planning is hardly a credible assumption. Even a recommendation to gather complete and correct data at the project outset is inadequate (Bruijn & Leijten, 2008, p. 90). There is often contested information depending on which agency has provided the information.

The planning fallacy explores the fundamental factors that cause inaccurate planning. Optimism, lack of proper consideration of risks, biased evaluation or selection of project alternatives including the procurement strategies, may cause a deficient plan. A business case is generally accepted as the cornerstone of the project plan and may be subject to elements of the planning fallacy.

2.4.2. Organisational explanations

The disappointment of the existing strategies to achieve success in public infrastructure projects may also be due to the organisational settings that encourage behaviour that might affect project outcome. These explanations focus on the inside arrangements of a firm (people, culture, business processes) or internal relationships among project teams. The interactions of the

participants of a project may affect the quality of the decisions. Unlike the technical explanations that emphasise the role of external factors affecting a decision maker as a single entity, organisational explanations explore the internal structures and dynamics of the organisations.

Table 10 describes organisational explanations for project difficulties and its implications for public infrastructure projects. Five explanations are listed in this table. The table explains why public projects face challenges due to the complexity of incentives and interactions between the project participants and their organisations.

Table 10. Organisational explanations that address the shortcomings of the existing delivery strategies

Explanation	Description	Implications for Public Infrastructure	References
Illusion Of Control	The illusion of control is an expectation of success higher than objective probability would warrant. The illusion of control is a bias that underestimates the complexity and overestimates the ability to control the system. The issue becomes more severe when the uncertainty is high, and prediction is difficult. The bias may influence assumptions underlying forecasts and may cause deception by various actors with conflicting interests.	A project manager might believe that they can always decide the fate of the project. Nonetheless, project outcome is determined by a variety of variables, many out of control of the project manager. This bias of a project manager around the ability to influence the outcomes of the project may lead to the underestimation of the risk and overvaluation of the positive information. This behaviour is one of the reasons that lead to the disappointment of infrastructure projects in terms of cost overruns or benefit deficits.	(Durand, 2003; Kardes, Ozturk, Cavusgil, & Cavusgil, 2013; Langer, 1975)
Social Comparisons	A commitment made in front of others has a stronger impact and puts more pressure on better performance under the contract. If the commitment is witnessed by a team member of the organisation who has high levels of accomplishment, it may raise the likelihood of increased motivation to increase accomplishment similarly.	Secrecy in doing projects may undermine the project by reducing the witnessing pressure that pushes a project to outperform previous endeavours. Transparency of information and observing a projects steps may help to encourage the project team to do their best and achieve in accordance with the stakeholder expectations. Showcase of positive benchmarks and best practice add value to unleash the potential of project people to perform. It also sets a reasonable standard that prevents excessive optimism or pessimism during project planning and conceptualisation.	(Kast, Meier, & Pomeranz, 2012)
Agency Theory	Agency theory identifies the incentives a principal and agent in which the principal delegates a task to the agent. Due to the conflict of interest, asymmetric information and different risk preference, an agency loss may emerge that is a gap between the agency's outcome and the outcome of the principal's outcome if it had the same capability.	Projects are carried out in a contract between a client and a contractor. Agency theory can explain the behaviour of the parties. At least two major delegations occur in infrastructure projects. One delegation is the central agency (the government cabinet and treasury) delegate the planning, governance and control of a project to a delivery agency. The second delegation starts with the project tender when the delivery agency delegates the winning bidder from the private sector with the responsibility of the project delivery. In both delegations an agency loss is likely.	(M. Eisenhardt, 1989)
Silo Effect	In the absence of organisation integration of knowledge, the organisations left-hand does not know what the right hand is doing. It is hard for project people to see the big picture. Segregated departments become isolated islands with their own goals and preferences in mind-forged silos, e.g., Sony's hardworking department silos making different but incompatible early gaming systems.	Projects are collaborative activities that require consistent efforts from the constituencies. In infrastructure projects, the government should assess the need in line with the community need and urgency only observable from a comprehensive perspective. If government departments disregard or cannot see the big picture, they might get too obsessed with their own objectives such that they fail to identify the project with the best value for money.	(Gillian Tett, 2015; Hotărăn, 2009; Poole, 2015; Tett, 2016)

Explanation	Description	Implications for Public Infrastructure	References
Stakeholder Saliency Theory	<p>Three attributes of power, legitimacy and urgency are the foundation of any stakeholders' influence. These attributes are socially constructed. Seven different types of stakeholders are perceptible as the three foundations overlap.</p> <p>Applying strategies to the stakeholders may change the possessed attributes and so the level of influence.</p>	<p>Stakeholder management is an important part of any project. Infrastructure projects are sensitive to stakeholder's opinion for the formation of success perception. Ignorance about project power and interest may result in poor project outcomes.</p>	<p>(Aaltonen, Jaakko, & Tuomas, 2008; Mitchell et al., 1997)</p>

It is worth discussing one of the theories in a little more detail because of its wider application. Agency theory is one concept that may help explain the relationship between the government department and the consultants and contractors. It can provide guidance on the management of the relationship. The theory assumes that individuals are reasonably rational and the information is distributed asymmetrically throughout the organisations. It explores agency-principal relation when (a) the desires or goals of the principal and agent conflict and (b) the principal cannot verify what the agent is actually doing (c) the principal and agent have different attitudes toward risk (M. Eisenhardt, 1989, p. 58). Agency theory is relevant in situations in which agent opportunism is a likely, outcome is uncertain, and evaluation of behaviours is difficult (M. Eisenhardt, 1989, p. 71). Despite all the debates on the effectiveness of agency theory, it provides a unique, realistic, and empirically testable perspective on problems of cooperative effort (M. Eisenhardt, 1989, p. 72). The focus of the theory is in determining the most efficient governance of the principal-agency relationship.

The use of agency theory can inform the risk-sharing problem as one that arises when cooperating parties have different attitudes toward risk. Agency theory broadened this risk-sharing literature to include the agency problem that occurs when cooperating parties have different goals and division of labour (Jensen & Meckling, 1976; Ross, 1973).

Agency loss is minimised if the principal and agent share common interests (Niskanen, 1971; Romer & Rosenthal, 1978) or when the principal is well-informed about the consequences of the agent's doings (Bohnemeyer, 1995, p. 3376). As a result, two propositions are made to describe the situation. (a) When the contract between the principal and agent is outcome-based, the agent is more likely to behave in the interests of the principal (b) When the principal has information to verify agent behaviour, the agent is more likely to behave in the interests of the principal (M. Eisenhardt, 1989, p. 60).

Agency theory presents a partial view of the world that, although valid, also ignores a good bit of the complexity of organizations (M. Eisenhardt, 1989, p. 71). In public infrastructure projects, the interests of government agencies are expected to be in line with long-term government strategies. In addition, it could be assumed that the hierarchy of authority in the government should provide central agencies with complete knowledge of other agencies activities. Consequently, according to agency theory, the agency loss should be minimised among government agencies. Therefore, if sub-optimal decisions that might jeopardise the value for money are occasionally witnessed in public sector, a theory is needed to explain the extension of public agencies' behaviour beyond

the agency theory. Agency theory might be complemented with other theories such as stakeholder salience theory.

The concepts of influence and reliance are evident in the definition of 'stakeholder' and dependency. Stakeholders' power balance with an organisation could be any of the three forms of power dominant stakeholder, power dominant organization or mutually power dependants (Cleland & Ireland, 2007; Mitchell et al., 1997).

Infrastructure projects with multiple stakeholders effectively are political problems because of multiple actors and power structures between and within the stakeholders. Before a project implementation, there is no hard-scientific information about project dimensions such as cost and time. Moreover, different stakeholders have different criteria and view project benefits differently. A trade-off between criteria may not exist. In political problems, closing the doors, relying on one's self-judgement to collect good information and produce outcome does not prevent others from disagreeing. In these problems, truth becomes multifaceted and even contradictory since the information is accumulated by different people who have different levels of access to information and various assumptions.

Participants are the key players influence a project. The effects of participants in the decision-making and governance are a hot discussion topic. The theory of stakeholder salience explains the attributes of stakeholders and relates the level of influence they might have. The theory attributes stakeholders' influence to its power, legitimacy and urgency (Mitchell et al., 1997). These attributes are socially constructed and changing (Mitchell et al., 1997; Yang et al., 2009). That is to say; stakeholders may get the missing attributes and boost their level of influence (Aaltonen et al., 2008).

One explanation of project misfortune may rest in the failure to identify the interest and power of the stakeholder throughout project lifetime. Since the stakeholder power and interest change as the project proceeds, it is likely that the client fails to identify determinant stakeholders. Public infrastructure projects liason to the community for the service they offer and the public money they spend. The inclusion of the community in the decision cycle might avoid some disappointment that may arise later if the project was ignorant about the community preferences. The inclusion of the wider benefits of the project ensures that the investment with the highest value for money opts.

2.4.3. Behavioural explanations

Early decisions in projects are made by an individual or a group of individuals. In the literature, there exists a profound and extensive discussion about the process of decision making in human beings. The decision process might be influenced and swayed by internal or external factors. The behavioural

characteristic of the shortcomings of human being decision-making outcomes is captured in Table 11. It explains some of the inadequacies in the current actions to achieve success. The table describes the psychological side of difficulties in decision-making and its implications for public infrastructure projects.

Fifteen explanations are listed in Table 11. These explanations are extracted from the literature according to a theory(s) that might relate to the situation of public infrastructure projects. The table explains why public projects may face challenges due to the complexity of incentives and interactions of the project participants.

Table 11. Behavioural explanations that address the shortcomings of the existing delivery strategies

Explanation	Description	Implications for Public Infrastructure	References
Decision Maker Cognition	The utility of a decision is influenced by the level of accessible knowledge and time. Three categories of cognition exist in decision-making. (a) Optimising i.e. Decision is made under unlimited access to resources and cognitive capacity; it maximise the decision maker's interest; (b) Limited optimising i.e. Decision makers take the best decision within the constraints of access to resources and cognitive capacity; and (c) Satisficing i.e. Decision-maker functions within the constraints and cognitive capacity but make choices that only satisfy their desire.	The public expects a government to make project decisions. Time is of the essence and access to available resources to collect reliable information is limited. Complete information and limitless time are never a luxury governments afford to have. On the other hand, the social and political pressure may limit the government's cognition in having a comprehensive insight. The impact of cognitive and resource limitations (time, money, knowledge) may make the government 'intendedly rational, but only limitedly so'. That is to say, while the optimal decisions are insurmountable, the government may not pursue the limited optimality but suffices a satisficing choice according to the limited cognition.	(Sanderson, 2012; Simon, 1947)
Single Stage vs Multiple Stage Decisions (Prospect Theory)	The way options are presented may influence the probability of one particular option is selected. If all of the options are presented in one stage the chance of options depends on their intrinsic utility while when options are offered in multiple options, the options get more chance of selection. In an example, a person is given a choice to select a restaurant. First, she is asked to choose between Chinese, Italian, or Thai. Second, she is first inquired whether she choose Chinese and if she says no if Thai or Italian is her choice. The probability of choosing Chinese is higher in the second scenario.	A project starts with a need or opportunity. The options that address the problem or satisfy the opportunity are assessed in the business case for the highest value the project may generate. Identification of options and their appraisal is a critical stage. An agency may influence the process of option selection in the positive or negative way if options are selected in a sequence. For instance, a business case may generate a variety of options that differ in size, technology and location. Another business case may select the technology first, then the size and then the location.	(Kahneman & Tversky, 1979)
Framing & Loss Aversion (Prospect Theory)	People tend to fear a loss more than a lack of gain of equal value. Psychologically, an outcome, if presented as a loss is more assertive than the same outcome that is presented as a gain.	An infrastructure business case addresses a need or an opportunity to produce value for the community. The justification for a project is based on the benefits it generates that exceeds its cost. A more potent justification may come to effect if a project formulates its value based on a loss it may prevent. If a project overemphasises the loss that might occur in the absence of the project being implemented a higher pressure is generated for the government to approve it compared to when the net value of the project is presented as the justification.	(Kahneman & Tversky, 1979)
Self-Awareness/ Identity	An action that is candidly attributed to its actor raises a higher accountability of the actor than if the action is perceived independently. If the attribution of an action to the actor occurs before the action, it raises even higher pressure. That is why signing a form before filling in the form raise the level of accountability of the person in the declarations.	A project is an effort by project client and in partnership with other participants. If the client of a project is vague or mutual among many, the level of accountability will deteriorate. Orphan projects are those without a signature of the client on them. Orphan projects show a higher chance of failure and less effort from the participants to save them.	(Shu, Mazar, Gino, Ariely, & Bazerman, 2012)

Explanation	Description	Implications for Public Infrastructure	References
Perceived Progress	The sense of progress raises the endurance and resilience of keeping the activity. It is important to mention the difference between the actual progress and perceived progress. According to this hypothesis, the behaviour of an actor is influenced by the perceived progress.	A project sponsor may try to push a project by inspiring the sense of progress. While the project is not yet proved viable, a sponsor may consider it approved to push the project forward and raise the chance of success. Due to the perceived progress injected into the project team, the project might refuse to see worse case scenarios. Even if the project justification is endangered, the sponsor may still attempt to save the project against the benefit of the stakeholders. In another word, perceived progress add the inertia to stop.	(Zhou & Soman, 2003)
Administrative Behaviour	The theory of administrative behaviour informs the process of decision making in the organisation and acknowledge the limits of rationality in choices when the availability and level of knowledge varies.	Irrational decisions in project planning occur when high authority is possessed by a specific group of people. The same concept is also mentioned in the definition of power under the title of mobilisation of bias when a group with common interest intentionally or unintentionally exert power to promote their own interest.	(Flyvbjerg, 1998; Schattschneider, 1960; Simon, 1947; Szalai, 1997)
Pre-Commitment	People make wiser decisions for the future situations rather than for the present. A higher rationality is observed if a person is asked to make a decision that comes into effect in future rather a decision that addresses an immediate situation. Pre-committing people to their decision about future may generate high value due to the higher rationality of the decision. An example is committing one person to set aside a proportion of their future salary. If that person is obliged to commit to the saving, it is more likely to save money.	Public infrastructure projects should respond to the public shortcomings in the present and in future. A rationality of a government in planning for future may exceed the quality of the decisions that made to deal with the present situation. Social, political, organisational and economic incentives and constraints may deter a government from rational decisions of the time being. Hence, pre-committing to a plan, such as stable delivery pipeline, raises the chance of rational project decisions.	(Thaler & Benartzi, 2004)
Anchoring	Someone may manipulate others thinking by introducing a set point. Numbers are particularly sticky. When introduced at the start of a thinking process, they might engrave a mark. In the scarcity of certain data, any suggested figure, even if false, may become a gravity that influences any future outcome. Anchoring has a higher impact in the absence of any number to start with.	There are many critical numbers in a project plan such as total cost, and duration. Any guessing estimation at the start of the project may set an anchor that influence the future estimation of the project plan. Infrastructure projects are susceptible to pre-announcement especially in the early stage of the project when reliable information is scarce.	(Kahneman, Slovic, & Tversky, 1974)
Asymmetric Dominance/Decoy	Adding a new decoy option to the decision area may influence the decision maker toward a choice that is suboptimal. For example, a car buyer has to choose one of the two cars for the same price according to criteria of a gear transmission and the build quality. Car A is automatic with the build quality of 50. Car B is manual with the build quality of 100. If a third car	A project starts with a need or opportunity. The options that address the problem or satisfy the opportunity are assessed in the business case for the highest value the project may generate. Identification of options and appraisal is a critical part of an infrastructure business case. Under the shadow of a pre-selected solution, a business case may introduce a decoy option that changes the decision area in favour of the pre-selected solution.	(Huber, Payne, & Puto, 1982)

Explanation	Description	Implications for Public Infrastructure	References
Choosing vs Rejecting	<p>of the same price is added that is manual with the build quality of 90; the decision maker is more likely to choose Car B.</p> <p>The outcome of a decision process may differ whether the decision maker has to choose an option or has to reject other options. For example, an investor should choose one stock between two options. Stock A has an expected return of 10 and the risk index of 10. Stock B has an expected return of 20 and risk index of 20. If the investor has to choose an option, it is likely that B is selected as it offers a great return. If the investor has to reject one option, again B is likely rejected, as it is too risky.</p>	<p>A government receives a number of business cases and choose the ones that offer a higher value for money. Due to the limitation of resources only a portion of the business cases is funded. A business case promises a range of benefits for the cost of the investment. If the government has to choose a preferred business case, the outcome of the decision might differ in the outcome of the decision if the government should reject unsuitable alternatives.</p>	(Shafir, 1993)
Compromise Effect	<p>In the selection of multiple options, the one in the middle has a higher chance of being selected. Equally, the chance of choosing an option can be increased by making it the compromise option. The compromise effect works for few options, but its effect fades out if the options added.</p>	<p>Infrastructure projects usually have few major options in their investment proposal. Adding a borderline option to a business case may manipulate the appeal of an option in the middle. Adding or overemphasising a marginal option may convince choice of a middle option. For instance, the overemphasis on the option of ‘do nothing’ may push for a change.</p>	(Simonson, 1989)
Construal Level Theory	<p>People live in a dream about the future. They view future events with higher benefits. When the same event comes closer, reality becomes visible, and the details are exposed. Hence, approaching future events discount their perceived benefits. This results in a diminished attractiveness of the event as it comes closer in time.</p>	<p>Infrastructure projects start in high hopes. Optimism about future and lack of details makes them appealing government and a desirable accomplishment. Nonetheless, they become more troublesome as the project proceeds. The construal level theory explains optimism at the start of projects. It also explains discounting project risks and overlooking worse case scenarios.</p> <p>Orphan projects may be another manifestation of this theory. The people, who initiated the project fervidly, see the project faces unexpected risks and engulfed by wrong assumptions. The sponsors try to escape the project accountability and leave it like an orphan child!</p>	(Trope & Liberman, 2003)
Decision Points	<p>A decision point with an opportunity to pause and ponder reduces the probability of overconsumption. When there is no point to stop and think, consumption tends to continue until the resources are exhausted. Reminders, transaction costs, or physical partitions are examples of a decision point. For example, if a large bucket of popcorn is divided into many smaller bags, the consumption is likely to reduce.</p>	<p>The waterfall acquisition model requires project cycle in a sequence of stages that feed each other. The approval process of infrastructure delivery designates decision points for evaluation and approval. If a decision point is missed or taken lightly, the project may get in trouble as its desire to consume resources may harm value for money when there exist other projects with a higher value.</p>	(Soman, Xu, & Cheema, 2010)

Explanation	Description	Implications for Public Infrastructure	References
Payment Mechanism	Transparent payment such as cash payment impose higher impact and hence reduce the probability or amount of purchase. The manner in which the payment is made may influence the desire to pay. Electronic payment does not have a physical exchange of money and implies a lower pain of payment. The pain of payment impacts the willingness to spend.	Procurement of a public infrastructure is a purchase by the government. Procurement strategy of the project includes the payment regime. Different procurement strategies have different payment mechanism. Traditional models have a direct transfer of money in which the government pay the contractor for the work done. However, other models such as PPP may include a complex financial arrangement in which the government may not pay the money at the start-up but during the operation for the availability of the infrastructure facility or the service to the community. In the latter models, the payment is not as transparent as the former models. PPP may become more attractive due to their obscure payment mechanism.	(Soman, 2001)
Optimism Bias	Optimism bias (also known as unrealistic or comparative optimism) is a cognitive bias that causes a person discount the risk of facing a negative event.	One problem in a business case is optimistic. It is also an issue if the optimistic assumption is taken by the delivery agent who is favoured toward business case approval. Flyvbjerg's (2009) calls the process survival of the un-fittest. Those business cases that optimistically propose a better cost-benefit ratio have a higher chance of approval and a higher chance of failure too.	(Flyvbjerg, 2009)

Making a good decision and preparing a reliable plan is a challenge without decision makers who have the competency to do so. The competency of project participants including central and delivery agencies in public sector is critical to making better decisions that maintain value for money. A possible mistake is to view a project as a separate island, disconnected from the existing and forthcoming projects. Departments may get obsessed with their functional undertakings and get obsessed with a project. The effect is called Silo effects. In an organisation, Silos may harm value for money.

The situation is foreseeable when there is a deficiency in public sector competency and lack of cognition in the decisions. The outcome would be imperfect project definition, inapt procurement strategy, wrong investment, or inappropriate private partner. The imbalance of power in public sector affects major project decisions.

One issue in the planning stage of a project is the generation of dummy alternatives. Dummy alternatives are those proposed just to dismiss. In other words, they are fake alternatives to support the pre-selected alternative to get sufficient credit to be formally selected. For instance, the option to 'do nothing' might be a dummy alternative if it is not meant as a serious investigation. Even a genuine alternative might become a dummy alternative if it is not changeable. For instance, size of a facility is a characteristic of the asset that should remain open to change according to the project need. If a larger or smaller size is imposed, the option may become unacceptable.

Another issue in the early decision-making of projects is a failure in a fair evaluation of alternatives. Again, the effect of assumptions or constraints should be highlighted. For instance, in order to evaluate alternative enabler assets of a project, the wider impacts have to be identified and included in the evaluation model. An assumption that simplifies or diminishes the long-term impacts of a project may critically harm the outcome of the decision.

Among decision theories, normative theories try to make the best choice where the chooser is rational, fully informed, and with enough accuracy. On the other side, descriptive theories of decision-making look for the actual process, which is mostly not optimum. Limitation of time, money and knowledge affects the decision-making process (Simon, 1947: p.24).

The theory of administrative behaviour studies the process of decision making in organisations. The theory acknowledges the limitation of rationality in choices when the availability and level of knowledge vary (Simon, 1947). The same insight is also given as 'decision making cognition' when the decision utility is in relation to the level of accessible knowledge and time (Sanderson,

2012). In relevance to above, irrational decisions in another context, e.g. politics also occur when higher authority is possessed (Flyvbjerg, 1998).

Decision makers' cognition, stem from competency, versus its authority. Rooted in sovereignty are two spheres of participant's power. The two wings of power when not in balance influence decisions' utility and ultimately the project outcome. The determinant factors in making decisions and their relationship with participant's power asymmetry are to be worked out to provide a ground for better sanctions and consequently better project ending.

The decision maker's mere claim of competency does not guaranty an optimum decision. If someone is self-confident to be an expert, there is one test: did the person have a decent opportunity to learn how to perform that task that also provide rapid and unequivocal feedback on the quality of performance (Kahneman & Klein, 2009). Narrowing down and repeating the work is a path toward creating expertise and competency.

If there is a public sector incompetency, lack of dedication in the project early decision, or bias toward a pre-selected solution, the project outcome cannot be expected to produce value for money. The outcome would be an imperfect project definition, inapt procurement strategy, wrong investment, or deficient partnership with the private sector.

In public infrastructure projects, the government is the client or so-called buyer. If the client does not have the skills to make the right decision, an optimum decision is unlikely. The importance of this conclusion cannot be overemphasised. Nonetheless, unlike some of the decision theories that study individual decision makers, the government, as a project client, is a complex entity with multiple layers of authority. The complexity of the decision process should be investigated with theories that address the inter-relationships within the government as the public buyer.

Bias, often toward confidence and optimism, is a major issue in infrastructure planning. As a psychological explanation cognitive bias may explain the issue of optimism bias (Lovallo & Kahneman, 2003). In this view, the human mind is adapted to filter undesirable scenarios. Gradually our mind learns that a higher chance of survival exists in hope and optimism. In other words, our brain is hardwired to feel lucky.

Optimism bias does not get better over the time if the decision maker only relies on it's their own intuition. Even if the decision maker witnesses adversary outcome, the optimism is alive hoping for a next good outcome and even see it more likely. It is discussed under the title of 'Gambler's fallacy' that the more a gambler faces a loss, the higher the optimism becomes that they expect to see the next outcome to be a win.

In addition to cognitive bias, the deficient process of information, and organisational pressure may also cause optimism (Lovallo & Kahneman, 2003). Planning fallacy happens when the information channels of the planner are limited. Occasionally, the limited data is an outcome of a manipulated process of information generation that filters undesirable data. In a more common symptom, the data becomes bias due to the resource spent to acquire opposing data are much less than those to gather supporting data. The planner may unintentionally shift the resources, but the effect is an optimistic plan nonetheless. When under organisational pressure, the planner may be forced to include assumptions that are not necessarily included if the organisation is impartial toward the project. The functional urge of an organisation to deliver may lessen the value of 'do nothing'. The glitter can conceal the benefits of less imposing alternatives.

Standard economic theory tries to explain the high failure rate of businesses as an unavoidable result of companies taking rational risks in uncertain situations (Lovallo & Kahneman, 2003). It is the outcome of rational choice where the total benefits outweigh the total losses of the whole business ventures. In this view, failure and the deficient plan is an unavoidable outcome. The failure of the few is the price of others success. This view may explain the situation as a descriptive theory, but it raises no insight into a normative theory how to improve the situation. It leaves the decision maker with no clue why some investment are successful, and some are not.

The Hiding Hand principle coined by economist Albert Hirschman highlights the psychological side of decision maker's behaviour (Hirschman, 1967). The decision maker's ignorance of the future obstacles tolerates the person to choose to undertake the project. However, when the project is proceeding the decision maker has no choice but to overcome the obstacles due to the risk of the sunk cost if the project is abandoned or changed. Hirschman speculates that the urge of the decision maker to avoid loss inspires creativity that might, in fact, solve the problems. In his view, the hiding hand is a benevolent gift that helps make bold decisions.

Serendipity is a nice word but not in projects. Optimism in infrastructure planning causes overestimation of benefits and underestimation of required resources and inherited risk. It censors project scenarios with the most adverse outcome. Consequently, the expected outcome of the included scenario looks more attractive than a realistic outcome. One effect of optimism is seen as the tendency to oversize projects. The optimistic forecast of benefits and lack of any worse scenarios persuade the planners to maximise the plant. Nevertheless, big is not necessarily the best.

Pessimism is another fallacy when the decision maker overweight negative scenarios. Although bias harms a project when swayed by optimism, pessimism

bias can also cause opportunity loss. A government cannot stop the burden to service the community by directing the public money toward investment that generates the highest value. Failure to include the wider benefits of an infrastructure project may include shortfall in its value in comparison to other investment that might generate monetary profit in comparison.

Infrastructure projects follow cascade acquisition style that is a multistage approval regime. The high cost of turning back or lack of any efficient alternative process compels a forwarding waterfall-like-process in which each stage surrenders to the next through a formal sanction. Fear of sunk cost or cost of stoppage may urge a project to move on despite a doubtful destination. As a result, infrastructure projects may tend to continue even when there is a dead-end. Stoppage of a large project needs a brave decision maker with the right authority to do so. Optimism may persuade the participants to pour more money and allot more time to the project in the hope for an outcome. Nonetheless, these projects resemble a swampland that the more time a project struggle, the deeper it gets into trouble.

2.4.4. Political theories

The interactions of project players may be hard to understand if the existence of conflict is not considered. A political view in which a possible conflict of interest is acknowledged may better explain the behaviour of project actors.

Table 12 describes political explanations for project difficulties and its implications for public infrastructure projects. Six explanations are listed in this table. These explanations are extracted from the literature according to a theory(s) that might relate to the situation of public infrastructure projects.

The table explains why public projects face challenges due to the difference in incentive and power of the participants. It explains why a project might not be pursued for project success but for a client's strategic success. That is to say; a project becomes a means of success, not a goal. The client and other stakeholders might take advantage of the project delivery process. They perceive the project arena as a game to win.

Table 12. Political explanations that address the shortcomings of the existing delivery strategies

Explanation	Description	Implications for Public Infrastructure	References
Game Theory	<p>This theory devises a multiplayer game scheme in which players' decisions interact each other's and influence the pays off. The most famous example of this theory is presented as prisoners' dilemma where two prisoners are kept separated and are asked if they betray their mate for a reduced punishment (zero-sum). However, the prisoners are better off if they both keep quiet (non-zero-sum). The game could be cooperative/non-cooperative, symmetric/asymmetric, zero-sum/non-zero-sum, and simultaneous/sequential.</p>	<p>Projects produce expected outcome only in the presence of cooperative behaviour of project actors. If some of the players perceive the game a zero sum, it may hinder proper communications among them and deteriorate trust. Government success in generating value for money depends on reliable information coming from the agency to make possible a reasonable appraisal of investment opportunity that preserves value for money. If the agencies in a government play a zero-sum game against each other, they may prefer to disclose information to the central government selectively or misrepresent. Game theory may also explain the competitive behaviour of contractors to win a project tender. Although the law forbids collusion, the game theory explains why it might interest project bidders.</p>	(v. Neumann, 1928)
Political Cycle Short-Sightedness (Political Budget Cycle)	<p>In democracies, governments are regularly elected and need social support for re-election. The political driver of government prioritises the social popularity when it is closest to the election day in which the people delegate the power to a political party. This focuses decisions with a view to the electoral cycle.</p>	<p>Infrastructure projects are long-term projects with enduring outcomes much longer than the political cycle of ordinary democracies. The project life cycle of infrastructure starts with conceptualisation, peaks at startup and ends much later, often decades. It is unusual to fit the life cycle of large infrastructure in short cycles of political swings. Hence, seeking political benefits may make government become myopic to get the short-term benefits of a project that serves as a political advantage.</p>	(Australian Institute of Company Directors, 2016; Rogoff, 1990)
Adverse Selection Theory	<p>Adverse selection occurs in a market situation where either buyers or sellers have difficulties determining the quality of a product to be exchanged. The asymmetry of information causes adverse selection, which would have been avoided in the presence of complete data. An example of this situation is insurance company's reluctance to sell insurance to senior people since the insurer cannot know the complete health condition of the applicant.</p>	<p>Adverse selection theory may explain the relationship between delivery agencies and central agencies in public projects when there are a severe information gap and distrust. Central agency's efficiency depends on trustworthy information received by the delivery agency that has access to field data and user requirements. Allocation of central funds is done in accordance with the value of the proposed investments to raise value for money the government spend. In an adverse relationship between the agencies, the quality of a business case may remain controversial, and the final decision cannot be made or made with unreliable data.</p>	(Akerlof, 1970; Ozdenoren, 2004)

Explanation	Description	Implications for Public Infrastructure	References
Temptation Bundling	Bundling products together may change their utility. Adding an indulgence to a virtuous product or attaching them together will affect the consumption of the virtuous product.	Project business cases is an offer that promises a product for a handful of resources. Infrastructure projects are sanctioned by government handpicked among many received business cases. There is the probability that a business case is bundled with some desirable outcome to make it more saleable when sent to the government for a decision.	(Milkman, Minson, & Volpp, 2014)
Strategic Misrepresentation	An organisation finds some misconduct as a rewarding activity to satisfy a superior strategic objective. The organisation might try misleading for the benefits it might provide for the organisation that ultimately bring about a strategic initiative.	It is not too farfetched to imagine a delivery agency is desperate to fund its project and so enlarge the benefits or undervalue the cost of risks. The strategic need for survival urges the project agency to overstate the value of the project to raise the chance of approval.	(Flyvbjerg, 2009)
Hiding Hand (Malevolent Hiding Hand)	A decision maker is unaware of the risks and challenges of a plan until the plan is implemented. The ignorance of the decision maker is the reason the decision is made. It is only later when the decision comes into effect that the decision maker realises the obstacles, but it is too late to return. Hence, the decision maker does the best to tackle the problems creatively. Flyvbjerg calls the phenomenon ‘Malevolent Hiding Hand’ to address the shortcomings of the original reading by Hirschman that recognise the hiding hand as a benediction.	A government might find the hiding hand a blessing. It makes the triggering of an infrastructure a breeze! The public agency may initiate a project as a treat due to being uninformed about the challenges. Nonetheless, in the presence of another opportunity to invest, any sub-optimal decision is a bad decision. A government should not take the courage to start a project a talent or a helpful characteristic. In his view, it is not a mercy that a decision maker’s courage is rooted in the ignorance about the future issues. In public infrastructure delivery, such planning will cause even more problems than realistically include obstacles and risks in the decision-making process.	(Hirschman, 1967) (Flyvbjerg, 2016; Flyvbjerg & Sunstein, 2015)

Adverse selection may emerge in a market where either buyers or sellers have difficulties ascertaining the quality of the product to be exchanged (Ozdenoren, 2004). The theory was first introduced by Akerlof (1970) in his paper 'the market for lemons' with some examples in the auto market and insurance. The theory, however, can explain a situation, in which asymmetry of information can cause adverse selection, which could have been avoided in the presence of a complete data set.

Adverse selection theory may try to explain the relationship between delivery agencies and central agencies in the public sector in the selection of a project portfolio when there is an information gap. The central agency may reject a proposed business case assuming it promises more value than it actually will deliver. Nonetheless, adverse selection theory does not expose the behaviour of the public agency entirely because the public sector constantly initiates new projects. Should the government be more vigilant with low-quality business cases, they hardly approve projects that do not provide value for money.

Despite the prediction of the theory that the market collapses in the short term, the public infrastructure projects run a prolific pipeline. Nonetheless, adverse selection theory may attribute central agencies' cavalier behaviour in the decision-making process to the functional and political pressure from the public to trigger infrastructure projects although it is sub-optimal. The central agency may know that they do not know about the quality of the business case, i.e. it might be a 'lemon' but prefer to buy a lemon than buy nothing.

2.4.5. Power

Power is a fundamental concept in political science (Falkemark, 1982; Isaac, 1987). The concept of power is introduced as an individual and organisational characteristic that might explain the behaviour of project participants. The classic theory of power implies power as means of behaviour compliance (Dahl, 1957). A common definition of power comes from the causal relation between two entities one desires to influence, and one is influenced (Isaac, 1987). "Power is the ability of those who possess it to bring about the outcome[s] they desire" (Salancik and Pfeffer, 1974, p. 3). Such power could extend over a broad span of means. The leverage that is embedded in an actor's potential activities is called power field (Kurt Lewin 1935 p. 146). According to Raven (1993), Lewin (1944) defined power as the ability to induce forces of a certain magnitude on another.

In a sense, the definition of power has been expanding to encompass behaviours not normally reflected in decisions. Power is regarded more than behaviour compliance as Dahl (Dahl, 1957) and Lukes (1974) supposed but also consists of non-decision making as in mobilization of bias (Schattschneider,

1960; Szalai, 1997). ‘Non-Decision’ Influence is an invisible influence. When B is under the non-decision influence, B’s initial desire or interests are transformed (Szalai, 1997). Under mobilization of bias B’s own preference changes. Mobilisation of bias is a bias in doing something in favour of the few and suppresses the many (Schattschneider, 1960). “[Mobilization of bias is] is a set of predominant values, beliefs, rituals, and institutional procedures that operate systematically and consistently to the benefit of certain groups and persons at the expense of others” (Szalai, 1997, pp. 43-44). Nonetheless, the classic definition of power is shaped around the idea of behavioural compliance and influence. In behavioural compliance or the ‘Decisionist’ view “A has power over B to the extent that A can get B do something that B wouldn’t otherwise do” (Dahl, 1957).

Kernaghan (1993) defines stakeholder relation to a project “a relationship involving sharing of power, work, support and/or information with others for the achievement of joint goals and/or mutual benefits”. In a project, the influence of parties to impact the project could be classified into three categories of those who have controlled the process; those who have some influence; and those who only receive impacts (Cleland & Ireland, 2007).

The classic theory of power identifies expert power, reward power, referent power, legitimate power, and coercive power as the bases of power (French & Raven, 1959). The model was then completed by informational power as the sixth bases of power (Raven, 2008). Power aims to realise the purpose of the powerful by changing the behaviour of others. Power comes from information, knowledge, skills, expertise, and access to reward/punishment, legitimate position, reputation and force.

Notwithstanding the prevailing definition of power from political science, in projects, power not only manifests as an authority one entity has on the others but also the competency to do a task. The term ‘powerful’ in projects implies competency, skilfulness, expertise, experience, qualification and adequacy. For instance, a knowledgeable consultant has an influence on a client, and a skilled contractor has the power to demand higher costs. In projects, power is not only perceived, like the ability to change other decisions but the competency that convinces others to comply. Power is a combination of authority and competency. Table 13 tries to interpret the classic theory of power in project management.

Table 13. Sources of power in classic theory of power and its mirror in projects

Classic theory of power (French & Raven, 1959)	In projects
Information	Information/ Knowledge
Expertise	Expertise/ Skills
Reference	Reputation
Legitimacy	Authority
Reward	Compensation/ Exclusion
Coercion	Media / Lobbies

The connection between power and rationality has also been investigated in the literature to show the mal-effects of power in decision-making (See, Morrison, Rothman, & Soll, 2011; Whitson et al., 2013) . If the client has less competence and high authority, the course of sub-optimal decisions may start.

Inappropriate project evaluation, unsuitable project teams, not fitting procurement strategy, an inept private partner and eventually wrong investment is more likely to occur.

In public sector project delivery delegation between the central agencies and delivery agencies, the central agencies rely on the expertise of delivery agencies to identify the need and prepare a quality business case. The power asymmetry emerges when the government agencies possess imbalanced sources of power.

2.5. Discussion

This section reflects the insight received from the literature about project success and the delivery processes. It analyses the literature to develop an understanding of the concept of success in infrastructure delivery. It also revisits the delivery process to emphasise the critical role of early decisions in the project and investigates the role of decision-makers in public infrastructure delivery.

Whether the intention is to measure success or to realise it, two different streams of thinking emerge. The first passively tries to give a guideline to measure project success by means of success criteria while the second actively searches for the determinant factors that contribute to success, Figure 12.

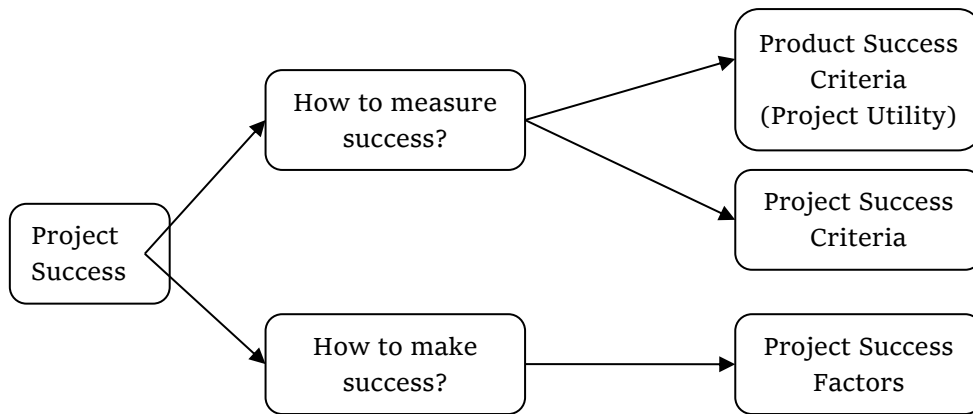


Figure 12. Streams of thought in project success

Success is more than just management performance reflected in measurable outcomes but also includes project function and utility that is mirrored in stakeholder satisfaction. Therefore, to make a judgement on a project outcome it requires looking at long-term benefits of a project, stakeholder satisfaction as well as performance measures. In this research, three dimensions of success are proposed to encompass the performance of project outcome in its wider and longer term. Figure 13 depicts the elements of comprehensive success measurement for a project. Table 14 describes them in the context of project delivery.

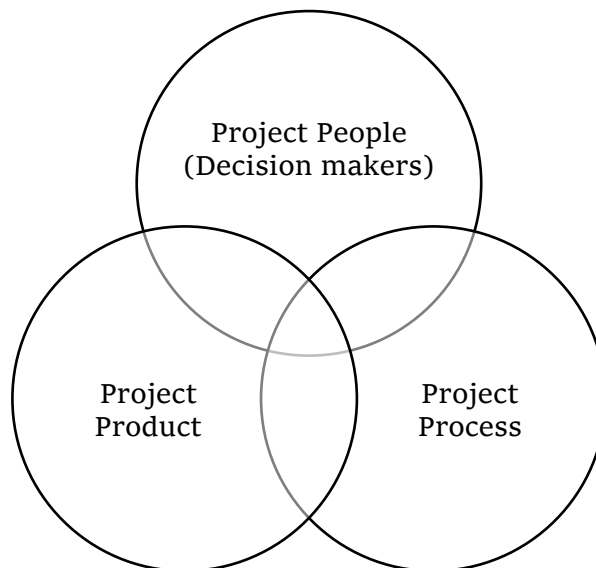


Figure 13. Project success in 3P model

The 3P model summarises the diversity of success criteria into three key dimensions that cover the outcomes of a project in its broadest sense. The long-term and wider perspective in measuring success are certainly needed in large infrastructure projects that have long-lasting effects on the community.

Table 14. Dimensions of success in 3P model

Criteria	Dimension	Implication
Product	Project utility and function, i.e. fit for purpose, value for money, strategic alignment with need, and wider economic benefits.	Product success relies on the robust planning of project need during investment appraisal. The actual success of a project product becomes evident sometime after the project is completed and in operation.
People	People competency to fulfil the task, Satisfaction of project participants and other stakeholders indicated by a willingness to engage in another project. Stakeholder satisfaction that includes environmental and sustainability considerations.	People success or stakeholder satisfaction is heard throughout project lifetime. In public projects where the stakeholders are diverse and numerous, it is perceivable that some stakeholders are overlooked, and some are not enough engaged to express their views.
Process	Project management success, i.e. project time, cost and scope management and effectiveness of guidelines instructed by a jurisdiction and authorities to realise success.	Jurisdictions deliver projects through a set of guidelines and instructions. Assessing the level of process success requires separating the effectiveness of process from other elements of performance.

In theory, success is measured as a comparison of output to the initial objectives. Although the initial objectives emerge at the outset, measurement of success should wait until the measurable outcome becomes available. In other words, in theory, contribution to the measurement of success begins just before project start-up and continues until the project product is ongoing. In practice, however, projects are intensively appraised when they come close to the planned startup. They are acclaimed, criticised or condemned mostly during their start-up. Success is measured by stakeholders during that time, and lots of controversies may emerge. However, a project is less known for its output generating the expected product in the long term. This does not necessarily mean that a project outcome is unsatisfactory in the long term but on the contrary, a project might outperform its original expectation in the long term by providing wider economic benefits. In practice, more emphasis is given immediately after the start-up, and less is given to the wider benefits (or dis-benefits) that are realised long after project startup. In other words, there is a hidden assumption that a decent project continues to be worthy in the future, a bad one will never change.

Distinctions between project people, product, and process as dimensions of success force us to observe projects in a broader perspective. Projects should not be judged for one part or element of their outcome. In infrastructure, the outcomes are realised in the long term or in a wider spectrum that is concealed at the time of start-up. For instance, wider economic benefits of a project may be generated through agglomeration, which takes years if not decades to

emerge. In public projects, one reason that governments are less likely to return to assess the success of a project lies within political disincentives. A project from a previous government is hardly likely to be acclaimed by its rival party even if starts to become a fruitful product.

The role of project outcome in measuring success is well understood in the literature although its extension is expanding and under debate. Nonetheless, the importance of the initial plan and the expectations are less studied, and its influence on success is still somewhat unexplored. To highlight the importance of initial expectation, imagine an efficient project with an excessively optimistic plan that fails to fulfil the terms of its plan after delivery and so disappointment is inevitable. Also imagine when the product of this project is compared to similar projects, it could perform extremely well in terms of outcome. The reason behind its disappointment would be the false expectations it inspired due to the overly optimistic initial plan. This example shows that the contributing elements of success are not evident when a project is implemented but may lay in the expectation a project broadcast even before implementation. Consequently, it is suggested that success should be monitored and theoretically could be measured when the expectation is moulded into stakeholders at the conceptual phase. These three different views to the measurement of success are depicted in Figure 14.

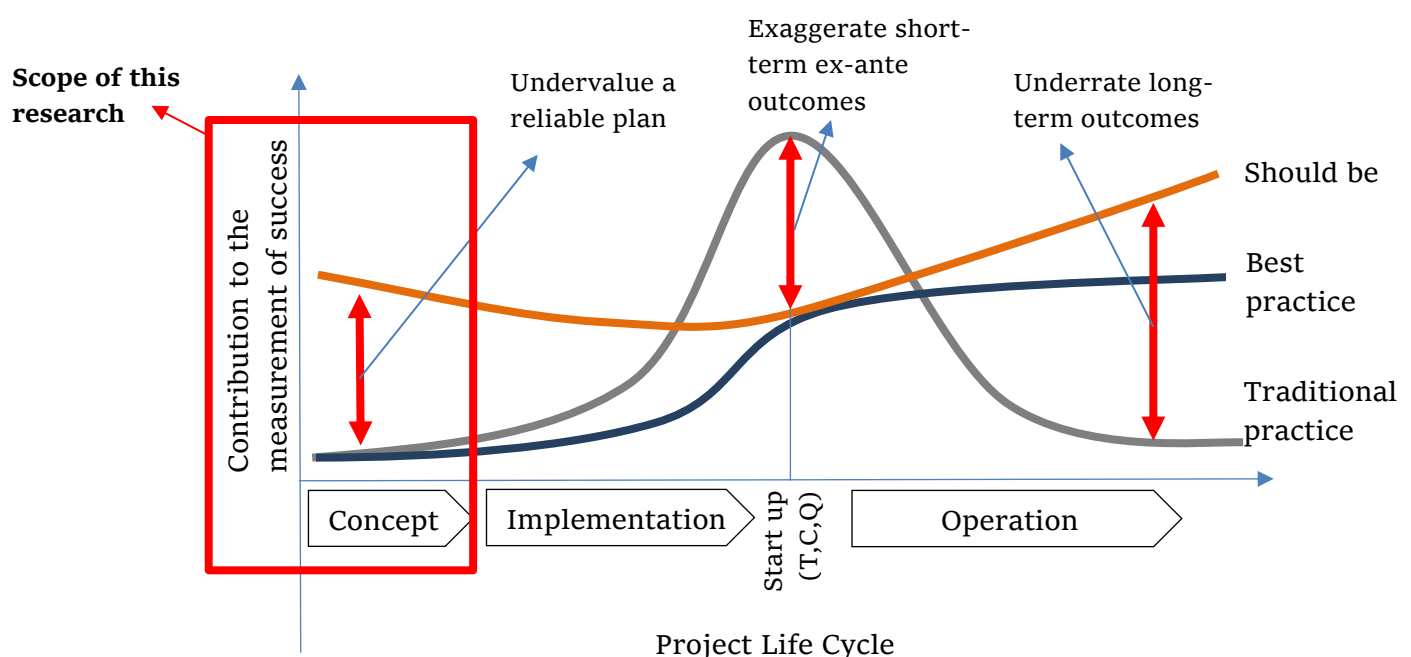


Figure 14. Proposed approach to measure success in comparison to the prevailing approaches

Figure 14 is a graph with time running along the X-axis and an abstract measure of success on the Y-axis. The project life cycle begins with the concept of the project and then with business case approval moves into implementation.

When implementation is complete, the project can begin or “start-up”. What follows is then the project in operation generating benefits measured on the success axis. There are three lines on the graph reflecting three different perspectives on project success. The ‘Traditional’ line shows how success is usually observed and measured. At the beginning of a project, there is little or no measurement of success, but the interest and the desire to measure grows as the project moves forward. As the project nears completion, the desire to measure success increases and reaches a peak at the startup. It is here that the iron triangle is used to define and measure success in terms of timing, cost and quality of the project. This interest typically declines as the project in operation continues. In the traditional view, the data is now available on time and cost and quality.

The ‘Best Practice’ line is what is drawn from the literature on measuring project success. It is similar to the first view at the beginning but takes a longer-term view of success and recognises that the iron triangle is only part of the measurement of success. Wider benefits often become available sometime after the project is in operation. Hence, the current theory says that measurement of success should occur gradually throughout the whole project lifecycle.

The ‘Should be’ view is a proposition of this thesis that suggests success should be measured at the commencement of a project because it is when expectations are set which directly impact the perception of what will be deemed a successful project. Hence, it proposes more measurement at the beginning, relatively less up until startup and then an increase in the measurement of success in order to capture wider project benefits that are not manifest until well after operation commences.

In projects, any decision is made under time, cost and a knowledge constraint. Nonetheless, any decision should aim to maximise the outcome of the decision. There is a number of significant early-stage decisions that have a high impact on projects prospects. The high-level early stage decisions are at project inception and development of a business case, selection of procurement strategy and the final investment decision.

The ability to influence the project outcomes decreases as project proceeds and the cost of change increases when the project progress through the delivery process. Mobilisation of resources, selection of technology, identification of requirements, and managing stakeholder expectations are efforts that have the costly or limited capacity for revision. As a result, early project decisions should be made with the utmost care since the cost of change is high. When the waterfall acquisition model is applied, the delivery process is a one-way stream of project steps one after the other where the output of every step is the input of the next. Any change in the specifications may change the whole process.

There is not a single delivery method suitable for every project, but there are parameters that make one option superior to the other. Choice of delivery model is a significant decision in a project. It is a delicate task and requires a well-written business case to help the government decide. There are elements that can influence the selection. In the UK, Deloitte (2008) suggested a focus on project characteristics such as size, divisibility, risks and residual value. Another factor in the selection of a procurement strategy is a risk; for instance, a PPP provides some relief for governments by providing private finance, but it is sensitive to scope creep; as a result, the delivery model is not suitable for projects with high uncertainties. On the other hand, Alliances are quite flexible in term of scope changes and therefore provide the best option when there are uncertainty and a need for flexibility. In a Design/Construct (or Design/Build) approach, the work can be split and awarded to contractors in a tailor-made procurement model. Nonetheless, in D/C, the responsibility of the government remains high, and integration among sub-projects can be difficult. Figure 15 lists and classifies influencing factors in the selection of a procurement strategy.

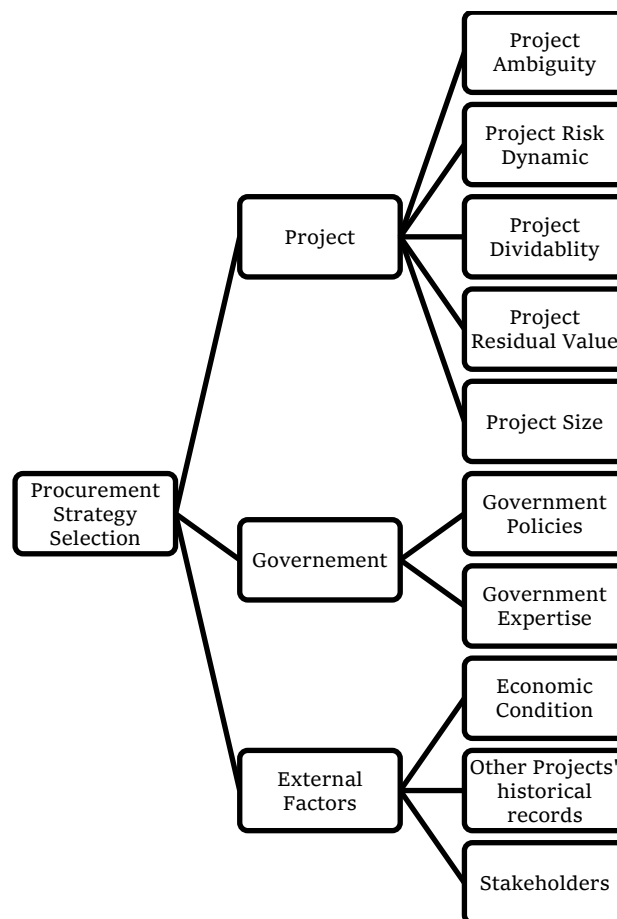


Figure 15 Determinant factors in selection of infrastructure procurement strategy

Large infrastructure projects are predominately run by the public sector deploying the private sector capability to deliver. Within the public sector, the

cabinet, the operating departments (for example health, transport, justice, and education), the treasury and the delivery agency oversee identifying the need and initiating a project idea. Figure 16 depicts the process network of an infrastructure project from concept to product delivery involving the main actors. It includes major constituencies from the public and the private sectors. At the top of the diagram, three major stakeholder groups are delineated:

- The private sector including financiers, contractors, the media and the market,
- The infrastructure delivery project and,
- The public in the broadest sense, represented by the government and its agencies.

The central panel of the figure, infrastructure project delivery, captures a project in its major stages. This panel is structured according to the phase or stage of a project. At the top of the figure, a project begins with the identification of a need encapsulated in the first ellipse. The next stage is the business case, followed by the tender, implementation and operation. The interaction between the constituencies is depicted by a network connecting the private constituencies with the infrastructure delivery and the public constituencies.

During the delivery process, the parliament committees, Auditor General (VAGO in the case of the state of Victoria), and the ombudsmen are the main public sector independent watchdogs that appraise the performance of the project as a new investment. In the private sector, the media and the people oversee the project and report its value for money.

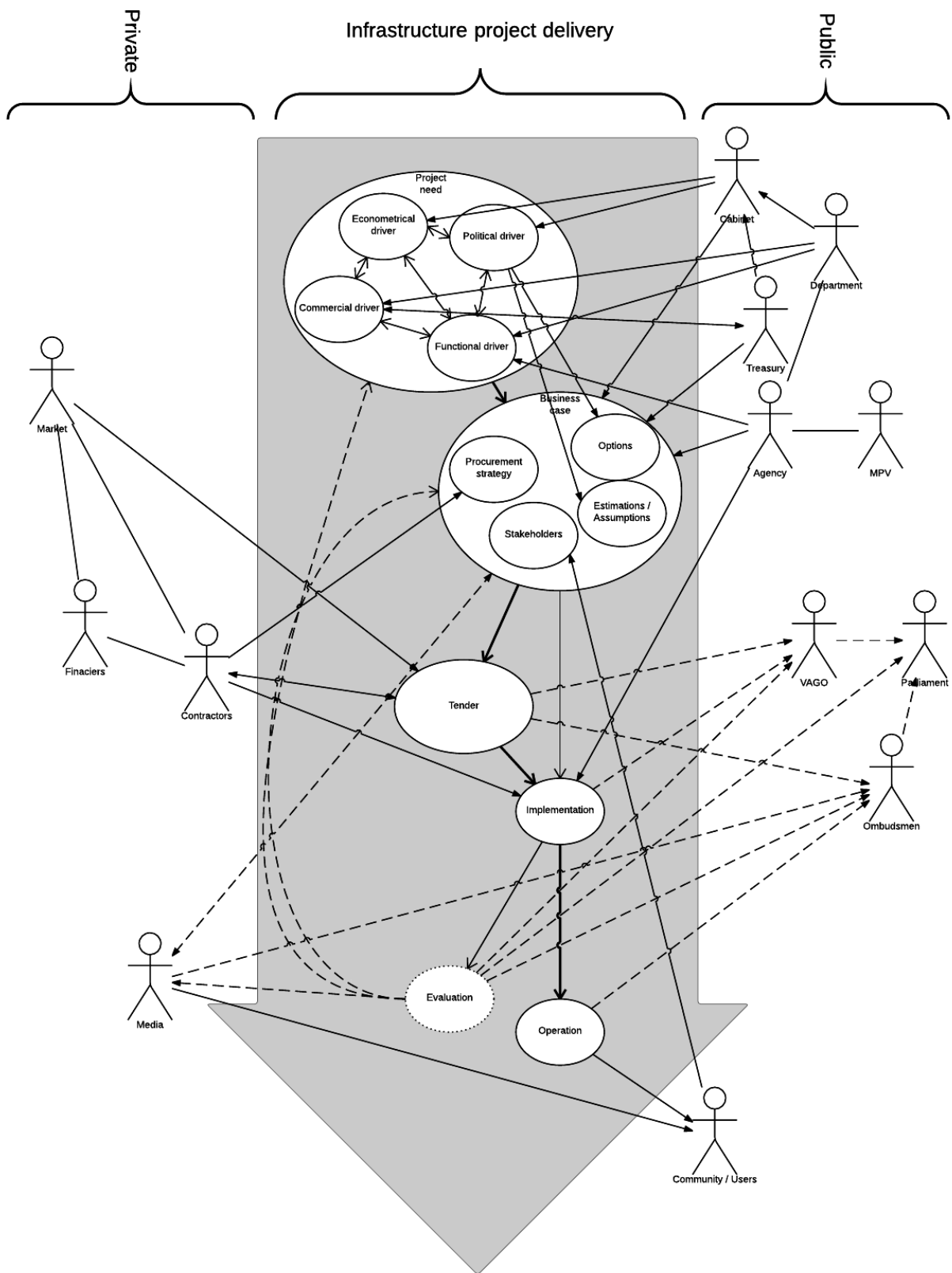


Figure 16. Project constituencies in infrastructure delivery process

Figure 17 outlines the decision space for a public infrastructure project. An agency or government department such as health or transport operates in a market with users of the government service and suppliers to government to provide the service. Suppliers include consultants, vendors and contractors. This triad is the building block of almost all government-led projects today in Victoria. Each agency identifies needs and projects to meet those needs. The agency generates a business case for the central agencies to gain approval and resources. The central agencies are the treasury and the cabinet but also include government audit agencies, which monitor and observe the project at various stages of its lifecycle and report independently to the parliament.

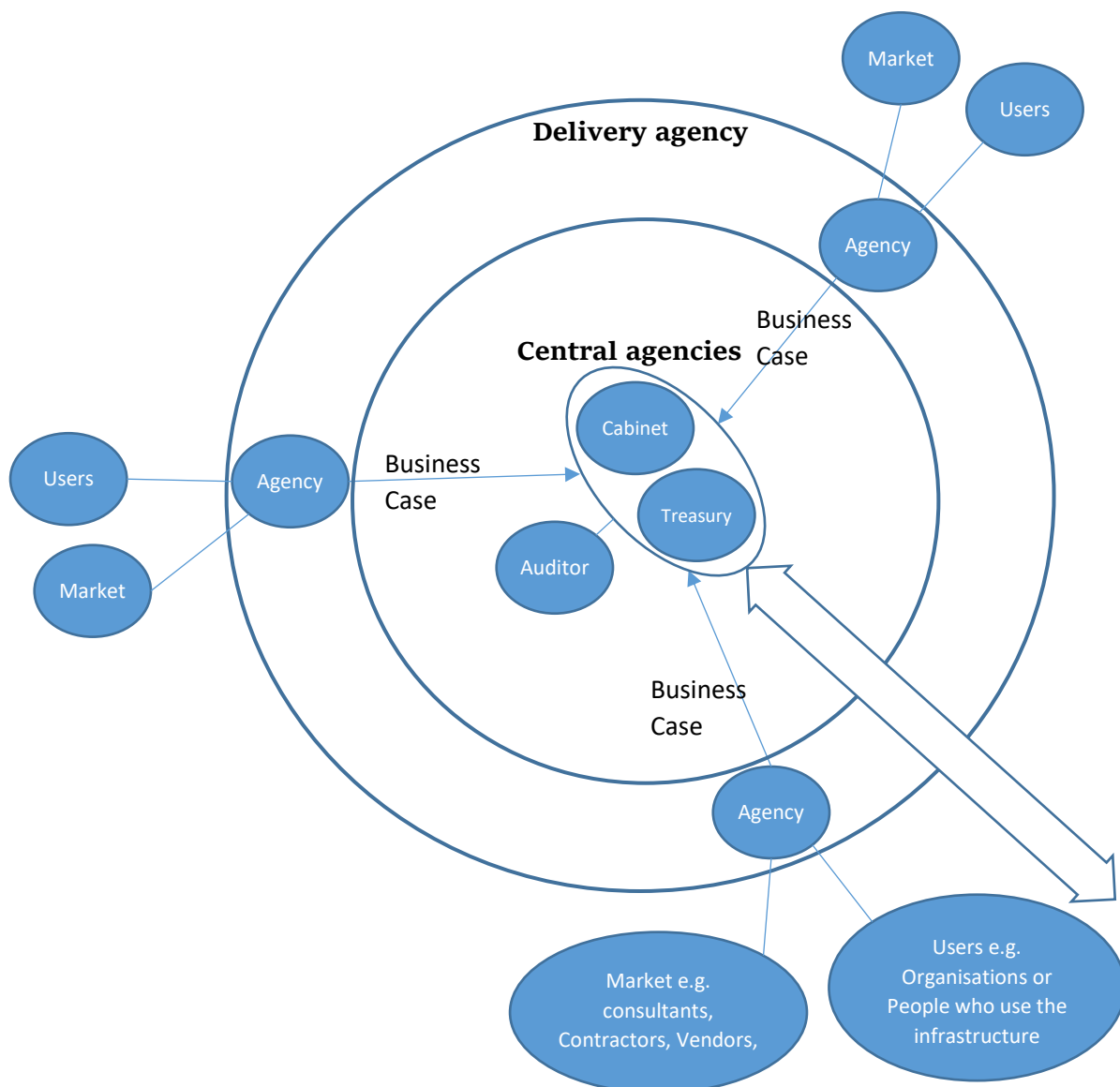


Figure 17. Schematic view of public infrastructure decision space in distinction between central agencies and delivery agencies

In Victoria, the government follows strict principles in public project delivery. One of these processes is an investment evaluation process that is published by Department of Treasury and Finance (1996) that consists of three main consecutive steps, i.e. make a clear objective, then make the decision to proceed, and finally manage the implementation. Among them, 'decision to proceed' has five sub-activities:

- First, the possible options must be contemplated, i.e. assets versus non-asset options need to be considered to assess the presence of private sector.
- Second, financial analysis of the project needs to be done, e.g. selection of discount rate is important since it has a key effect on public sector comparison, revenue or non-revenue investment, cash flow analysis and scenario analysis are all in this section.
- The third step is a socio-economic assessment that assesses project impact on household, business and other stakeholders.
- The fourth step integrates socio-economic measures with those financial ones.
- The fifth step in which risk management is performed that include non-project and project risks, i.e. If the private sector is yet to be involved, private risk (it is the risk of private sector default or failure in project objectives) must be included too.

A project's fate depends on its proper start. Success may best be maintained if a project identifies the need and assesses options that address the need and that generate the highest value.

Previously, a broad spectrum of technical, organisational, behavioural and political explanations have been presented that might explain why wrong projects may start or why projects may go wrong.

As a conclusion to this section Figure 18 and Figure 19 depict the underlying reasons behind an investment that is wrongly chosen or a project that goes wrong. The theories and explanations from the previous sections are included to integrate the literature to identify the shortcomings of early-stage decisions in infrastructure delivery.

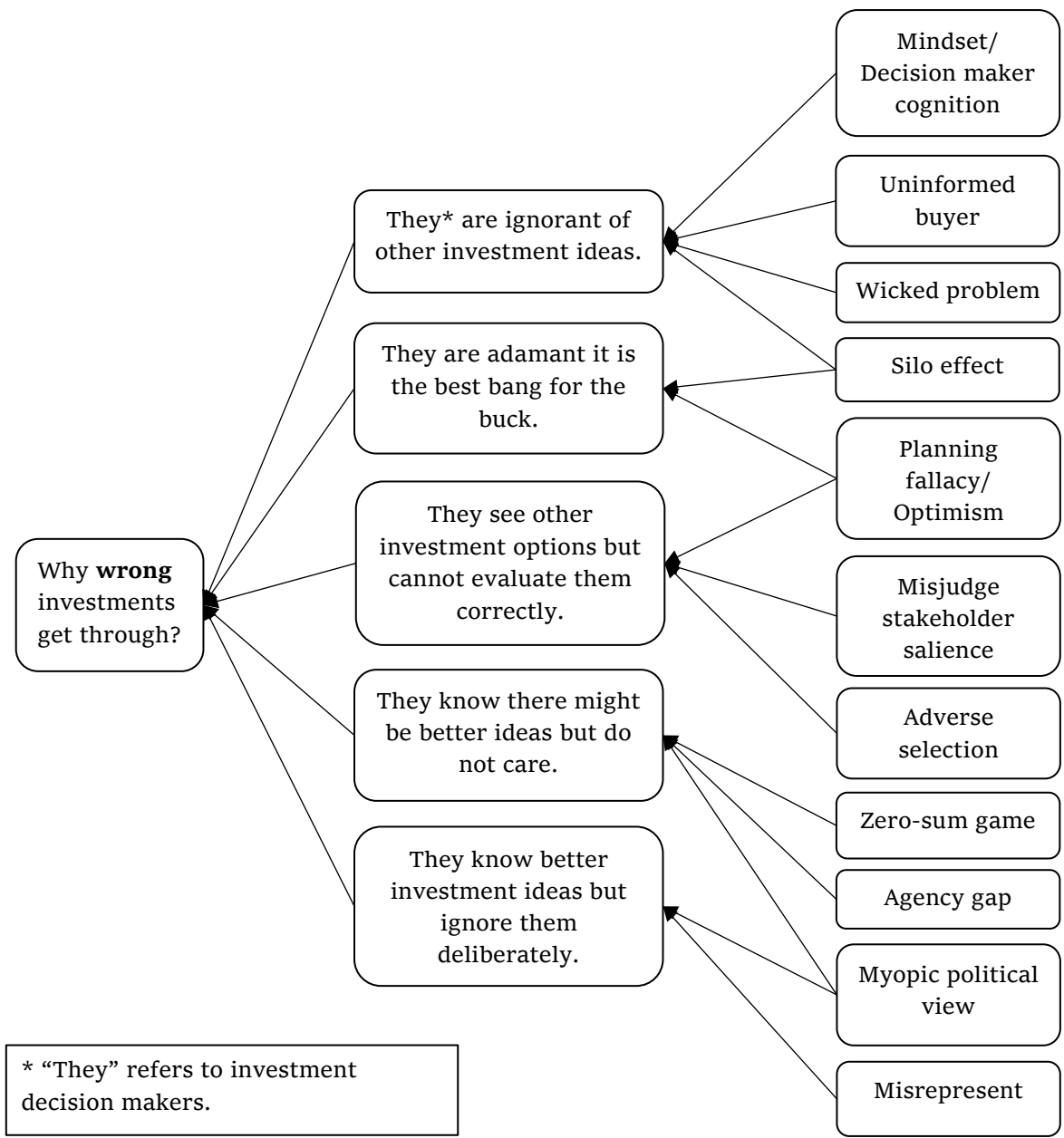


Figure 18. Different explanation for initiation of sub-optimal investment

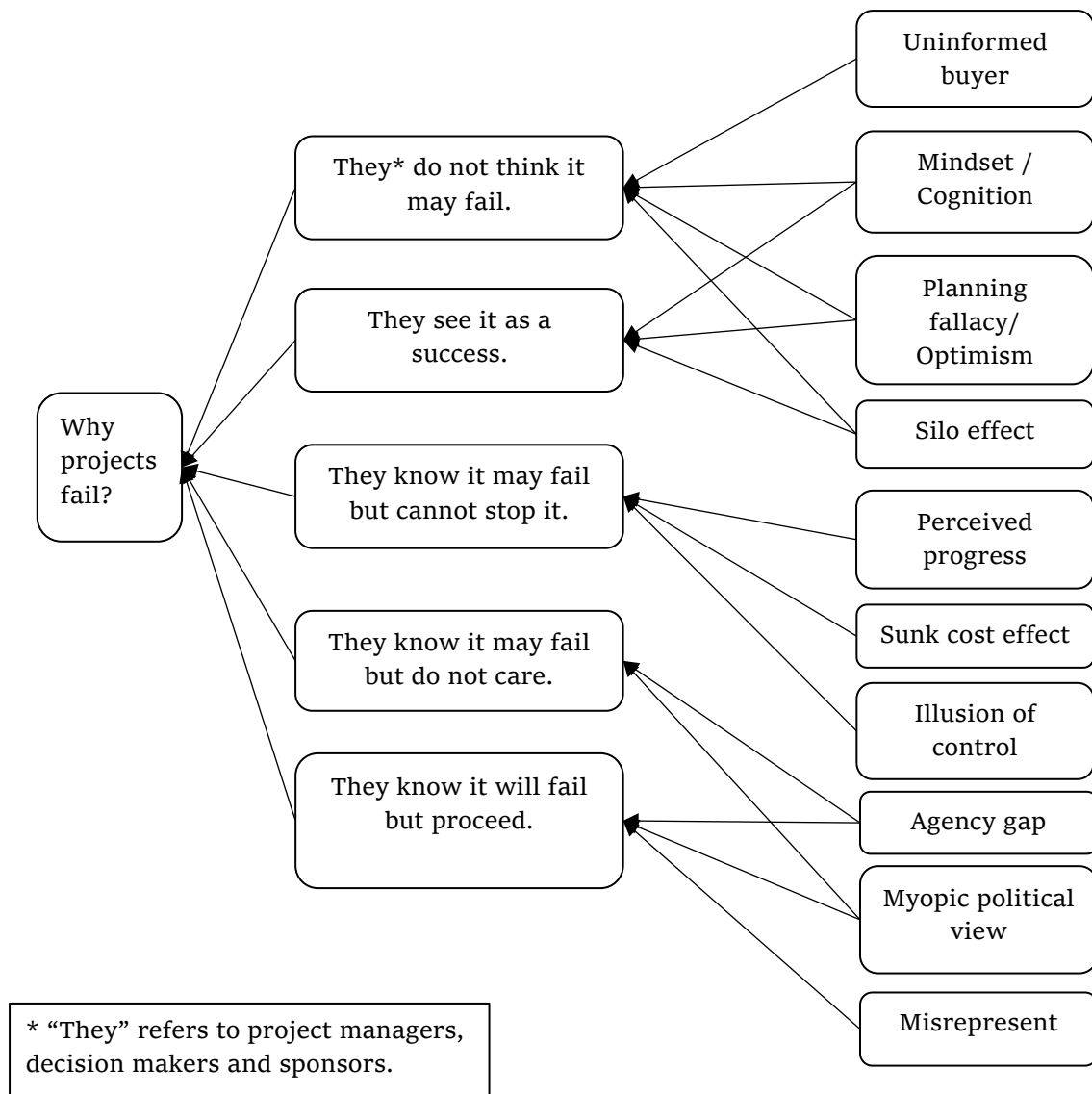


Figure 19. Different explanations for project failure.

2.6. Conclusion

This chapter reviewed the literature to identify the problem, the previous attempts in addressing the problem and the existing gaps. Public infrastructure delivery is a significant task of governments that if not successful may cause loss, dissatisfaction, and missed opportunities. This chapter identified the problem in public infrastructure delivery, the existing strategies to address those issues and the shortcomings of the strategies.

Project success is the objective of any client, yet the definition of success is a contested area. The idea of success in infrastructure delivery was investigated. The definitions, criteria and contributors to success were reviewed in the literature. The dichotomy of success criteria was presented as project management success and project product success. The first, concerns the

performance of project management such as time and cost performance, while the latter checks the usefulness of the project outcome.

Projects tend to measure success too late in the project lifecycle. If success is a perception, the initial expectation of project stakeholders should matter. While success is mostly shaped during the planning stage, when the expectation of participants is formed, projects measure success after implementation at “Start-Up”. In a critical review of the literature, the contribution of early decisions in project success was reviewed.

It was noted that success criteria are passive indicators, i.e. they measure success when the project is over, and the chance of change is nil. Success factors, on the other hand, actively realise success. A review of success factors in the literature signifies that project processes and the role of project decision makers are critical. Nonetheless, the literature demands to know more about how project participants behave and interact with the predefined processes.

The context of public infrastructure delivery was explored and the processes and procedures reviewed. Victorian public project delivery was examined for the detailed processes. The acquisition models in public sector were reviewed. The Waterfall management process is the prevailing acquisition model in which, project stages are delivered one after the other. The waterfall model indicates the significance of early decisions as the cost of change increases by time.

Within the delivery processes, the approval regime was reviewed. The model of the business case and the gateway review systems used in Victoria was examined in detail. The delivery agency and central agencies are recognised as the two main public delivery agencies in charge of the early project decisions. The objective of the government to deliver value for money was revisited and its determinant factors identified. The quality of the business case as the cornerstone of a project plan is indisputable. Furthermore, the evaluation of a business case by the central agencies is critical to producing value for money.

Understanding the problem in the current project delivery is a starting point if improvements in existing routine are to be achieved. Challenges in current delivery of infrastructure are reviewed. Despite the government objective to preserve value for money, there exists a gap between project deliverables and the expected value (Caravel, 2013, p. 11). The existing challenges in Victorian infrastructure delivery are either project management issues such as delay and cost overrun or issues relates to the usefulness of the project product for the community. Experts and academics’ recommendations for improvement is reviewed. A robust planning, a modified business process, a refined decision-making, better governance, and a competent public store are called by a variety of reports in the literature.

Issues in the delivery of public infrastructure projects suggest the following questions be asked in every public project.

- Inception
 - Is the need for the investment properly justified?
- Planning
 - Are project requirements well understood?
 - Has the business case been developed impartially? Is there an unbiased evaluation?
 - Are wider benefits for community addressed?
- Participants' power
 - Is the delivery agency able to prepare a robust business case?
 - Can the central agency verify and approve the quality of the business case?

The existing strategies of the government to improve infrastructure projects were studied and their merits discussed. Project governance was reviewed in the literature and its contribution to project approval regime. The role of the Victorian Department of Treasury and Finance was clarified. The governance of public infrastructure begins when the investment idea is incepted even before the projects start. Effective governance requires management of authorities and decision process through delegation and control.

Stakeholder management is another strategy to help the project get the expected outcome. Stakeholder management is defined and reviewed for its application in public infrastructure delivery. The line between public and private sector and the interaction among central public agencies and delivery agencies are elaborated. Inadequate attention to stakeholder management such as identification of stakeholders and determination of their level of interest and power may harm a project by obstructing communication and expectation management processes.

Governments require private sector expertise and resources to delivery infrastructure. Partnerships in forms of bilateral or multilateral contracts such as joint ventures are common in large infrastructure. Procurement strategies in public infrastructures are diverse without any best option that fits all. The merits of traditional, Alliance and PPP models are discussed in the context of infrastructure delivery. Risk sharing, the flexibility of design, budget certainty, innovation and project characteristics may suggest one procurement over the other. Nonetheless, appropriate procurement strategy is a critical success factor in public infrastructure projects.

Governments should decide on future infrastructures for delivery. Value for money may realise only if the investment decisions and the governance of the approved business cases (projects) are made impartially and in line with long-term government strategies. It requires technical, financial, commercial and organisational skills to assure the selected project produce expected outcomes

that preserve public value for the money. Delegation cannot excuse the government from being an informed buyer. Upskilling is a necessary undertaking by the government to ensure informed decisions are made or supervised.

Despite all of the attempts and deployed strategies, the frequent misfortune of public infrastructure suggests shortcomings in the current practice. Several explanations are proposed to clarify the underlying reasons behind sub-optimal early decisions. Technical explanations address the inherited complexity of the projects disregarding the human or organisational side of the project.

Organisational explanations address the challenges in public delivery arise from the fact that a project is a teamwork. Behavioural explanations study the shortcomings of a decision process and the pitfalls that deviates from the optimum decision. Political explanations concern the conflict of interests and the desire to power that might defect project decision process.

This chapter discussed the merits of existing theories. These theories aim to explain the issues in early decisions of public infrastructure projects. Infrastructure projects are complex problems with multifaceted issues in social, economic, organisational, and political. The complexity of problem needs a higher collaboration among the participants to go beyond the single lens view of each stakeholder. The motives, authority and capability of project participants differ. The supposition of assuming the public sector as a united entity is the first simplification that should be avoided for a more elaborate explanation. The relationship among public agencies is elucidated by the use of game theory and agency theory. The invisible tension between central agencies and delivery agencies are explained. The reasons behind shortcomings in public delivery are discussed in two domains (a) Explanations of a wrong investment is investigated (b) Reasons behind a project failure is studied. Notwithstanding with the capacity of the existing theories in explaining the shortcomings in early project decisions, the complexity of infrastructure projects requires a new hypothesis to explain the deficiencies in public infrastructure decision process.

Power as an individual and organisational characteristic was introduced and its bases discussed in project delivery. Power, as a social notion, suggests the possession of authority as well as competency. The adaptation of power in project arena might untie the complexity of the interactions of project agencies, especially public agencies, in making early decisions.

Projects are a complex set of activities that not only deliver the expected outcome but also produce many other side effects. Project planning is the most important stage of a project, and yet this stage shows serious shortcomings. The current international standards for project management and national policies and guidelines have been studied to explore the underlying strategies of project clients to realise success through governance processes. Among the

governance processes, project approval regime was recognized to be praiseworthy for further investigation as it is where the two processes of project management and product management overlap. Endeavouring to fulfil the importance of the role of decision-makers in projects, the relevant theories of management were analysed to explain the contemporary issues in the project arena.

The literature advocates a range of explanations for the existing issues in the delivery of large projects, notably the shortcomings in the planning of infrastructures. While none of them is considered comprehensive to uncover the cause of the problem, jointly they may explore the problem area by identifying the principal themes that should be further investigated for a robust explanation of misfortune in public infrastructure.

The literature highlights the critical role of the project client in planning and governing a project. When the project is a complex infrastructure, the competency of the client becomes vital to identify the requirements and the right vehicle for delivery. Improvement in the outcome of a project is possible through probing the quality of early decisions. In public infrastructure delivery, the complexity of the public sector decision making processes deserves more attention. It should acknowledge the diversity of agencies that together contribute to the key decisions of public infrastructure.

Review of the literature suggests that a better understanding of infrastructure problem requires investigating the themes that collectively may give away a new explanation for the cause of the shortcomings in public infrastructure delivery. The early decisions during the planning, governance and the selection of procurement strategy should be investigated. It requires studying the behaviour of the stakeholders who contribute to a project early choices. Such investigation needs considering the expectations, interests, perceptions, competencies, authorities and power of the stakeholders. Different agencies that directly or indirectly influence the process includes central agencies, delivery agencies, and audit agencies.

3. Research Method

The research in this thesis has been developed from the perspective of a rationalist, realist mindset that reflects the engineering and project management experience of the researcher. There is a multitude of other frameworks that have been used to study projects and project management processes including more radical constructivist views. Somewhere in the middle the grounded theory approach of Glaser and Strauss (1967) has been instrumental in highlighting the importance of using data as close as possible to project being studied.

The research in this thesis involves close contact with the individual projects. A very detailed report to the Parliament of Victoria from the Public Accounts and Review Committee: 112th Report to Parliament; “Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects” (Public Accounts and Estimates Committee, 2012). The researcher also collaborated on a study for the Regional Rail Link Authority, which used a questionnaire to key stakeholders to ascertain their views on the success of the rail link project. This research provided the data for the Regional Rail Link case.

This study is essentially qualitative using a combined approach of case studies, detailed content analysis of public inquiries, a literature review and an expert workshop; this is summarised in Figure 20.

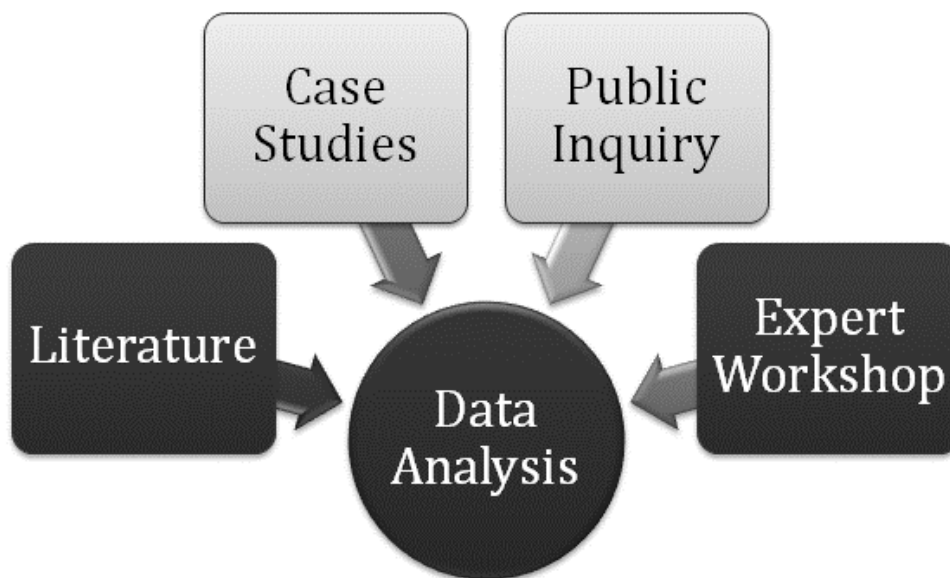


Figure 20. Triangulation of research data

The seven cases used in the research were:

1. Melbourne Convention Centre
2. HealthSMART

3. Melbourne Market Relocation
4. Royal Children's Hospital
5. Myki
6. Victorian Desalination Plant
7. Regional Rail Link

These cases are briefly described in chapter 5 of the thesis.

The main stages of the research were:

1. Literature Review
2. Analysis of records of public enquiry
3. Analysis of project cases
4. Theory development
5. Workshop with key project managers to test and validate the theory

These stages are elaborated in more detail in Figure 21 which aligns the research activity with the data sources.

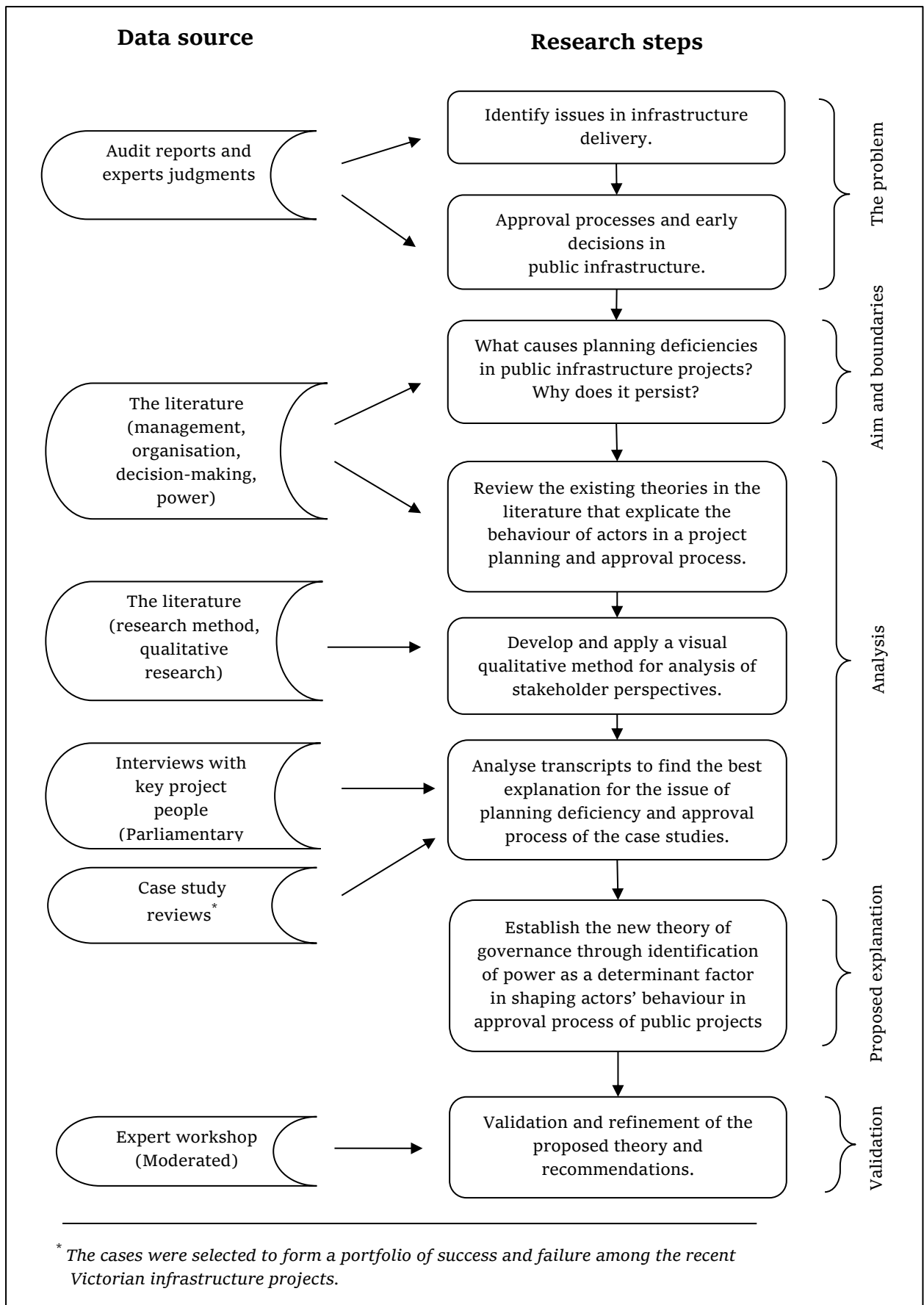


Figure 21. Research steps and data source

Inquiry of the Public Accounts and Estimates Committee (PAEC), “Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects was conducted over 8 days between March 20th and October 8th, 2012. The inquiry called 88 expert witnesses that were responsible at executive levels for the delivery of the seven projects. This included departmental secretaries, deputy secretaries, executive directors, assistant directors, chief legal officers and chief executive officers of construction companies and other agencies involved with the projects as well as university academics.

The public enquiry generated 41 detailed verbatim transcripts, which are available from the Parliament of Victoria website at:

<https://www.parliament.vic.gov.au/paec/inquiries/article/1496>

The government departments and organisations interviewed during the enquiry are given in Table 15:

Table 15. Interviewees in PAEC inquiry

Government Departments	Government Related Agencies	Private Sector	Other Organisations
Treasury and Finance	Transport Ticketing Authority	Lend Lease	Australian Institute of Project Management
Business & Innovation	Austin Health	AquaSure	Engineers Australia (Victoria Division)
Sustainability and Environment	Children’s Health Partnership	Capability Management International Pty Ltd	Monash University /The University of Melbourne
Planning and Community Development	Committee for Melbourne	CSC Australia (formerly iSOFT)	
Justice	Infrastructure Australia	Ensemble Partners	
Health	Royal Children’s Hospital	KAMCO (Keane)	
Education	Royal Eye and Ear Hospital	Boulderstone Ltd	
Victorian Auditor-General’s Office	State Services Authority		
Victorian Ombudsman’s Office			

Each transcript was read, and key concepts were identified, copied and coded into an MS Access™ database. This was also produced as an MS Excel™ File. There were 1170 separate items of text identified from the 41 transcripts. These were coded, analysed and key themes were identified from the transcripts, and 57 themes were categorised. These are given in Table 16. The themes were constructed from an analysis of the 41 transcripts. The number of categories

exceeds the number of evidence since some evidence were allocated more than one label.

Table 16. Themes constructed from PAEC transcripts

Number	Categories	Items of Text
1	Audit and Probity	28
2	Business Case	88
3	Competency	40
4	Contract	36
5	Delivery	42
6	Domestic	42
7	Early Stages	64
8	Elsewhere	28
9	Entities	105
10	Evaluation	11
11	Experience	40
12	Failure	5
13	Governance	147
14	Governance (Other)	25
15	Government	54
16	Guidelines	17
17	HealthSMART	81
18	High Value/High Risk	15
19	Implementation	18
20	Informed Buyer	41
21	Investment	49
22	Knowledge	17
23	Leadership	31
24	Learning	4
25	Market	31
26	Melbourne Convention Centre	28
27	Melbourne Market Relocation	30
28	Myki	102
29	Operation	13
30	Organization	32
31	Other	8
32	Pipeline	17
33	Planning	92
34	Pool of Skills	10
35	Power	31
36	Practice	9
37	Private vs Public	102
38	Processes (Other)	16
39	Procurement	136
40	Project Processes	147
41	Project Team	33
42	Project Type	26
43	Regional Rail Link	2
44	Review and Reporting	49
45	Risk	39
46	Royal Children Hospital	50
47	Sector	46
48	Skills (Other)	30

<i>Number</i>	<i>Categories</i>	<i>Items of Text</i>
49	Skills Distribution	66
50	Skills Management	76
51	Stakeholder	92
52	Standards	14
53	Success Factors	70
54	System Thinking	18
55	Tender	63
56	Training	23
57	Victorian Desalination	24
	Grand Total	2553

These were then combined into 22 super categories; refer Table 17, for theory creation. The super categories created were:

Table 17. Supercategories derived from PAEC transcripts

<i>Number</i>	<i>Super Category</i>	<i>Items of Text</i>
1	Case studies	325
2	Competency	110
3	Contract	36
4	Control	77
5	Entities	105
6	Governance	172
7	Investment	49
8	Jurisdictions	70
9	Market	31
10	Organization	32
11	Planning	92
12	Power	31
13	Private and Public	156
14	Procurement	481
15	Project People	64
16	Project Processes	265
17	Project Size	26
18	Sector	46
19	Skills	205
20	Stakeholder	92
21	Success Factors	70
22	System Thinking	18
	Grand Total	2553

After analysing the text, a theory of power asymmetry was developed which seemed the best explanation for what had been observed in the projects. This was developed using abductive reasoning – that is – it emerged as the simplest and most plausible explanation for the common project problems, which arose in the case study projects. In order to test and validate this theory, a workshop was held involving senior project executives with deep experience in

management. This workshop was moderated by an expert in moderating expert panels.

3.1. Research boundaries

The research focussed on project processes and specifically the decision-making processes and governance involved in the seven projects, refer Figure 22. In particular, the literature review and the analysis of the public inquiry texts identified the importance of early decisions. These include the initial identification of need (inception), procurement strategy, and investment decision. It focussed on seven large infrastructure projects that were the subject of extensive government reviews in 2012. It involved senior people who were directly involved in the development of each project. The projects were selected because in different ways each of the projects failed in the eyes of the government.

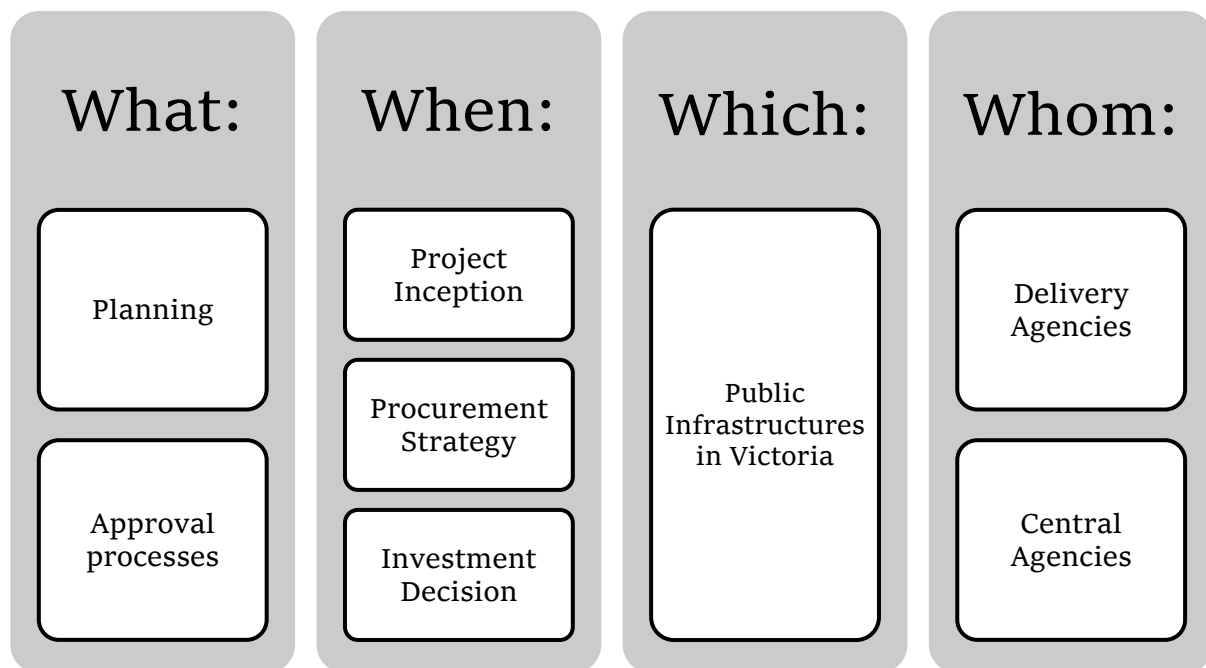


Figure 22. Research boundaries

3.2. Conclusion

This research explored the “unofficial” story of infrastructure projects behind the gloss and marketing of their project reports. Although it begins with the question of WHAT has happened, it aims to end up with the question of WHY that happened. Reports and the literature are suggestive but acquiring a broad knowledge of project delivery requires direct observation, only found in direct contact with experts.

Gathering executive managers is hard considering their time constraints and apprehension for candid discussion. There is, however, a systematic process to

bring a range of experts together and ask tough questions. Parliaments in democratic nations such as Australia have the power to audit governments and their departments. They invite witnesses from the public and private sector to answer questions. Fortunately, there was a Parliamentary inquiry that provided detailed information about seven large projects.

The diversity of people witnessed in this inquiry and the calibre of the participants seems incomparable to any privately conducted survey in this area. The data is essentially a dialogue between the members of the Public Accounts Committee of the Parliament of Victoria, Australia and the invited witnesses. The witnesses came from their affiliated organisation or in a few cases multiple guests with a shared interest.

In this research, a new method of qualitative data analysis is developed to study the collected data. This elaborated upon in the next chapter. This attempt is a justified effort due to the high value of the data unavailable elsewhere. Instead of relying on the format and style of information, the method focuses on the content of messages that are given by the witnesses. It summarises, indexes and organises data and graphically illustrate them to uncover the conceptual maps and network of causality. Mapping techniques such as dialogue maps are applied to see what are the experts prevailing opinions. The method of analysis aims to prepare the ground for extracting meaningful knowledge from unsettled, noisy, contradictory data commonly found in third-party interviews with participants from an extreme range of disciplines.

4. An Enhanced Mapping Technique to Understand Complex Project Systems

This chapter aims to address the limitations of current methods of project management research by integrating inductive research approaches with abductive processes to facilitate an in-depth investigation of complex data. It is well recognised that the prevailing research approaches of processing qualitative data in social systems involve inductive methods, aided by a statistical inference. However, when the problem is complex, or data are diverse, fragmented, incomplete, or subjective, inductive methods may present some shortcomings to investigate the system behaviour.

It is postulated that an abductive technique (the logic of discovery) for qualitative project management research may complement other research methods that interpret the grounded views of stakeholders to find a better explanation. In this thesis, the merits of major qualitative research strategies are evaluated. Amongst them, visualisation is found capable of uncovering complex data such as the meaning of stakeholders dialogue.

A new thematic semi-structured mapping technique is proposed to visualise, analyse and explain knowledge through summarising coding, and mapping linguistic data. It connects method link between obtained data and assists in the identification of emerging trends, preferences and ultimately the development of an underlying theory that best explains the observations. Application of this approach is outlined and exemplified through an analysis of third-party interviews of the performance of major public infrastructure procurement.

4.1. Introduction

Current methods of research into project delivery systems are generally based on inductive research methods. The current approaches in the research of complex project systems may be inadequate in explaining social issues (Ackoff, 1975; Churchman, 1967; Horn 2001) and in connecting different viewpoints (Rittel and Webber 1972; Simon 1984). The problem is compounded when the data is massive, incomplete and changing (Australian Public Service Commission 2007). For example, it would be a challenge to use the generalised predictive outcomes from such approaches to developing new project processes on the basis of lessons learnt from past outcomes or the views of experienced stakeholders.

Case study research is an example of an inductive approach that has frequently been used in research analysing major project delivery. Such inductive approaches may not adequately address the issue of complexity brought by complex systems, inter-organisational behaviours and differing data exchange

requirements of multiple stakeholders and is not unique to the domain of delivery of major projects and project management.

This thesis proposes a novel visual mapping method that will improve some of the weaknesses in inductive research methods. The method is tested on transcripts of interviews conducted by the Victorian government as part of their parliamentary review of the delivery of major projects (Public Accounts and Estimates Committee 2012). A detailed review of the limitations of existing research approaches into project management to test the assertion that current methods of research into complex systems have limitations follows.

4.2. Project management research methods

4.2.1. Social problems are wicked

Project environments are social systems as project tasks are typically made up of activities carried out by people interacting with internal and external stakeholders. Problems encountered in projects can “ill-structured”, “messy” or “social messes”. The term “wicked problem” (Ackoff, 1974; Churchman, 1967; Horn, 2001) is used to describe an issue in social systems that are complex, ambiguous, severely constrained, interconnected, are seen differently and even contradictory from different points of views (Rittel and Webber 1972; Simon 1984). Wicked problems are multi-facets and often change over time (Churchman, 1967). Ackoff (1974) also postulated that no problem exists in isolation and every problem is a part of a system of problems. Problems in complex projects are usually wicked as they form part of an interconnected system. Researchers’ use of a single lens view to investigating a specific problem is unlikely to address the issues adequately especially when these are considered in the broader context of the system. Due to methodological limitations or data impediments, project management researchers face challenges in incorporating their observations of all stakeholders, finding a way to consolidate them and identifying any underlying patterns that may give rise to predictive tools and proposes, or even identifying root causes that may lead to improvements.

Projects are unique since they differ in goals, boundaries, contextual settings, resources, and stakeholders. Furthermore, in complex projects, these characteristics are even more interconnected, and this makes a complex project unique study environment. Generalisation, therefore, is restricted when there are differences between different samples. It is even more challenging from a complex social system point of view due to the inclusion of the broader population.

If a series of observations in a complex project is used to generate a pattern, it may suggest an underlying grounded theory that might apply to other similar

projects. Nonetheless, the findings may only extend to projects with similar parameters. As complex projects are rarely similar over the broad spectrum of the project parameters, generalised findings based on inductive reasoning are strictly speaking not adequate and may pose a challenge to the researchers.

4.2.2. Data limitations

The majority of data obtained from large projects are complex since the data is incomplete, contradictory or changing (Australian Public Service Commission, 2007). The data may have internal inconsistencies, too many variables to cope with, and an infinite number of scenarios. The use of language by the social actors also contributes to the complexity.

In project management research, it is common to encounter subjective data in the form of stakeholders' viewpoints, judgement or interpretation. Pure hard facts, such as projects statistics and numerical data would also exist alongside these subjective data. According to information theory, shifting from numbers to linguistic increase the capacity of communication but at the same time, the level of ambiguity or misinterpretation (Cover & Thomas, 2005). This forces the researcher to acknowledge the actions and intent of project stakeholders and to consider the meaning of specific social actions.

Research data should be a real representative of the system to justify the validity of findings (Lincoln & Guba, 1985). Prolonged engagement with the observed system, persistence observation and triangulation are proposed to increase the credibility of data (Kemperaj & Chavan, 2013). However, despite all of the efforts, there is no definitive answer to the issue of validity in qualitative research including project management research (Burnard, Gill, Stewart, Treasure, & Chadwick, 2008, p. 431).

The validity of data can also be affected by the nature of the data in project management research. Data collected in project management research are usually fragmented. In projects, the outcome is realised only in long-term when the project is near completion. In large projects, it might take decades to get hold of the actual outcome, and thus the duration required for data collection affects the consistency of the data due to potential changes in market conditions.

In large projects, project managers may be reluctant to publish any data other than those that they consider under control. While secondary data might be abundantly available to the researcher, the depth and coverage may overwhelm the researcher. Furthermore, the use of analysis of secondary data may appear to be troublesome when it is collected and published by a third party who may have objectives and agenda other than research.

Abductive research strategy, goes beyond description by searching for an explanation. It is a method that generates a hypothesis as an appropriate method of theory construction in interpretive social science (Blaikie, 1993, p. 162). It involves building a theory from social actors' language, meanings and ideas grounded in everyday activities (Blaikie, 1993, p. 163). Abduction begins with colligation of a variety of separately observed facts about the subject of the hypothesis using analogy among similar concepts. In short, the action of observing can generate ideas that assist in explaining the facts (Pierce, 1934, pp. 404-5).

Abduction speculates on the most probable causes by observing the effects and searches for the best logical explanation among concepts. Abductive inference, when applied to analysing the social system, searches for the most likely explanation for the behaviour, therefore has the potential to overcome the deficiencies in deductive and inductive reasoning.

To better understand which research approach gives the most insightful reflections on the complexity of project delivery, the qualitative techniques currently available for research into complex social systems is critiqued in Table 18. The selected methods are qualitative to address the complex nature of project systems that is not reflected in quantitative data.

Table 18. Critique of selected qualitative research strategies in project management research

Research Method	Grounded Theory (Glaser & Strauss, 1967)	Constructivist Grounded Theory (Charmaz, 2000)	Abductive Research (Blaikie, 1993)	Case Study (K. M. Eisenhardt, 1989)	Action Research (Torbert, 1976)	Qualitative Comparative Assessment (Ragin, 2008)
Application	Emerge a new hypothesis grounded in the data	Studying the subjective and intersubjective meanings and motives of participants	Find the best logical explanation through a process of diagnosing that also applies existing theories	Study a problem in a single or multiple cases to draw a general conclusion	Address a particular problem through study of actors behaviour, establish and test a hypothesis	Compare cases across selected embedded variables to find a pattern
Reasoning	Induction	Abduction	Abduction	Abduction/Induction	Abduction / Induction	Induction
Ontological consideration	Positivism	Interpretivism	Interpretivism	Positivism/Interpretivism	Positivism/Interpretivism	Positivism
Epistemological consideration	Constructivism/ Objectivism	Constructivism	Constructivism	Constructivism	Constructivism	Objectivism
Type of observation	Qualitative	Qualitative	Qualitative	Qualitative and quantitative	Qualitative and quantitative	Quantified qualitative
Ability to incorporate complex data	Able to investigate a broad range of topics; Capable of processing segmented and incomplete data	Able to cope with subjective data such as experiences of the respondents (Ong, 2012, p. 420)	Uncover complexity of social behaviour by dedicating more attention to the motives and intentions of people in their social situations (Ong, 2012, p. 423)	Look beyond initial impressions and perceive evidence thru multiple lenses, i.e. ask "Why" behind relationships	Unravel confronting data by going through 'ladder of inference' to reach the first point of agreement (Argyris, Putnam, & McLain Smith, 1985, p. 57)	Simplex complexity could be traced through selected variables that are cross compared to reveal an underpinning relationship; Uncover causality through Boolean truth table (Baumgartner, 2009)

Research Method	Grounded Theory (Glaser & Strauss, 1967)	Constructivist Grounded Theory (Charmaz, 2000)	Abductive Research (Blaikie, 1993)	Case Study (K. M. Eisenhardt, 1989)	Action Research (Torbert, 1976)	Qualitative Comparative Assessment (Ragin, 2008)
Limitations	Less capable of handling contradictory data due to assumption of data consistency; Searching for a unique truth may bias the researcher to discount unusual ideas	Too much flexibility and less structure of the research method add to the burden of validating the research findings	The research outcome is highly sensitive to the interpretation of the social actors' language by the researcher as an outsider viewer.	Any postulation that has no immediate connection to the case review might be overlooked; Generalisation of findings is restricted if cases are unlike	Less intention to embrace an alternative explanation outside the research boundaries; Favour hard, observable data over open discussion of a situation (Friedman & Rogers, 2008, p. 255)	Defining determinant variables is vulnerable to researcher's assumptions, The process requires homogenous and complete set of data to generate an outcome
Expected application in project management research	Post-mortem studies such as project audit, to examine an identified issue or investigate a hypothesis based on the data only not the researcher's partiality	Examine project practices through analysing stakeholders' subjective data	Analysing complex project issues to find a logical cause through triangulating diverse stakeholders perspectives and analyse it against existing theories	Investigating project performance; might join other methods to enrich research outcome	Study project governance and authorities through analysis of agencies behaviour to uncover the dynamics of the decision process	When applied to multiple project cases may suggest a prevailing cause for a shortcoming or phenomenon in project delivery

Despite the potentials of qualitative research strategies in dealing with complex data and looking at the big picture, some may have shortcomings in a variety of areas such as handling incomplete and contradictory data, avoiding researcher bias, investigate alternative explanations, and validation of findings. To address the limitations, a robust strategy of research might use both methods of induction and abduction to process incomplete data from one or multiple observations. A technique that incorporates inductive and abductive processes have the potential to improve our project management research.

4.2.3. Need for new methods of making sense of complex data

Research data obtained from observation, survey, interviews and workshops contain potential biases and subjective perspectives of key stakeholders. Although these can be minimised via statistical approaches, the complex integration of these perspectives that aligns with the overall project would require a whole different approach to making sense of the situations when the data is extremely complex. Robert E. Horn (2005) believes that the analysis and presentation of complex systems require the use of a visualised methods. Reflecting on the limitation of use of textual arguments, he proposed a form of information mural and information maps to show large processes or larger contexts that create the issues, represent severe and complex debates, portray different cultures, represent multiple strategies, understand ideologies, get a more comprehensive picture of unknowns, and represent mindsets and worldviews.

4.3. Qualitative illustrative methods

People find illustrations to be more efficient and effective in conveying meaning and understanding.

Despite extensive use of visualisation as a means of presenting research findings and knowledge, there have been few efforts dedicated to investigating the use of visualisation as a method of data analysis.

Researchers have used visual tools such as mind maps and concepts maps as means of collecting, analysing and presenting information (Shallcross, 2013; Valdes-Vasquez & Klotz, 2013). These can be used in a manner similar to survey tools or interviews by asking respondents to build and connect concepts. These maps are then analysed for their content, repetition and relations.

4.4. Review of specific visualisation methods

Mind maps are a representation of a thinking process in a visualised illustration; they are usually author focused. Mind maps are easy to make but not easy to read in a structured manner. They help record and review the flow

of thinking and is highly dependent on the author's mindset. Mind maps might create bias since they are influenced by author's thinking process. The comparison between maps is hardly possible unless they are structured for comparison purposes. They are a monologue and usually only offer a one-way flow of information from author to audience. Mind maps are used to record individual reflections for saving time, connecting concepts, seeing the big picture, and helping memorise it (Burgess-Allen & Owen-Smith, 2010; Crowe & Sheppard, 2011).

A concept map is a presentation of data by identifying the concepts and the relationship between them. It is a semi-structured illustration, and an example of a concept map is shown in Figure 2. Concept maps establish a shared understanding between the author and audiences with a controlled emphasis on the link between author and audience. When applied to projects, they explore the conceptual framework of a problem and its boundaries. Concept maps are monologue unless they are prepared collectively.

Concept maps have been extensively used in research, education, and learning processes (Jackson & Trochim, 2002). In projects, concept maps have been used to record a brainstorming session, display categories of various causes for an issue or self-reflect a personal understanding of an experience or a case. Nonetheless, the depth of information in a concept map is inadequate to illustrate a complex relation of different concepts or explain the root cause of a problem.

Flow maps such as flowcharts that show a precedence of time using block diagrams that present the flow of data or authority. Flow maps are useful in illustrating details of process and sequences of steps. Although flow maps can incorporate process details, the core structure is limited to contain station blocks and connecting arrows. Flow maps are easy to make and effective tools.

Logic maps explore the logical connection between defined elements and their corresponding merits. Generally, logic maps encompass decision maps, dialogue maps, and argument maps. Logic maps are especially useful in situations requiring decisions or appraisal.

As in decision trees, decision maps explore decision options and the thinking behind these options. A decision map consists of actors, decisions, questions, options and sub-options, pros and cons, arguments and evidence – and their relationships. The map helps uncover the behaviour of an actor or decision maker. It is usually illustrated in a systematic, disciplined way (Francois, Blackwood, & Jowitt, 2002; Kingsford & Salzberg, 2008). The process of decision mapping includes 1) identifying the problem, 2) exploring the options, 3) evaluating the options, 4) building solid foundations, 5) taking a critical view of the options, 6) finding the assumptions, and 7) weigh everything to find the

best solution (van Gelder, 2009). Decision maps have the potential to minimise the biases of the author, and it aids in providing a shared understanding among decision players. Their only shortcoming is their scope is limited to decisions only.

Dialogue mapping when applied to recorded conversations, produces a collective reflection on complex problems. It has three elements of 1) shared a display, 2) active listening, and 3) argumentation scheme (Conklin, 2005, p. xii). Dialogue mapping as a technique challenges the traditional process of linear thinking in problem-solving, i.e. that solution comes from an issue in an orderly way (Conklin, 2005, p. 8). Also named as 'Argumentation map', dialogue maps have the potential to show alternative scenarios and different viewpoints (Horn, 2001).

Issue mapping or issue-based information system (IBIS) is a technique for dialogue mapping. IBIS consists of the following three elements: 1) Issues (or questions), 2) Ideas (or positions), 3) Arguments: Pros (arguments for) or Cons (arguments against) an issue (Burgess Yakemovic & Conklin, 1990). Issue mapping has a potential to uncover a wicked problem as in project management issues.

Causal maps are a special type of flow map that conveys the flow of causality. Causality and correlation in a system can assist a researcher in modelling and predict system behaviour. Causal maps uncover the causal relation among concepts and variables in a system. Application of flow maps in project management is numerous including and not limited to planning, governance, management and research. Although causality or correlation are investigated in research, mapping the relationship helps to evaluate and improve findings through a constructive process of polishing and refinement. Hence, causality maps will enrich any qualitative strategy of research by offering a big picture of the ultimate relationship in the collected data for further validation.

An integrated representation of assorted visual maps that individually and severally support each other to convey a message may consist of a number of illustrative models or semi-structured complex model. One page visuals such as posters, info-graphs, or murals present knowledge that focuses on the audience. However, they can be shallow when it cannot cover the depth of content. They have been applied to business, education, or visual inquiry-based learning (Hui, Zarei, & Duffield, 2015).

Figure 23 illustrates few examples of mapping technique from various type applicable in representing complex knowledge related to project management research.

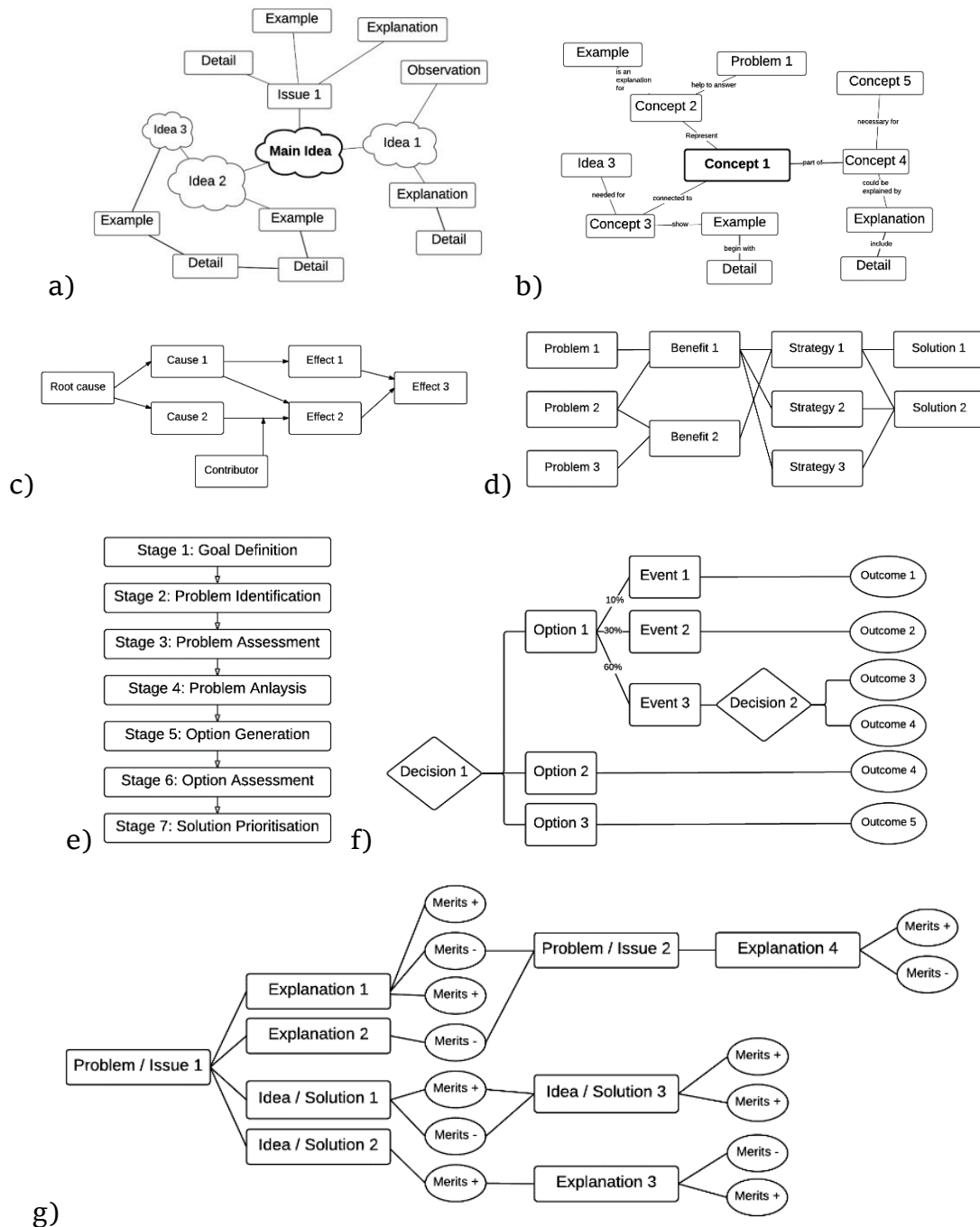


Figure 23. Examples of illustrative models applied in analysing and presenting complex data; a) Mind Map b) Concept Map c) Causal Map d) Logic Map e) Flow Map f) Decision Map g) Dialogue Map

The most appropriate usual technique for incorporation into project management research is considered in the next section.

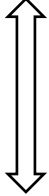
4.4.1. A critical discussion of alternatives to aid analysis and understanding

A 2-dimensional taxonomy of visual models is developed to appraise the merits of mapping techniques for project management research, see Table 2. The first dimension is a classification of whether the tool is relational or dimensional.

Relational models have a flat structure with elements connected to a network, e.g. Network Diagram, Entity Relationship Diagrams, and Concept Maps. Dimensional maps, on the other hand, prioritise features and show a hierarchy or precedence, e.g. Organisation Chart, Flow Chart or Triangular Diagram.

The second dimension is how well-structured a tool is, i.e. structured versus non-structured models. Structured illustrative models use predefined elements and standard principles. UML (unified modelling language) for instance is a structured model that aims to facilitate communication between the author and the reader. In general, structured models appeal to a broader audience. Non-structured models, on the other hand, are easy to make but harder to communicate.

Table 19. Taxonomy of visual models and examples

		Examples		
Relational  Dimensional	Structured	Semi-structured	Non-structured	
	Network Diagram	Concept Map/ Thematic Map	Mind Map	
	Logic Map	Dialogue Map	Poster/Mural	
	Flow Chart	Causal Map	Non-structured Flow Map	
Ability to incorporate complex data	Low	Medium	High	
Ease of use	Low	Medium	Medium	
Transferability of the comprehension	High	High*	Low	
Appropriateness for project management research	Medium	High	High	
Appropriateness for Abductive research	Medium	High	Medium	

* If the structure is pre-communicated with the audience

The use of social science approaches which brings the dimensions of abductive inference gives potential to address some of the current difficulties encountered in the investigation of complex projects. Inductive research methods if complemented with a thematic analysis using an abductive reasoning may overcome the inherent difficulties in qualitative research method in finding the best explanation. In complex project situations where stakeholders' perspective largely differs and where there is no common ground, to begin with, the proposed method may add some value by identifying the

main constructs of dialogues, elaborate them and find a possible elucidation for the situation.

The aim, therefore, is to develop a model of reasoning that make sense of complex data and find the best explanation of an abductive process. As such, an interpretive method is developed that decode the complexity of project management research data through a constructive process of learning.

Traditional inductive content analysis, thematic analysis and the proposed abductive method are compared in Table 20 below.

Table 20. Comparison of the proposed technique with content analysis and thematic analysis

Inductive Content Analysis (Elo & Kyngäs, 2008, p. 110)	Thematic Analysis (Braun & Clarke, 2006)	Proposed Abductive Method
1. Making sense of data	1. Familiarising with the transcripts	1. Familiarising with the data
		2. Summarising the data
2. Coding and categorising	2. Extracting the codes	3. Coding and categorising
3. Abstracting the data	3. Generating thematic maps	4. Generating thematic maps
4. Analysing the data	4. Analysing the themes	5. Generating dialogue maps
		6. Generating causality maps
5. Reporting the model, conceptual system, conceptual map or categories	5. Reporting the story of the data	7. Report the best explanation

It is concluded that the combination of inductive and abductive techniques provides a practical step forward in the practice of project management research. The presentation of these complex matters visually would be beneficial. Consideration of visualisation follows.

4.4.2. Proposed visualisation method of data analysis in project management research

Incorporation of the positive features of inductive and abductive research is complemented by presentation through the most informative visual technique has led to the proposed approach. The proposed approach is a mixed mapping technique involving rich data, context, logic and visualisation, refer Fig 2 It is considered that this approach has the potential to provide an enhanced and integrated analysis of the likes of interview transcripts. The application of

visual mapping to explore data patterns is extremely useful when the data is complex.

The proposed mapping technique follows a sequential process where the data is analysed, summarised, coded and different concepts are connected. This is then consolidated to arrive at the simplest and most effective interpretation. This technique presents complex systems linking data and causes in a simple visual manner.

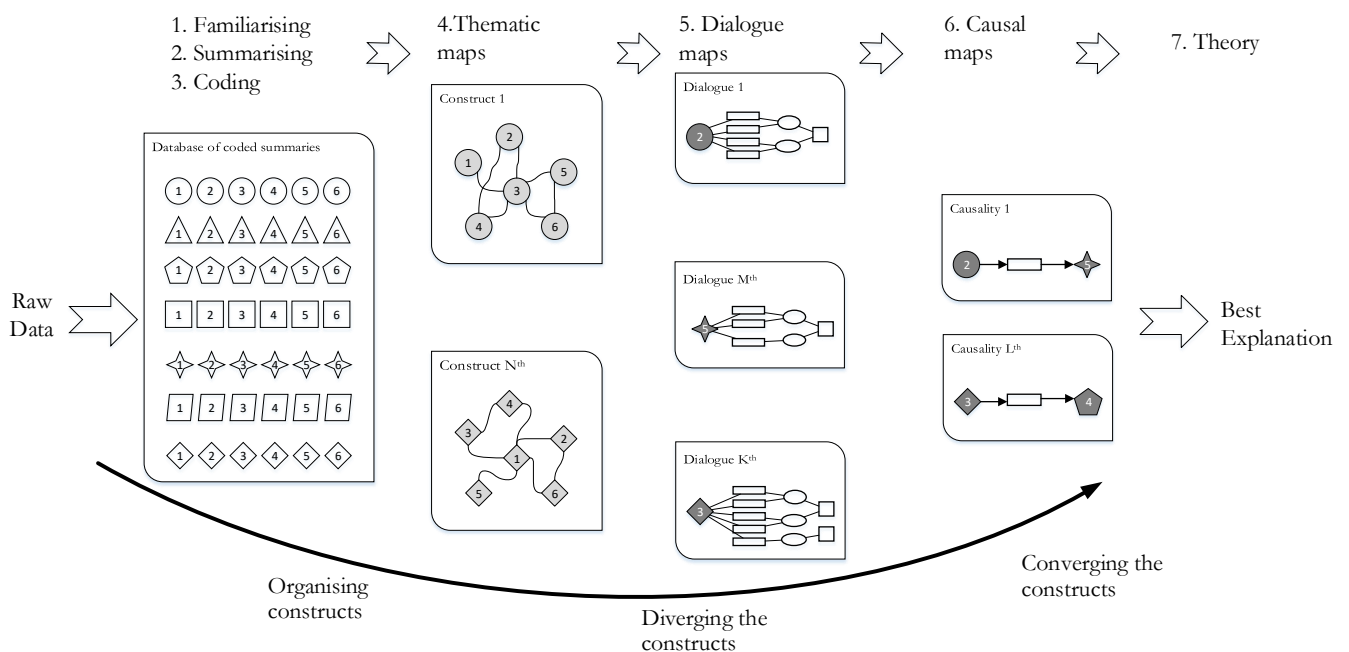


Figure 24. Proposed method of visual mapping to analyse collected data of a complex system

In the proposed technique, raw data is processed to work out a new theory that better explain the existing data. Although the technique in principles resembles Grounded theory, it goes beyond by acknowledging the possibility of conflicting views or opposing dialogues in the data, not for the sake of one truth but a multiview interpretation of contextual reality. Stakeholders' perspective is collected and processed, yet individual arguments are escalated for their merits if they can elucidate the circumstances. As a result, firstly the data generates dialogue maps in a diverging approach to capturing broader view and outside picture from the stakeholder opinions. Thereafter it converges them toward more plausible explanations by assessing the power of each comment in justifying the data. The more simple and comprehensive an argument, the more credible it is.

When applied on in case studies, this model draws together the advantages of the inductive process through a detailed interrogation and analysis of the data. More elaboration on procedure and steps are presented through case studies. In this paper, there is a focus to test the approach using interviews as reported by others.

4.5. Testing the proposed method

This method is tested using two case studies that are good examples of complex project management information. The first involves skills sets contributing to public sector project failures and the second investigates the root cause analysis of public controversy over the decision Victoria to invest in a desalination project. Both themes demonstrate the wide-ranging domain and the richness of the stakeholder perspectives. Each of these examples draws heavily on the publicly available data from Victoria's 2012 inquiry into effective decision making for the successful delivery of significant infrastructure project as conducted by the Public Accounts and Estimates committee (2012) of the Victorian Parliament. The data available includes 20 formal submissions from key industry stakeholders, transcripts from 43 public hearings, the Parliamentary report of the findings of the inquiry and formal responses from the government agencies mentioned in the report. This material has been supplemented by independent reports from the Victorian Auditor General (Victorian Auditor-General's Office (VAGO), 2008, 2012, 2013a), and project-specific data gleaned from public project websites.

Two case study projects have been evaluated using the new approach to testing the practicality of using the approach.

4.5.1. Case 1: Application of the proposed method to the problem of skill sets contributing to public sector being an uninformed buyer

Problems relating to public sector projects are normally captured on Parliamentary Inquiries, parliamentary interviews, auditor-general reports and comments and dialogue from stakeholders. The failure of such projects can be attributed to many causes. However, if these are systematically investigated, likely themes may be uncovered. The range of data that relates to public sector project failure is enormous. Here we illustrate the steps of how using the proposed method to uncover the relationship between skills set as a theme and public sector as an informed client. We expect the proposed method assist in finding the causality among concepts.

4.5.2. Steps 1, 2, 3. Familiarising, Summarising and Coding

The thematic content analysis shown as steps 1, 2 and 3, involves analysing transcripts, identifying themes within data and gathering instances (Burnard et al., 2008, p. 429). Within content analysis, taking memos is a common technique to capture and refine raw data. Memo taking is a process of summarising texts, provide a working ground set of summaries in a format unbiased to the original transcript. Glaser (1978) suggests that memos are a

core process, and without using them theoretically to write up ideas, the researcher is not, doing grounded theory. This process minimises the interference of the researcher and supports the credibility of the outcome as the researcher only paraphrases, abridge, polish, or refines the original text into a concise format. Memos individually identifiable records that help to sort, searching, and citing the content. Summaries can be accompanied by contextual metadata such as when, where, who, whom.

Evidence that is collected at this stage is still perplexing to analyse as the intended topics of discussion are wide-ranging, and the opinions are diverse. Coding and categorising form the next step to process the assorted data by labelling the data set into comparable subsets, classified according to the content and structure.

The process of coding is a repetitive task. As the population for a chosen code may be very large, there is always a trade-off to choose the right code that most effectively represents the message in the expressions. Themes and types are the two common codes used. Theme identifies the topic and type classifies the form of evidence. Themes set the scope of the discussion and categorise similar evidence for consolidation. The researcher should find suitable themes for the evidence that joins similar evidence and distinguish dissimilar ones. See Fig 3 as an example.

Table 21 lists four coded summaries (presented in the italic text to represent handwritten notes) in the theme of skills distribution. The Metadata is preserved as who and when the evidence is given. The Metadata might provide an opportunity for further analysis of data such as qualitative comparative assessment that is beyond the scope of this paper.

Table 21 Examples of evidence from interviews related to the concept of 'skills.'

ID	Summary	Code	Metadata
19	<i>We suggest centralised expertise as it retains the corporate memory and enables applying the lesson learnt.</i>	<i>Themes: Skills distribution</i>	<i>Who: key stakeholder 1 When: specific date</i>
28	<i>When there are similar repetitive projects done by a department, it is wise to have skills on board.</i>	<i>Themes: Skills distribution</i>	<i>Who: key stakeholder 2 When: specific date</i>
160	<i>For expensive and complex skill, outsourcing would be wise.</i>	<i>Themes: Skills distribution</i>	<i>Who: key stakeholder 3 When: specific date</i>
499	<i>External skills are available but sufficient in-house skills is essential.</i>	<i>Themes: Skills distribution</i>	<i>Who: Key stakeholder 4 When: specific date</i>

4.5.3. Step 4. Thematic maps

Identifying the underlying constructs uncovers the patterns of the survey data (K. M. Eisenhardt, 1989). The construct is a concept highlighted in a statement

such as skill distribution illustrated in Table 4. These constructs can be coded and shown visually as in Figure 25 below.

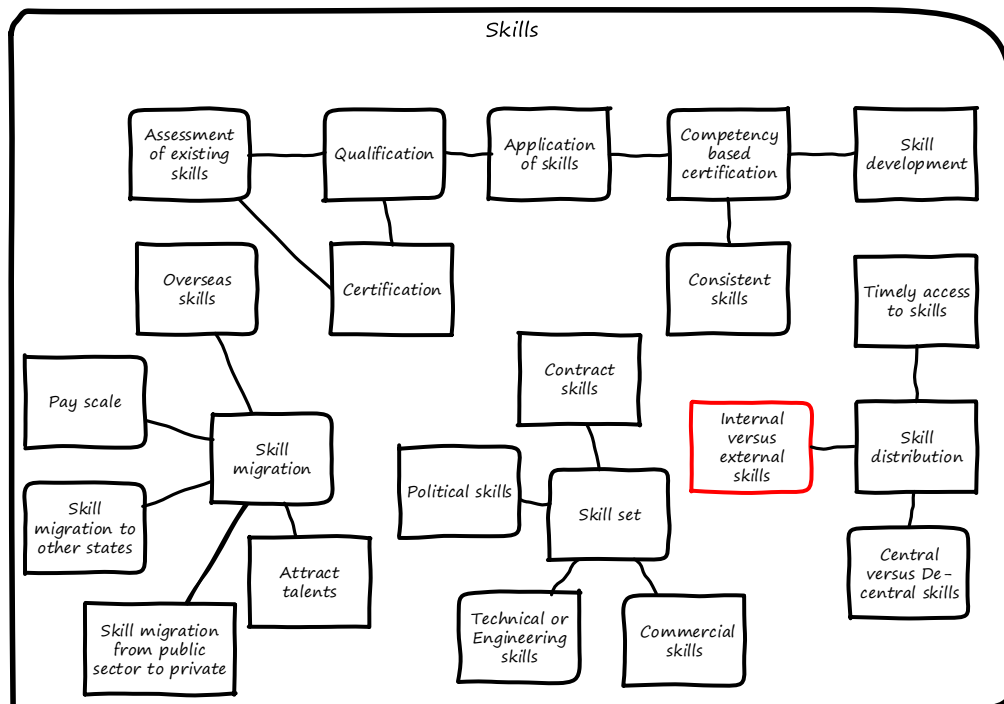


Figure 25. Thematic map of underlying constructs under the topic of 'skills'.

Figure 3 shows a concept map of the codes under the theme of 'skills'. We call it Thematic map as it is an ad-hoc map for one theme. In the case of too many codes, the map might get filtered through a ranking system such highest occurrences.

One of the codes should be started as an anchor point to build the dialogue maps around. Usually, the code with the most number of associated summaries is preferred. This code should have attracted a fair bit of discussion and argument in the data. It is preferred if the code suggests a question or decision that is addressed in the data. In this example, we start the process with the code 'internal vs external skills'.

4.5.4. Step 5. Dialogue map

Based on the key construct identified in the thematic map, the next step is the creation of dialogue map. The dialogue map is an effective instrument to depict the stakeholder view by processing and finding meaning in stakeholder dialogues. A dialogue map tries to capture questions, ideas, or arguments around a construct that have been addressed by different stakeholders. Dialogue map tells the story of the idea by linking the question, the options, the appraisal, the conclusion and presenting this visually to the reader. Figure 26 illustrates the dialogue map for a construct (internal vs external skill) identified in the previous thematic map.

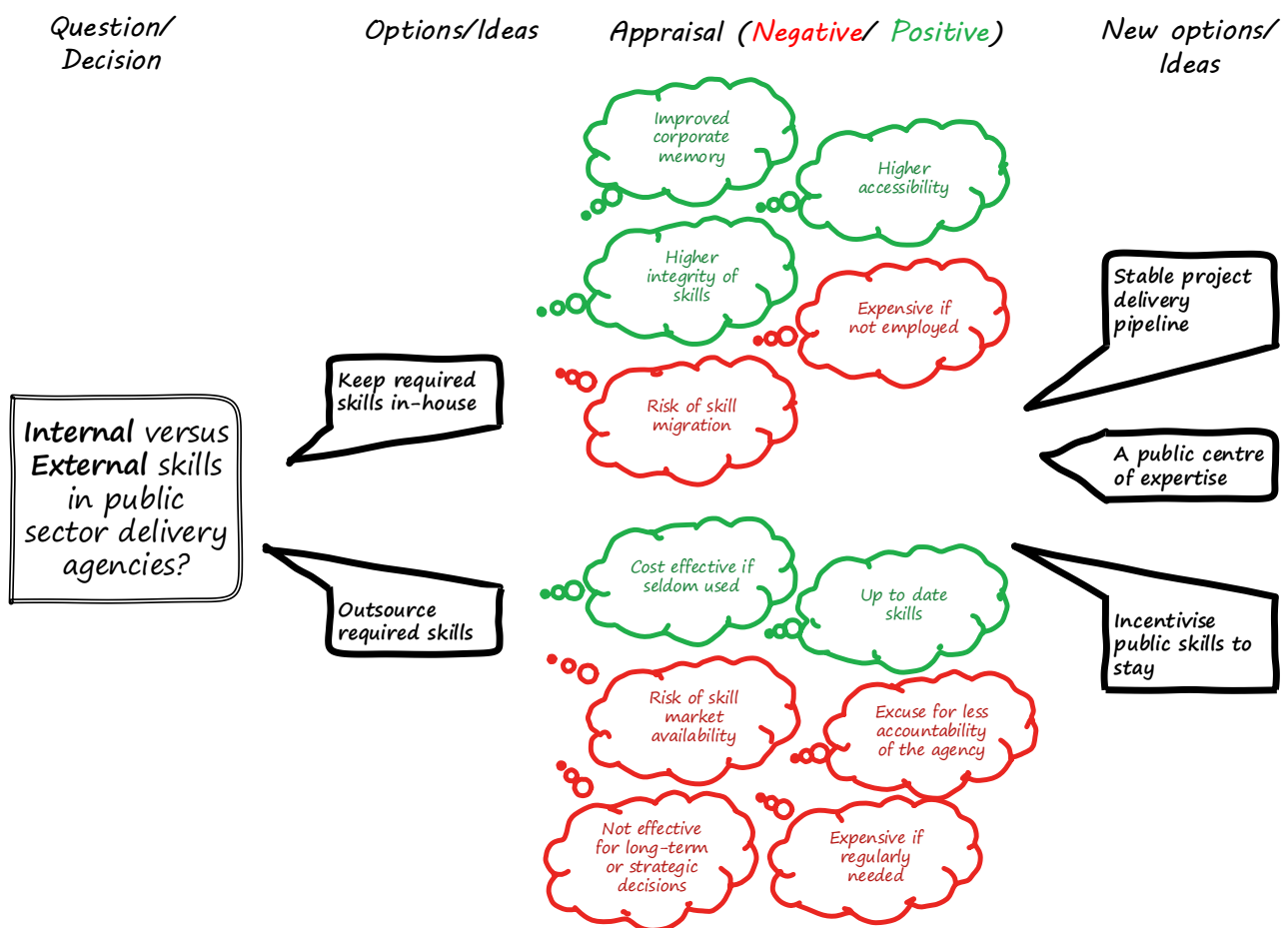


Figure 26. Dialogue map of external versus internal skills in public sector

As it is shown in the figure, stakeholder perspective is collected as ideas or options that might address the starting issue. The merit of ideas is investigated again from the collected data. In the second iteration of the analysis new ideas are extracted that might refine the first perception of the problem and adds more value. The process should continue until the researcher finds a direct link between the found ideas and the search for the investigation.

4.5.5. Step 6. Cause and effect map

The next step is the creation of the causal maps that explain the effects of various contributory factors on a construct. It helps in the modelling and prediction of system behaviour. An example of the causal map for an imbalance between internal and external skills is illustrated in Figure 27. From the dialogue map, respondents have expressed that stable project pipeline, a public centre of expertise and higher pay are different available options and ideas. The interaction of the cause and the contributing leads to the effect.

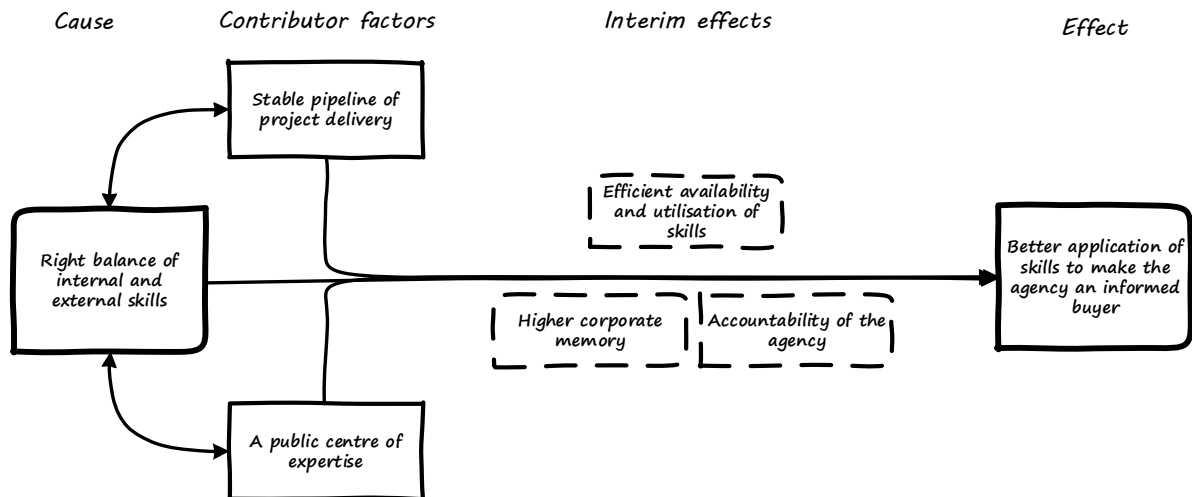


Figure 27. Causal map of the relationship between skill distribution and being an informed buyer

The case study investigates the issues around client skills in Victoria through insights received from stakeholders. The arguments and discussion of stakeholders are captured to uncover ideas, questions and decisions. The relation between the distribution of skills and being and the informed buyer is established. The causality between the right balance of skills and the buyer competency is recognised through contributor factors and interim effects that facilitate and complement the causality link.

The proposed method provides richer information in comparison with the traditional content analysis of incomplete data. Analysis steps are transparent to other viewers, and the chain of abduction is presented in semi-structured maps. Validation of findings is more in hand as the research steps are visible and verifiable. The maps although may leave some room for interpretation, which is inevitable in an interpretivistic approach, they communicate with a wider audience and in a quicker way.

4.5.6. Case 2: Application of the proposed visual technique to investigate controversy over Victorian desalination project

The following section describes how the proposed mapping technique is applied to analyse a complex project system such as high-risk projects. Such projects oftentimes aim to fulfil objectives without the unanimous consent of their stakeholders. With such inherent risks, the projects face many internal and external issues. The Victorian Desalination Plant, also known as Wonthaggi desalination plant is a good example of projects falling into this category. After a long drought in Victoria built at the cost of over A\$ 5 billion by the private sector with a PPP contract (Public Private Partnerships), the aim of the desalination plant was announced to supply water to Melbourne and surrounding region. Since the beginning of this project, there were strongly

held differing opinions around the strategic soundness of the project and whether all the options are well examined before reaching the solution. Major stakeholders are not always in agreement with the aims of the project and the long delivery lead times compounded the problem. However, more than three years on, the plant is only now starting to produce water for the community. Funds to pay the quarterly service payments for the PPP contract have been raised by increasing ratepayers' water bill; this continues to irk the public, particularly when they understand that Australia's largest desalination plant is underutilized.

An attempt to fully analyse and determine the root cause of project perception of failure would require a reliable data of the current situation and a theoretical model of what it should be. However, data in this particular case is scarce, as is the case with most other project management research. Internal projects stakeholders are often reluctant to expose their mistakes or poor decisions when the outcome is not satisfactory. As a result, reliable data of actual project processes and transactions would be hard to obtain.

To overcome this problem of unreliable, biased data, the researchers relied on available public data that yielded rich information such as the transcripts of the Parliamentary Inquiries, Parliamentary interviews, the Victorian Auditor General's report, etc. related to the Victorian Desalination Project (Public Accounts and Estimates Committee, 2012). These third-party interviews are a valuable source of secondary data that is unbiased since the public authorities investigate the performance of public projects with an aiming to learn from it. Despite the richness of these interviews, researchers find it difficult to analyse them due to the large amounts of data.

Relevant statements from witnesses, cited in the above sources, were picked up by the researcher and compiled in a database using Microsoft Access [™]. The transcript of interviews was summarised in short statements and given a code of the theme. An example is shown in Table 22 below.

Perception of success is selected as the starting point. Stakeholders' discussion is then analysed to complete dialogue map that question whether the project was a success or failure. Figure 29 maps the dialogue.

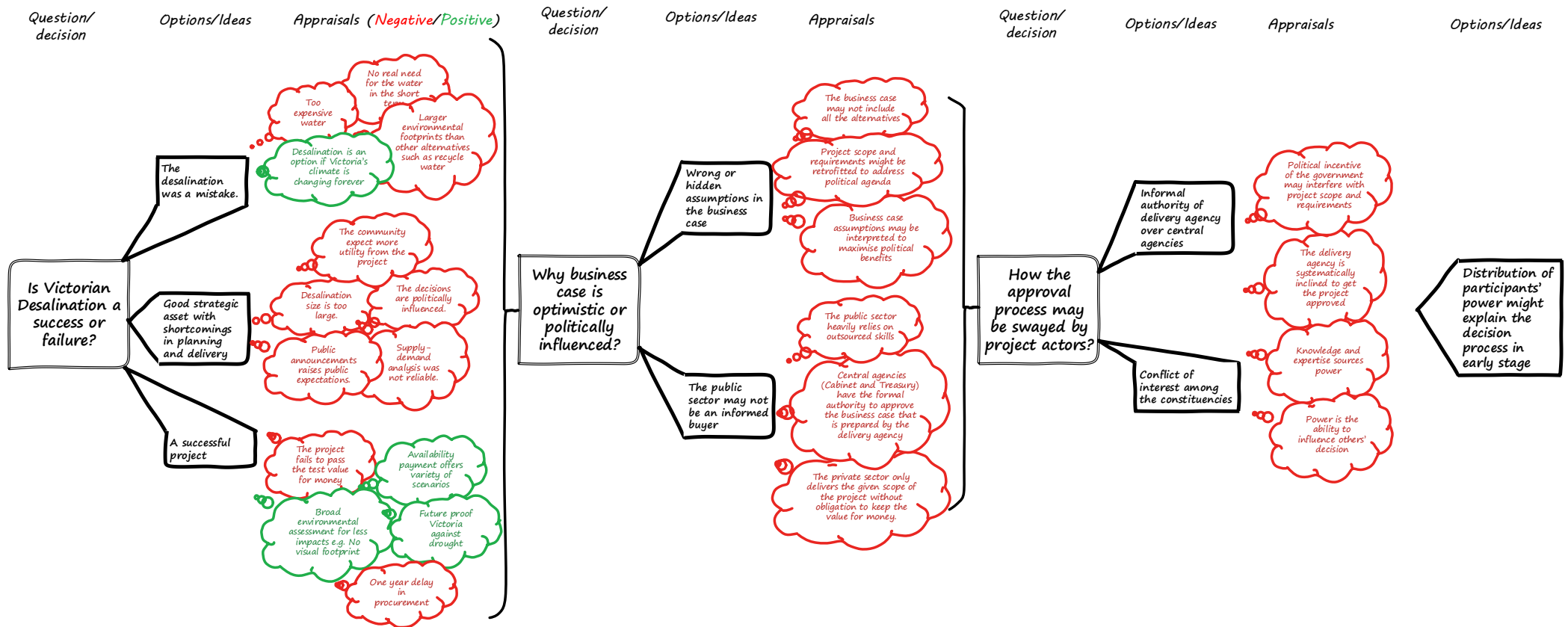


Figure 29. Dialogue map of Victorian desalination issue of perceived failure

In the first round of discussion, the quality of the business case is blamed. Wrong assumptions and uninformed buyer are suggested and discussed. Then the approval process has been identified as an issue whereas political influence, empowerment and authority were found to be the top topics surrounding the theme of power and finally, power asymmetry is found to be a key determinant of project success or failure.

Finally, the causal map is developed that connects power asymmetry to project failure, see Figure 30. Although power asymmetry is the root cause, there are other factors contributing to the problem. Power asymmetry and the contributor factors cause an interim effect that ultimately causes the perception of failure among the public.

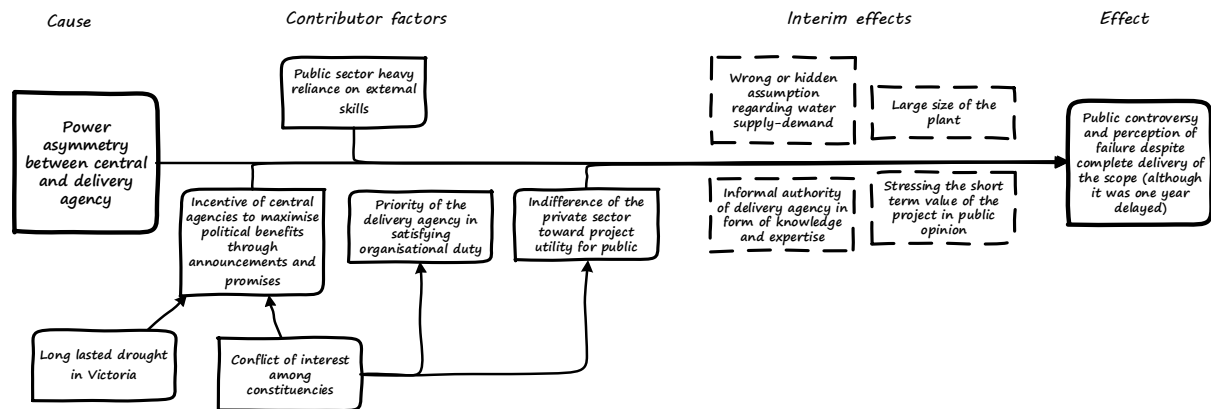


Figure 30. Causal map for Victorian desalination project issue of perceived failure

It would be a compelling question why Victorian desalination project faced a public outrage from startup. Through analysis of transcripts of interviews with stakeholders, the discussion was summarised, coded and mapped to analyse the arguments given in a dialogue with stakeholders regarding the reason for the perception of failure in this project.

The proposed method manage to identify and relate themes of interviews and establish a link to find the cause, contributory factors and interim effects of failure in this project.

4.5.7. The practicality of the proposed method

The findings from case studies one and two clearly demonstrate that the proposed method of integrating inductive and abductive processes combined with the visual application of the data is using thematic analysis and dialogue maps can be used as an analysis tool when there is sufficient data for the modelling. Further, the results have provided richer reflections and insights various possible via traditional techniques as is demonstrated by comparison of the results of the new model with the Parliamentary report.

The benefits of using the new method as a technique to evaluate complex projects are validated by comparing the findings with a traditional analysis of the same data. The proposed method manages to capture a wider range of concepts through visual thematic maps. While traditional content analysis is more competent for in-depth analysis of individual topics, the proposed method do a better job to connect concept and to build a deep semantic out of complex data. The dialogue maps of the proposed method assure a possibility of third-

party review and comfort an inclusion of opposing views on every question. The causal map of the proposed method offers an enriched and simple explanation of the concept in relation to each other that not only clarifies the root cause but also identifies contributory factors and interim effects.

The suggested method goes beyond the conventional method of content analysis by applying the logic of discovery to obtain new findings from available incomplete data in a semi-structured method of visual representation of knowledge. It shows the potential of abduction in getting the big picture and reaching a novel explanation for the existing problem when the issue is candidly discussed by stakeholders that also provide open and even opposing views.

4.6. Discussion

Having identified some general weaknesses in how project management research is typically undertaken, the researchers propose a novel way for project management research for mapping data that includes the social science approaches and visual mapping.

The complexity of the research data generally increases as the project becomes larger or more complex. The practical ability of the researcher to carry out direct interviews with stakeholders often means that the primary research data may be restricted to publicly available information such as expert interviews. These expert interviews offer an authentic and rich data source in which perceptions and preferences of individuals may differ and can be seen as a viable sampling process which acknowledges the diversity of perspectives in the system.

The analysis of the transcripts presents a huge potential to explore patterns in project systems behaviour. From the chaos of the data in the transcripts, visual mapping technique uncovers the different perspectives and explores the dialogue among them. It also uncovers the causality link between the prevailing concepts.

The seven-step technique presented in this paper appear to fill the gaps in current research project management research methodology. In complex project situations when stakeholders' perspective largely differs or opposed, the proposed method may add some value by identifying the main constructs of the discussions, elaborate on the dialogues and explain the situation.

The use of an abductive inference gives potential to fill some of these gaps. The case studies show that the richness of the stakeholders' perspectives can be captured and analysed with this style of analysis.

4.6.1. Limitations

The reliability of the research is dependent on two risks of error. First, the danger of explaining the research outcomes through a random occurrence or a random observation. To deal with this, researchers can deploy statistical analysis to assess the significance of random happening of the research outcome (Crano, Brewer, & Lac, 2015, p. 28).

Secondly, there is a risk of overlooking any latent factors in the proposed hypothesis. The validity of a social research has two components of internal and external. The inner validity of a social research is influenced by aging data, system change or maturity, influence of observation over the system behaviour, selection error such as drop-outs, instrumental errors due to calibration of measuring tools, and internal consistency in form of random error or systematic error (Crano et al., 2015, p. 32,46). The external validity, on the other hand, addresses the inclusion of the determinant factors that form an appropriate ground for the interesting conclusion.

4.7. Conclusion

It has been established through the literature that research into project delivery systems generally struggles to adequately explain social issues that overlay a variety of different viewpoints surrounding the massive incomplete and changing nature of complex projects. Some have characterised this problem as 'wicked'. This severely affects the conference researchers have to develop generalised predictive outcomes based on the lessons learnt from past projects or the views of experienced stakeholders. The research methods used in project management frequently involve inductive reasoning based on the likes of case study analysis, survey instruments, and subsequent statistical analysis. In such approaches, the validity of any new hypothesis is tested and extended until it ensures the observations are the true representative of a broader population.

Research strategies involving inductive, deductive and abductive approaches were reviewed in detail. It was found that researchers frequently underestimate the intelligence of their subjects and that by so doing some of the richness of the context of the research is missed. It was hypothesised in this paper that the integration of inductive research approaches along with the abductive reasoning (Bryman and Bell 2008), has the potential to furnish a more in-depth understanding of complex projects and their associated data. Detailed consideration of a range of qualitative research methods including: grounded theory, constructivist grounded theory, abductive research, active research, case studies, and qualitative comparative assessment lead to the hypothesis that, a new investigation technique that incorporates both inductive and abductive processes has the potential to improve the current state of

project management research. The method subsequently developed also incorporates state of modelling and visualised representation as a mechanism to understand the likes of interview information better.

One of the issues associated with complex projects (wicked problems) is the difficulty in communicating the context and findings of any research. Illustrative techniques certainly assist in communicating results are often illustrative only and add little to the analytical process. There are of course exceptions and visual tools such as mind maps and concept maps do create a mechanism for collecting, and analysing and presenting the information. A critique of relevant visualisation techniques led to the conclusion that mind maps are limited in that they tend to provide monologue information flowing from author to audience. Concept maps, on the other hand, establish his share and understanding between author and an audience. Whilst these concept maps have been used extensively in the areas brainstorming, research, education and learning processes, the technique does not lend itself to understanding the complex relationship of different concepts nor to uncover the direct cause of the problem. Flow maps and to some extent, causal maps make it easy to understand logical links between numerous variables that again tend to be more visual and analytical in their outcomes. Logic maps are especially useful in decision making for appraisal situations in technique such as decision trees are widely used. An extension to traditional decision-tree mapping is a process called the dialogue mapping, and this has the potential to show alternative scenarios and different viewpoints, such processes are sometimes converted into issues mapping systems, and this approach offers a genuine mechanism to enhance the richness of project management research.

Incorporation of the positive features of inductive and abductive research that also incorporates informative visual techniques has led to the proposed approach.

The proposed approach has been tested for two case studies using rich data gathered as part of the Victorian Parliamentary inquiry into effective decision making for the successful delivery of significant infrastructure and it was concluded that the new technique is both practical to use and that the method provides an enhanced understanding of the projects that was documented in the formal report of the inquiry.

It is acknowledged that further validation of the approach is required to ensure there is no bias or unexplored key findings missing either in the use of this new approach or in the original inquiry outcomes. To address this need for further validation a workshop has been convened, using a Delphi style approach, with key stakeholders involved in the original inquiry. The findings of this workshop are reported in Chapter 8 and in the appendices.

5. Infrastructure Delivery Themes Developed from the Victorian Parliamentary Inquiry

Public infrastructure is critical for the economy and quality of life of a community. In Victoria, some large infrastructure projects did not meet public expectations and resulted in Parliamentary enquiries. The existing theories discussed in the literature are not sufficient in explaining why projects do not always achieve what they promise. The aim of this chapter is to understand the actual practices of Victorian infrastructure delivery based on evidence received from key decision makers involved in the delivery of public infrastructure in Victoria.

Stakeholders provide valuable information that assists in understanding a project delivery system. A stakeholder perspective based on the views of public and private experts is used to explore infrastructure delivery in Victoria. The views are based on records from a public inquiry into infrastructure delivery that has been held by the Parliament of Victoria in 2012.

5.1. The method of data collection and analysis

Chapter 3 explained why qualitative methods such as Grounded Theory and case study analysis could provide a deeper understanding of a social system. Abductive and inductive reasoning are effective when a new explanation is needed to explain the observations, but this becomes difficult when there is a complex data set with many interconnections. Visual techniques such as concept mapping and dialogue mapping are effective methods to uncover a pattern behind a complex data set. The major source of the data used in this chapter is from the report of the Public Accounts and Estimates Committee into effective decision making in large public infrastructure projects. The report and its transcripts of the hearings provided a rich data source containing contested ideas about the problems being investigated and controversial reasons and suggestions to tackle the problems.

A visualised abductive methodology has been proposed in Chapter 4. The method is applied in this chapter to unravel the complexity of data received from several data sources.

The visual method has two main stages of divergence and convergence. In the divergence phase, the data is analysed, and broad concepts developed based on an analysis of the transcripts of the public interviews. A big picture is created drawing relevant concepts together. The next stage, convergence, groups the concepts into constructs that are related to themes that have emerged from the transcript analysis.

The process of abduction aims to find a cause and effect between concepts. It may come up with a new explanation for the evidence. It also includes a broader view of concepts around the problem that usually may be ignored in traditional approaches. The proposed method is an appropriate method to gain an understanding of the current process of infrastructure delivery and the behaviour of key stakeholders in these processes.

Triangulation of data is a primary strategy for reliable judgement (Baxter & Jack, 2008, p. 556). When a pattern from one data set is corroborated by the evidence from another, the findings are stronger and more reliable (K. M. Eisenhardt, 1989, p. 540). An essential feature of the qualitative method is a comparison of the emergent findings with the literature (K. M. Eisenhardt, 1989, p. 544).

5.1.1. The data sample

A public inquiry that has been carried out by Public Account and Estimate Committee (PAEC, see www.parliament.vic.gov.au/paec) of the Victorian Parliament, was selected as the data source to collect the perspectives of major stakeholders in public infrastructure delivery.

This public inquiry was selected because of the alignment of its goal with the aim of this research. It investigated the same research questions, e.g. why sometimes infrastructure projects fail to succeed. The inquiry was titled “Effective decision making for successful delivery of significant infrastructure projects”. The inquiry involved a series of interviews attended by high profile witnesses from the public and private sector. The inquiry aimed to address the following points of interest:

- The level of public sector competency in protecting public interest
- The relation of the existing delivery policies and the competency of the public sector
- Strategies to improve the competency of public sector
- Lesson learnt from the previous infrastructure projects

The interviews allowed witnesses to elaborate on their views of the decision-making process which resulted in a wide range of topics being discussed in front of the parliamentary committee. Forty-one separate interviews were conducted attended by eighty-nine delegates between March and October 2012. Interviews of the inquiry are listed in Table 23.

Table 23. The list of interviews within the public hearings that constitute the data source of this research

ID	INTERVIEW
1	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Department of Treasury and Finance. Melbourne, Australia.
2	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Victorian Auditor-General's Office. Melbourne, Australia.
3	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Department of Transport & Vic Roads. Melbourne, Australia.
4	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Department of Sustainability and Environment. Melbourne, Australia.
5	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Infrastructure Australia. Melbourne, Australia.
6	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Infrastructure Partnerships Australia. Melbourne, Australia.
7	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Building the Education Revolution Task Force. Melbourne, Australia.
8	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Department of Health. Melbourne, Australia.
9	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Department of Planning and Community Development. Melbourne, Australia.
10	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Baulderstone. Melbourne, Australia.
11	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with State Service Authority. Melbourne, Australia.
12	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Committee for Melbourne. Melbourne, Australia.
13	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with The University of Melbourne & Monash University. Melbourne, Australia.
14	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Australian Institute of Project Management. Melbourne, Australia.
15	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Department of Education and Early Childhood Development. Melbourne, Australia.
16	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Association of Professional Engineers, Scientists and Managers Australia. Melbourne, Australia.
17	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Department of Business and Innovation. Melbourne, Australia.
18	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Department of Justice. Melbourne, Australia.
19	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Plenary Group. Melbourne, Australia.
20	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Ensemble Partners. Melbourne, Australia.
21	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Engineers Australia Victoria Division & Swinburne University of Technology. Melbourne, Australia.
22	Victorian Parliament; Public Accounts and Estimates Committee. (2012, March). <i>Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects</i> ; Interview with Capability Management International Pty Ltd. Melbourne, Australia.

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23	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Transport Ticketing Authority. Melbourne, Australia.</i>
24	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Victorian Auditor-General's Office. Melbourne, Australia.</i>
25	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Department of Business and Innovation. Melbourne, Australia.</i>
26	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Department of Treasury and Finance. Melbourne, Australia.</i>
27	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Keane Australia Micropayment Consortium (KAMCO) & Asia Pacific NTT Data Inc. Melbourne, Australia.</i>
28	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Victorian Ombudsman's Office. Melbourne, Australia.</i>
29	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with CSC Australia. Melbourne, Australia.</i>
30	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Lend Lease. Melbourne, Australia.</i>
31	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Austin Health. Melbourne, Australia.</i>
32	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Royal Eye and Ear Hospital. Melbourne, Australia.</i>
33	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Department of Health. Melbourne, Australia.</i>
34	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Royal Children's Hospital. Melbourne, Australia.</i>
35	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Children's Health Partnership. Melbourne, Australia.</i>
36	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Lend Lease. Melbourne, Australia.</i>
37	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Plenary Group. Melbourne, Australia.</i>
38	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Department of Sustainability and Environment. Melbourne, Australia.</i>
39	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, August). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with AquaSure. Melbourne, Australia.</i>
40	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, October). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Department of Transport. Melbourne, Australia.</i>
41	<i>Victorian Parliament; Public Accounts and Estimates Committee. (2012, October). Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects; Interview with Department of Treasury and Finance. Melbourne, Australia.</i>

The 41 transcripts analysed for this thesis generated about 500 pages of text containing approximately 350,000 words.

The interview sessions and the subsequent transcripts are available at:

<https://www.parliament.vic.gov.au/paec/inquiries/article/1496>

All of the transcripts have been considered in this research.

Figure 31 charts the depth of evidence across the invited organisations. The depth of evidence is indicated according to the level of complexity and certainty of the statements. Complex statements such as hypothesis relate concepts. In contrast, facts that are mere reflections of the witness about an event. The profile of collected evidence supports the analysis. The researcher would be more vigilant in analysing high-level content.

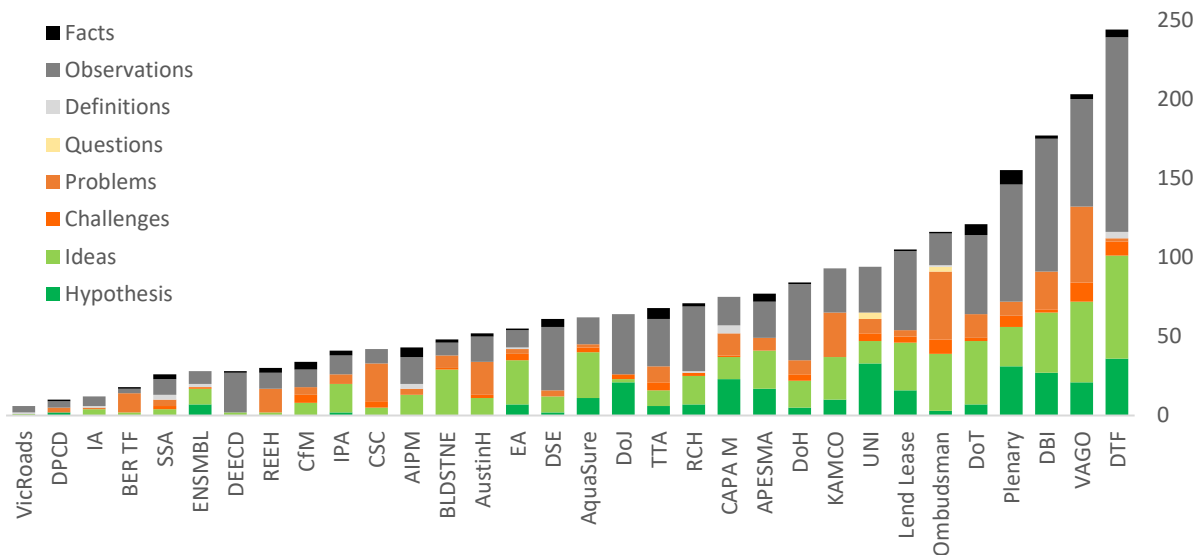


Figure 31. Depth of evidence received from the invited organisations

The spectrum of the invited guests reflects the diversity of stakeholders in public delivery. Experts from the public and the private sector have attended the interviews. Delegates from central agencies such as treasury as well as delivery agencies such as Department of Health have attended the hearings. Seven members of the parliament conducted the interviews. They themselves should be considered experts in the area of public delivery. Their subsequent positions in the newly elected government show their significant role in public infrastructure delivery.

5.1.2. Justification of data

The public inquiry into effective decision making in large infrastructure projects aligns with the objectives of this thesis. In general, the inquiry confirmed that:

- Victorian records of delivery show both success and failure
- Improvement in outcome depends on improving the process of delivery
- The role of people in the process of delivery is prominent
- The process of decision making is where to start an investigation

Almost all of the influential entities in public infrastructure projects are included in the inquiry. Assorted voices of stakeholders exist in the dataset. A team of senior people were invited to represent each organisation. The power

of the parliament brought an amalgamation of opinions onto the table. The access to this level of information is quite unique and an opportunity to analyse the transcripts through an academic lens.

However, the validity of any conclusions from the collected evidence is limited to Victoria because the projects were developed in the context of a particular political, social, cultural and administrative environment. Nevertheless, a significant similarity between Victoria and other states in Australia is expected because of the similarity of their administrative and judicial machinery of government.

This research assumes the legitimacy of the interview data, but although the inquiry was held in a semi-judicial setting, the transcripts do not guarantee the truth or accuracy regarding a particular answer about a question from the committee. Witnesses sometimes disagreed and provided contradictory views about the same project.

5.1.3. Data analysis

A qualitative method of research similar to Grounded Theory has been applied to "let the data speak for itself". A structured technique of data analysis was applied to minimise the influence of researcher on the research process.

Witness statements were analysed, and keywords were identified in the transcripts. These keywords often were repeated in the transcripts. This analysis aimed to explore the stakeholder perception of the problems, challenges, and dilemmas in the delivery of an infrastructure project. It hunts for the causality among concepts that root the shortcomings.

According to the proposed method of analysis, the evidence is analysed, and the main areas of interest are recognised - here called 'constructs'. These constructs are considered important by the experts. The constructs have repeatedly been mentioned during the interviews. They have also attracted a fair bit of discussion during the interviews. The transcripts were a verbatim record of the interviews and contained off-topic and sometimes irrelevant content. Filtering and cleaning the data was required for the findings to make sense. The transcripts were processed to generate 1170 summaries. The summaries were labelled and categorised according to the domain of discussion, type and content. The main themes of the discussion were identified according to the repetition and intensity of their citations.

Summaries are cited in brackets, e.g. [37:1154,1157] that includes two or more numbers. The first number indicates the interview (among 41 interviews), and the subsequent number(s) is the ID of the evidence(s), i.e. the evidence is a summary extracted from the interviews. In the bracket, the first number is separated by a colon from the second number. If two or more pieces of evidence

are cited from an interview, their IDs are separated by a comma. Due to a large number of the summaries, the database is uploaded and available in the Cloud at <https://1drv.ms/f/s!AjW4HDKOEasYhPoIJXjMXRNftTdhDg>.

In this particular example [37:1154, 1157] the number 37 refers to the 37th public inquiry. The number 1154 refers to the evidence of Mr Hay from the Plenary Group, and 1157 refers to the evidence of Mr White from CRC. The influential concepts within the constructs are identified. These concepts show the related elements that form an understanding of the issues, questions and problems. The concepts are depicted in a series of concept maps under the relevant construct.

The dialogue among the stakeholders shows the extremes of opinions around the topic. The ideas and solutions about the issue are discussed. The discussion is closely connected to the collected evidence from the interviews. It should be noted that the dialogue among stakeholder might be an intermittent talk in which pieces of the dialogue are acquired from more than one interview in discussion with multiple audiences.

Causal maps are the most valuable output of the analysis process that connects cause and effects. The relationships among the concepts are pictured in causal maps. The contributing factors and the interim effects are shown in the maps for an enriched understanding of how the concepts affect each other.

5.2. The themes

Thirteen major themes were identified after mapping the evidence into concept maps and refining the maps to reduce overlapping content. These findings are presented individually, followed by a section that unpacks their content. Each of the themes involves one or more constructs.

5.2.1. Theme 1: Central agencies vs delivery agencies

Two different types of public entities are distinguishable in projects; first, those that deliver the outcome, and second, those organisations involved with governance and its mechanisms [17:379]. These can be summarised as the central agencies (Treasury and Finance, Premier and Cabinet and the Premier), the delivery agencies (such as the Departments of Health, Transport and others as given in Figure 32 which shows the spectrum of infrastructure stakeholders in public delivery).

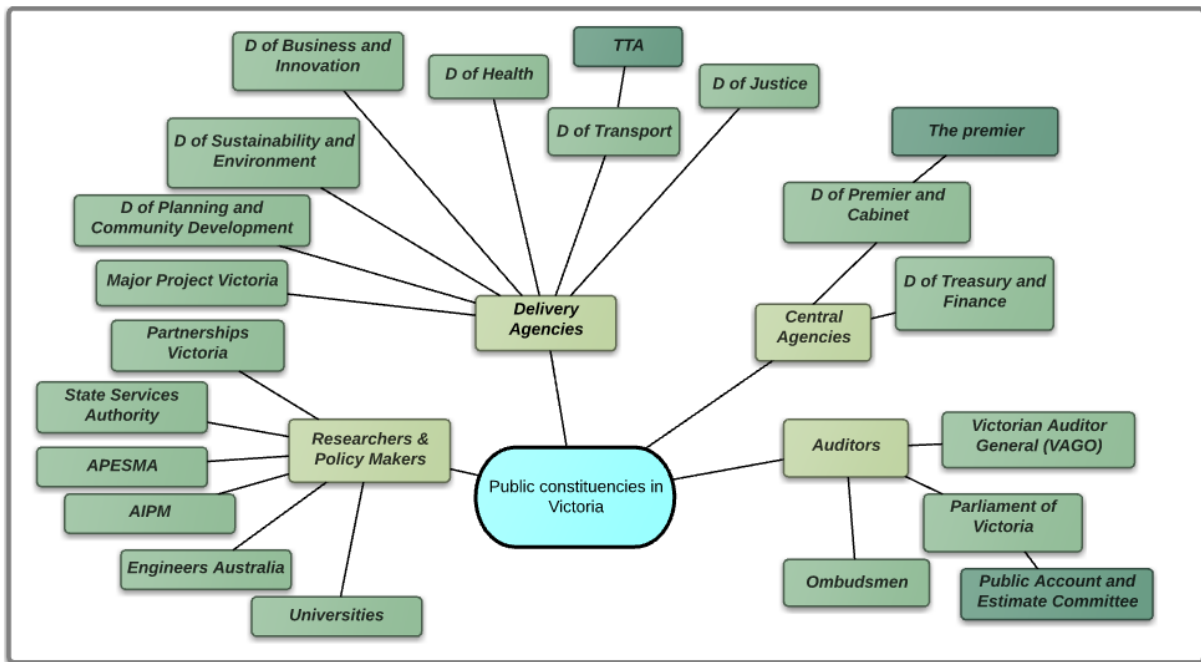


Figure 32. Public participants in public projects

Central agencies govern public sector project delivery. They are not specialised in any specific sector but focused on maximising the overall effectiveness and efficiency of the government in reaching strategic objectives. In project delivery, two roles can be identified in central agencies, decision-making and governance. In infrastructure delivery, the decision makers are The Department of Premier and Cabinet (simply known as the government), and the DTF (Department of Treasury and Finance). The auditors work beside the central agencies on behalf of the public to watch and preserve value for money. In Victoria, the auditors include the Auditor General (known as VAGO – Victorian Auditor General), the Parliament, and the Ombudsman.

A government department has a Secretary who is responsible for the management of the Department. The role of Secretary in a government organisation is similar to the CEO of a private sector organisation. The Secretary of a government department reports to a Minister of the Government and is accountable to the Minister for the delivery of services and projects associated with that particular department.

Recently, a popular governance structure among delivery agencies is a special purpose vehicle that has the maximum focus on a program or a portfolio of projects, e.g. LMA (Linking Melbourne Authority) and RRLA (Regional Rail Link Authority) [40:1010]. In this structure, a temporary delivery agency is established to deliver a series of affiliated projects. This structure helps benefit the synergy among projects activities and assure a consistent alignment with strategies.

Governing a project requires the cooperation of project agencies. In public infrastructure, the early stage of a project demands close relation between the central and delivery agencies. Optimal decisions require governance skills within public agencies. Although Victoria's PPP guideline is internationally known, they leave a range of governance skills and issues up to the government of the day to decide [13:270].

5.2.2. Theme 2: Insufficient competency of the public sector

Managing infrastructure projects requires a high level of competency including skills, knowledge and experience in project governance, oversight, project management and project team levels [18:406]. While competency is an individual attribute, the capability is an organisational quality that requires competent individuals but also the processes, structures, measures and information flow to make things happen [22:520]. Capabilities cover skills and knowledge in leadership, technical, commercial and financial capacity. Client capability is identified as a success factor in large infrastructure project [35:865]. Capability requires a balance between systems, people and culture [3:99]. The private sector complains that the public sector has an inadequate capacity, i.e. it is difficult to deal with the government because they happen to be an uninformed buyer [16:355].

Figure 33 illustrates the discussed concepts under the construct of knowledge. It shows that application of knowledge is equally important if not more. It also identifies corporate memory as an asset for an organisation to remain informed. Operational knowledge and sector-specific knowledge indicate the kind of knowledge that a delivery agency needs to access in connection with project users.

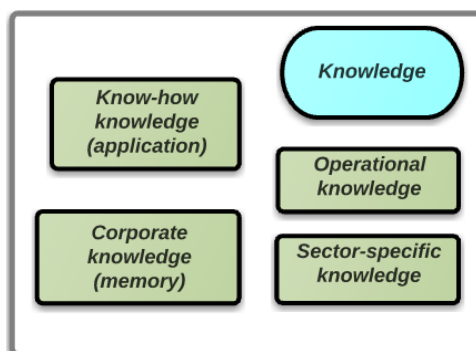


Figure 33. Concepts around the construct of 'Knowledge' in the perspective of stakeholders

Knowledge and the ability to apply it are necessary to understand project requirements and prepare a reliable plan. Project knowledge covers a variety of disciplines. The sector-specific knowledge that is greatest at the local level, is necessary to understand project needs and verify the requirements [13:272]. In

order to become a smart solution, a good design requires operational knowledge as well as technical, commercial, legal and contextual knowledge [18:418]. Identifying and managing project stakeholders have been identified as success factors in projects. Knowledge of stakeholders, their interest and power over the project are critically important to have an effective plan. Furthermore, knowledge about expectations, risks and requirements are essential to appraise the viability of project options.

Corporate knowledge from a government department is lost when people leave the department for various reasons [39:1104]. See for example the Department of Transport expressing concern about lost skills when the Regional Rail Link project was completed[40:1009]. Projects involving significant time span between inception and delivery, as for example in PPP's, may also lose valuable knowledge and skills [19:455]. A public centre of excellence was identified as a strategy to retain corporate memory in the public sector [19:449, [19:436] See also statements from the private sector witnesses.

Since knowledge becomes dated, a delivery agency should be exposed to recent procurement advances and involve in the project on a regular basis. Fortified knowledge of legal interpretations and contractual obligations is identified as a critical factor that effectively helps to deliver successful projects [18:424], [39:1109].

The insufficient experience of project managers is a problem in project delivery [15:341]. Some experts believe that capability already exists in the public sector, but it fails in application [24:640,645]. Planning skills are also very critical. Skills should be applied to prepare a robust business case [2:62].

Experience is the ability to understand when things are going well or not and how to react [35:873]. Figure 34 maps the concepts identified by the witnesses regarding the necessity of experience in running successful projects. Ability to apply the skills in practice is important. The value of acquiring experience in major projects is emphasised.

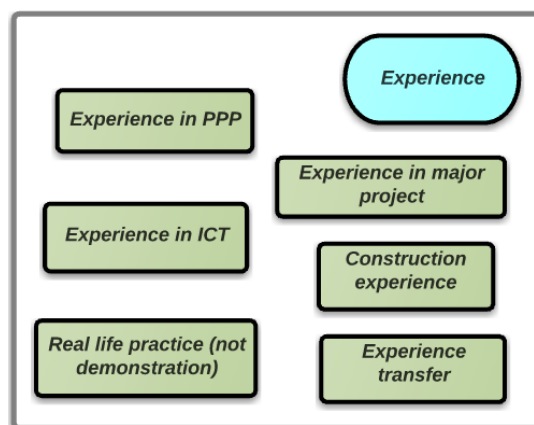


Figure 34. Concepts around the construct of 'Experience' in the perspective of stakeholders

Construction projects and ICT are indicated as two industries with their own range of skills.

In project teams, it is understood that only engineers who have appropriate work experience can effectively contribute [21:495]. For young engineers, one issue is the private sector inclination to recruit only experienced people [16:366]. Training and on-the-job experience are a recipe for high-quality skills [1:4]. Consequently, cadetships [16:336] and on the job training [3:101,18:402] are recommended to promote experience in young engineers.

While competency of project managers and delivery agencies are recognised as success factors in project delivery [14:317], lack of experience in project managers has been an issue in public projects [28:821]. In large projects, the experience is required to address process deficiencies in governance and review mechanisms [22:514]. [17:381]. [15:342]. [33:904].

Judgement about the level of available skills in Australia is controversial. Some experts believe Victoria leads Australia in its skill base [17:390,392,39:1103,1093]. IPA (Infrastructure Partnerships Australia) says “Victoria is, in many senses, Australia’s best-skilled jurisdiction in the identification of funding, financing and delivery of major infrastructure” [6:145]. DBI declares that the issue of skills is rather exaggerated, i.e. except for big one-off projects, a contract is governed by a bunch of public servants usually administered very well [17:390]. There are experts who believe skills exist, but the challenge is timely and cost-effective [1:23,24]. Figure 35 indicates the different concepts among the stakeholders about the existing project skills in Victoria. It acknowledges the range of skills required. Outsourcing and skill distribution is a critical discussion. How much of the skills should be kept with the delivery agency and how much of the central agencies are important issues that remain to be resolved.

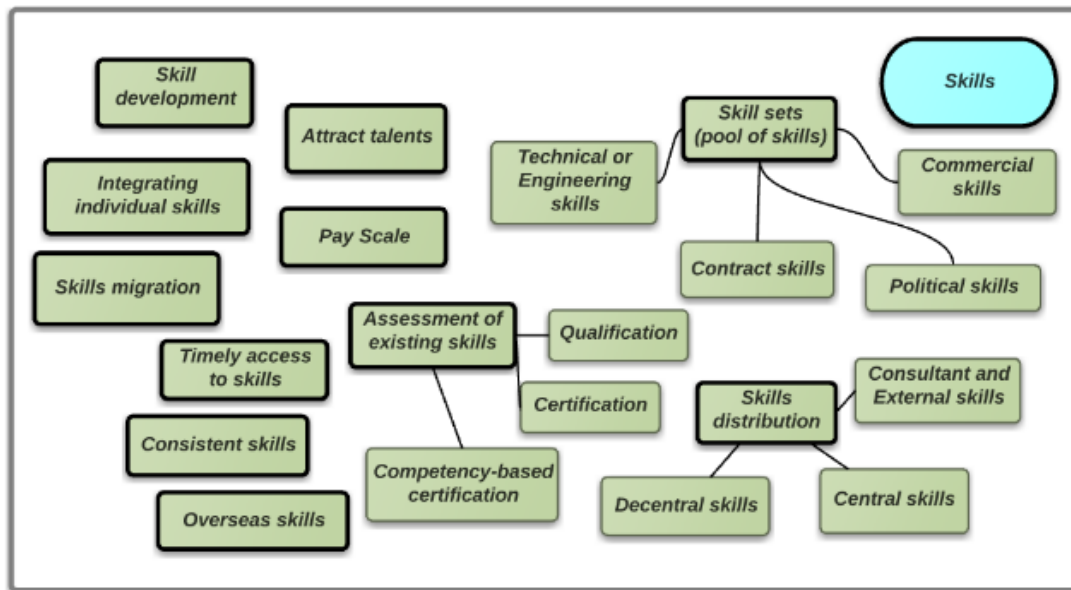


Figure 35. Concepts around the construct of 'Skills' in the perspective of stakeholders

Despite the optimism of some people in readiness for skills, others warn of a persistent skill shortage in engineering particularly in Victoria [16:351,352,353,371], e.g. VAGO, June 2011 report states that VicRoads is incompetent to forecast traffic and hence project benefits [3:104]. Currently, there is no research plan looking at skill development in the public sector [5:135], and therefore, none of the sides of the argument cannot be supported or rejected without further investigation.

A client should possess at least two core competencies; first to understand the stakeholder requirements in the context of the project, e.g. health, transport, prisons, and second to have an experience in the various form of contracting and their merits in managing risk [30:751]. Public skill set should include political skills, commercial skills, business acumen and implementation skills, moreover to the technical skills [13:280]. The type of procurement may urge the private sector to be mindful of project performance during the operation phase too. Plenary reminds the importance of operation skills in addition to design skills. It is highlighted that in order to make a design well appreciated, it is necessary to have a balance of technical and operational skills [37:1137].

Governance of infrastructure projects is critical and requires its own skill set [13:266]. There is an awareness that it is more important than individual skills to get the project done [14:324]. You need a cocktail of skills [14:319]. Project management itself is a skill [3:95] and should be a dedicated career to pursue [14:320].

Among the statements analysed, there has been a rather unorthodox opinion that gives the impression it undervalues the significance of skills in project success, i.e. "if the deal is a good one and you have the skills to comprehend it

is a good deal then there is no problem; but if the deal is a bad one, no matter how much skill you put on the outcome is bad” [17:398]. There is a logical explanation that unites this statement with the rest of the evidence. Poor early decisions in a project are impossible to make up in subsequent decisions. If a bad project is commenced, there is no skill that can change the course of actions[23:614].

Cultivating skills in project people has been identified as a shortcut to success [18:424,22:514]. However, competency improvement of individuals needs to be married with maturing organisational process that appreciates training and skills development [22:514]. The biggest cause of failure is a lack of leadership. Educating the senior management of government how to govern, sponsor, and steer, is a success factor [22:538]. Training people without changing processes is pointless; likewise defining new processes without competencies of people is unfruitful [22:516]. Figure 36 maps the major discussion point around training and skill management.

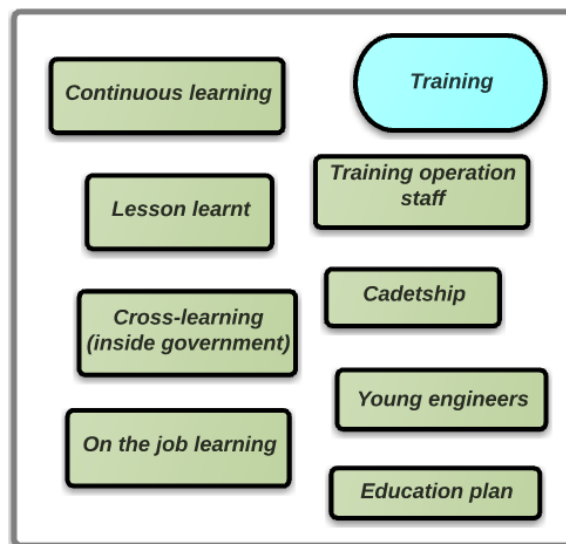


Figure 36 Concepts around the construct of 'Training' in the perspective of stakeholders

In project planning, identifying the worst case scenario requires farsightedness and capability that seems nonexistent in the public service [24:675]. Mapping the capabilities of the delivery pipeline may help to identify the gaps that lead the government and private sector to an education plan [21:501].

5.2.3. Theme 3: Auditing dilemma

It became apparent from the witness statements that there was a tension between the delivery agencies and the audit agencies. Delivery agencies wanted flexibility in contract negotiations, particularly when the private sector was involved. Issues of audit review, probity and compliance were important for VAGO and the DTF.

Review and reporting are important means of communication with secondary project stakeholder such as auditors. Projects habitually report time and cost performance, but fail to inform about other dimensions such as the expected value and risk in a standard format. The wider scope of risks and the project value should be reported in a standard way [22:526]. Project reports don't offer a balanced content of information on costs, and physical progress compares to the service outcomes and the organisational change implications [22:527]. Figure 37 shows the concepts captured during the stakeholder discussion around the construct of project review.

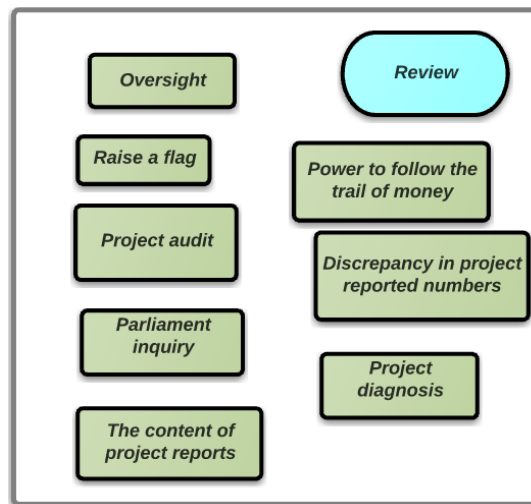


Figure 37 Concepts around the construct of 'Review' in the perspective of stakeholders

The probity of a project requires the active involvement of auditors and up-to-date intelligence collected from the project. The concepts of importance around the construct of probity are shown in Figure 38.

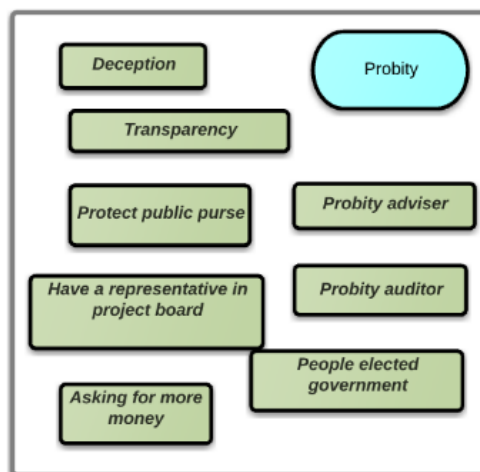


Figure 38. Concepts around the construct of 'Probity' in the perspective of the stakeholders

In order to ensure public interest and transparency, the auditor should get engaged in the project early enough [18:423]. It is also useful if the auditor

monitors the decision-making process by attending the steering committees or project advisory boards [18:423].

Nonetheless, the delivery agency (client) fears that probity measures may cripple communication with the bidders as soon as RFP (Request for Proposal) is launched. The client may get distressed that any involvement with the selected bidder may concern the auditors because of the risk of influencing the tender process [29:1167]. It is not clear where the balance between efficient communication and probity measures should be to assist project move forward to enhance tender process [29:1170].

Early selection of the contractor has been considered as a solution to ease the probity issues [1:38, 19:441]. Impartial procurement and protecting IP (intellectual property) of project bidders, is considered as a guideline to improve the current probity processes [10:218]. Another way to mitigate the impact of the probity on communication is the nomination of a third party that transfers project requirements to the tenderers [10:234].

Another concern of auditors is preserving value for money when the public sector enters a contract with the private sector. The auditors should reassure Treasury that the private sector does not overcharge [16:373].

5.2.4. Theme 4: The risk of outsourcing expertise

The balance between in-sourced and outsourced expertise is important to have an efficient business and make informed decisions [26:586]. Skill distribution has been a dilemma for the public sector [37:1150]. There is no benchmark to set the ratio of internal to external skills [3:98]. On the one hand, there has been an urge for a lean government with only the strategic awareness, which outsources any specialised skills to the agents [41:1044, 1:26]. On the other hand, there is a need for the public sector to be an informed buyer with an in-depth understanding of the technical requirements of the project. Nevertheless, the former approach has been mostly implemented by central agencies and the latter by the delivery agencies.

DTF believes that nowadays we do business different to two decades ago, so there no need to keep skills inside the organisations [1:26]. Recently DTF relied on an external consultant to support the Public-Sector Comparator in PPP projects [41:1036]. However, the Ombudsmen implied DTF was not properly skilled and recommended DTF acquire greater skills to be able to verify the information they receive [28:852].

DoT acknowledged that external skills are expensive to engage [3:102]. The workplace offers an opportunity for development and on job training [40:1029, 1031, 3:101]. Some of the discussion around the construct of organisation

captures concepts relevant to DTF skills and the capability of the public sector in making good decisions. Figure 39 shows the construct of the organisation.



Figure 39 Concepts around the construct of 'Organisation' in the perspective of the stakeholders

External expertise has always seemed like an immediate solution to make up skill deficiency in agencies [23:621]; nonetheless, outsourcing comes with problems. One risk of outsourcing specific skills outside government is losing the technical knowledge that should be overpaid later [28:834]. To some experts, a consultant is, 'Someone who borrows your watch and tells you the time' [28:833]. The analogy is not far-fetched when we observe experts who are trained in the public sector; later migrate to the private, e.g. in VicRoads and Melbourne Water [3:107, 11:241]. In further evidence, concerns were expressed for the skilled people who migrate from government to the private sector [16:349].

It is suggested by the public and private sector that where there is a series of projects that are similar, it is justified to keep the expertise in-house, but for one-off projects external expertise or a public sector centre of skills such as MPV (Major Projects Victoria) offer more efficient resource use [1:28,29, 39:1090, 26:587, 30:574, 11:239].

It is also suggested that more consistency among public projects is achievable by engaging a specialised delivery agency such as MPV [37:1149]. An example of this central government expertise is the centre of excellence in Ontario, Canada [19:457]. It has the advantage of retaining the corporate memory, and capturing lessons learnt [19:449]. See also [30:739] and [37:1144] regarding MPV.

The DTF rejects the absolute advantage of in-house skills over outsourcing [26:585]. DTF finds no causal link between using or not using consultants and being an informed buyer [26:590]. The DTF heavily relies on external consultants in their reviews but the Ombudsman and VAGO think that in-house capacity should be retained, so things are done more efficiently [28:836]. They believe that even if you outsource the skills, you need skilled project managers (in-house) to establish the link [28:837]. The Ombudsmen particularly suggest DTF and SSA retain technical skills in-house since they are engaged in every public project [28:835].

Managing the balance between external and internal skills is essential for a project to reach expected outcome. One form of external expertise may be hailed during a project tender. Competition during a tender might be a clients' method of confirming cost and time. However, if the client is not an informed buyer, a tender may mislead the client and produce a false estimation.

It is believed that the current perception that occasional one-off projects require less in-house expertise led to the current incompetence of the government [26:588]. One other contributor to the skill deficiency in the public sector is the discrimination that a public centre of expertise can never compete with private sector due to private sector higher number of projects in both public and in private [13:274].

5.2.5. Theme 5: Leadership Inadequacy in public sector

This theme has four constructs associated with leadership and the issues of consistency and strategic integration. The major problem with all the failed projects was identified as leadership, which was lacking in almost every project. [28:818]. Figure 40 illustrates the concepts that have been discussed under the construct of leadership.

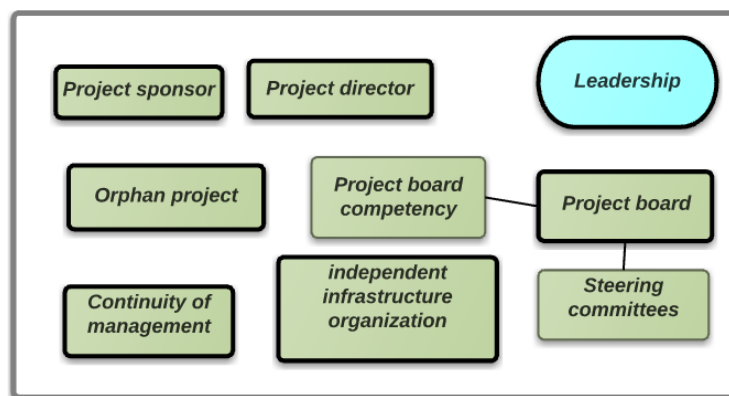


Figure 40. Concepts around the construct of 'Leadership' in the perspective of the stakeholders

Orphan projects tend to fail, and failed projects are called “orphans” in many instances [14:327].

Witnesses at the inquiry said that project directors, including the board and committees, should take responsibility for project decisions from the early start of a project. Continuity of management assures integrations of project decisions and a higher level of accountability. More consistency is achievable by engaging MPV more in projects [37:1149]. Better decisions are made by an informed public sector [22:512]. It is also critical that the public sector is informed during the planning stage of a project [1:40, 2:50]. Informed managers make better decisions in public sector and, therefore, run projects better [22:512]. It is a concern that in the recent decades, we de-skilled the engineering skills from the government [10:221].

Building the right project team is one of the early activities of a project that requires an informed client who has the right competency [30:752]. During a project tender, the criteria for being an informed buyer are indicated by an adequate number of tenderers, tender competitiveness, and good value of the project for taxpayers [16:348].

The second construct involved with the Leadership theme was the buyer or client. Witness statements referred to the need for an informed buyer. DTF was not considered an informed client in projects but an expert in finance [39:1105]. DTF admitted, “There is a lot of significant work that needs to be done in enhancing the capacity of government to be a skilled purchaser” [26:589]. Figure 41 shows the array of concepts discussed by the witnesses around the construct of the buyer (or client).

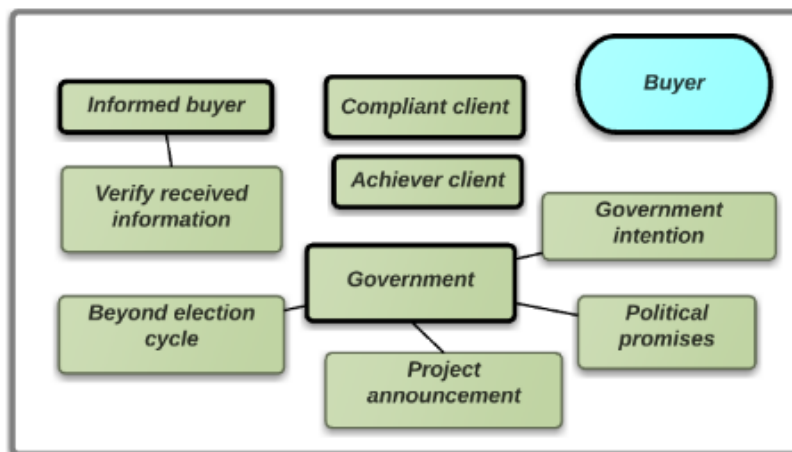


Figure 41. Concepts around the construct of 'Project client' (Buyer) in the perspective of the stakeholders

It is expected that until planning is complete and the tender selection process finished, cost and time estimation are tentative estimations. Some industries are more vulnerable to the unreliability of number, e.g. ICT projects [33:896]. Any public announcement at the outset that suggest the expected cost, time or scope, will affect stakeholder expectations. As a result, DTF was more cautious not to give precise dollar values at the early project stage but used probabilistic

terms instead. DTF is getting more explicit on the risk that these early numbers cause for projects [41:1041].

The third construct relating to leadership is the attitude of the people involved with a project. The attitude of project people is criticised by experts. A change in the mindset and better collaboration among the decision makers is required to promote value for money. A Mindset shift is needed toward systems thinking against the traditional way of managing the complexity that is reductionist in its outlook [20:470]. In the absence of systems thinking, a sub-optimal result for the system as a whole is likely [20:471].

The spectrum of witness discussions around the attitude to infrastructure projects is captured in Figure 42.

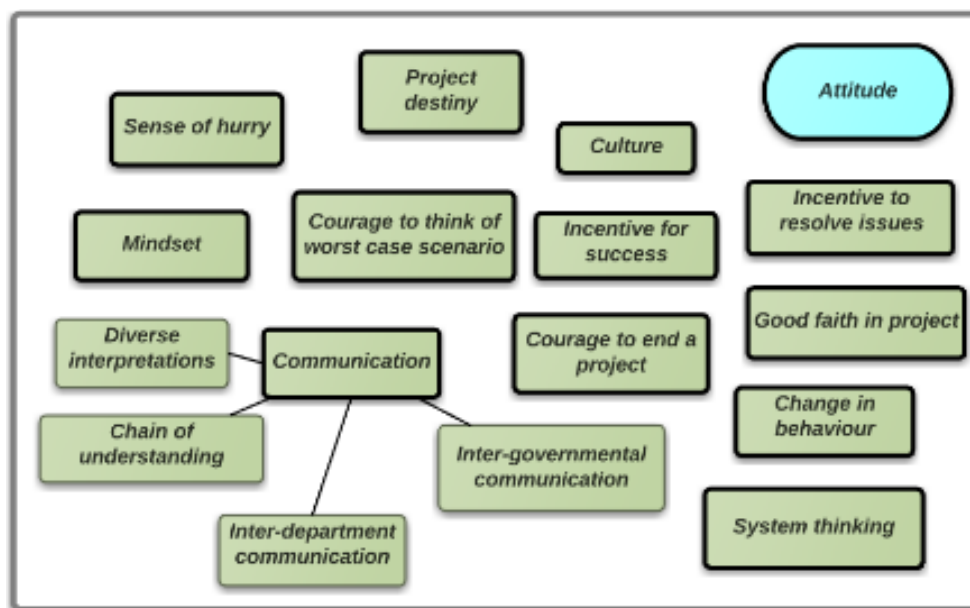


Figure 42. Concepts around the construct of 'Attitude' in the perspective of the stakeholders

Shifting the viewpoint from technical management (typical project management) toward business management that is more comprehensive is an avenue toward value for money [22:536]. ICT projects in Australia have been underperforming for decades with no remarkable improvement [22:540]. Instead of focusing on time and cost more attention should be given to the value of the product that the project delivers to the community [22:524].

The psychology of project members shows a diversity in mindset and approaches in defining and managing project activities. In comparison to the public sector, so far, the private sector has been more successful in acknowledging and utilising these personality differences to improve project outcome [27:727].

The final construct underpinning the leadership team was identified as the need to have the right team. This construct was created from concepts around

project personalities. Three types of personalities were identified. Starter personality has the capacity to jump-start a project and take the risks of a new design. Achiever personality is driven by the project outcome. The finisher personality is good at wrapping up the project. Allocation of people with the wrong personality may halt a project at its design stage. These personalities are shown in Figure 43.

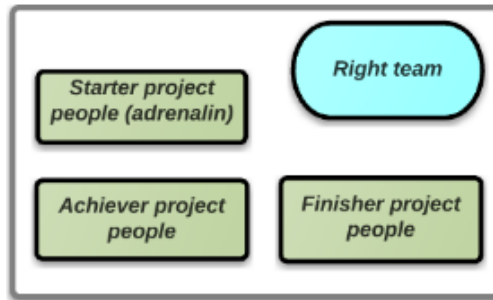


Figure 43. Concepts around the construct of 'Project teams' in the perspective of the stakeholders

5.2.6. Theme 6: The appropriateness of procurement methods

The theme of procurement was supported by many witness statements that could be described by a variety of concepts. The concepts identified are provided in Figure 44 which together create the construct of procurement which is also the sixth theme.

In public projects, a competitive tender process is trusted to produce the highest value for money. Nonetheless, a tender is not a transparent decision-making process [13:292]. Project delivery should be so that all options are considered [21:486]. Two main factors in selecting the procurement strategy are who fund the project, and second how the risk is allocated [39:1102]. The procurement strategy should be selected in accordance with private sector interest [6:163].

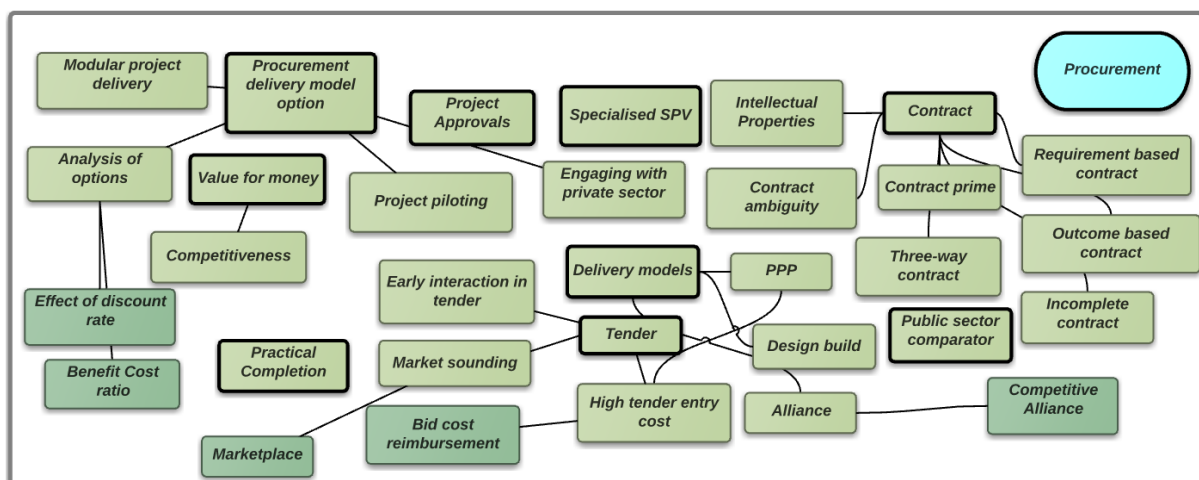


Figure 44. Concepts around the construct of 'Procurement' in the perspective of the stakeholders

Three major models of procurement in Victoria include Alliance (competitive or non-competitive), D&C (Design and construct), and PPP (Public Private Partnerships) [4:122]. The fitness of the procurement model is based on the project nature. While D&C is the most common delivery model [6:167], there is no one contract for every project [1:39, 4:123, and 36:958]. In fact, any of these models may work well if the client knows what is happening [16:368]. Governments need to be careful about selecting a procurement model if they intend to achieve value for money [6:162]. Confidence pays nothing except ambitious plan.

The infrastructure investment policy offers a well-organised process for PPPs since 1994 [6:150]. PPPs are complex projects [17:397]. Transfer of the risks is at the heart of a PPP. DTF defines a PPP as a structure to transfer risk [26:593]. Fluctuations of an SPV's (Special Purpose Vehicle's) share price in response to the project difficulties indicate that the risk is transferred to the private sector [26:594]. PPP is a flexible model and suitable for a wide range of projects [19:467], [17:396, 18:419, and 19:465].

PPP projects are essentially large and therefore only attract a portion of the market to participate [18:420]. Challenges with PPPs are (a) enormous upfront knowledge is required by the private sector doing the design (b) the tender and delivery process needs high expertise and knowledge transfer between the public and private [19:443]. Hence, a PPP does not fit a simple-type construction [41:1066]. Ordinary projects such as roads (Toll roads are different though) should not be PPP because they do not need to be smart or they may become too expensive [41:1048]. Where the capital cost is high and operational cost are trivial, PPPs may not be the best option [41:1059].

Within the process of a PPP, a PSC (public sector comparator) is prepared to calculate the whole of a life cost of the project, if it is delivered and operated by the public sector. There are two versions of the PSC, the raw and the risk-adjusted. In the risk-adjusted, PSC estimates the capital cost, adds the operation cost, adjusts the cost according to the risk, and discounts it based on 10-year TCV (Treasury Corporation Victoria) bond rate [41:1065]. The raw PSC is released to the bidders to help them understand the scope; the adjusted PSC is published after project finance closes [26:596].

An Alliance Contract addresses the government dilemma to access the market resources when there is not a sound plan to start with [33:899]. It is a good choice when the risk is high and time is of the essence [6:165]. Alliances, however, require professional engineers in both the public and private sector [16:363]. It also requires good commercial people on both sides of the equation [13:307].

The choice of delivery mechanism could be deferred if only simple elements such as discount rates are considered [13:294]. A procurement strategy that facilitates early engagement and innovation is a success factor [30:739], [39:1083].

The bid cost, particularly in PPP, is too high which mostly account for legal cost due to complicated contract [39:1097]. Standardisation of PPP contracts is perceived as a solution [39:1097]. Roughly in Australia, the bidding cost of PPPs is around 1.5 to 2 percent of the capital costs vis-a-vis in the Canadian market of about 0.5 to 0.75 percent. This could be as a result of an irregular project pipeline. This will lead to less number of participants in Australian tenders [19:461]. Canada also uses reimbursement of bid cost mechanism to attract more bidders [10:226].

Recently there is an initiative by the DTF to change the procurement process so the private sector can access PSC; instead of the process of BAFO (best and final offer) which is costly for both parties [10:209].

Keeping two compliant tenders on the table until the very end worked for Convention Centre project. Similar to what had been done in City Link project, there were two proposals in this project, fully compliant with Public Sector Comparator (PSC) and PPP guidelines; so, the client ended up with two complying bids [25:780].

Providing the losing bidder with a degree of compensation encourages more competition [25:782, 39:1099]. Reimbursement of a bidder for complex projects with high entry costs, i.e. Projects commonly more than 100-200 million, will eventually benefit the public sector [10:219]. In MCEC, it was justified as both the tenderer went through the detail review and negotiation with dedicated teams [25:782].

Is the lowest cost tender the best outcome for the community? Not necessarily, because of lifelong maintenance and other things [16:367].

5.2.7. Theme 7: Mismatching priorities

The constructs of partnerships and external issues were combined to create the theme of mismatching priorities with agencies that can negatively influence project outcomes. Central agencies can be motivated by political and social issues as well the need to deliver VfM. However, delivery agencies such the departments of health, transport or justice are focussed on the functional aspects of a particular project. This may be at odds with the objectives of the central agencies.

It is important to recognise different expertise is expected from different project partners [35:870]. The balanced capability of partners is a factor in producing good outcome [35:867]. Cost overruns and delays occur primarily

due to the lack of capability in the government, but we also have the challenge of ensuring that private sector capability [16:357].

It is also important to watch the full range of commercial relationships among constituencies (particularly head contractor and sub-contractors) at the tender stage to see what risks the private sector is exposed to because they become state risks ultimately [40:1002]. Figure 45 describes the concepts associated with the Partnership construct.

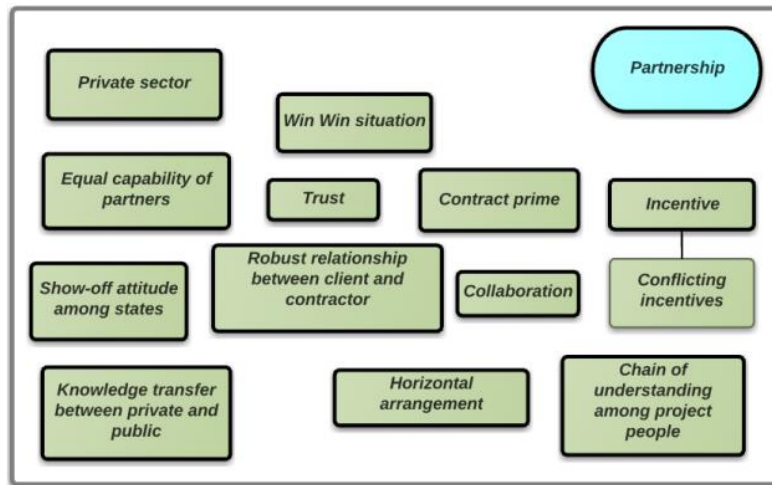


Figure 45. Concepts around the construct of 'Partnership' in the perspective of the stakeholders

Insight from South Australia, Western Australia and other states shows that late engagement with contractors due to probity concerns is wrong and lead to the more uncertain cost of the project. A better approach is to bring them to the table up front from very beginning [1:38]. In Ontario, the preferred bidder is announced much earlier so some of the probity issues are going away much earlier and they don't tease the project until very late time [19:441].

One view finds engagement of private sector in social projects, perfectly justifiable and reasonable [13:297], [36:959], [1:19]. A new model of partnership has been suggested by one of the expert witnesses that suggested the government could build a facility and when it shows a dependable stream of revenue, sell it to private (super funds perhaps) and with the money go to the next project [12:255].

The construct of external issues is also responsible for generating a mismatch between the priorities of the central and delivery agencies. The concept of risk identification and allocation was an important element of external issues. A prevailing practice was shifting risks to the private sector presuming they are more effective in managing them [16:372]. It was noted that a blind allocation of risks to the private sector is not an excuse to avoid accountability. It was also observed that private sector risk premium might ultimately cost even more [16:372]. Thinking of the risk profile of the project helps the client to be an

informed decision maker of the procurement vehicle they need to deliver the project within expectations [24:659]. Figure 46 maps the relationship between the concepts and the construct of external issues. The risk is a common concept related to concepts of allocation, uncertainty and forecasting.

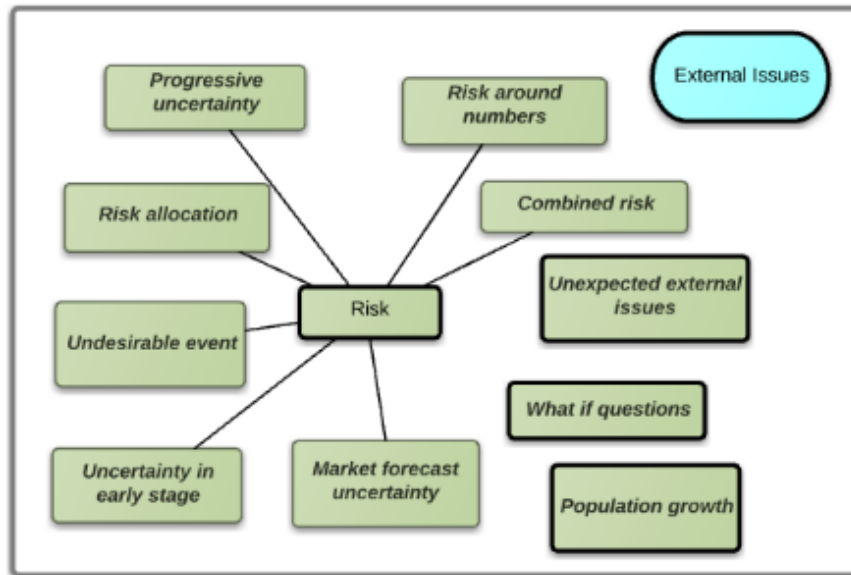


Figure 46. Concepts around the construct of 'External issues' in the perspective of the stakeholders

The DTF see PPP's as a means of putting all risk on the private sector, but PPPs require close supervision by the client [39:1106].

5.2.8. Theme 8: Complexity of governance structures

The complexity theme was developed out of the constructs of governance and accountability. Figure 47 describes the concepts associated with the governance construct.

Every project needs to have a very clear governance framework where accountability for every specific area of delivery is clear [26:577]. The details of governance framework also depend on the complexity of the project [26:577]. Infrastructure has complex Interfaces [8:196]. The governance structure should listen to a wide spectrum of voices from the stakeholders [37:1153]. A chain of understanding is required from the central and delivery agencies and from the political executives. If the chain is broken, problems are inevitable [25:789]. To govern with integrity is critical for infrastructure projects [13:267], [13:268], [13:266].

The governance structure ought to prescribe when should something be escalated to the department, when does the department need to get involved and what is their involvement [28:863].

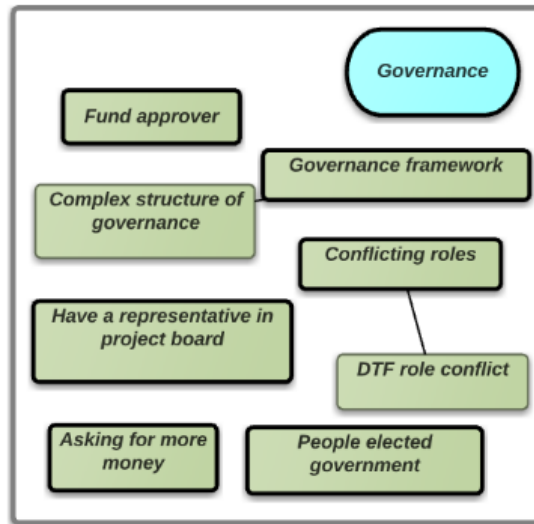


Figure 47. Concepts around the construct of 'Governance' in the perspective of the stakeholders

No matter what diligence or consideration we make into major project, some issue hit eventually, because we do not have perfect foresight [17:382]

Maximising single-point accountabilities is the objective to optimise a governance framework. It is critical to have a single focus point in the client that has a clear governance structure to reach to decisions [37:1139]. In contrast to single point accountability, joint accountability happens when an outcome is produced by multiple actors, and the contribution of actors in the outcome is hard to identify. In projects where there is someone who prepares the recommendation, someone who decide upon it and someone who fund it, there is a joint accountability [28:847]. Joint accountability may become 'No accountability' if all of the decisions are inter-dependent and the value a single decision add is unknown.

It is noticeable that when a project starts, agencies often seem to be reluctant to make serious decisions such as placing it on hold or termination [28:860]. LINK, a police IT project, was stopped only after allocating a new IT manager [28:861]. One of the few examples that a project being stopped until more data is collected is LEAP, a defence residential construction project. The project was stopped until to know more about its objective and benefits [24:667]. It is unusual to see a deficient project stopped early enough.

There are instances when governments make decisions without full business cases because they find something urgent or critical [41:1062]. The Secretary of DTF says: "There will always be a circumstance where the procedures that you put in place will not be followed ... there will be occasions where governments will decide that something has to happen so urgently that those processes will be truncated" [1:35].

There is potentially a mismatch of what DTF believe and what the community expects to be the DTF role in projects [24:642]. Consequently, the role of DTF is less defined and vague in some projects, e.g. MMR [25:773]. In some projects, the flow of information has been a one-way stream of information from project to DTF, e.g. Myki [28:842]. The head of DTF lists the role of Treasury with respect to major projects as follows

1. Providing guidance to departments how to develop a project, i.e. from developing the business case until completion;
2. Review the process and a) assist the department agent to make informed decisions b) advice any remedy;
3. Advise the government on a) budget, allocation and prioritisation b) project progress and diagnosis [26:542].

Thus, DTF is considered the prime adviser of the government to inform how much debt those projects might incur [25:770]. From time to time DTF, along with VAGO and others, look at project performance [25:770]. DTF itself believes that its job is not to make the final decision, but to advise the government and watch over the delivery done by the department and delivery agency [26:563]. DTF, however, does provide support and advice to the delivery agency if they need it. VAGO thinks that DTF has a challenge of doing three conflicting roles: setting the rules, improved guidelines, and internal advice to the cabinets [24:669]. The Ombudsman has identified a case of one treasury officer who could not explain his role and did not know whether he/she was a delegate or representative of DTF on the board of the project company [2:85].

The accountability construct (Figure 48) has several concepts including responsibility, delegation, allocation and organisational change. Accountability cannot be delegated There is a misperception that when you delegate responsibility, accountability is gone [24:646].



Figure 48. Concepts around the construct of 'Accountability' in the perspective of the stakeholders

A premature announcement of a project has been a challenge in managing stakeholder expectations. In addition, to the political incentive, another explanation for the premature announcement is to use it as a leadership instrument. The premature announcement might inspire a sense of confidence in the project to help it go forward [2:90]. The accountability of an agency reduces when external knowledge is applied in the process of decision-making.

5.2.9. Theme 9: Perception of failure

Success is perceived by measuring the extent of accomplishments to the promises. To some extent it is relative, and with the passage of time, projects initially considered to have failed have become successful. A good example is the Sydney Opera House which upon completion was considered to have failed because of massive cost and time blowouts and its controversial design. Today it is deemed an outstanding success and a major image representing Sydney and Australia.

The perception of failure arises because of the gap between initial expectations and the actual outcome. Poor planning and implementation are often cited as reasons for project failure [10:216]. Figure 49 shows the concepts which make up the construct of evaluation. How a project is evaluated determines whether it is perceived as being successful or a failure.

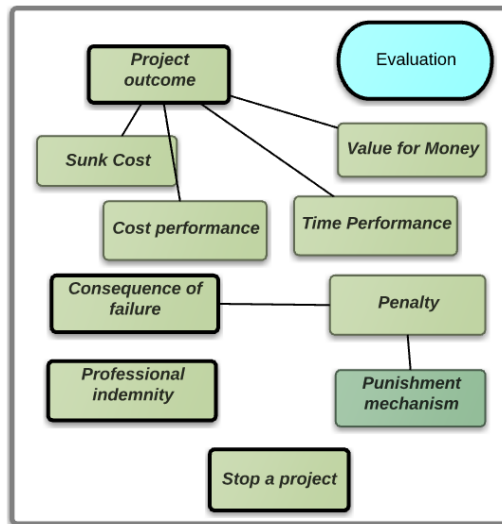


Figure 49. Concepts around the construct of 'Evaluation' in the perspective of the stakeholders

For medium size construction projects (budgets between 10 million and 150 million euros), the norm of overrun has been 50 percent; in IT projects it was up to 500 percent on the target projects [2:54]. The DTF says that IT projects are mostly recorded as a failure because usually, they do not have a clear understanding of what they are seeking and will let it try to evolve by the time [1:41], [29:1162].

Project failure might also be due to unreasonable expectations [14:326], [2:74].

5.2.10. Theme 10: Managing the stakeholder's expectations

An important theme to emerge from the inquiry was the need to manage stakeholders and their expectations. The concepts around the stakeholder construct are given in Figure 50.

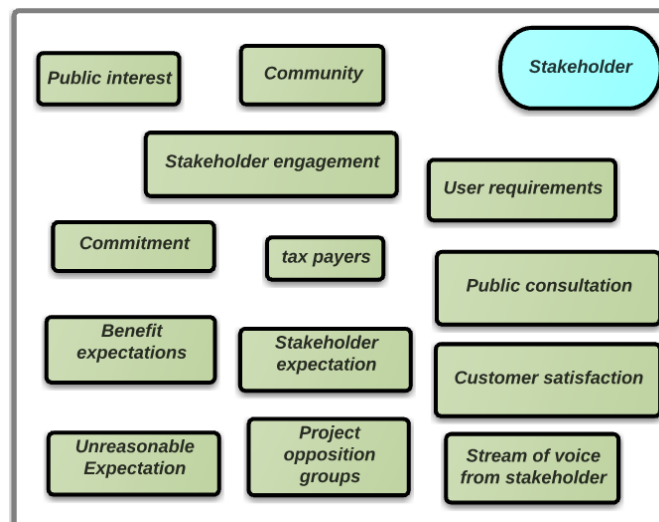


Figure 50. Concepts around the construct of 'Stakeholder' in the perspective of the stakeholders

Early engagement of the stakeholders in a project can be useful in gaining different and diverse requirements [37:1152]. There will always be people opposed to a project when they become aware of its impact [25:795]. Central and delivery agencies rather than contractors are best placed to manage stakeholders [30:759].

A centralised management model may, however, increase the risk of disconnection between client and procurer in understanding the requirements and getting the expected outcome. A challenge with the centralised approach is when project governance is too far from the users (such as the responsible department); there can be a gap between the actual outcome and expected one [1:27].

IPA identifies the best set up is to empower the central agencies by 'cycling down' expertise and deposit it in a centre such as in MPV [6:159, 1:37]. There has been an example of public agencies borrowing skills from other public organisations such as MPV, Places Victoria, VicRoads and DoT [9:201]. However, having a central skill centre, would not have improved the Myki project, as the general skills were already available in other subsidiary organisations and the external consultants had been involved throughout project life [40:1013, 995].

It is essential to have input from users in managing a project, not necessarily on the selection of procurement strategy but on the specification of the outcome [34:979].

5.2.11. Theme 11: Quality of decisions in the early stage

Spending more time on planning always pays off. There is a tendency for agencies to get the project moving as quickly as they can that might fast track the planning phase and jump to conclusions [28:825]. This urge to get a project started (often from political pressure) can result in less planning and analysis of a project. Figure 51 shows the concepts associated with the construct of decision making.

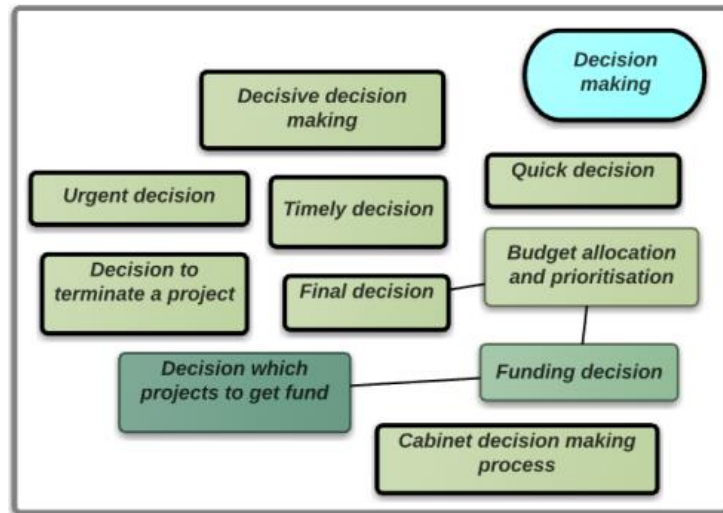


Figure 51. Concepts around the construct of 'Decision-making' in the perspective of the stakeholders

Market sounding is an important step in structuring an infrastructure project. A rudimentary market review may fail to identify the existing limitations or verify the planning assumptions. In Myki, there have been some national and international market soundings to see other projects, but the depth of the analysis was not that much to canvass the pitfalls of the implementation [23:604]

To receive community's approval and depoliticised a project, the government has to promote, explain and get the community onside right up-front to help them understand 'Why we are doing it' [39:1095]. For instance, in Victorian Desalination, the project could have been advertised as a long-term insurance policy instead of a water production plant.

Quality decisions in the early stage and within the parameters of the business case could have changed the fate of Myki if the client had a clear understanding of the business case and what they are trying to fulfil, and then clearly and succinctly relate them to the supplier [27:711]. The secretary of DoT says "After I became a secretary, we put additional skills onto the TTA board with the appointment of somebody with significant ICT expertise. With hindsight, we probably should have put the expertise of that kind on the board earlier on."

A public infrastructure project begins with a need or an opportunity for an asset that has an added value for the community. A business case is developed as a response to requests from the government or a discretion of the department. The business case is appraised by the treasury, and the government decide whether it should proceed immediately, wait in the queue or rejected. The process is called gateway review, and Victoria has been first Australian jurisdiction to apply it [1:13].

In order to make good decisions about a project, it is critical to have options presented in the business case. Figure 52 presents the concepts associated with

the construct of options. The government is given the financial information on a proposed business case to decide whether the project should be funded [25:771, 26:562]. VAGO names two stages of a project that require more attention, Pre-stage or planning and Post-evaluation [2:45]. At the pre-project or planning stage, option identification and assessment become a fundamental part of making a good decision about a project. [2:47], [2:48], [2:46].

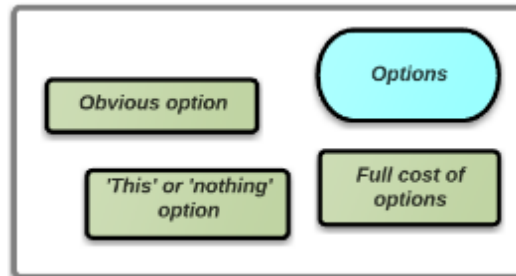


Figure 52. Concepts around the construct of 'Decision options' in the perspective of the stakeholders

“There are undoubtedly times when governments make decisions without a full business cases. Because something is urgent, critical or whatever, they make the decision to do it” [41:1062]. In some projects, the appraisal of the project occurs after the government has committed to the project and approved the funding. It is not clear, whether the government would have proceeded with the project if a business case has been prepared before [4:131]. Project delivery should begin after all options are considered [21:486].

5.2.12. Theme 12: Deficient planning

Deficient planning has been identified by witnesses to the inquiry as for the persistent cause of failure in project delivery. The constructs of estimation, assumptions, business case and requirements have been identified as possible causes for this. Figure 53 outlines the concepts that make up the construct of estimation. These include optimism bias, underestimates, delusion and forecasting.

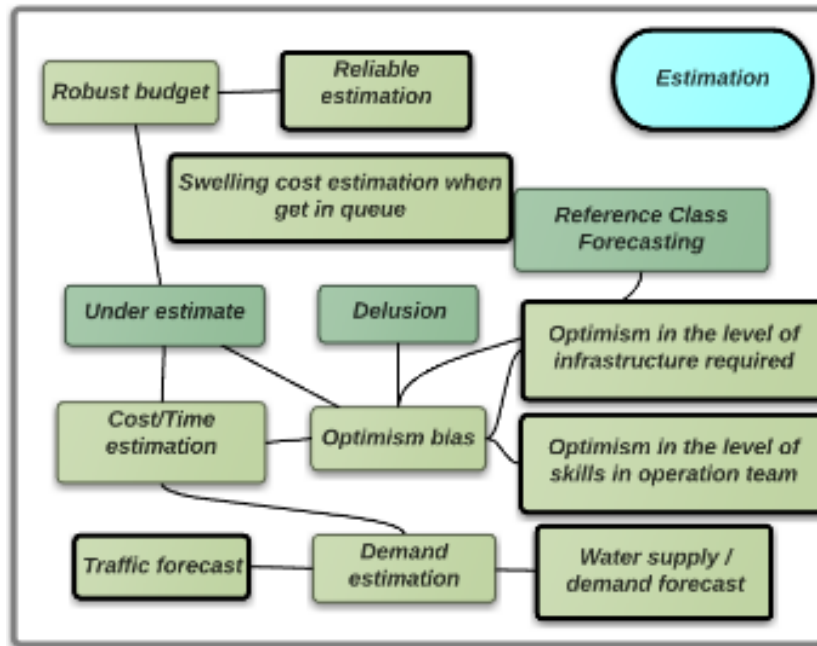


Figure 53. Concepts around the construct of 'Estimation' in the perspective of the stakeholders

The Ombudsman reported a persistent inadequacy of planning in projects and called it a primary factor leading to other problems [28:825,826]. Out of 10 selected projects reviewed none were adequately planned [28:826].

In the planning stage of the project, we need not limit our options by going for the obvious solution [2:48]. We should properly assess the need Not jump to solutions [2:46].

The reliability of a plan depends on the robustness of its assumptions. For example, in the Victorian desalination project, the size of the plant is a consequence of Melbourne water supply-demand modelling and scenarios of inflows [38:1125]. Figure 54 presents the concepts for the assumptions construct.

It is extremely important that the client prepares the ground even before engaging with the private sector through preparing the solid business case, i.e. they know what they want [35:879]. One way to minimise unreliable assumption and risk in projects is the client carries out pre-planning studies such as geotechnical, and share it with tenderers [39:1083]. Incorrect large assumptions in business cases are a source of risk that will come up later [25:810].

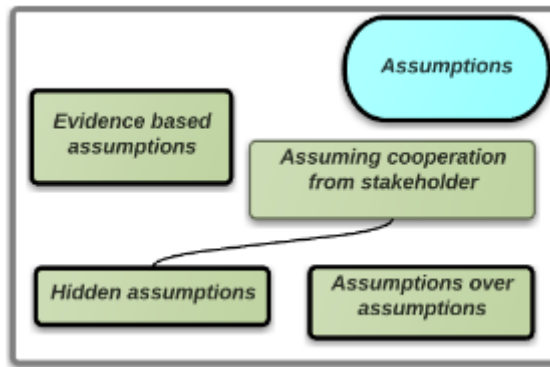


Figure 54. Concepts around the construct of 'Assumptions' in the perspective of the stakeholders

Lack of a rigorous business case is a recipe for failure [3:108]. Most of the projects that had poor outcomes had a poor business case up the front [1:32]. A robust business case is only prepared through the application of right skills [2:62]. Business cases are prepared based on assumptions about project contextual variables, e.g. Victorian Desalination project was sized according to climate estimation of supply and demand by Melbourne Water [38:1130]. Figure 55 presents the concepts identified with the business case construct.

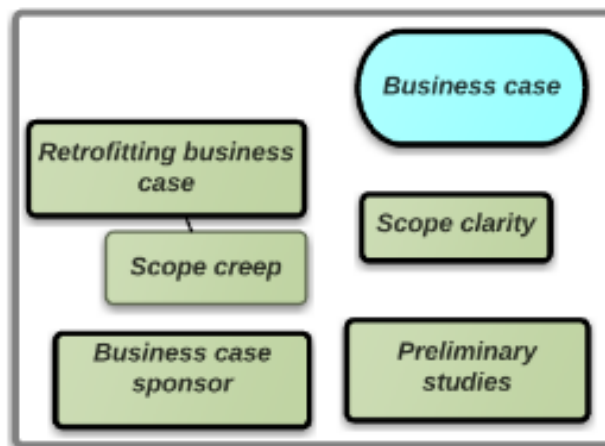


Figure 55 Concepts around the construct of 'Business case' in the perspective of the stakeholders

“One of the problems that have occurred in Victoria is that some business cases with very large amounts of money have been quite cavalier, perhaps, in the way they have been constructed, but they have received large amounts of funds and seemingly very little oversight” [24:671].

The cause of deficient business case is either deception or delusion [2:64]. Delusion is driven by lack of knowledge and research, while deception is an organisational misrepresentation. The sense of hurry and urge to do something is one of the reasons business cases are not seriously taken [28:852].

Not every challenge in projects could be attributed to lack of a proper business case, but it is extremely important that the client prepares the ground even before engaging with the private sector through preparing a solid business

case, i.e. they know what they want [35:879]. The more time we spend up front to come up with a better business case is justified [25:811].

Evidence-based assumption in business cases are needed [28:822, 24:668]. Robust business cases should also cover the oversight deficit that can arise; and a meaningful reporting on performance [24:668]. The capability to bring up the worst-case scenarios in a business case does not exist in the public service [24:675].

Figure 56 presents the concepts associated with the requirements construct. If government make efforts to understand requirements, it will save time and cost later on [27:712].

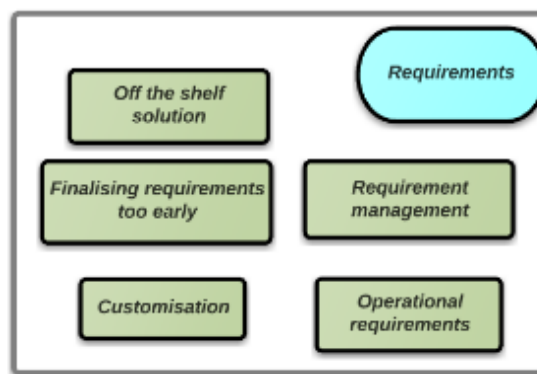


Figure 56 Concepts around the construct of 'Project requirements' in the perspective of the stakeholders

In ICT projects, a mistake clients can make is relying on the software promises of the supplier rather than their specified requirements [22:531], [22:532]. It is suggested that a project is much deeper than the physical product. For instance, a prison is not just a physical facility but a complex creation with impacts of social and psychological dimensions [18:416]. The requirements of a project, therefore, may not be known even to a client (DoJ) unless they have taken into account wider issues than simply the need for security.

5.2.13. Theme 13: Power in Public agencies

Government agencies possess different sources of power that can influence and impact the project approval process. Ministers of departments possess legitimate authority and can instruct their department secretaries to implement a project. The rationale of many of the project is we just need a new one, and we need money for that, if we don't do it, the sky will fall in [28:848]. Figure 57 provides the constructs that make up the construct of influence. It is the influence of Ministers and their secretaries that give them power.

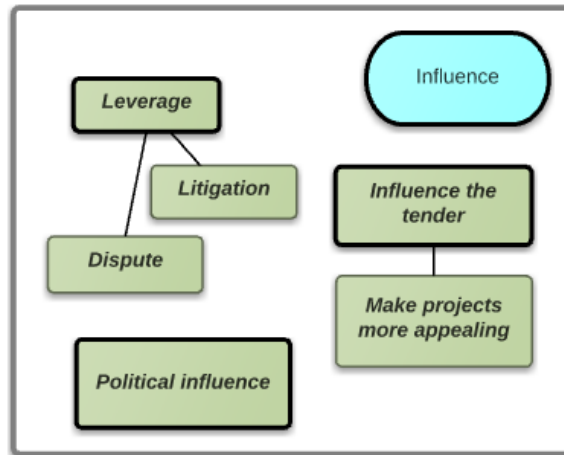


Figure 57 Concepts around the construct of 'Influence' in the perspective of the stakeholders

Public projects tend to shrink the cost to get into the queue, and once they are in the queue, they tend to increase the cost, so they increase the chance of being successful [41:1071]. Announcing a project schedule and cost before the business case is finalised generates political pressure on the project managers [3:112].

Early public statements about the project cost and time (by a minister) can sacrifice the long-term value of the project. There is a tension between the desire for transparency in early stage and project outcome [6:169]. Some relevant comments from an audit agency and a government department executive support these views:

VAGO: "The reality is that a lot of business cases are retrofitted to ministerial announcements" [2:63].

DSE: The government makes commitments on the election, which is good, but it is imperative that we as its agents build upon those initiatives to find the least-cost solutions [4:134].

5.3. Discussion

The analysis of the expert witness transcripts generated 13 themes around infrastructure project delivery, refer Figure 58. Each of the themes was created from constructs – higher order summaries of concepts that could be tagged or tied to words or phrases in the transcripts.

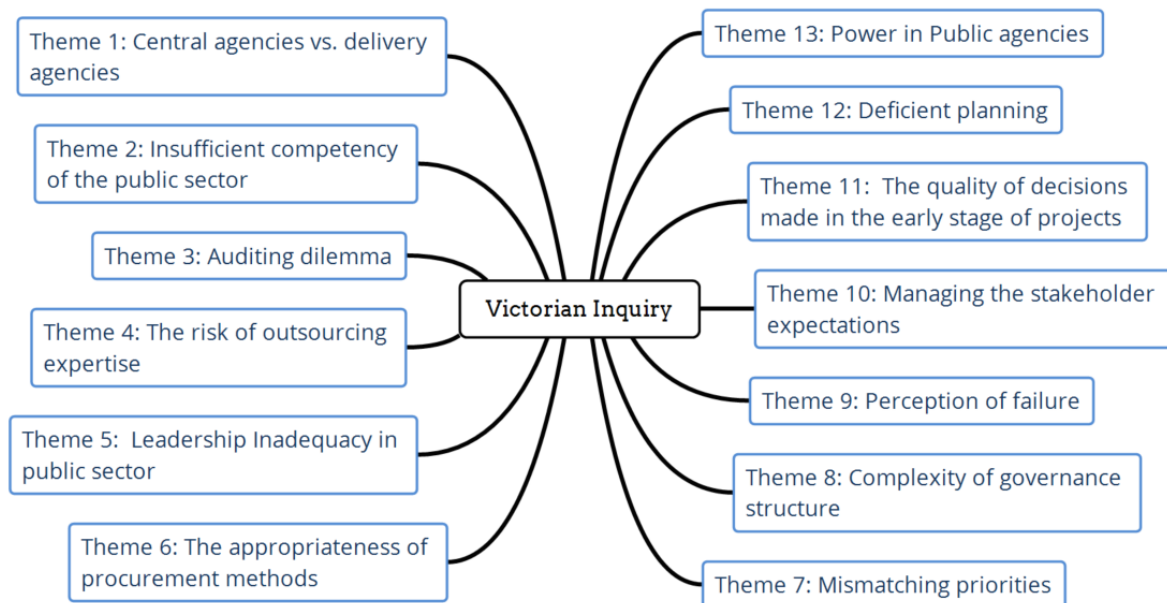


Figure 58. Summary of the 13 themes identified in the Victorian Inquiry

These themes are taken together identify the many ways in which projects have gone wrong. They are effectively the evidence from the participants reflecting on their project experiences. They also provide ideas about how to improve project management and delivery to improve the chances of successful delivery.

Projects are collective endeavours. The success of project outcomes is intertwined with the quality of both project planning and the early decisions. Project early decisions are influenced by the interests, expectations, perceptions, authorities, and competencies of the actors notably the central and delivery agencies. Power is an ability to influence others' decisions. The competency and authority of an agency define its power. Power of an agency can explain its behaviour against other agencies. The notion of power is a binding thread of the thirteen themes in Figure 58. The dynamics of power appears when project agencies interact within the project processes. Delegation and outsourcing relate to the dynamics of power as they influence the competency and authority of agencies. Project governance, on the other hand, is critical since it aims to manage the right balance of power among the project constituencies.

Figure 59 combines the construct maps that created the themes. The constructs and their related concepts are assembled and presented diagrammatically on one page. The diagram shows the constructs and related concepts that in combination are the factors identified with successful projects. The figure summarises the factors that were associated with successful project delivery.

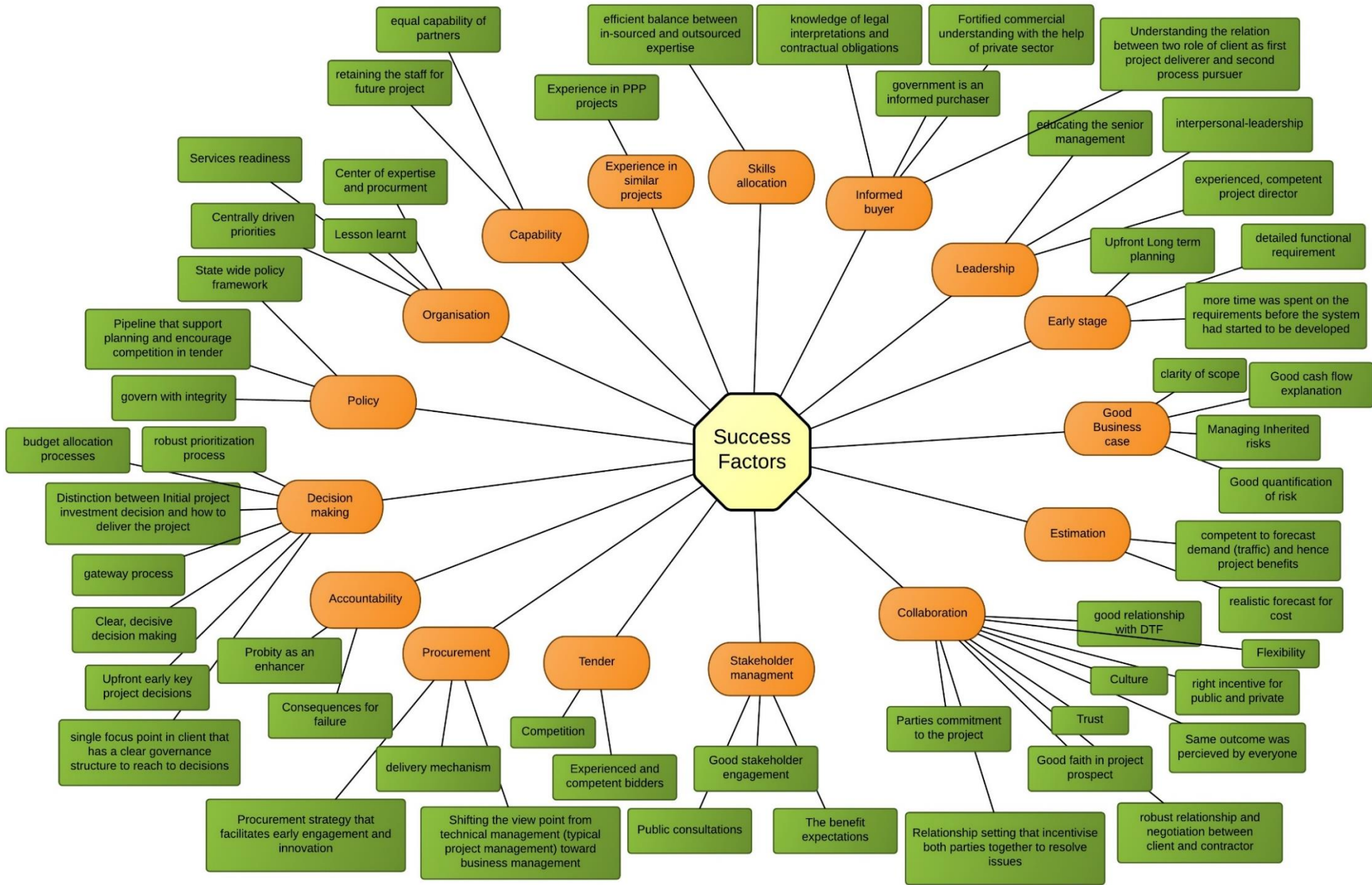


Figure 59 Public infrastructure success factor from the perspective of the expert witnesses

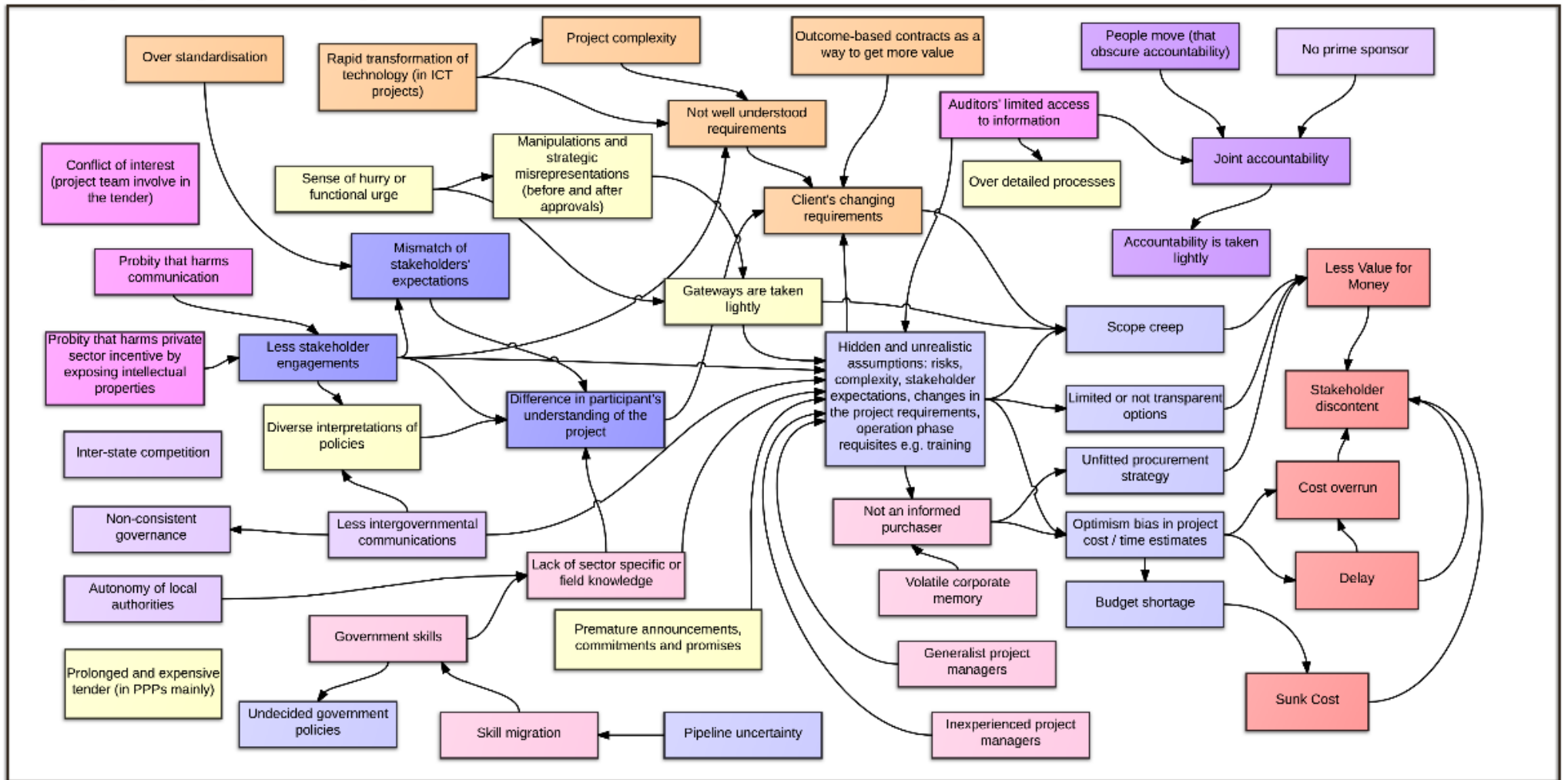
The transcripts from the expert witnesses gave their advice to the committee quite clearly. Relevant comments about project success follow:

- The success factors have to be exercised upfront in the planning stage [3:96]
- Project success factors are: - The competency of project management professionals -The competency of the delivery organizations - The project selection processes - The business case - The benefit expectations - The corporate processes more [14:317]
- The solution to the process deficiencies across the state is 1st. to see each departments' own capability and maturity 2nd: distinguish the roles and levels of public sector managers. 3rd "competency improvement of individuals needs to be married with maturing organisational process." 4th "the governance and review mechanisms require sometimes greater experience and not just more evidence." [22:514]
- Shifting the viewpoint from technical management (typical project management) toward business management is a success factor [22:536]
- Critical Chain of Project Management as the first necessary step to make the process more successful [20:478]

But members of the Public Accounts and Estimates Committee of the Parliament of Victoria were apprehensive about how to deliver projects successfully.

- MP: we have not found a model where we can fully engage the private sector to help us design the best project and manage our probity risk, in effect, and also get the best financial outcome, competitive alliance sounds promising though [13:303].

Having identified concepts and constructs and grouped them into 13 themes, the next stage of the research developed a causal map (Figure 60) of the factors associated with project success and failure. It is a complex network, but it attempts to draw together the root causes that can lead to delivery failure. The causal map reads from left to right. Root causes identified on the left side of the map are a conflict of interest, probity, interstate competition, non-consistent governance, the autonomy of local authorities and prolonged, expensive tender processes, inter-government communication and government skills. The centre of the causal map is a factor associated with hidden and unreal assumptions. It brings together into one factor significant causes associated with project failure. From this central factor, project problems can develop such as scope creep, optimism bias, opaque options and procurement strategy. These lead ultimately to less VfM, stakeholder discontent, costs overruns and delays; all attributes of project delivery failure.



Legend



Figure 60. Causality maps in public infrastructure delivery based on stakeholder perspectives

Figure 60 is complex and time consuming to understand. Nevertheless, it attempts to unpack and organise the observations, ideas and recommendations of the senior executives to develop a causal relationship: the drivers of project failure. The next causal map (Figure 61) is a higher-level summary of the more detailed causal map presented above. In this map – the drivers or root causes are synthesised into 3 fundamental root causes; not being an informed purchaser or client, the political imperative and lack of stakeholder engagement. Each of these factors has been hinted about in various ways in the transcripts. They were common elements among the 7 projects investigated by the PAEC. The root causes generated by these fundamental factors are listed in the middle of the map; these are related to the constructs; hidden/unrealistic assumptions, misunderstanding requirements, misrepresentation, fudging a business case (retrofit), mismatched expectations and auditors limited access to project information. Together these factors lead to optimism bias, scope creep and joint accountability. The transcripts show that joint accountability can mean no accountability. With these factors in play in a project, costs are overrun, delays appear, and the quality and value of the project are inevitably queried.

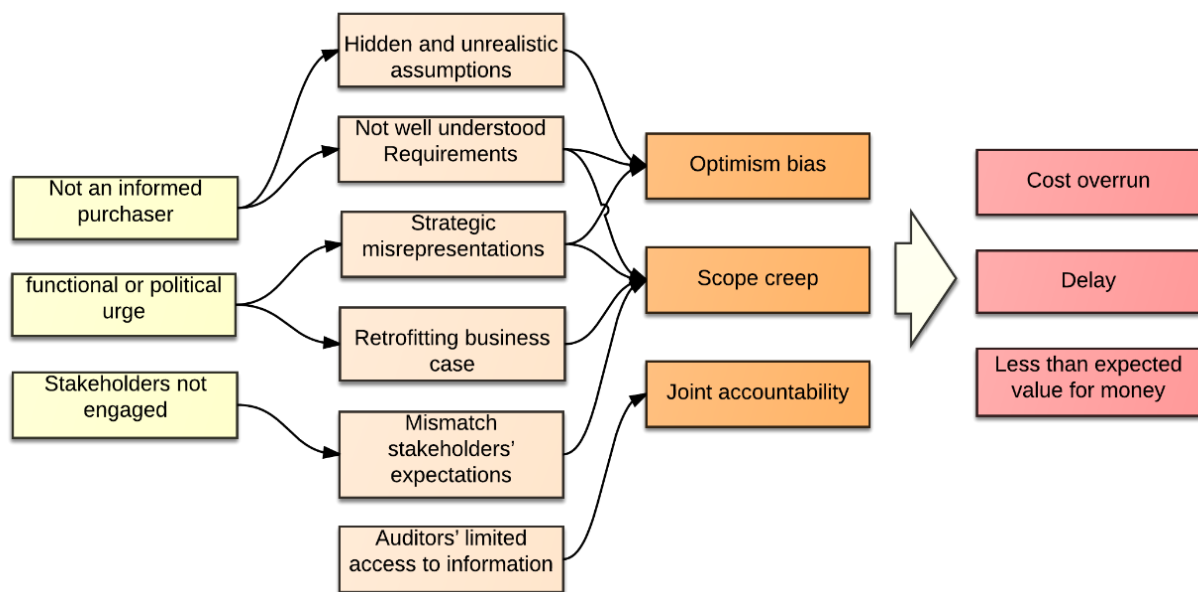


Figure 61 Simplified causal map of public infrastructure delivery

5.4. Conclusions

This chapter has presented the results of a detailed analysis of 500 pages of transcripts of an investigation into the decisionmaking surrounding seven large infrastructure projects in Victoria. It has also explained the methodology that was used to make sense out of the 350,000 spoken words by expert witnesses answering questions about the infrastructure projects. It used a grounded

theory approach to analyse the text of the witnesses and identify from the text concepts that could be combined into constructs – that summarised the intent of the witnesses answering questions about the decision making processes in the infrastructure projects.

From the analysis of the text and the creation of the concepts and summary constructs, 13 themes were identified that summarised the ideas in the transcripts. These themes led to the identification of factors that could be associated with successful project deliveries.

The rich data set and the use of the concepts and constructs were summarised in a complex causal map that attempted to relate fundamental root causes with the final outcomes of projects. In order to simplify this and distil the core ideas, a summary simplified causal map was produced which combined all of the previous themes and maps.

The analysis has, among other things, clearly shown that the expert witnesses believed that the public sector agencies were less than competent in their knowledge, skills and experience in the delivery of large pieces of infrastructure.

To start to test these findings the next chapter investigates a range of case study projects.

6. Case Study Analysis of Causes Driving Project Outcomes

A new visual method was developed in Chapter 4 that facilitates the analysis of interviews to establish the root causes as to why projects are not delivered as expected. The Victorian Parliamentary inquiry into decision making around infrastructure projects was coded, summarised and the main reasons for project difficulties were identified in Chapter 5. This chapter seeks to confirm the root causes for the project difficulties and then establish that the findings of the parliamentary inquiry are consistent with the analysis and results conducted for this thesis. It also seeks to provide an extended understanding of the specifics of the root causes and which causes may be generally true for major projects and which may be peculiar to a specific project.

Based on an in-depth reflection of the case study projects, the project outcomes and root causes for these outcomes are identified. These root causes are compared to the causality maps presented in Chapter 5. The root causes were evaluated to identify causes that apply to multiple projects and which may be project specific. The findings were then reflected in past research as detailed in Chapter 2.

6.1. Case studies

Projects are social endeavours. In social research, hard measures are usually absent. Even quantitative data are typically a transformation of qualitative data. Triangulation of data sources, data types and research studies are common methods that add to the reliability of conclusions.

Below is the list of refinements that were applied to the initial themes, i.e. triangulation. (More details of the method of triangulation are presented in the next section).

- Case studies are used to check and refine our understanding of the interview data.
- Findings are sharpened through open-ended interviews with selected experts in Australia.
- Initial understanding is checked through structured interviews with international experts.

Seven infrastructure case projects in Victoria were studied by the PAEC 2012 report. The statements received from the witnesses during the public hearings refine the case studies to provide a means of triangulation that offer a robust understanding of the current routine of infrastructure delivery in Victoria. This chapter presents an analysis of statements from the PAEC that specifically reference one or more of the seven case studies.

The following section introduces the seven cases and describes them in more detail.

6.2. Data sample

The sample of projects selected by the PAEC of the Victorian Parliament was selected because they had special characteristics, refer Figure 62.



Figure 62: Case study projects

There were projects that were significant delivery failures and caused the government much political embarrassment (Myki, HealthSMART and the Victorian Desalination Plant). There were also projects that were seen as generally successful in their delivery (Regional Rail Link, The Royal Children's Hospital and the Melbourne Convention Centre). The Melbourne Market Relocation project had some elements of disappointment. Eisenhardt has suggested there is merit in selecting polar types for study:

“Given the limited number of cases which can usually be studied, it makes sense to choose cases such as extreme situations and polar types in which the process of interest is "transparently observable".(K. M. Eisenhardt, 1989, p. 537).

The extent of evidence and references to these case study projects in the Victorian Inquiry is detailed in Figure 63. This is followed by specific consideration of each case study project.

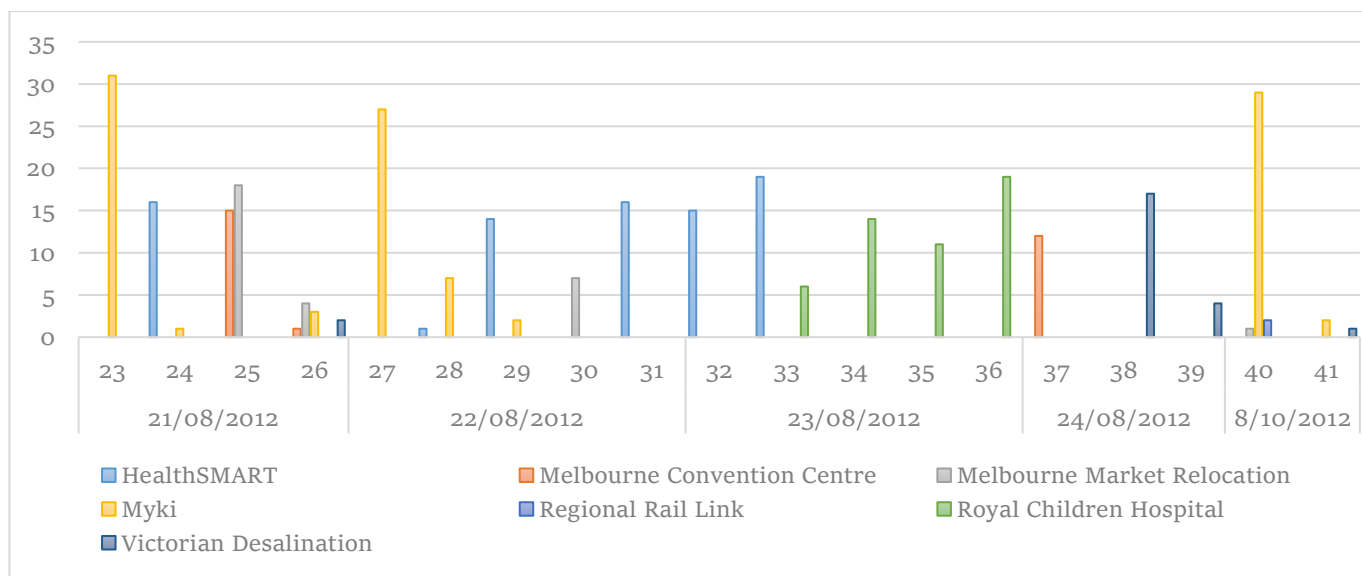


Figure 63. Evidence received around the case studies

6.2.1. Melbourne Market Relocation Project (MMRP)

The Melbourne Wholesale Fruit and Vegetable Market and the National Flower Centre have an annual turnover of more than \$1.6 billion. The market is a critical piece of infrastructure forming the supply chain distribution hub for fresh food and flowers in Melbourne and Victoria.

The original Melbourne Metropolitan Market was located opposite the port of Melbourne, quite close to the CBD. It was an ideal central location with access to the larger metropolitan area. However, the facility was very old, in need of significant repair and was running out of capacity. In June 2002, the business case for the redevelopment of a new market was done and officially announced in April 2004. The new market aimed to offer a modern, innovative and efficient trading and distribution precinct in a new location in Epping, Victoria. A PPP with a 25-year contract was initially chosen as the procurement strategy to deliver the project in 2008. Nevertheless, the delivery method and the arrangements for the operation and ownership of the market have altered twice since the project commenced. In December 2007 the PPP model was abandoned, and MPV was selected to deliver the trading floor using a traditional procurement style. In 2009, the Minister for Major Projects and the Department of Business and Innovation took responsibility for the project and approved over \$190 million of additional funding subject to a revised business case. In December 2009, the revised business case was submitted to the Department of Treasury and Finance. In March 2010, the contract was signed and MMA appointed as the market operator (VAGO, 2012).

Key observations in the transcripts about the MMRP were:

- Considered not a successful project [25:766]
- One of the reasons behind relocating the MMRP was to free the land adjacent to the port [40:1026].
- In Melbourne Market Relocation, the government sparked a conflict with stakeholders through a political announcement; the alleged mistake was not repeated though [25:792].
- In Melbourne Market Relocation some of the conflicts between the client and the tenant were related to the Premier's statement, and they are not going to move, although the premier didn't repeat this statement again it made expectations among the stakeholders [25:792].
- The risk that the tenant may not want to move from Footscray is not considered [25:787].
- The business case was trying to justify the project under the shadow of port expansion (Spacing up the old market for port facilities). It does not answer the question of why we need a new market for public benefits [25:779].
- change in the scope of the project after signing the contract [30:760]
- although the contract was D/B, there was a major change in design after contract come into effect [30: 761,742]
- Melbourne Market Relocation had a deficient business case [26:552].

This project attracted significant public attention and its failings were reflected in the witness statements.

6.2.2. Victorian Desalination Plant (VDP)

The context of this project was the 12-year drought that preceded the decision in 2007 to build a desalination plant to "drought-proof" Melbourne.

Melbourne's water storage catchments were at their lowest ever capacity generating severe water use restrictions throughout the city and the state. Engineering and climate forecasts convinced the then Victorian Premier to construct a desalination plant.

On 19 June 2007, the Victorian Government announced a plan to construct a desalination plant. The feasibility study was conducted by Melbourne Water.

The Victorian Desalination Plant (VDP) is a reverse osmosis water plant in Dalyston, on the Bass Coast in southern Victoria, Australia. The production capacity of 150 billion litres of water a year is flexible to move between 0 and 150 billion litres and has an expansion capability of 200 billion litres a year if necessary. As an independent source of potable water, the desalination plant complements Victoria's rainfall, in times of drought. However, it was a controversial part of Victoria's water system because there were some engineers and economists who argued better water management and pricing strategies were a better use of public monies.

For example, see the following witness statement:

- There is a question as to why VDP should have been built instead of a dam or why not a smaller plant [38:1119]

The VDP was procured by under a PPP scheme. The tender process commenced when expressions of interest were called in June 2008. Among the eight tenderers for the contract, two consortia were short-listed (Kenneth Davidson, 2009). On 30 July 2009, the Victorian Government awarded the Victorian Desalination Project to the AquaSure consortium –Thiess & Suez- to finance, build, maintain and operate the project for 30 years. The construction was scheduled to commence in late 2009, with the intent that water is delivered by late 2011. Construction of the desalination plant and water transfer pipeline commenced on 30 September 2009 and was completed in December 2012. (AquaSure, n.d.). By the time the facility was completed in December 2012, Melbourne's reservoirs were adequately full because the drought had broken. The plant was immediately put into standby mode (Simon Lauder, 2008). The first water released for public use was in March 2017.

AquaSure's fixed price for construction of the whole project was \$3.5 billion. The total maximum net present cost of financing, building and operating the plant over 30 years is expected to be \$5.7 billion (assuming water orders of 150 billion litres per year).

Questions on the creditability of the investment were raised at the time of start-up. The Victorian ex-premier and his government were criticised in media and accused of wasting money over an ambitious plan that turned to be more like a white elephant (Drill, 2012; Millar & Schneiders, 2011; Schneiders & Millar, 2011).

In the inquiry, the effectiveness of decisions in public delivery of the VDP was investigated extensively. (Committee of Public Accounts and Estimates, 2012) The DTF was obliged to pay for the availability payment, embedded in the contract. The parliamentary committee members seemed uncertain whether or not the project objectives had been identified properly. The transcripts suggest that there was no agreed consensus about what success meant for the VDP. After the fact, it is certain that outcome and utility of this expensive public infrastructure, i.e. \$5.7 billion net present value of state expenditure, is far from what was originally expected. The project experienced a one-year delay to come on-stream. The project put a minimum/maximum burden of paying \$18/\$24 billion over the next 28 years even if the plant remains standby.

The procurement method for this project is also, under debate. A similar plant constructed in Western Australia used an alliance contract as the means of delivery. The process of decision making regarding those early decisions was studied by the PAEC. Issues regarding the validity of the rainfall forecasts were

raised during the inquiry. The cabinet review process was also, scrutinised and criticised.

In retrospect it can be said that the rainfall forecasts were flawed, the plant capacity was excessive and the choice of procurement strategy was inappropriate. The project was subject to significant political influence which put pressure on the project team to make hasty decisions. The project is an example of flawed early decision making and the need to spend more time and resources on the early decisions.

6.2.3. Royal Children Hospital (RCH)

The new Royal Children's Hospital project valued at \$946 million (net present value, as at June 2007) was delivered by the Department of Health and Human Services and the Royal Children's Hospital. On 21 November 2007, a consortium led by the Children's Health Partnership commenced a design, build, finance, and maintain the contract for 25 years. The consortium included Bovis Lend Lease as the builder, Spotless Group as the facilities manager, and Billard Leece, Bates Smart and HKS as the architects (Partnerships Victoria, 2008; Victoria. Auditor-General., 2009).

The new hospital was built immediately to the west of the existing site on Flemington Road in Parkville. The project was the largest hospital redevelopment undertaken by the State Government of Victoria. The outcomes of the project have a major impact on the quality of tertiary health services to be delivered to children in both metropolitan Melbourne and rural/regional Victoria.

The view of the expert witnesses was that this project was successful:

- Consistently, it has been said that RCH was a successful project for the competence and previous experience of the project team in the strategy of procurement [33:905,909,36:937].
- PPP was best delivery model for RCH [36:960].

6.2.4. Regional Rail Link (RRL)

In 2011, the Federal Government and Victorian Public Minister of Transport announced contracts worth more than \$1.6 billion to build 7.5 kilometres of new rail track that separated metropolitan and regional services through Melbourne's west; the work began in 2012. The project constructed dedicated tracks for the Geelong, Bendigo and Ballarat trains through the metropolitan system from Sunshine to Southern Cross Station as well as building a new station at West Footscray and upgrading the existing stations at Footscray, Sunshine and Tottenham (Regional Rail Link Authority, 2010).

The work was divided into work packages with a tailor-made procurement strategy in each package. A consortium of Thiess, Balfour Beatty, Parsons Brinckerhoff and SKM won the project (Ministers for the Development of Infrastructure and regional development, 2011; Regional Rail Link Authority, 2012).

The Regional Rail Link project was the winner of the Australian Construction Achievement Award 2015 and Infrastructure Project of the Year 2014, as well as receiving the Premier's Sustainability Award in 2014, and an IABC Gold Quill award for Community Relations in 2015 (Victoria State Government, 2017).

The following statement is indicative of the expert witness's views about the RRL:

- Regional Rail Link Authority is a good example of a good piece of governance, where it has a dedicated board, a chair and a CEO reporting through into the department [40:1008].

6.2.5. Melbourne Convention and Exhibition Centre (MCEC)

The Melbourne Convention Centre development project was delivered as a Public Private Partnership project under the Partnerships Victoria framework. The Victorian Government contributed \$370 million toward construction of the centre, and the remaining commercial development was financed privately. Major Projects Victoria managed the delivery of the project on behalf of the Victorian Government.

The precinct provides an important link between Docklands and the city and is an exciting public space for all Victorians and visitors to enjoy.

The project was located at South Wharf which is adjacent to the Melbourne CBD. The project partners were the Plenary Group, the architects – Woods Bagot / NH Architecture and the builder was Multiplex Constructions. The project includes a 20,000-square-metre expansion of Melbourne Convention and Exhibition Centre, a new 347-room, four-star quality hotel and a new 1,150-space multi-level car park.

This project delivery was seen by the PAEC to be a successful project. Statements from the inquiry were:

- Considered a successful project [25:766]
- In Melbourne Convention Centre government successfully used external expertise on different skills and managed the balance between external and internal [19:451]. This project is an example of in-house resources that effectively assisted the client transfer the end user requirements to the project team [37:1136].

- The type of contract, PPP, in Melbourne Convention Centre urges the Plenary, the private consortium, to be mindful of project performance during the operation phase too. Plenary reminds the importance of operation skills in addition to design skills. It is highlighted that in order to make a design well appreciated, it is necessary to have a balance of technical and operational skills [37:1137].

6.2.6. Myki

Myki is a public transport ticketing system that was designed to provide Melbournians with a multi-purpose credit card style ticket that could be used for public transport and also in retail shops. The objectives were optimistic, and the project was significantly over budget and over time. It was the subject of several government enquiries and caused significant public embarrassment to the government. Relevant statements about the project from the inquiry are:

- It is simplistic to reduce the issue of Myki inaccuracy and optimism just to its board incompetence [23:618].
- Part of Myki complexity stems from the history of metcard, its zone, types and fares that unconstructively influenced the requirements. It would have been easier to begin from scratch than an existing one [27:706].
- In Myki one of the main changes in scope is the removal of the short-life smartcard. Another is reducing the scope not covering V/Line [27:724]
- Based on the Ombudsman report in 2004, in Myki business case it was at \$741.9 million over the life of the project from 2004 to 2017. Then when we have the project awarded, it jumped \$257 to the total sum of \$998.9 million. It shows an un-robust business case [26:571].
- Kamco, a contractor in Myki, reports that the government was not correctly skilled and certainly did not understand requirements and requirements management [27:719].
- In Myki, the cause of the whole situation goes back to the requirements not being well specified, well understood and well accepted by both parties at the beginning [27:713].
- The contractor, Kamco, and the client, TTA, signed the contract that meant they both considered the time and cost are doable [27:717].
- It was not correctly understood by participants that a software practice is likely to creep dramatically [23:619].
- It is believed that if the government made efforts before the tender to understand the requirements, it would have saved time and cost in the later stage [27:712].
- In ICT projects, another mistake is a client relies on the software promises rather than their specified requirements [22:531].

- Another problem is the client discovered the requirements wouldn't satisfy the need too late [22:532].
- The reason Myki cost blown out is the delay in time [40:1023]
- People may have preferred the option of Metcard (no change) if they would have seen the real data of the current expenditure compared to the new investment outcome [23:601].
- Myki got off the track at the beginning when the requirements are defined poorly defined [27:702].
- Myki's driver back in 2002 was the expected expiration of Metcard and the international pressure that all the transportation ticketing system are becoming smart [23:615].
- In Myki, identification the requirements at the outset was done very poor since the contract was an outcomes-based rather than a requirements-based contract [27:702].
- In Myki, due to the complexity of the system, it would have been better for everyone if more time was spent on the requirements before the system had started to be developed [27:703].
- The assumption that the project finishes in 2 years while no similar project had finished in less than 5 [28:822].
- The business case was not able to manage the complexity of the project [23:635].
- Project cost jumped \$257 million to total sum of \$998.9 from the business case estimation of \$741.9 million [26:571].
- Changes in the scope [40:983,987,23:603], in order to manage the cost blow-out [40:982].

These are some of the statements made to the PAEC about Myki. It is clear from the discussion at the inquiry that the project suffered from multiple failures throughout its implementation. It, unfortunately, provides a rich case with many lessons about the implementation of ICT systems.

6.2.7. HealthSMART

HealthSMART was intended to be a comprehensive patient information system across all public hospitals in Victoria. It was initiated by the Department of Health in 2003 and was to be an electronic medical record of all patients in the public health system. It was to contain medical records of patients to support clinical decisions. It was to be integrated with external medical information systems to provide accurate, timely medical information about patients.

Governance for the HealthSMART clinical ICT system was to be managed through a complex hierarchy of boards, project committees and advisory groups. There were 4 main groups:

- Clinical Systems Steering Committee

- Clinical Systems Reference Group
- Clinical Systems Advisory Groups- including medications, e-health and radiology
- Agency Steering Committees – for health service implementation

HealthSMART was the subject of a comprehensive audit by VAGO as its costs and delivery times blew out. Eventually, after much departmental and political anguish, the project was abandoned.

The following statements from the enquiry provide a flavour of the expert witnesses' thoughts about the project:

- In HealthSMART, the outcome of the project would have been altered if the information and experience of ex-post were available to the decision maker beforehand [33:900].
- In HealthSMART the required training for clinicians was underestimated and so impacted project outcome for stakeholders [32:923].
- The sense of hurry and urge to do something is one of the reasons business cases are not seriously taken [28:852]. Ombudsman report reads that HealthSMART had no business case, despite seeking over \$300 million in funding. The funding was requested based on a high-level strategy document and a 14-page implementation plan [33:884]
- In HealthSMART, the software package couldn't manage the coming complexity as it was expected in the first place [24:661].
- One of the causes of the problem in HealthSMART was the poor state of IT infrastructure in our public hospital systems at the time [31:683].
- There is evidence, particularly in HealthSMART, that agency might try to add projects together and make them big in order to make denial (the option of not to proceed) more difficult to proceed [24:666].
- One of the difficulties in HealthSMART was that requirements were set even before engaging with the leading health services which meant some of the complexity was not foreseen until added by the health services [32:917].
- HealthSMART was stopped by the government after observing failure in the system and finding the vendor's responses inadequate [28:862].
- It was visionary with some concept brief rather than a well-written business case [24:673].
- It was not expecting or too farsighted for application of the technology [24:662].
- unexpected complexity in the medication formulary [31:680]
- One finding in HealthSMART according to Ombudsman's report is the business plan wasn't produced as expected [29:1158].
- In HealthSMART the complex structure of governance in Health system (the role of health service board) was taken lightly, that was a problem

[32:919]. The project was finally announced by the minister not to be pursued; the cost probably is a sunk cost since the value is unknown [24:657]. Moreover, the relation of health services with the department was complex as each of the health services had a different level capability [32:926].

- In HealthSMART of the overall issue was no agency was given the accountability to deliver the whole programme [29:1159, 1177].
- Regarding the HealthSMART, in Australia, we are quite bad at collecting financial benefits from systems like this, Compare to US [31:694]. The 'after-the-event evaluation' is little done on projects [13:286].

Having provided a background and context to the seven infrastructure projects and presented relevant statements from the PAEC, the next section begins to relate causes to project the project outcomes. Why did some projects succeed why others failed in delivery?

6.4 Cause and effects of project shortcomings

The causes that hinder a project from being successful are identified through analysis of the public inquiry and review of the case study projects. The causes were traced back to the trigger elements, facilitators or root causes. Finally, a causal network was mapped in Chapter 5 that depicted the relationship of different concepts that contributed to project shortcomings with more attention to the early stage of a project. Some of the reasons for delivery failures are now discussed in more detail.

Scope creep is an uncontrolled change in project scope without proper attention to the consequence of the change. Scope creep reduces the total project value for the client although it might look yielding higher output. Scope creep is different from customisation and enhancing project requirements at an early stage. It happens after the project set the time and cost and is often because the requirements are not well understood in the beginning. Scope creep is caused or facilitated by project complexity, the rapid transformation of technology, e.g. in ICT projects, or lack of client knowledge power to understand the requirements, the technology or the effect of requirements on cost and time. Another reason that a client might constantly change the requirements is the type of contract they use in a project. In an outcome-based contract, a slight change in the expected outcomes could immensely impact the project's other dimensions. In these projects, scope creep might have a severe effect on time and cost even though the changes might look trivial. For instance, in an ICT project, adding a new feature to the user interface platform might require a comprehensive redesign that also impacts other parts of the system. Although scope change is usually necessary and vital for project success, scope creep is mainly caused by constantly changing the project requirements. Scope creep harms value for money if applied after the announcement of cost and time

commitments to the stakeholders. Myki and HealthSMART provide examples of scope creep.

Differences in participants' understanding of the project might also cause the client to change the requirements due to unawareness of the actual needs and requirements. A client who has a low field of knowledge might struggle to define the actual needs. Consequently, the initial requirements will change when more insight is gained from the end users or other stakeholders. Similarly, mismatch of stakeholders' expectations could be unstable the definition of project requirements when one stakeholder introduces a new expectation or requirement that was ignored by others. Less engagement of stakeholder is the major cause of misunderstanding or mismatch of project requirements at an early stage of a project. Project tenderers should be regarded as one of the stakeholders. Therefore, probity measures that might harm the tenderer or client engagement and communication especially at the early stage are detrimental and will negatively impact client's understanding of the project requirements.

Another reason that a project scope might drift away is the absence of proper gateway reviews. Gateway is a process of quality control to checks the project quality along the way, from an idea into implementation and then expected benefits. Gatekeepers review the project status in comparison to the previously promised to other gates and assess projects project's status and the expected outcome. Green light, red or amber are the possible outcomes based on the project performance. If there is a change in the scope, it will be investigated to assure greater value for money. If the scope change is because of planning or implementation issues such as unrealistic initial budget, then the project is put to tighter reviews. Loose gateway reviews might encourage a project to change scope to cover other glitches such as cost, time errors.

The sense of hurry or functional urge might happen when a delivery agency is focused on their functional output and might not be able to see the big picture of public infrastructure delivery. The delivery agency over-emphasising on their functional role as a governmental body, find cancellation of alteration to the project a threat to their agency's existence. As a result, the agency may see gateway review as an obstacle to fulfilling their functional duty. The partiality of the delivery agency to deliver the project may cause manipulation or strategically misrepresentation of the approval process, i.e. over-announcing the benefits before approval and reduce it after.

Optimism in the early stage of the project is another factor that prevents a project to succeed. An optimistic plan overestimates the benefits and underestimates the costs. Optimism bias is a type of planning fallacy that occurs in any project due to many factors including errant assumptions or strategic misrepresentation. Uninformed buyers are more susceptible to this

phenomenon, and insufficient supervision in project approval and control process acts as a contributor. If a project is one off and unique in every aspect, optimism could not be identified until the project ends. Nevertheless, experience in previous projects, provide a benchmark that finds optimism even before implementation. Consequently, a client with short-term or volatile corporate memory has less chance of managing optimism. Optimism bias also hurts project success by influencing stakeholder expectation formed at the early stage of the project. Premature announcement of the project estimations such as cost and time can exacerbate the issue.

A complete knowledge of project risks, complexity, stakeholder expectations, and requirements hardly exists in a project. Nonetheless, we call a client an uninformed buyer when there is a significant ignorance or unrealistic assumptions about the project need, scope, complexity, requirements, risks or stakeholders. Some clients even suffer more with a volatile corporate memory that doesn't learn from the past. They may never become an informed buyer even if they repeat the same type of projects.

An uninformed buyer is vulnerable to optimism bias. There are individual and organisational explanations for optimism in an uninformed buyer. Individually, the way our brain works shows that we value positive scenarios more than negative ones. We unintentionally forget the risks or put fewer efforts and resources in exploring them. In organisations, the process of project delivery may encourage optimism since only those more valuable projects survive. The idea of optimism bias in project delivery is well-discussed in Flyvbjerg's "Survival of the un-fittest" (Flyvbjerg, 2009). In a competition of business cases attracting public funds, the gateway process only permits projects with a higher value for money. There might be an unintended tendency in delivery agencies to promote the benefits and discount the risks and the costs.

Uninformed buyers may choose an unfit procurement strategy too. Uninformed buyers know less about the project as well as the traits of procurement methods. Hence the selection of procurement strategy depends on the prevailing market and the client's previous experience rather than the actual need of the project. Some procurement methods such as various styles of Alliance, require the client to engage in the process actively. Hence, even if a client chooses the right procurement strategy but doesn't fulfil the terms of collaboration, the outcome may suffer.

Client skills and expertise are vital to ensure a buyer is an informed one. Skills are required for estimation, plan, control and operation. In the early stage of a project, skills are necessary to determine the robustness of the business case and reassure the completeness and validity of assumptions. Skills and expertise, however, are not easy to acquire and maintain. Skills mostly reside in people who are free to walk away, so expertise may migrate company to

company, state to state and country to country. Skills may also move from public sector to private and vice versa. In Australia, there is evidence that the skilled workers are inclined to migrate to New South Wales and Queensland if they can. Clients and contractors need to plan in order to attract and maintain expertise. Undecided government policies and uncertainty of project pipeline make it harder for public or private agencies to plan the required skills in project delivery.

The competency of project managers is key to project success. There are myriads of context-based competencies a project manager should have in order to lead a project toward success. But two types of project managers are identified to be more susceptible to making unrealistic assumptions, a generalist and an inexperienced manager. The term of generalist project manager is used in contrast to a technical one who has the specific knowledge of technical side of a project and has accumulated the knowledge of doing a project bottom up and comprehends the details of a project work packages. Generalist managers, on the other hand, are more focused on management, law and finance and less knowledgeable about engineering. They oversee projects top-down and rely on other people to comprehend the technical side of a project. Inexperienced project managers, on the other hand, know the theory but less of practice in the specific domain of the project. So, the experience is defined in the context of the project and not in general sense of any project. Therefore, clients who run a one-off project may have an issue of finding an experienced manager because the project is unique and requires a new experience hardly found anywhere.

Premature announcements and making commitments and promises may be an indication of hidden or unrealistic assumptions in a project or may lead to it. Project announcements usually try to fulfil a political incentive. Even when the initiative is social, the ultimate objective could be political. Sometimes announcements attempt to fortify a project by raising the cost of turning back. In such a case, the project is announced, and its benefits are promised to the public before the project passes through all of the gates. If this happens before the implementation phase, it could be considered as a violation of gateway process, or it indicates the inability of gateway process to stop a project. Either way, it is a flaw in the process. Early stage announcement of project scope, time, or cost, sets or modifies stakeholder expectations. Through announcement of pre-mature estimates, sometimes, the principal aims to increase the value for money by forcing an expectation, e.g. a lower time or cost, to the project. Conversely, it may hurt the project by raising the expectation in public users and auditory authorities, and by emitting a message to the market that the client is an uninformed buyer. Both results disadvantage the project from being properly appreciated by the stakeholder.

Lack of sector-specific or field knowledge contributes to the hidden or unrealistic assumption in a project too. The issue is more observable moving from delivery agencies who have a close connection with end users to central agencies that has less relation with sector-specific requirements. The more autonomy the field agencies have, the more gap of knowledge between central, and delivery agencies exist. This gap of knowledge is not necessarily is a defect as the delivery agencies are normally commissioned to be in close contact with the end users. An efficient organisational structure requires a division of responsibilities. Central agencies rely on the knowledge received from field agencies to make critical decisions that influence other stakeholders, e.g. end users. This decision-making structure may create a risk of making suboptimal decisions if the information that field agencies provide is not accurate.

If agencies are not accountable for their decisions and actions in projects, erroneous actions will prevail. Taking accountability lightly is a problem in a project delivery system. Having no prime sponsor is a dominant factor in confusing the accountability of a project decision. People also move among companies that also obscure accountability. Joint accountability is named as a solution to get people responsible for their actions collectively, but on the other hand, it could be a means of escaping from it since a prime sponsor is less visible.

Auditors' limited access to information may contribute to the formation of naïve assumptions in a project moreover to the risk of corruption. To avoid these pitfalls, auditors seek more access to information through probity measures, as well as accessing project data and decision process. Some delivery agencies, however, blame audit mechanism to over-processing the delivery systems. They find probity measures discouraging the communication among parties during the tender and auditing system intrusive in accessing sensitive project data. Some delivery agencies also convict over-regulating the process of delivery, reasoning that every project is different to others and a reasonable level of flexibility should be retained for the agencies to deal with situations. Although a reasonable level of supervision is under debate, auditors do not take responsibility for any depression in communication, innovation discouragement or inefficiency in project delivery due to a more supervision. Although auditing may tighten the flexibility of a delivery agency in making bold and perhaps essential decisions, inadequate supervision is costlier if a dodgy project put in place and hard to stop.

The last but not the least contributor to project shortcomings are hidden or unrealistic assumptions about the project. The hidden or erroneous assumption is also related to optimism, scope creep and limited options. Project assumptions are established at an early stage of the project and should be updated as the project proceeds. Assumptions about project risks and

complexity, technology, stakeholder expectations, requirements, productivity and performance, market condition and operation phase requisites, e.g. training, prepare the ground for project planning. If assumptions are errant or obsolete a plan would be deficient. Hidden assumptions may also turn a project into optimism. Postulation about the utility of a project product, demand for project services, and the market price of the raw material are examples of the assumptions that might fundamentally influence a project planning. Sometimes optimistic assumptions existed but hidden to the client. In Melbourne market relocation project, the client assumed that the shop owners would appreciate the move which mostly didn't happen.

6.5 Discussion

The previous section on the causes of project failure was based on the statements provided to the inquiry by the witnesses. There were 12 major findings identified in this research that is summarised in Figure 64.

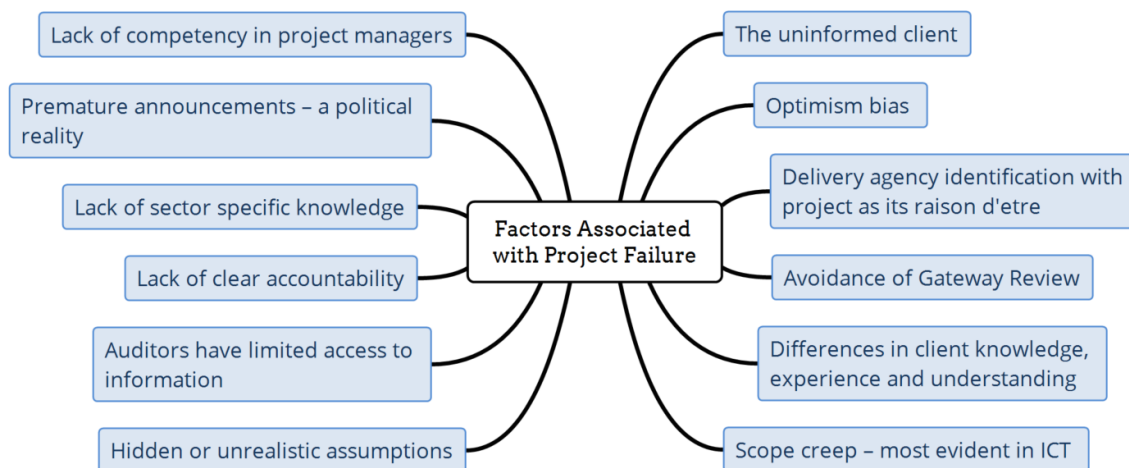


Figure 64. Major causes of project failure according to case studies

There are many more reasons for projects failing. Yet another is the observation that a strong Minister can gain project approval from Cabinet without obtaining a business case. A witness statement observed:

- The reason they didn't put a formal business case for HealthSMART was that the government made its mind [33:887].

Successful projects had in common strong business cases and good governance procedures:

- The successful outcome of projects could be attributed to a good business case, e.g. RCH [33:909] and MCC [25:812].
- In RCH, according to VAGO report "Clear and sound advice was provided to the government during the decision-making process to commit to and invest in the project. The business case was comprehensive and

incorporated the key information and analysis required by Partnerships Victoria and other guidelines. It included transparent analysis of options, including procurement options, as well as risk and project management issues.” [36:950].

- Regarding MCEC, the Auditor General says: “The business case is comprehensive and evidence-based ... It transparently analyses the issues and challenges of the project, given its scale and economic importance” [37:1145].
- In the RCH, the SPV used a horizontal arrangement of players that disaggregate when the project is delivered [35:877]. In the project, there were four main project directors – one from the consortia side, one from the builder, one from the state and one from the hospital. The directors met regularly, both formally and informally [35:875].
- There was a liaison group formed from Royal Children's to ensure the key stakeholder (Royal Children's) is up to date and give feedback [33:914]. The project had a project board in the government with representatives from DTF, and the cabinet [33:914].
- According to the VAGO report, in RCH, the government was provided with clear and sound advice. The business case was comprehensive and incorporated the key information and analysis required by Partnerships Victoria and other guidelines. The report continues to appraise the project for the transparent analysis of options, including procurement options, as well as risk and project management issues [36:950].

But where there was not a strong business case nor good governance projects such as the MMRP went astray:

- MMRP is a classic case in which the chain of governance was broken [25:786,790]. The project is called an orphan due to lack of a prime sponsor [30:740,25:788].
- It is vague who is responsible for the Myki project [26:574]. In Myki before 2008, the Department of Transport hadn't been invited to TTA (the delivery agency)'s board meetings [40:992]. DOT excuse is to have a separate accountability completely remain with the delivery agency who also prepared the business case [40:991].

A common thread to these discussions of both success and failure in delivery is that decisions on governance and the business case occur at the earliest stages of a project. This suggests that more care and attention needs to be provided at the beginning stage of a project. From these decisions, the consequences followed in the projects that were analysed.

6.6 Conclusion

The public inquiry of PAEC in 2012 aimed to improve the delivery of infrastructure projects by first seeing the errors, missed opportunities and deficiencies, and second to devise a response to the challenges for future projects. Although the inquiry observed the positive achievements of the case studies, the mainstream discussion was on the negative side of infrastructure delivery to prevent loss for the future. As it is expected in a public inquiry, most of the issues in the reviewed projects were believed to be preventable ones. The majority of the problems were also attributed to the internal process of the delivery, e.g. planning and control, rather than unforeseeable external matters. This is a promising observation to see the diversity and depth of content in this inquiry. It suggests a better outcome in infrastructure delivery should the identified challenges be properly addressed.

It can be concluded that the final outcome of a project is reflected in its time and cost performance, compared to the business case estimates, and also the project value for money that encompasses a variety of stakeholder preferences. A successful project is a project that produces equal or more than the expected value within equal or less than the estimated time and cost.

It is reconfirmed that any improvement in project outcome depends on project people and process to realise project success. Investigating the current delivery of infrastructure in Victoria shows that cost, time and value for money are the main concerns among the project stakeholders. Scope creep, unfitted procurement strategy, optimism bias in business case are some of the main contributors to the problems. It is observed that sub-optimal decisions in the early stage of a project made by an uninformed client, hidden or unrealistic assumptions about the project perimeters, governance issues in gateway process and supervision, lack of a prime sponsor or lightly taken accountability of sponsors, changeable project requirements, premature announcement and promises are pieces of the causal factors.

The next chapter explores the role of power asymmetry in project outcomes.

7. Theory of Participants' Power Asymmetry

This chapter develops the idea of participant's power asymmetry as a reasonable explanation for the project failures and misadventures in public infrastructure delivery confirmed by a review of seven infrastructure case study projects. The theory is proposed as an abductive explanation to the behaviour of project actors in the early decision processes such as in the approval stage. The theory explains the way that participants' power asymmetry goes through a decision-making process and influences the project outcome. This emerges from public hearing data, cases studies and audit reports. The theory uncovers a new aspect of the planning fallacy, which remains a problem in public project delivery. Definitions, assumptions and fundamentals of this theory are presented and discussed in the context of infrastructure delivery.

7.1. What is power?

A common definition of power comes from the causal relation between two entities one desires to influence, and one is affected (Isaac, 1987). "Power is the ability of those who possess it to bring about the outcome(s) they desire" (Salancik & Pfeffer, 1974). Such power could extend over a broad span of means and leverage embedded in an actor's potential activities, called the power field (Kurt Lewin, 1935). According to Raven (1993), Lewin (1952) defines power as the ability to induce forces of a certain magnitude on another and is a fundamental phenomenon to clarify actors' behaviour during interactions. Power is defined as the capacity to influence the conduct of others. It is usually sourced in an exclusive access to resources less available to other, e.g. access to information, knowledge, skills and expertise.

The classic theory of power identifies expert power, reward power, referent power, legitimate power, and coercive power as the basis of power (French & Raven, 1959). The model was then completed by informational power as the sixth basis of power (Raven, 2008). Power aims to explain the intention of the powerful in changing the behaviour of others. It originates from information, knowledge, skills, expertise, ability to reward/punishment, rightful position, reputation and force. Means of exertion of power are diverse and changes according to the base of power.

7.2. Power in project delivery

In a project, stakeholders have a different level of influence to impact the project (Cleland & Ireland, 2007). Stakeholder salience theory considers power an indicator of stakeholder influence (Mitchell et al., 1997). Kernaghan (1993) defines a stakeholder relation to a project "a relationship involving sharing of power, work, support and information with others for the achievement of joint

goals and mutual benefits”. The participants’ ability to influence a projects decision-making process lays in their proficiency as well as authority.

The term ‘powerful’ in projects also implies competency, skilfulness, expertise, experience, qualification and adequacy. A knowledgeable consultant has an impact on a client, and a skilled contractor has the power to demand a higher price. In projects, power is not only perceived as the ability to change other’s decision but the competency that convinces others to comply. That is to say; power is a combination of authority and competency in project systems.

The classic theory of power recognises knowledge, skills, reputation, reward, legitimacy and coercion as origins of power. In this research, the six power attributes were mapped into authority and competency. This is because these two attributes are the most relevant in the early stages of project development. The central agencies have the authority to start, change or stop a project. Authority provides legitimacy, reward and fuels coercion power. On the other hand, competency relates to knowledge and skill power. It is rather puzzling how to associate reputation, as a source of power, with authority or competency. Reputation is not an actual characteristic but a perceived effect on others in a long-term collaboration. Reputation or referent power as a means of influencing decisions should be investigated in the context project delivery to explore cause and effects of any possible risk it may impose on the project actors’ behaviour. The interaction between the central agencies, with legitimate power, and the departments that work with contracts to deliver projects is underpinned by the power structures. The delivery department usually has more information and detail than the central agencies and in this sense can use that information and project management competence to affect the trajectory of an infrastructure project.

7.2.1. Power in central and delivery agencies

Central agencies in government organizations typically only have executive powers to implement and enforce government decisions. Central agencies may or may not have the expertise to decide and the control of resources at the grassroots level or the delivery level. It is the essence of the delegation process that a Principal asks agencies to do a task that requires ad-hoc skills and knowledge. The central agency finds it inefficient and burdensome to keep all the necessary resources in-house but instead, to break down the work and allocate it to delivery agencies. Nonetheless, in a delegation, an implicit form of influence exists within approval process. Informal power is thought to be held by delivery agencies due to the knowledge, expertise and referent power over the central agencies that will influence the approval of the proposed business case. There is, therefore, an element of exposure to the risks arising from the informal power that resides in these delivery agencies.

A closer look at the arrangement reveals that the power balance may influence information flow, decision making and dynamics between policymakers and project delivery team. While the central agencies use the business case as a means of evaluating the value of an investment proposal over other candidates, the robustness of the business case becomes important as it may influence the selection process. That is to say; delivery agencies may affect the content of business case, which is the primary form of information flow used for decision-making. It is a critical risk if the business case may be made to look good in order to push the project through the initial approval stages.

Power comes from the delivery agencies close interaction and engagement with two groups of agents: (a) Users, i.e. these are the people who finally use the infrastructure; (b) Market, i.e. these are the individuals or groups who design, who construct and who supply parts and components to bring the project to fruition. The superior knowledge of a delivery agency of user's requirements and market condition provide higher information power to delivery agencies in its communication with central institutions. Being close to the users and market brings a particular type of advantage in that the delivery can choose to withhold information from the agency or embellish the information or even to distort the information to their organization advantage or to enhance their positions. Although they are expected to act on behalf of the central agency, organisational need for survival and their ignorance of the government priorities of resource allocation may make them a bias toward their proposed business case. The approval process inevitably faces a risk of optimism in a proposed business case where the central agencies rely on a delegation process of delivery agencies prepare and propose a business case in line with government strategies. In effect, acting on behalf of a higher authority brings about the risk of optimism bias and overpromising in proposed business case that might lead to opportunity loss or less value for money.

7.2.2. What is power asymmetry?

There is a link between the utility of decisions and the cognition reflected in the level of knowledge and required resources to make an informed choice. There is no guarantee that the degree of authority and cognition in participants (for example central agencies) are in the balance when the opposite is suggested by literature which relates irrationality to power (Flyvbjerg, 1998). Power has been blamed for being the cause of optimism bias (Inesi, 2010; Tost, Gino, & Larrick, 2012), over-confidence (Fast, Sivanathan, Mayer, & Galinsky, 2012), constraint ignorance (Lammers, Gordijn, & Otten, 2008), and lack of advice taking (See et al., 2011). Actors' power in a project should be investigated as it originates the behaviour and hence the quality of decisions.

Participants' power is a part of any project, and its role should not be overlooked in project success. While power is the ability to influence other's decision, it is also the capacity to fulfil the allocated task. Power asymmetry or imbalance exists when one party has more power than its working partners. In projects, a lack of in-house knowledge in the public sector was a serious problem that contributed to time and cost overrun (Patel & Robinson, 2010). Competence is a collection of knowledge, attitude, skills, and experience needed to successfully perform a function (International Project Management Association, 2006). Participants have a different level of competency in a project. An inappropriate level of competency hinders effective communication, cooperation and flexibility to change; new ideas are ignored, and collaboration is diminished. A possible extreme scenario is where project clients have supreme authority but inadequate resources to make an informed decision. The gap between participants' authority and competency prevent an optimum utilization of resources or maximised decision. The outcome would be a 'limited' decision (Sanderson, 2012) that occurs where either all options are not identified, or the best possible option is not preferred amongst them.

7.3. Identifying power asymmetry in infrastructure project delivery

The main source of data to test the idea of power asymmetry as a factor in why projects might go wrong was the Victorian parliamentary inquiry and its transcripts that were detailed in chapter 3 of this thesis. Over 1170 statements from key senior actors in the Victorian infrastructure delivery system were generated, coded, and analysed to find the challenges in the delivery of infrastructure projects. The analysis allowed the root causes of the shortcomings to be identified. A key recurrent theme was overpromising in project delivery. It was hypothesised that a root cause of overpromising in Victorian infrastructure delivery was the power asymmetry held by the delivery agencies relative to the central agencies.

Optimism bias in planning the value and overpromising behaviour of sponsors were the key factors in deterring a project from success. The findings also endorsed the risk of over-ambitious decisions particularly those made in a business case. The quality of the business case is significantly affected by the client's fallacy of initial estimations especially if exaggerated benefits or optimistic costs are prime considerations. Many other factors were also found to be a possible cause of the over-promising behaviour. The insufficient understanding of requirements, errant assumptions, inadequate technical knowledge, strategic misrepresentation and insufficient supervision were identified as leading factors that might cause a project team to bite off more than it could chew. The workshop outcomes confirmed the initial hypothesis

that the distribution of power among participants explains the risk of bias in preparing a robust business case.

Suboptimal decisions are partially attributed to the participants' conflicting interests when combined with asymmetrical power. There is a risk of the over-promising business case when resources are constrained and governed by central agencies, but the field knowledge of user requirement and market data rest with the delivery agencies. If the central agency is less informed of the decentralized project requirements, the risk becomes more severe.

7.3.1. Informal authority as a pseudo power

In this research, the notion of informal authority is conceptualized to explain the agency's referent power to manipulate and influence principal's decision. Informal authority contrasts formal authority, a known legitimacy power of an entity that possesses it lawfully as a form of authority to make a decision. In public delivery systems, the central agencies have the formal authority because of their given position in the approval process, such as gateway review. Central agencies allocate resources and control the progress. Conversely, informal authority is a tacit power possessed by an entity, usually a subordinate or a reporting organization. In other words, informal authority influences a formally authorised entity's decision. In projects, the informal authority may originate from information, expertise or reputation power of an agency to manipulate other organizations' behaviour. Every time a business case is found trustworthy the reputation of the delivery agency increases. The more the reputation of the delivery agency, the more the informal authority due to the increase of reputational power. As a conclusion, the concept of informal authority is relevant to the organizational challenge of Victorian public delivery, and so it is embedded in the theoretical framework of our proposed theory.

7.3.2. Power and optimism bias

The intrinsic worth of power asymmetry theory is cross-checked against the seven recent case projects in Victoria, refer Chapter 6. These selected case studies covered the full range of performance outcomes.

The successful projects in the eyes of experts were the Convention Centre, Royal Children's Hospital, and Regional Rail Link. Less successful were Myki, Health SMART and Market Relocation, which were deemed disappointing. Some of these projects were the subject of detailed audits by VAGO. They were unsure about the Victorian Desalination plant because it was not in operation at the time.

It was found that informal authority exists among the central and delivery agencies. This was partly due to the governance structure frequently adopted in

Australia where delivery agencies are delegated to communicate the field data. The role of central agencies is to direct and audit. The information gap and distribution of skills among central and delivery agencies creates an informal authority for the delivery agencies that might create a risk to the project. It appears that if a delivery agency has an accurate understanding of the requirements, the risk may be minimised, e.g. Children Hospital. The contract structure of Children Hospital project is PPP (Public Private Partnerships) that allocated the risk of cost overrun and time delay to the private sector. The procurement strategy for this project played an active role to provide robust project estimation. A solid understanding of the project and user requirements provides reliable information to the central agency to make a decision that preserves value for money. An adequate understanding of the requirements, make a client an informed buyer that profoundly contributes to project success.

When considering the balance of power between the central agencies and the delivery agencies, some of the case projects considered situations where the delivery agencies were in possession of more information than the central agencies and therefore had more power – it was evident that power asymmetry was in play and the results were generally suboptimal. Informal authority if not managed through another mechanism of informing the decision maker, e.g. proper procurement strategy, will cause a risk of failure.

7.3.3. A sense of power can contribute to optimism bias

In the research study on Victorian large infrastructure projects, it became apparent that the central agencies held the formal authority and approved the funding for the proposed project, i.e. the Cabinet and the Treasury. Central agencies make the final decision and tend to have an over-reliance on the delivery agencies for developing a business case. The delivery agencies, on the other hand, are expected to have field knowledge while being in a relationship with end users and market entities. They initiate or develop a business case for the central agencies that compete for the limited funding and approvals. The race for limited resources provokes the delivery agencies to use their informal authority to sway the final decision (they may not be aware that they are doing this because it is a part of the game that is played out between the central agencies and the delivery agencies on a regular basis).

The issue of informal authority introduces risk into the system, as central agencies do not have the first-hand information and expertise. The delivery agencies have the power to make the business case optimistic and more appealing to the central agencies either intentionally in a strategic misrepresentation of swaying the approval process or unintentionally because

of a psychological process of discounting worst-case scenarios or absence of realistic assumptions.

7.3.4. Uncertainties and risks arising

Uncertainty is inherited in infrastructure projects. Exact numbers and certain estimations are scarce. A business case is the first project plan that incorporates the fundamental structure of the project by introducing the need, the options to fulfil the need, the requirements, the resources and the expected value of the project outcome. The approval process in infrastructure delivery may not be able to identify the true value of money for the received business cases. The informal authority as a pseudo power of the delivery agency may become a hazard. A risk stems from one party holding more power and influence than others. The result is (a) An overpromising behaviour and (b) Failure to satisfy the expectation due to under-delivering. Figure 65 illustrates the rise of informal authority within the interaction of project agencies.

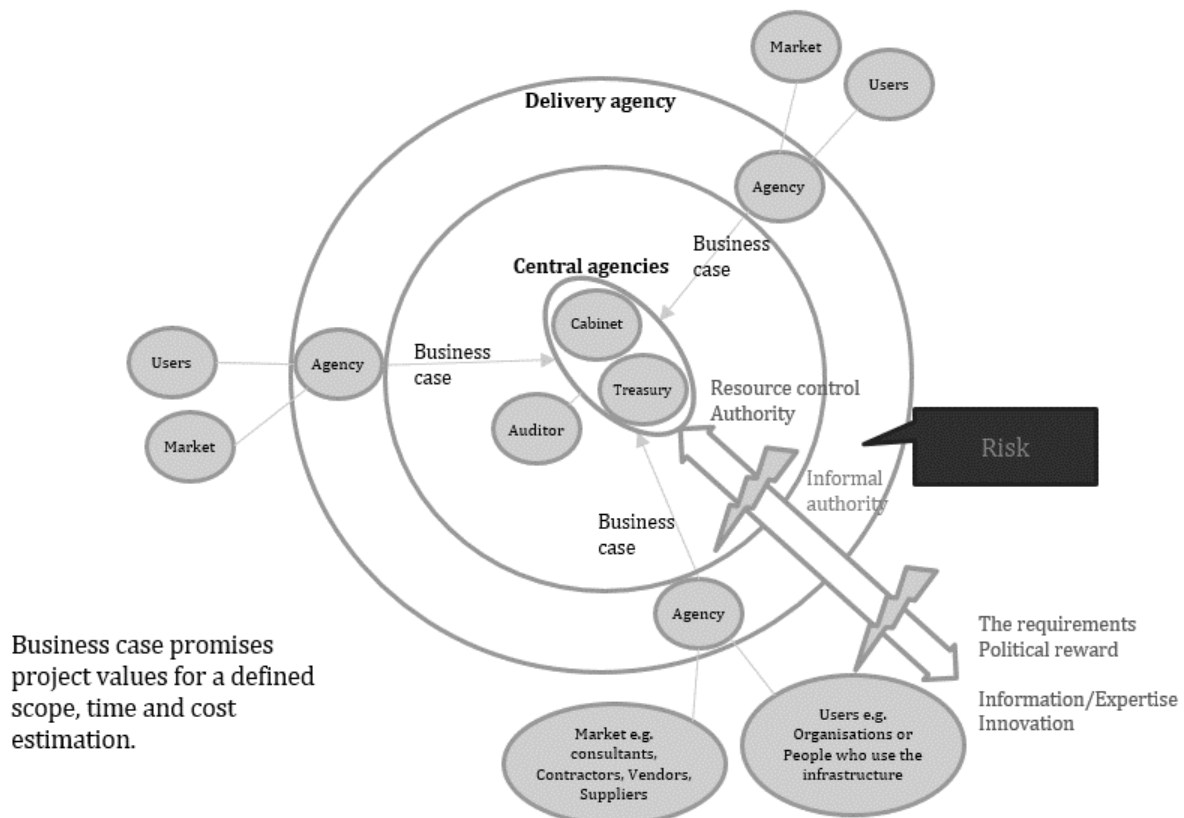


Figure 65. Power fields and interaction of agencies in infrastructure delivery

Due to the lack of knowledge and expertise, central agencies may not have a sound check and balance system in place. They are not physically present while the business case is being developed. They are continually relying on the delivery agency for information and advice. A delivery agency wants to get initial project approval from a central agency. Hence, they may overpromise in

the business case to gain approval. This begins to introduce uncertainty and risk.

7.4. Formulating the Participants' Power Asymmetry theory (PPA)

The theory of power asymmetry links the concept of power asymmetry to decision process within the interaction of principals and agents. The principal-agent relationship is a prevalent kind of cooperation in multi-level organisations through a delegation of tasks. The interaction of central and delivery agencies in public delivery system is a prime example of such situation.

The theory assumes (1) the central agency(s) delegates the task of preparing a solution (business case) to the delivery agency(s) (2) the solutions are expected to produce value for money for the central agency(s), (3) the agencies have a history and see a prospect of cooperation in future.

In the presence of the assumptions, the theory expects the followings to happen. The following items also explain the principles of the theory in affecting the behaviour of the agencies.

7.4.1. Pseudo power in agencies interactions

The principal-agent relationship is a delegation in which the principal assigns a task to the agent because of the inefficiency of in-house provision. While the principal retains explicit power (authority), the agent possesses the implicit power (competency). The balance of power is a key to start a delegation. For instance, the more skilled an agent, the higher reward the principal might offer. Establishment of a principal-agent relationship requires a balance of explicit and implicit power. The principal expects that the explicit power governs the agent implicit power. That is to say, the explicit power of the principal should motivate the agent to offer the best business case with the highest value.

A new source of power emerges in a lasting delegation. A history and prospect of cooperation in a lasting delegation establish reputation and trust as a new advantage. Despite principal's explicit power, the agent forms an informal authority through becoming a trusted counterparty. This informal authority is a pseudo power. Pseudo power origins in agent's competency but can go beyond that. The Principal's lack of the same competency is another contributor. The higher the principal perceives the agent's competency, the greater the pseudo power. Trust and reputation inflate the pseudo power that the agent holds in such a relationship.

7.4.2. Informal authority vs formal authority

Informal authority emerges because of the Agent's superior know-how power known as competency in collecting and analysing data. Agent's authority fuels a pseudo power that might manipulate the decision process. If two entities concern a decision, the magnitude of power is determined as to the extent of the impact they can cause the decision. The competition of the principal and agent within the approval process is an example. Deterrence of the principal from the decision is an indication of a greater informal authority. Although the principal has the formal authority, the higher informal authority may sway the decision to be in line with the agent's interests.

7.4.3. Power asymmetry lifecycle

A long-lasting relationship is an opportunity for the principal to appraise the competency of the agent by monitoring the outcome of the solution that the agent had offered. The principal perception of the Agent's competency is updated nonstop. If the principal observes a satisfactory outcome from the approved solution that was originally proposed by the agent, trust builds up. Another pseudo power of the agent emerges in the form of principal's trust in the agent's knowledge and skills. The pseudo power of the agent rises as it becomes a more reputable and trusted partner. Every time the principal receive value from an agent's work, the reputation increases (referent power). Asymmetry of power exists in any delegation but the emergence of pseudo-power as a reputation of the agent fuels a further asymmetry between the principal and agent. Power asymmetry repeats itself through the increase of agent's reputation.

7.5. Managerial implications and significance

The exertion of power is the process of influence other's behaviour in order to satisfy the latent motives of the powerful. Consequently, if players' motives contradict, their powers play to win the course of actions. Power plays as if the motives. If agencies' interests conflict, power asymmetry can cause a significant influence on the decision process.

In the presence of a discrepancy of motives between the agent and the principal, the decision might deviate toward the agent's inducement. Pseudo power of the agent increase or decrease if the agent keeps working for the principal. While the principal's formal authority is public and transparent, the pseudo power is hard to see and measure. The level of the formal power is rather same in comparison to the pseudo-power that changes as soon as the perception of agent's competency is changed. Power asymmetry is invisible but may influence early decisions significantly.

Projects with a known boundaries and accurate estimation models, such as buildings, are less risky than those with complex interfaces with latent conditions such as information technology, earthworks, or unpredicted market demand. Furthermore, a delivery agency with an on-going stream of projects accumulates experiences and gets a true understanding of the user requirements. That might explain why a department that routinely delivers hospitals has a higher chance of being successful, even if it has a medium level of informal authority. Nonetheless, informal authority remains a threat for early-stage decisions particularly if the delivery agency is not an informed buyer. Even a reliable and positive record of a delivery agency in fulfilling expected value for money is not enough to assure the central agencies. A change in the approval process is required to deal with this uncertainty. Power asymmetry could only be controlled from the outside of the delegation framework.

To mitigate this risk, different strategies to manage participants' risk of power asymmetry are proposed. Six strategies are proposed by looking at the effects of power asymmetry in influencing the decision process of infrastructure investments to control the risk of planning deficiency by balancing the participant power. These strategies are listed in Table 24 and detailed in subsections below.

Table 24. Strategies to manage power asymmetry

Agency	Strategies to manage power asymmetry	Enablers
Central agency	a) Increase know-how power	1. Outsource external expertise 2. Centre of Excellence or Centre of Expertise (COE)
	b) Reduce reward power	3. Stable delivery pipeline
Delivery agency	a) Increase know-how power	4. Advance financial engagement
	b) Control informal authority	5. Active auditing 6. Stop safe scope definition

7.5.1. Outsourcing external capability

Lack of adequate expertise in the public sector is a danger in infrastructure delivery. Not only are there examples of the public sector being incompetent in addressing the proper requirements of a project, but there is also a growing concern for managing and preserving the existing corporate memory.

The rationale of delegation dictates that central agencies rely on the delegated agencies to prepare a quality business case. It is inefficient for Central agencies

to keep all the required skills sets in-house to assess the business proposals received from delivery agencies.

Outsourcing expertise to an independent consultant is a strategy to make up the inadequacy of know-how power of central agencies in the approval process. Outsourcing is an efficient means of appraising the quality of the received business case for the reliability of risk and assumptions in a business case. Since an independent consultant is not biased toward any option in the business case, a dependable judgement is expected to measure the robustness of the business case.

Although outsourcing is listed as one of the strategies of central agencies in increasing the know-how, outsourcings provide an outsider view to delivery agencies to prepare an unbiased business case. Optimism bias is one of the reasons that business cases are deficient and unreliable. An outsider view is considered as one of the few approached to identify optimism. A consultant who is independent of the project may offer a genuine view to the reliability of the assumption (some assumptions are hidden), the confidence level of estimations and risk considerations.

Despite all the benefits that agencies may receive from an impartial consultation, it may not always substitute government ability to develop a comprehensive plan that aims a portfolio of investment in line with long-term public strategy. The public sector should always keep the strategic competencies in-house, or any outsourcing should be carefully supervised to assure consideration of the government policies and communities contextual elements. These policies synergise the investments and escalate value for money in long-term.

Over-reliance on external expertise may also diminish accountability of agencies. Accountability of a decision is harmed if outsourcing becomes an excuse for the government to discount the value of in-house skill sets.

7.5.2. Centre of Expertise (COE)

Because of a lack of in-house expertise, the delivery agencies find outsourcing an efficient approach to access occasional skills. Consequently, lack of in-house expertise is more likely in the major one-off projects that require unique know-how normally non-existent in agencies' skill set. Although it might not be efficient for every deliverer to keep a separate skill set, having a state-wide centre of expertise would be an answer that has been applied in other jurisdictions, e.g. Ontario, Canada.

The aim of this centre of expertise, or so-called centre of excellence, is to create knowledge, assist in implementing large projects, maintain public competency and accumulate the experience. Such a centre will benefit delivery agencies as

well as central agencies by providing a reliable benchmark in assessing the optimism in a business case. A virtual centre such a database of the public and corporate memory of experts and skills in infrastructure delivery may reduce the running cost of the centre.

7.5.3. Stable delivery pipeline

Public infrastructures are typically large, and their delivery cycle is likely to be lengthier than a political cycle. That is to say; a government might not last long enough to witness the end product of an incepted infrastructure project. The longer life cycle of infrastructure delivery than the political election cycle may create a risk of a government becoming biased toward early benefits of a project for political reasons. One way of balancing political demands on central agencies is to create a project pipeline to emphasize the long-term value of a project for the community.

A steady delivery pipeline has the advantage of retaining public skills in-house or helps outsource it more efficiently. A delivery pipeline provides an opportunity for stakeholders to engage and share their requirements. A qualified public agency with sufficient understanding of user requirement has a higher chance of success. This is also true in the private sector where a reliable schedule of infrastructure projects is beneficial to manage human resources.

Even though it is accepted that a delivery pipeline should be kept away from short-term political influence, the legitimacy of a long-term isolated pipeline is under a question. An elected government sets forward to fulfil the people's direct interests. It is easily conceivable that a plan of a newly elected government might be different to those of a long-term infrastructure pipeline. It remains to be investigated how to find optimum mechanisms of a government to influence the infrastructure pipeline.

7.5.4. Early engagement of stakeholder

For some stakeholders, such as end users of an infrastructure project, the first engagement might occur the first day of the project operation. That is to say; these secondary stakeholders feel no legitimate link, no urgency and no power to influence the project in the early days. Nonetheless, the impact they receive from the project is substantial. That might explain why social infrastructure is prone to create a controversy just close to the initial day of operation.

Early engagement of dormant stakeholders may stimulate streams of communication that assist transferring the stakeholder requirements when the cost of change is reasonably low. Users may have less incentive to engage since they underestimate the value of early decisions. Infrastructure users should be given an opportunity to express their expectations and advise their requirements.

While fees traditionally start after the operation, infrastructure users might be summoned to discuss the payment regime long before the asset is delivered. A form of financial commitment ahead of product delivery would intrigue stakeholders and attract their attention. This financial structure could be optimized to raise the voice of silent stakeholders. Project scope and requirements might change in early stages, or the investment might fail the test of feasibility. The early financial engagement of the stakeholders should carefully avoid any sense of guarantee by the project team and be flexible in listening to stakeholders. Nevertheless, the project team also needs to be aware of managing scope creep.

7.5.5. Active auditing

Audit as a project autopsy benefits less than actively engaging in the decision process and incorporate public priorities. Traditionally, audit processes are conducted post-mortem a project for any evidence of loss of opportunity, misconduct, deception or corruption to prevent the future incidence and improve the processes. Passive audit generates lesson learned for policymakers to consider and project managers to apply. Notwithstanding the value of passive audit, an active audit also has the benefit of improving the project before it gets too late.

Active auditing requires timely access to project information and decision-making processes. A transparent flow of information is necessary for the auditor to understand the project performance before it becomes a project history. Having a say in project steering committees during the early stage of a project not only provides an opportunity for active auditing but provide a mutual understanding if passive auditing to be done ex-post.

An auditor may not be an expert in project specifications and requirements but can watch the project steps for a diligent application of necessary skills in the process.

7.5.6. Stop safe scope definition

Projects start in high hopes, but some get into trouble due to many reasons. Despite the visible signs of trouble, the fear of sunk cost may drive a project forward even without enough confidence in the project outcome. Project sponsors may be afraid of substantial damage if the project is stopped; rather they prefer to end the project with something even if it is not perfect. Stopping a wrong project may seem like a proof of an earlier mistake. The sponsors may find the reputation expenses of admitting to the mistake higher than a deficient project outcome. In infrastructure project, a deficient outcome may last for decades, and the loss may exceed the sunk cost if it had been cancelled at the outset. Moreover, a method of misleading project sponsors is applied by

agencies in superfluously binding subsystems together to do a huge project, which no sponsor dares to stop.

Infrastructure projects are usually delivered through a waterfall acquisition strategy, and a grand design approach is prevailing. In this approach, the scope of the work is defined as accurately as possible, and a comprehensive design is prepared before implementation. Hence, the design may only look forward to delivering the final product as a holistic system with many sub-systems. The design might be optimised to deliver the whole product as one single deliverable. In grand design approach, if the project is cancelled in the middle of the way, it would become a total loss.

The stop-safe scope is defined by addressing the division of deliverables in which sub-systems' value is independently acknowledged. A trade-off is made between deviating from the efficiency of a holistic design and a multi-stage design with multi-stage deliverables. Stop-safe scope definition reduces the distress of sunk cost. If a project is stopped due to any reason half through, it will deliver something valuable even though it is not final. A scenario making is necessary to devise the best combination of scope division that provides the highest expected value of the project facing the uncertainty.

7.6. Conclusion

Governing a construction project includes many constituencies working together. Public projects are defined and proposed in the context of political interaction of government agencies and the private sector. Breaking down the government agencies into delivery agencies and central agencies may unravel the complexity of decision processes. The behaviour of agencies in decision and approval process determines the quality of planning and ultimately the project outcome.

During the planning stage, a business case defines the project scope and conceptual design that affects the project perception of success in the long term. While the quality of the business case is the cornerstone of project success, an optimistic plan often ends up with a perceived failure. The risk of influence over the approval process may hinder the government achieving the expected value for money.

Agency theory assumes an information and incentive gap between principal and delegates. The theory tries to explain shortcomings in the quality of early decisions when the agencies may not follow the interests of the principal as it would follow their own. In public infrastructure, early decisions are made by a business case that a delivery agency proposes to central agencies for review and approval. In the presence of misaligned objectives of agencies and unbalanced distribution of information, the delivery agency may manipulate the process in favour its organizational preferences in preparing the business

case such as scenario making and analysis, estimation of time and cost, identifying and analysis of project options, and selection of procurement strategy.

Power plays a role in any multiplayer settings. Power comes from an efficient access or exclusive control over relevant resources and is always a perceived concept rather than an absolute term. A Principal's power is the ability to align an agent's action with the Principal's values. The Agent's power is the ability to influence the principal decision. The classic theory of power identifies knowledge, skills, reputation, legitimacy, and force as sources of power. Authority and competence are the two axes of power in projects. Bringing the classic theory of power to the context of projects shows delivery agencies may possess implicit sources of power due to their competency (or know-how power) and reputation (or referent power). Pseudo power emerges as an informal authority of the delivery agency that might exceed the formal authority of the central agencies. Such asymmetry of power recreates itself as the delivery agency develops more reputation in a long-term collaboration. The concept of informal authority explains the risk of overpromising as a behaviour that delivery agency exhibit during the approval process.

In a visual framework, that graphically illustrates the power field of project agencies, the dissimilar perspectives of central and delivery agencies are studied, and the risks of making suboptimal decision investigated. It was observed that decision makers' power balance is a significant contributor to the quality of early decisions. Six interventions are suggested to manage the power asymmetry in infrastructure project delivery. These recommendations address the balance of power between central and delivery agencies.

Having postulated this theory of Participants' Power Asymmetry, it is critical to test the conclusions drawn. This has been done through the conduct of an interactive workshop with senior project staff involved in either project discussed during the Parliamentary Inquiry or involved in the case study projects. The structuring of this workshop and the reflections of the participants on the findings of this research are detailed in Chapter 8.

8. Discussion and Validation

Chapters 5, 6 and 7 have explored and developed a new explanation as to why there are ongoing difficulties in delivering public infrastructure. This chapter seeks to test the validity of these findings and to discuss the relative merits of the suggested findings from the review of the parliamentary inquiry (Chapter 5), the case studies (Chapter 6) and the developed theory outlined in Chapter 7.

The testing of the findings has been undertaken through an interactive workshop of experts conducted at The University of Melbourne in accordance with ethics approval procedure. The approval letter was received in March 2015. The Application ID for the research is 1339987.1.

A dedicated workshop attended by project management experts reviewed seven infrastructure projects in the state of Victoria, Australia. This chapter details the process and outcomes from this workshop of experts and discusses the merits of the new theory developed and its relevance to public infrastructure delivery.

8.1 Workshop of experts

Previously it has been established that projects may get into trouble if the plan is undependable and not enough diligence has occurred in the early stage of project inception involving the business case. It has been hypothesised that power asymmetry in public agencies may explain the planning deficiencies. In order to test the research hypothesis, an expert workshop is organised. The workshop was organised aiming to fine-tune and validate the previous findings.

8.1.1. Workshop structure

A team of project management experts with deep practical project experience were brought together in a daylong workshop at the University of Melbourne in March 2015.

Forty-four experts, who have previously invited by the Parliament in the public inquiry, were contacted via telephone, 26 were formally invited, 19 expressed their interests, and finally, 17 attended the workshop. Table 25 describes the 17 workshop participants; their position, industry sector and the projects with which they had knowledge.

Table 25. Affiliation of workshop the delegates and the case study projects they represent

	Position	Sector	Representative project
1	A/Director	Public (Delivery)	MCEC
2	Director	Public (Delivery)	Myki
3	Manager	Private (Contractor)	MMR
4	Consultant	Private (Consultant)	Various
5	A/Professor	Policy and process	Various
6	CEO	Public (Delivery)	RRL
7	Founder	Private (Consultant)	Various
8	Partner	Private (Consultant)	RCH
9	Adviser	Public (Central)	Various
10	Manager	Private (Contractor)	Various
11	Director	Public (Delivery)	Various
12	Sector Director	Public (Central)	HealthSMART
13	Director	Private (Contractor)	VDP
14	President	Policy and process	Various
15	A/Professor	Policy and process	Various
16	Lecturer	Policy and process	Various
17	Senior Lecturer	Policy and process	Various

Figure 66 summarises a) the affiliated sector of the seminar delegates and b) depicts their depth of knowledge of the case study.

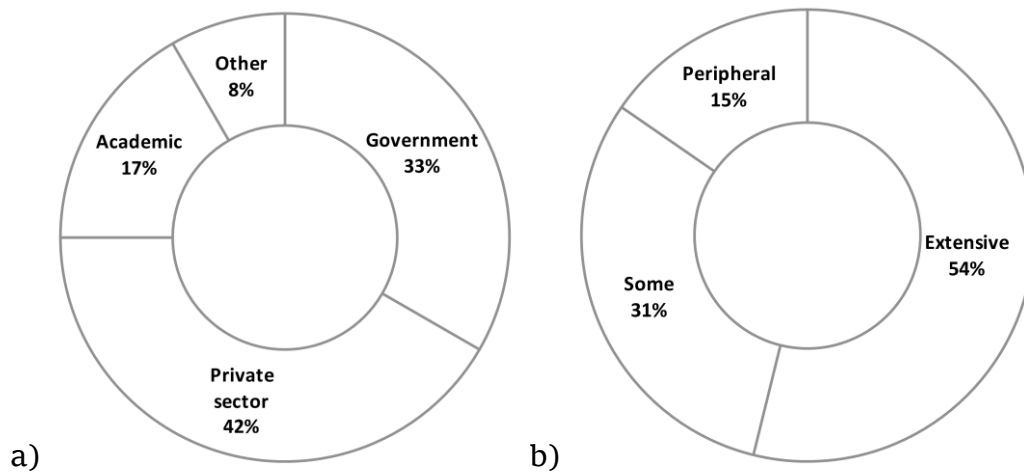


Figure 66. Demography of the workshop delegates; a. sector; b. knowledge of the studied project cases

The participants for the workshop were drawn from the senior managers and executives from the public and the private sector in Victoria. The invitees are selected to represent the seven case studies too.

8.1.2. Method and process

During the workshop, the identified challenges, causes, and recommendations were presented and discussed. The experts' feedback was collected at every

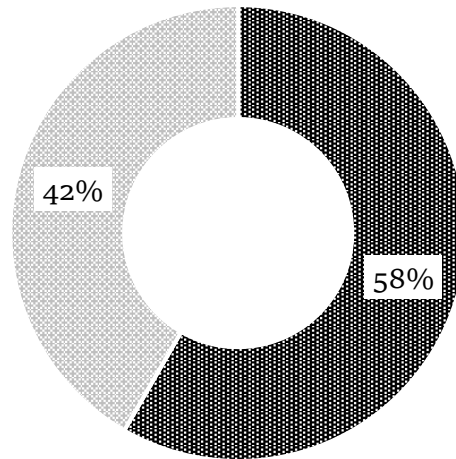
step. At the same time, the case projects were presented, and learning lessons are solicited.

The workshop was conducted by a professional moderator. Specialized software was used to capture the Expert's statements (recording was avoided to encourage candid views of participants). Just over half the participants had significant involvement with the seven projects while another third had some knowledge.

The workshop reviewed the seven Victorian case projects. The project approval process was considered in a broader framework of central and delivery agencies. In an extension to the literature of organizational theories, e.g. agency theory, the research splits up central and delivery agencies. It provides a better understanding of the current state of public procurement and highlights the existing organizational challenges such as asymmetry of power and conflict of objectives. The findings verified that underestimating the overpromising behaviour of project delivery agencies during the planning stage of infrastructure was a critical risk that would impact the perception of success. It was postulated that the risk of optimism bias could be attributed to the power balance of the participants. Power imbalance or asymmetry can be linked to the present shortcomings in public infrastructure by uncovering the people's behaviour within project processes. These were the questions and issues put to the experts in the workshop.

8.1.3. Outcomes from the workshop

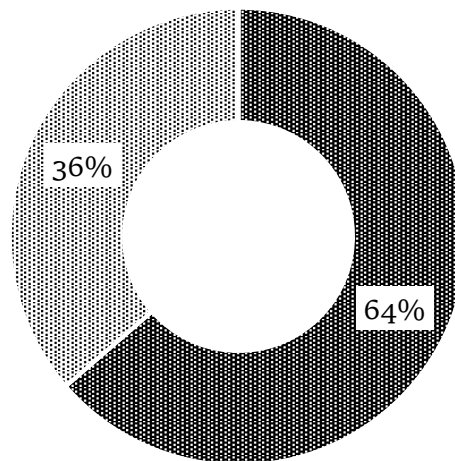
A dedicated workshop attended by project management experts reviewed seven infrastructure projects in the state of Victoria, Australia. The workshop teased out the experts' view of success in infrastructure projects. Failure was measured through questioning the workshop experts about the gap between expectations and outcome. Because of their in-depth and inside knowledge of the projects, they were able to discuss what was expected of each project and what was actually delivered. They had insider knowledge because of their executive positions in the projects. Their discussion revealed a mix of perceived success and failure among the case studies. Whereas the common understanding from the literature implies that success is an outcome of project performance according to the plan, the majority of participants in the workshop, 58%, believe that success is mainly measured in the shadow of the initial expectations; see Figure 67.



■ Meeting/exceeding expectations ■ Others

Figure 67. How project success is best defined

Sometimes the outcome of a project disappoints. The disappointment of a project can be rooted in either wrong expectations that are shaped at the beginning of the project or the poor project outcomes. Remarkably, 64% of experts in the workshop believed inflated expectations the leading cause of disappointment in projects; see Figure 68.



■ Inflated expectations ■ Poor outcomes

Figure 68. The cause of a disappointing outcome

Deficient planning as in optimistic benefits and overpromising behaviour of sponsors are vital factors in deterring a project from success. The findings also endorsed the risk of over-ambitious decisions particularly those made in a business case. The quality of the business case is significantly affected by the client's fallacy of initial estimations especially if exaggerated benefits or

optimistic costs are prime considerations. Many other factors were also found to be a possible cause of the over-promising behaviour. The insufficient understanding of requirements, errant assumptions inadequate technical knowledge, strategic misrepresentation and insufficient supervision was identified as leading factors that might cause a project team to bite off more than it could chew. Figure 69 shows the reasons experts thought were behind overpromising on a project.

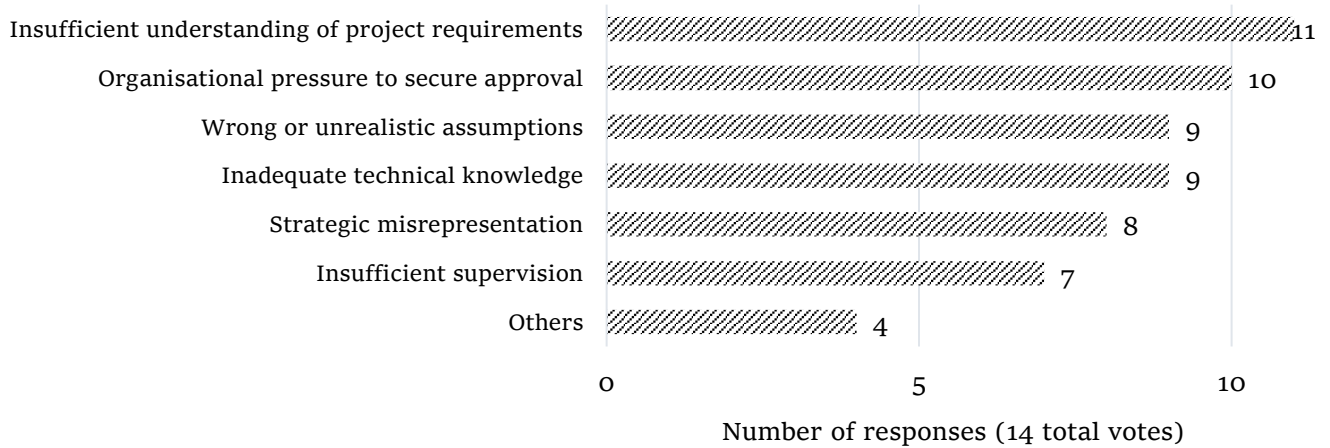


Figure 69. Experts' view on the reason why do projects sometimes promise more than can be achieved (Optimism)

Suboptimal decisions are partially attributed to the participants' conflicting interests when combined with asymmetrical power. There is a risk of the over-promising business case when resources are constrained and governed by central agencies, but the field knowledge of user requirement and market data rest with the delivery agencies. If the central agency is less informed of the decentralized project requirements, the risk becomes more severe.

The correlation of the perception of failure and informal authority in the case projects were assessed. An association between the informal authority of the delivery agencies and the project perceived failure exists. This informal authority manifests itself in power asymmetry between the agencies. Figure 70 graphs the extent of failure as well as the power asymmetry in the studied case projects. Extreme asymmetry of power may lead to a failure.

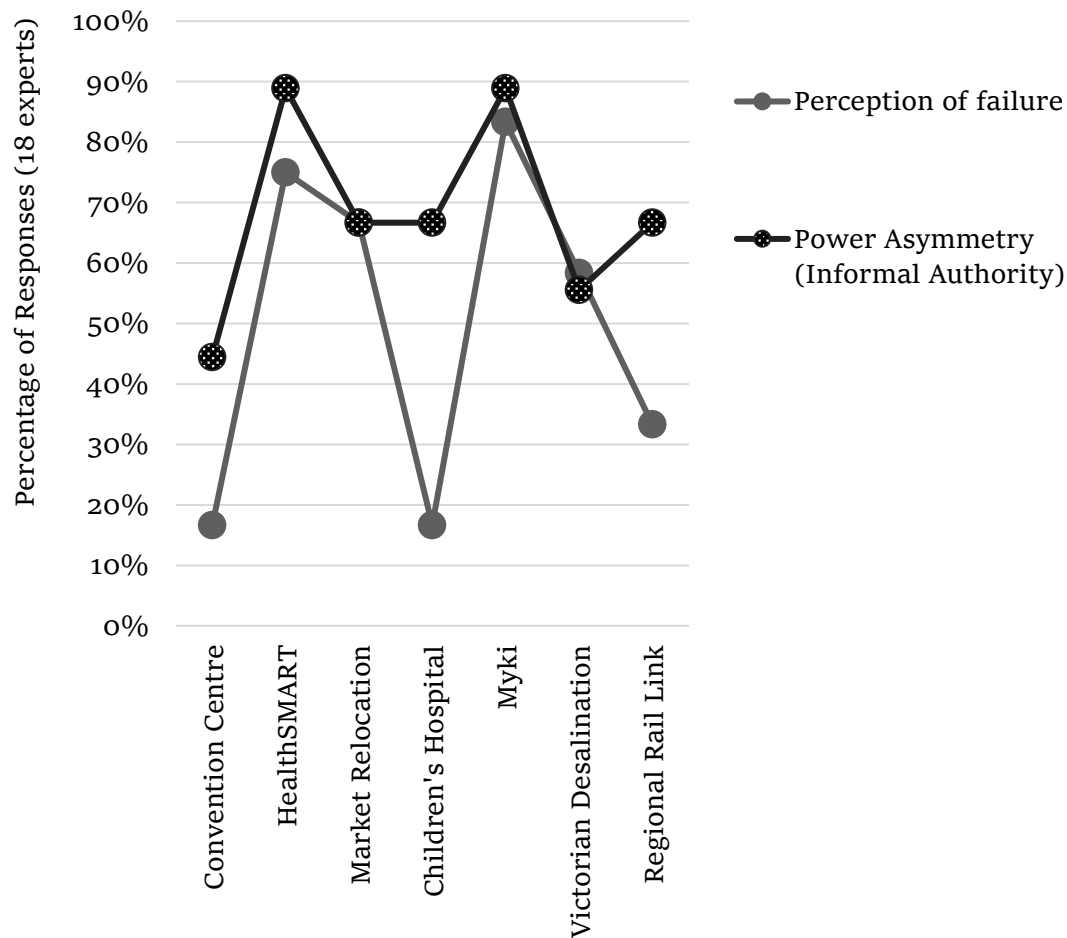


Figure 70. Correlation of perception of failure and power asymmetry

In the view of the workshop experts, the risk of power asymmetry (informal authority) and failure are connected. The higher the perception of power asymmetry, the higher chance of a failure.

HealthSMART and Myki are diagnosed with high power asymmetry and failure too. The Convention Centre (MCEC), Children's Hospital (RCH) and Regional Rail Link (RRL) were perceived as successful (Only about 10% of the experts associated the Convention Centre and The Children's Hospital as failures. About one-third thought the Regional Rail Link was a failure).

The findings show that power asymmetry, fuelled by informal authority, is not unavoidable nor does it always lead to a failure. However, it might be suggested that there is a threshold that beyond which the risk of manipulation is high and that disaster is probable, e.g. Myki and HealthSMART. If significant power asymmetry exists between the central and delivery agencies, the chance of failure is high. Within the threshold level, the central agencies' understanding of the requirements is a key to defusing the threat of informal authority.

The workshop confirms the significance of the hypothesis that the distribution of power among participants clarifies the risk of bias in preparing a robust plan, e.g. a decent business case.

The experts were asked to evaluate the significance of participants' power asymmetry theory (PPA) as a factor in the quality of infrastructure investment decisions. Figure 71 illustrates the ballots received by experts that indicate the merits of the theory.

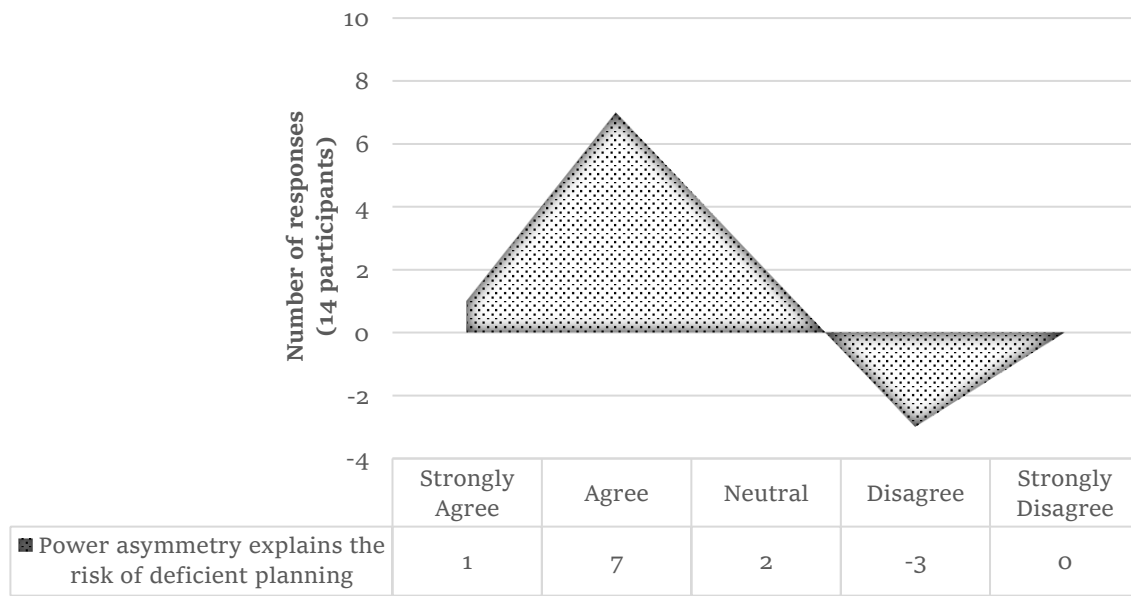


Figure 71. The reception of power asymmetry theory by the experts in explaining the shortcomings of infrastructure planning

The majority of experts have identified the theory as a pertinent explanation; some endorse its ability to interpret the risk of inadequate planning.

8.2. The merit of the recommendations

The proposed recommendations were presented and discussed with the experts and their effectiveness in managing the distribution of power was measured. Three suggestions were well received by the experts with more than half of the experts vouching for their application in the future of infrastructure delivery. Figure 72 charts the acceptance of the proposed strategies from the experts who attended the workshop.

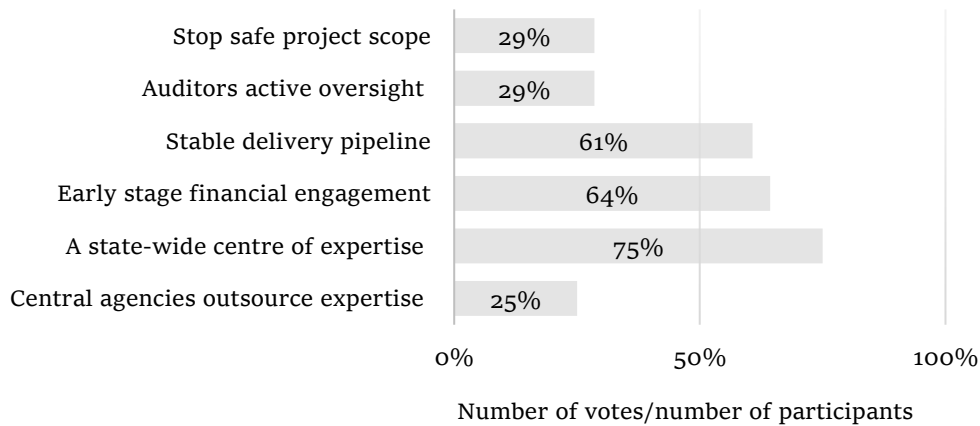


Figure 72. The effectiveness of the proposed strategies to manage power asymmetry

A centre of excellence, stable delivery pipeline, and early engagement with stakeholders was identified as strategies that are more effective.

8.3. Discussion of the key findings

An investment decision is made based on a business case prepared, appraised and approved by the government. Notwithstanding with the significance of auditors and the private sector, the role of public agencies is primary and prominent in the early stage of a project due to their power, urgency and legitimacy in the project. The perception of failure is instigated by a gap between expectations and the actual outcome. It is caused by either erroneous planning or poor implementation of the project.

Success depends on the robustness of business case as the cornerstone of the project plan. Quality of a business case is prone to inadequacies in its reliability. As the literature suggests (see chapter 2 for prospect theory, compromise effect, and decoy) identification and evaluation of options in a business case might be inadequate. A failure of the project plan to select a proper procurement strategy and payment regime (see chapter 2 for payment mechanism and transaction decoupling) may harm value for money. Deficient planning contributes to the perception of failure. Deficient planning is a critical and persistent cause of the problem in Victorian infrastructure deliveries

A better understanding of infrastructure delivery is available if the primary project constituencies are divided into central and delivery agencies. In an extension to the literature of organizational theories, the research splits up central and delivery agencies in the public sector. According to agency theory, an agency loss is foreseeable in a delegation process. The loss occurs due to the difference in interests or information gap. The interaction of self-ruling decision makers in a decision area is encapsulated in the literature, i.e. game theory and adverse selection theory. When decision makers are self-interested and have asymmetric information, the maximum gain is unlikely to reach.

Infrastructure projects are complex challenges with interconnected problems. Infrastructure delivery may become a wicked problem due to the inherited uncertainty and external issues. The need for reliable estimations becomes a challenge since the estimation models might become imperfect predictors. Moreover, the complexity of governance structure in infrastructure projects complicate decisions and accountability mechanisms. Successful infrastructure delivery requires competency of the public agencies. Alas, the public sector leadership shows an indication of inadequacy to reassure consistency and strategic integration. The competency of the public sector, i.e. knowledge, skills, and experience, is currently insufficient. An uninformed buyer cannot prepare a reliable plan.

Cognition of a decision maker changes by the level of access to resources required to make an informed decision, e.g. information. Information gap between decision makers reduces the ability to manage stakeholder expectations. Project planning is done based on multiple explicit or implicit assumptions about internal and external variables. Due to the limited resources and pre-existing mindsets (see chapter 2 for decision maker cognition, mindset, and administrative behaviour), a business case may comprise wrong or unrealistic assumptions.

The argument of planning fallacy and construal level theory explains how decision makers may undervalue the complexity and risk involved in a decision that might look far away (see Chapter 2 for more details). A decision maker may focus on positive aspects, may simplify the problem and ignore the details. A hiding hand effect (see Chapter 2 for more details) may blind the decision maker seeing the risks. The decision maker may then thoughtlessly start a venture that otherwise would not have been initiated. Optimism bias is a common hazard in decision-making that undervalues the probability of adverse scenarios (see Chapter 2 for more details). A delivery agency may become optimistic and prepare a promising plan, i.e. a business case that overpromises the benefits and underrate the risks and resources. The central agencies, on the other hand, may have an illusion of control that their formal authority to say the final word guarantees an optimal decision. Optimism is a hazard that may cause overpromising behaviour in the project. It may also influence the investment portfolio by raising the chance of approval of optimistic proposals.

Governments are political entities with a political agenda. Survival is their principal objective. In democracies, the political cycle usually is shorter than the life cycle of infrastructure projects. A government may prioritise the political advantage of a project over the public interest. The short-sightedness of the political cycle may cause a myopic view in public agencies that discounts the long-term impacts of an investment that has to be embedded in the decision process. Mismatching priorities among the organisations may influence project

decision processes such as evaluation and approval regime. Government preannouncement of a project benefits or resources may generate political advantage but becomes a burden. Preannouncement may introduce numbers as a pure guess that becomes an anchor point of future estimations or adds project liability against other stakeholders. Pre-commitments as a strategy of project sponsors to escalate project confidence may add project inertia to change direction or a project being cancelled. The delivery agency may also influence the decision process by manipulation or exclusion of information in the business case, e.g. asymmetric Dominance or temptation bundling (see chapter 2 for more details). Misrepresentation is a deliberate strategic act to change the course of action in favour of the decision maker. Misrepresentation affects the quality of a project plan by offering false or misleading information.

Self-awareness theory (see Chapter 2 for more details) argues that project accountability should be explicit. A publicly known connection of project sponsors with the project raises accountability according to social comparisons theory (see Chapter 2 for more details). Auditing and supervision are required to ensure public agencies follow the processes and make the highest value for money.

Central agencies rely on the external capability to verify the received information from delivery agencies. Extensive levels of outsourcing may paralyse the central agencies identifying the true value of an investment proposal. Without proper audit that enforces application skills in making the right decisions on infrastructure investment, the robustness of the business case to generate value for money may not be effective. Single point accountability in which the decision makers are known and their responsibility is overtly broadcast is needed for adequate supervision. Insufficient supervision may contribute to deficient planning.

Public agencies hold different sources of power that might influence their behaviour during planning, approval and control processes. On the surface, power comes from a formal authority of agencies. The control of central agencies over limited resources gives them the power to make investment decisions and controlling project gates. Power also comes from an ability to fulfil a task. Delivery agencies are expected to be competent in planning and implementation of projects. It is the essence of delegation in the public sector that delivery agencies should have the competency to plan and implement projects. Central agencies assume delivery agencies have the information, knowledge and expertise to develop a robust plan and have the capability to implement the project producing the expected outcome. The perceived competency of delivery agency transforms into an informal authority. Power asymmetry becomes a determinant factor if the informal authority of delivery agency exceeds the formal authority of central agencies.

Figure 73 pictures a causal network of cause and effect in infrastructure delivery. Failure could be attributed to the gap between the expectation and outcome. Deficient planning is the prime cause of the gap. Optimism has been identified as the leading cause of deficient plan. Nonetheless, four other causes are also identified that contribute to planning deficiency either directly or through optimism bias. Power asymmetry between the public agencies is designated to tackle the problem. Three principal strategies are framed to reduce power asymmetry or its impact on the decision processes. Figure 8 is read from right to left. It begins with a failed project (the right panel titled failure) and then tracks back to identify the causes and effects and the root cause.

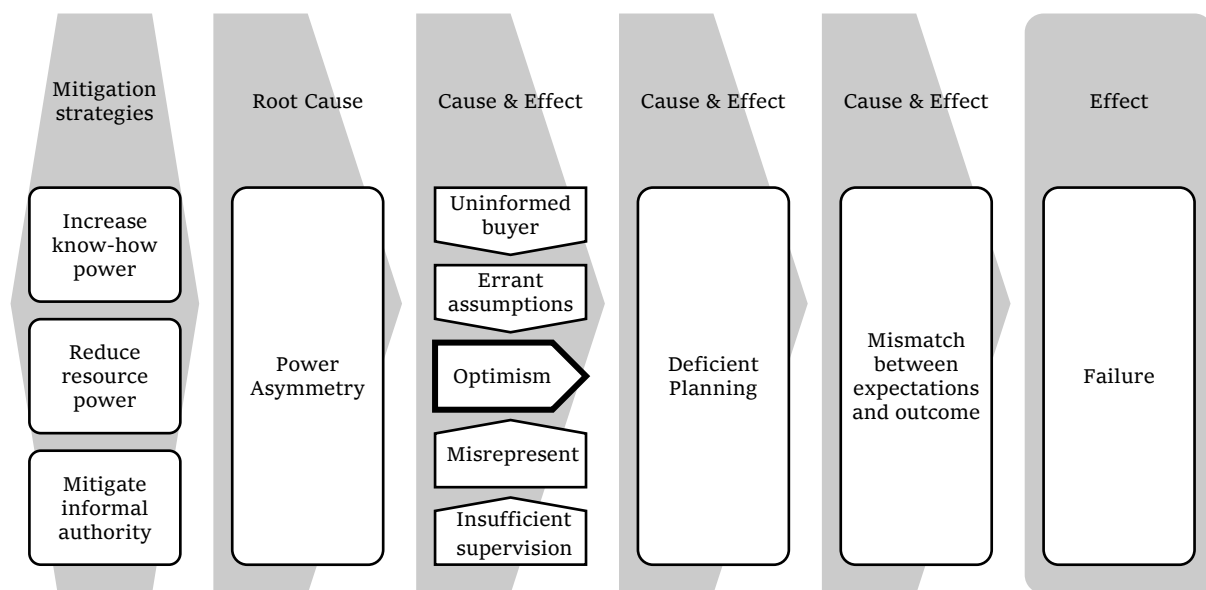


Figure 73 Root cause of failure in infrastructure delivery and recommendations to mitigate the issue

Closing the gap between formal and informal authorities of public agencies reduce optimism. Even if power asymmetry cannot be avoided, its impact might be mitigated. Three strategies may minimise the mal-effect of participants' power asymmetry in infrastructure projects. (a) Increasing know-how power of public agencies improve the quality of planning developed by delivery agencies and enhance the ability of central agencies to assess the proposed plan, i.e. business case. (b) Reducing resource power of the central agencies limits their budget control. It reduces the chance of being swayed by a flamboyant business case. (c) Controlling delivery agencies' informal authority reduces the incentive to prepare an optimistic business case.

Six enablers are proposed to achieve the three strategies.

- (1) Access to external resources is a simple answer to the lack of competency. Although outsourcing may not always assure value for money, it may provide an efficient application of skills in one of a kind project. Central agencies may keep expertise for investment and

portfolio management in-house but access ad-hoc technical skills from external consultants to check the hidden assumptions behind a business case.

- (2) A centre of expertise may help to increase the know-how power of public agencies. Silo effects (see Chapter 2 for more details) divides departments and kills cooperation. A centre of expertise can facilitate corporate collaboration, enhance government memory and reduce the silo effect. A centre of expertise deposits lessons learned and provides a benchmark to measure optimism bias (similar to reference class forecasting).
- (3) A stable pipeline of infrastructure delivery controls the resource power of central agencies. It also provides an opportunity for all agencies to plan acquisition of know-how power in an efficient way. The effect of pre-commitment and construal level theory is controlled because of a steady pipeline. It also manages political deliberation due to the short-sightedness of the political cycle in comparison to the infrastructure lifecycle.
- (4) Early engagement with future project stakeholders raises a decision maker's cognition about the project requirements. An informed buyer has a higher chance of making a robust plan. The inclusion of assumptions in a project plan requires a deep understanding of the project requirements and contextual elements. Close interaction with the project stakeholders may disclose hidden assumptions and provide information to verify project requirements. According to stakeholder salience theory (see Chapter 2 for more details) urgency, power and legitimacy define the significance of a stakeholder. Because of the lack of a sense of urgency that can occur at the inception of a project, power and legitimacy and users' requirement may be overlooked. An early engagement of project users with a financial incentive may raise their level of urgency, power and legitimacy to become part of project planning.
- (5) Stop-safe project scope reduces the incentive of being optimistic. One issue in large infrastructure projects is the high sunk which may induce the government to continue with a poor, failing project. Adding decision points (see chapter 2 for more details) increases the quality of decision-making process by adding a chance of rethinking the project. The fear of sunk cost and the effect of perceived progress (see Chapter 2 for more details) is reduced. Stop-safe scope reduces the impact of power asymmetry. Since the project will remain open to future judgment, optimism will do no good in satisfying the organisational incentive of a delivery agency in offering an optimistic plan.

- (6) Active supervision by auditors reduces the informal authority of delivery agencies and the control resource power of the central agencies. It is suggested to change current audits which are effectively a passive post-mortem of a project to active auditing engaging in the decision processes in real time. Active auditing requires transparency and access to information. It may avoid deficient planning because the quality of the plan is exposed before it is too late.

8.4. Conclusions

This research is a journey from a series of unstructured expert data sets (the inquiry transcripts) to a well-established theory. Data collected in a series of public hearings have been processed and analysed, and their underlying themes triangulated with seven case studies. Thereafter a workshop of experts was organised to validate the findings.

The perception of failure in the project is a result of a gap between the expectation and the actual outcome. The gap may occur if a project outcome cannot satisfy the expectation. If the initiation of a project triggers wrong or unrealistic expectations, the chance of perceived or actual failure is high. This research focuses on the early decisions in a project and investigates planning deficiency as a cause of failure in infrastructure delivery.

Optimism is the usual suspect in the shortcomings of a decision-making process. An optimistic plan is synonymous with a deficient one. The experts confirm that the uninformed buyer, wrong or hidden assumptions, misrepresentation, and insufficient supervision contribute to optimism as well as deficient planning.

The notion of informal authority is revisited as an explanation for the pseudo power of delivery agencies within the approval processes. Informal authority originates from the perceived competency of the delivery agency by the central agencies. If the perceived competency of a delivery agency is less than its real competency, project planning faces a risk. The findings verify that underestimating the overpromising behaviour of project delivery agencies during the planning stage of infrastructure is a critical risk that would impact the perception of success. It is postulated that the risk of optimism bias could be attributed to the power balance of the participants.

Seven infrastructure projects in Victoria were presented to infrastructure experts to measure their views on the level of success and the extent of power asymmetry in the projects. It is shown that a high level of power asymmetry between the central and delivery agencies can contribute to project failure. According to experts' judgment, the theory of participants' power asymmetry (the theory is formulated in Chapter 7) may explain the behaviour of public

agencies in taking actions that might lead to a deficient plan. Power imbalance or asymmetry can be linked to the present shortcomings in public infrastructure by uncovering the people's behaviour within project processes.

Three strategies are devised with six enablers to address the issue of power asymmetry. The experts find a centre of excellence, a stable delivery pipeline, and early engagements with stakeholders more effective undertakings to mitigate the impact of imbalanced power within the public agencies.

The following Chapter 9 describes how the aim and objectives of this study have been met and the contributions made along the journey.

9. Conclusions

This thesis has outlined the reasons why public infrastructure projects are complex systems. They have compound decision structures that include multiple stakeholders and planning often becomes a wicked problem involving many agencies with different objectives and interests that may conflict.

The successful delivery of major public infrastructure projects often remains elusive, with many projects disappointing clients and ultimately the community by failing to meet the terms of their promises. The shortcomings manifest as a failure to satisfy time, cost or quality requirements or to offer the expected utility for the stakeholders.

This study set out to identify the root cause of why large public infrastructure projects frequently fail to produce the anticipated value for the money as detailed in the initial stages of a projects life cycle. This aim has been achieved by:

1. Refining the extent of factors considered when reflecting on the success of delivery of major public infrastructure.
2. Identifying the key issues confronted during the procurement of public infrastructure by considering the context and process of project delivery and in so doing clarify the current best practices and strategies that project practitioners and researchers may apply to improve project delivery processes. Explanations to the reasons for the shortcomings of the strategies also emerged. A hypothesis was formed that current project procurement processes neglect to consider power asymmetry between key decision makers adequately.
3. Cross-pollinating the relevant theories from the literature with an in-depth investigation of project delivery in Victoria facilitated the development of a refined process for project initiation that recognises the role of various agencies and assists in structuring necessary resources that collectively can make a project successful.
4. A new theory (the theory of power asymmetry) was developed to in part explain the reasons for continuing issues in the delivery of public infrastructure projects.
5. The concepts developed were tested through the conduct of an interactive workshop with leading public infrastructure professionals. This testing enabled refinement of the proposed theory and prioritisation of the suggested improvements to project initiation processes for procuring major public infrastructure.

9.1. Research contributions

The research has also made significant contributions to the body of knowledge by:

- Developing a new research method based on the abductive reasoning for analysing transcripts and interview data conducted by third parties on complex systems, i.e. where there is no opportunity to clarify information from interviewees (refer Chapter 4).
- Developing a new and simple explanation for the behaviours of actors in government departments and central agencies when making decisions regarding the procurement of major public infrastructure, i.e. power asymmetry (refer to Chapters 2 for the theoretical background, Chapters 5-6 for supporting evidence, and Chapter 7 for the foundations of the theory).

Proving a compelling case in support of recommendations for improving project management practices based on 13 themes revealed through investigation of stakeholder perspectives (refer to Chapter 5 for discussion over the themes, and Chapter 7 for discussion on the recommendations).

The 13 themes detailed in Chapter 5 were:

- ✓ Theme 1: Central agencies vs delivery agencies
- ✓ Theme 2: Insufficient competency of the public sector
- ✓ Theme 3: Auditing dilemma
- ✓ Theme 4: The risk of outsourcing expertise
- ✓ Theme 5: Leadership Inadequacy in public sector
- ✓ Theme 6: The appropriateness of procurement methods
- ✓ Theme 7: Mismatching priorities
- ✓ Theme 8: Complexity of governance structure
- ✓ Theme 9: Perception of failure
- ✓ Theme 10: Managing the stakeholder expectations
- ✓ Theme 11: The quality of decisions in the early stage
- ✓ Theme 12: Deficient planning
- ✓ Theme 13: Power in Public agencies

Of these themes the following three were notably endorsed during the interactive workshop as measures that may mitigate the impact of imbalanced power within the public agencies (refer chapter 8):

- A centre of excellence deposits, shares and manages public memory and enhance public agencies' competency in infrastructure planning

- A stable delivery pipeline reduces the impact of political incentives and supports timely mobilisation of public skills and expertise.
- Early engagements with stakeholders may escalate decision cognition in early stage and inform delivery agencies of the users' requirements and preferences for a realistic plan.

The finding that the project initiation phase of projects should be used to establish how project benefits and success will be determined is a major departure from current thinking where project outcomes are typically considered at the end of the construction phase as lessons learnt. (Refer Figure 74, details in Chapter 2).

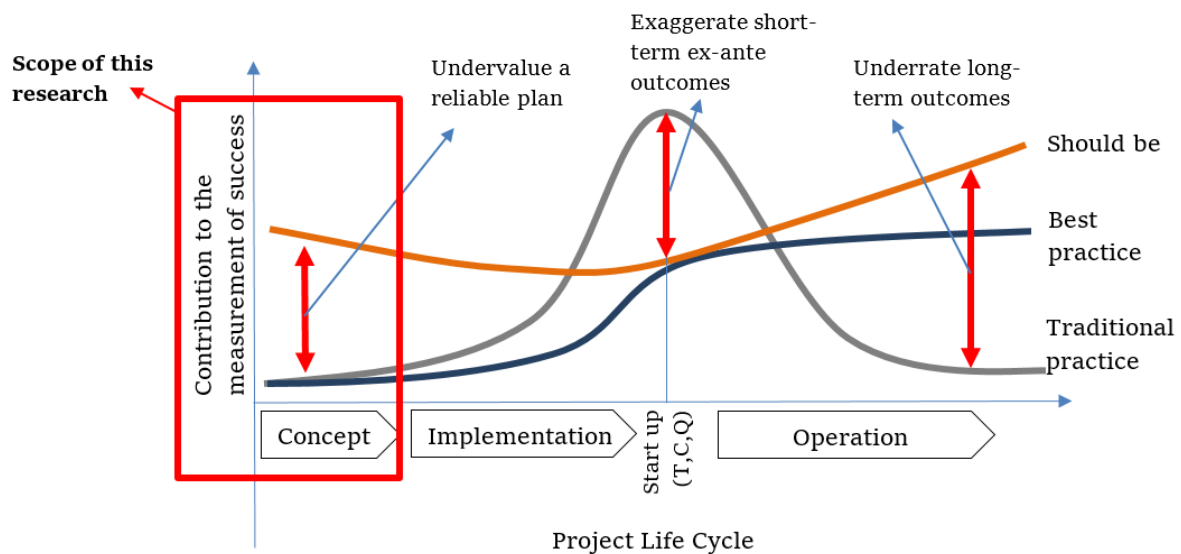


Figure 74. Early impact of a deficient plan as a contributor to success (replication of Figure 14 on page 79)

All of this work is grounded in real, contemporary data obtained from case studies, a major public inquiry that generated 500 pages of verbatim transcripts and structured communication with executives responsible for the delivery of major public infrastructure.

The outcomes and recommendations of this research have direct relevance to government departments and agencies involved in public infrastructure procurement. Specific relevance of these findings to Central Agencies and Delivery Agencies are summarised in Figure 75.

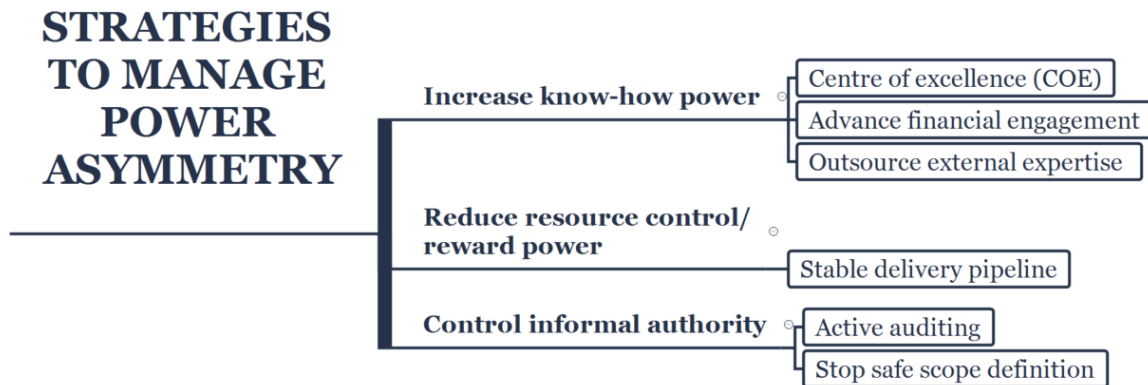


Figure 75. Strategies to manage power asymmetry

Specific outcomes of the research and issues worthy of considering for future research follow.

9.2. Research outcomes

The following is an explanation of the outcomes achieved by this research, referenced to the specific objectives (detailed in Chapter 1).

Objective 1: Redefine success that incorporates public project wider benefits for community

The traditional view of project success is criticised for a pro-active approach toward success. Project success divides into product success and management success. Success should include the broader benefits of projects that come to life long after the project starts up. The measurement of success originates in the contrast between a plan and actual outcome. If the plan is deficient, success is unlikely to realise.

Objective 2: Identify the main issues confronted during public infrastructure delivery

A massive amount of data was generated by the public interviews and seven case projects in Victoria. The collected data contains evidence from chief executives and distinguished experts of the public and private sector. It shows that the capability of the public sector, i.e. knowledge, skills, and experience, is currently insufficient to promise success. The inadequacy of public competency may make the government an uninformed buyer. Decision making and approval processes of infrastructure delivery may fail to preserve value for money due to deficient business cases. Planning of infrastructure project displays shortcomings in the form of optimism, wrong assumptions, misrepresentation and inadequate supervision.

Objective 3: Re-explain the early issues in public infrastructure projects through cross-pollinating the relevant theories from the literature.

Thirty-two contemporary theories are hand-picked from the literature in areas of management, social science, and political knowledge. The arguments are studied for their ability to explain the identified shortcomings. These arguments are adapted in the context of infrastructure delivery to uncover the technical, psychological, organisational and political aspects of public projects. The behaviour of public agencies is analysed in a separation of central and delivery agencies. In a search for an explanation, the cause of effects of the shortcomings in decision making and approval processes are identified and interconnected. The concept of informal authority is suggested as an abductive inference to explain the pre-existing planning deficiency and the inability of central agencies to prevent it.

Objective 4: Develop a new theory (the theory of power asymmetry) to explain the identified issues in infrastructure projects

Power is a fundamental concept in decision making. Power is the ability to influence others decision. Power sources of information, expertise, reward, legitimacy, reputation and force. In projects, power implies authority and competency. Reputation as a source of power is a perceived competency of one agency by the other. It produces as informal authority for the inferior agency. In projects, participants' power asymmetry (PPA) is an imbalance of power between agencies. This research study power asymmetry between public agencies, i.e. central and delivery agencies. PPA breaks the unity of government down into central and delivery agencies. Central agencies' delegation to delivery agencies may rise informal authority for delivery agencies. Although central agencies have formal authority to sanction, they rely on information received from project plan to make a decision. In the presence of confronting incentives, a risk of sub-optimal decision emerges. PPA contextualises the conflict of incentives and the participants' power balance in public infrastructure projects. The theory offers a simple clarification of the process of early decisions in public infrastructure projects. It clarifies the interface between central and delivery agencies in the public sector.

Objective 5: Validate and refine the proposed theory and assess its breadth of applicability

A workshop of experts was organised and attended by delegates from every division of infrastructure system that also represent the seven case projects of this research. The workshop discovers a correlation between the perception of failure and the level of power asymmetry in the seven case studies. In a survey, the workshop validates the major findings and agrees to take the theory of participants' power asymmetry as a compelling explanation. Power asymmetry may become a leading cause of failure if the level of asymmetry is too high. Strategies for managing power asymmetry are presented to the experts, and three are found more useful. These interventions may assist in closing the gap

between formal and informal authority or mitigate the impact of power asymmetry in decision making and approval processes.

Research Hypothesis: Participants' power asymmetry influences the quality of planning and leads to the perception of failure in public infrastructure delivery. Informal authority is a persistent phenomenon in a delegation. Power asymmetry becomes an issue in public infrastructure delivery if the central agency doesn't have the competency to assess the quality of received business cases. The current project procurement processes fail to consider power asymmetry between key decision makers adequately. Power asymmetry between key decision makers has been proven in the affirmative.

This thesis answers why large public infrastructure projects frequently fail to produce the anticipated value for the money. The scale of public delivery is vast and impact people's quality of life in long-lasting. The research finds the initial stages of a projects crucial. Preparation of business case and its appraisal are among the critical decisions that public agencies make.

The current processes of project delivery are incapable of preventing deficient planning as a critical cause of wrong investment decisions in infrastructure delivery. Reform in the process of planning and decision making is required. A hypothesis grounded in the data was unleashed to explain the current situation. The premise is presented against the collected data and cross-checked with literature. It becomes a new theory of power asymmetry that explicates the behaviour of project participants in early decisions. The new process recognises the role of public agencies. Through strategic intervention, the new theory assists in structuring necessary resources that collectively can make a project successful.

Collected information in this research is limited to the data received from people and authorities who are experienced in Victoria. The proposed theory is grounded in Victorian public infrastructure delivery. The focus of this research is large to medium size public infrastructure projects. As a result, the validity of the generated theory remains within the boundaries of mid-large public projects in a jurisdiction similar to Victoria.

9.3. Directions for future research

This research is a beginning of a new concept in public project delivery. The notion of power is studied to unravel the intrinsic traits of public agencies. The focus of this research is project planning phase in public infrastructure projects. The boundary of this research is marked by public projects and specifically the decision-making processes and governance including the early identification of need, selection of procurement strategy, and investment decision.

This study is qualitative research using a combined approach of case studies, detailed content analysis of public inquiries, a literature review and an expert workshop. This research is developed in search of a simple yet plausible explanation for the common project problems. Instead of relying on the format and style of information, the method focuses on the content of messages that are given by the witnesses. It summarises, indexes, organises data and graphically illustrate them to uncover the conceptual maps and network of causality. Although it begins with the question of WHAT is happening in public infrastructure, it ends up with an answer to the question of WHY it is happening.

Despite the potentials of qualitative research strategies in dealing with complex data and looking at the big picture, some may have shortcomings in a variety of areas such as handling incomplete and contradictory data, avoiding researcher bias, investigate alternative explanations, and validation of findings. The reliability of the research is limited to the extent of conceivable generalisation of the findings and the extent that the research can accommodate the spectrum of information including any latent factors that might influence the proposed hypothesis.

The external validity addresses the inclusion of any factors that corroborate an interesting conclusion. It is acknowledged that further validation is required to ensure there is no bias or defect either in the use of this new approach or the collected data. A workshop has been convened, using a Delphi style approach with key stakeholders that represent the original data set, to address this need.

a. Nonetheless, this research is constraints with the data received from Victorian jurisdiction. A generalisation of the findings is limited to a similar jurisdiction that portrays a comparable arrangement of public agencies playing in the process of infrastructure delivery. The findings of this research are based on the key stakeholders of infrastructure delivery from the public and the private sectors but might exclude voices from smaller groups in the community such as minority groups, ad-hoc political parties, and expatriates. The internal validity of social research may be influenced by aging data, system change or maturity of the observed system. Hence, the findings of this research are subject to change should the observed system changes by time or under any other circumstances.

Notwithstanding with the limitation of this research, three extensions to the findings of this study follow.

1. Project tender is a significant stage to preserve value for money. Power asymmetry between the delivery agency and the private sector is a considerable debate and requires further study. Investigation of power asymmetry in other phases of a project, such as tender, is a direction for future research that will generate valuable insight to project managers

effectively interact with the private sector for a proper procurement of the project expected outcomes.

2. Traditionally, success is measured ex-post in projects. Nonetheless, measuring success before a project commits to its plan improves the rate of success and the value for money. Measuring the quantum of informal authority and participants' power asymmetry may well inform the risk of planning deficiency early enough for an intervention. Pursuantly standard questionnaire and ad-hoc software could be developed for a quick test.
3. Projects are complex systems. Qualitative data prevails studies that investigate the behaviour of project actors. Collection of data is a challenge, let alone the interpretation. Data become a chaos if since they are incomplete, complex, confronting or open-ended. This research has developed a qualitative method of research to process stakeholders' assorted evidence in semi-open interviews. The abduction of the best explanation for the causality of the compiled evidence makes sense of data. Nonetheless, the need of management studies demands further methodological progress in qualitative methods of project research. Additional research is suggested to develop methodologies of inference and methods of data analysis when researcher steers the interviews.

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11. Appendices

11.1. The public inquiry

The original transcripts of the public inquiry are also available in the parliament of Victoria website. The link is below.

<https://www.parliament.vic.gov.au/paec/inquiries/article/1496>



PUBLIC ACCOUNTS AND ESTIMATES COMMITTEE

Terms of Reference

57th Parliament

Received from the Legislative Assembly on 5 May 2011

Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects

That under s 33 of the *Parliamentary Committees Act 2003*, an inquiry be referred to the Public Accounts and Estimates Committee for consideration and report no later than 14 December 2012 on:

- (a) the competencies and skills that public sector managers require for the effective evaluation, decision making and oversight of significant infrastructure projects and protection of the public interest;
- (b) the extent to which Government policies such as the National Public Private Partnership Policy and Guidelines and the Partnerships Victoria Requirements specify these requisite competencies and skills, and support the Department of Treasury and Finance's application of these across the public sector;
- (c) strategies in place within the public sector for the development of such requisite competencies and skills and for their ongoing refinement and enhancement through knowledge-building from the sharing of best practice examples and guidance in the public sector;
- (d) whether particular significant infrastructure projects have been developed and implemented in a manner which aligns with the public interest and maximises transparency and accountability for the life-cycle of the project;
- (e) relevant infrastructure delivery strategies and practices, including in public-private partnerships, in relation to enhancing public sector expertise in place in other Australasian jurisdictions and relevant jurisdictions outside Australia; and
- (f) the merits of centralisation versus decentralisation of available skilled experts in the Victorian public sector during the life-cycle stages of public-private partnership projects, including considering any benefits that may be derived from greater flexibility to contract specialist services from external sources.

Table 26. Schedule of interviews and contributions from individuals (New organisation data were accessed in March 2014, Blank means unknown)

<i>Date (sorted)</i>	<i>Interview ID</i>	<i>Expert</i>	<i>Organisation</i>	<i>Job Position</i>	<i>New Organisation</i>	<i>New Position</i>	<i>Number of collected evidence</i>
20/03/2012	1	1	Department of Treasury and Finance	Secretary	Audit Office of NSW	Auditor-General	73
		2	Department of Treasury and Finance	Deputy Secretary, Commercial Division	Same		0
		3	Department of Treasury and Finance	Director, Infrastructure Risk Management	Same		0
		4	Department of Treasury and Finance	Director, Partnerships Victoria	Same		0
	2	5	Victorian Auditor-General's Office	Auditor-General	Melbourne Health, CAIP UniMelb	Executive-in-residence	77
		6	Victorian Auditor-General's Office	Sector Director, Technology Review and Annual Plan, Performance Audit	Caroplan Pty	Director/ Principal	15
		7	Victorian Auditor-General's Office	Sector Director, Transport, Performance Audit			1
	3	8	Department of Transport	Secretary	Infrastructure NSW	Secretary	26
		9	Vic Roads	Chief Executive	Department of Transport, Planning and Local Infrastructure	Deputy Secretary, Transport	6
	4	10	Department of Sustainability and Environment	Secretary	Department of Justice and Regulation	Secretary	18
		11	Department of Sustainability and Environment	General Manager, Capital Projects	Department of Environment, Land, Water and Planning	CEO, Capital Projects Group,	8
		12	Department of Sustainability and Environment	Director	Department of Environment, Land, Water and Planning	Executive Director,	0
		13	Department of Sustainability and Environment	Acting Chief Finance Officer	Victorian Department of Environment and Primary Industries		0
	5	14	Infrastructure Australia	Executive Director	Same		12
6	15	Infrastructure Partnerships Australia	Chief Executive Officer	Same		41	
	16	Infrastructure Partnerships Australia	National Policy Manager	Same		0	
	17	Infrastructure Partnerships Australia	National Policy Manager	Same		0	
21/03/2012	7	18	Building the Education Revolution- Task Force	Former Deputy Chair	ConstructionEdge™	Founder	18
	8	19	Department of Health	Acting Secretary	Department of Health	Deputy Secretary	18
		20	Department of Health	Capital Projects	Department of Health	Capital Projects	1
	9	21	Department of Planning and Community Development	Secretary			9

<i>Date (sorted)</i>	<i>Interview ID</i>	<i>Expert</i>	<i>Organisation</i>	<i>Job Position</i>	<i>New Organisation</i>	<i>New Position</i>	<i>Number of collected evidence</i>
22/03/2012	10	22	Department of Planning and Community Development	Deputy Secretary, Planning, Building and Heritage	Victorian Building Authority, Department of Environment, Land, Water and Planning	CEO	1
		23	Department of Planning and Community Development	Manager, Construction and Procurement			0
		24	Baulderstone	General Manager	Laing O'Rourke	Regional Director	46
		25	Baulderstone	Engineering Manager			0
	11	26	Baulderstone	Manager Project Development EPG	Health Infrastructure	Project Director	2
		27	State Service Authority	Chief Executive Officer			26
	12	28	State Service Authority	Assistant Director			0
		29	Committee for Melbourne	Executive Board Member			14
		30	Committee for Melbourne	Acting Chief Executive Officer	Australian Renewable Energy Agency (ARENA)	General Manager Strategic Communications and Knowledge Management	14
	13	31	University of Melbourne	School of Engineering	Same		41
		32	Monash University	Director, Centre for Regulatory Studies	Same		53
	14	34	Australian Institute of Project Management	Victorian President	Same		35
		35	Australian Institute of Project Management	National Director			8
	15	36	Australian Institute of Project Management	Chief Executive Officer			0
		37	Department of Education and Early Childhood Development	Secretary	Department of Economic Development, Jobs, Transport and Resources	Secretary	19
		38	Department of Education and Early Childhood Development	Acting Executive Director	Department of Education and Training	Deputy Secretary	5
		39	Department of Education and Early Childhood Development	Assistant General Manager, Office for Resources and Infrastructure	Department of Education and Training	Executive Director	2
	16	40	Department of Education and Early Childhood Development	Executive Director, Skills Victoria			0
		41	Association of Professional Engineers, Scientists and Managers Australia	Chief Executive Officer			61
		42	Association of Professional Engineers, Scientists and Managers Australia	Director, Marketing	Essential Media Communications	Associate Director	16
	17	43	Department of Business and Innovation	Secretary	Ambulance Victoria	CEO	60
		44	Department of Business and Innovation	Acting Deputy Secretary	Department of Economic Development, Jobs, Transport and Resources	Deputy Secretary	0
	18	45	Department of Business and Innovation	Executive Director, Major Projects Victoria	Department of Economic Development, Jobs, Transport and Resources	Executive Director, Major Projects Victoria	0
		46	Department of Justice	Secretary	KPMG Australia	Partner In Charge	45

<i>Date (sorted)</i>	<i>Interview ID</i>	<i>Expert</i>	<i>Organisation</i>	<i>Job Position</i>	<i>New Organisation</i>	<i>New Position</i>	<i>Number of collected evidence</i>
21/08/2012		47	Department of Justice	Executive Director, Strategic Projects and Planning	Department of Justice and Regulation	Deputy Secretary, Corporate Governance and Infrastructure	15
		48	Department of Justice	Director, Built Environment and Business Sustainability			4
	19	49	Plenary Group	Executive Director, Head of Origination	Same		32
		50	Plenary Group	Executive Director, Corporate Services	Same		58
		51	Plenary Group	Associate Director, Origination	Same		10
	20	52	Ensemble Partners	CEO and Founder	Same		28
		53	Ensemble Partners	Partner, Commercial	Same		
		54	Ensemble Partners	Fowler, Marketing Manager	Same		
	21	55	Engineers Australia Victoria Division	Executive Director			12
		56		Immediate Past President		Past President	33
		57	Swinburne University of Technology	Deputy Dean Faculty of Engineering and Industrial Sciences			10
	22	58	Capability Management International Pty Ltd	Partner			44
		59	Capability Management International Pty Ltd	Partner			24
		60	Capability Management International Pty Ltd	Associate Partner			7
	23	61	Transport Ticketing Authority	Chief Executive Officer			66
	24		Victorian Auditor-General's Office	Auditor-General			40
			Victorian Auditor-General's Office	Sector Director Performance Audit, Technology Review and Annual Plan			67
		62	Victorian Auditor-General's Office	Sector Director Financial Audit, Central Agencies and Whole of Government			2
	25	Repeated	Department of Business and Innovation	Secretary			61
		63	Department of Business and Innovation	Acting Deputy Secretary of Investment and Major Projects	Department of Economic Development, Jobs, Transport and Resources	Deputy Secretary, Major Projects	38
		64	Department of Business and Innovation	Executive Director, Major Projects Victoria	Client Representative, Melbourne Market Relocation Project		16
		65	Department of Business and Innovation	Client Representative, Melbourne Market Relocation Project, Major Projects Victoria	Department of Economic Development, Jobs, Transport and Resources	Executive Director, Major Projects Victoria	2
	26		Department of Treasury and Finance	Secretary			77
			Department of Treasury and Finance	Deputy Secretary, Commercial Division			2
			Department of Treasury and Finance	Director, Partnerships Victoria			6
			Department of Treasury and Finance	Director, Infrastructure Risk Management			2

<i>Date (sorted)</i>	<i>Interview ID</i>	<i>Expert</i>	<i>Organisation</i>	<i>Job Position</i>	<i>New Organisation</i>	<i>New Position</i>	<i>Number of collected evidence</i>
22/08/2012	27	66	Keane Australia Micropayment Consortium (KAMCO)	Executive Vice-President, Asia Pacific NTT Data Inc.	Same		12
		67	Asia Pacific NTT Data Inc.	Senior Vice-President and Chief Executive Officer			81
	28	68	Victorian Ombudsman's Office	Deputy Ombudsman			80
		69	Victorian Ombudsman's Office	Acting Principal Investigation Officer			36
	29	70	CSC Australia	Managing Director			20
		71	CSC Australia	Operations Director			22
	30	72	Lend Lease	General Manager, Victoria, South Australia and Tasmania			45
		73	Lend Lease	General Counsel, Australia			0
	31	74	Austin Health	Chief Executive Officer			44
		75	Austin Health	Director of Romeo			4
23/08/2012		76	Austin Health	Executive Director, Acute Operations	4		
	32	77	Royal Eye and Ear Hospital	Chief Executive Officer	21		
		78	Royal Eye and Ear Hospital	Executive Director, Ophthalmology Services	9		
	33	79	Department of Health	Secretary	Department of Health and Human Services	Secretary	60
			Department of Health	Executive Director, Finance and Corporate Services			5
			Department of Health	Director, Capital Projects and Service Planning			0
		80	Department of Health	Royal Children's Hospital Project Director	Moving Victoria - Roads Office	CEO	0
	34	81	Royal Children's Hospital	CEO	Same		36
	35	82	Children's Health Partnership	CEO	Same		34
	36	83	Lend Lease	Project Director	Same		60
	84	Lend Lease	Senior Legal Counsel	Same		0	
24/08/2012	37		Plenary Group	Executive Director, Head of Origination	Same		12
		85	Plenary Group	Chief Operating Officer	Same		41
		86	Plenary Group	General Manager, Plenary Conventions	Same		2
	38		Department of Sustainability and Environment	General Manager, Capital Projects			27
			Department of Sustainability and Environment	Secretary			8
	39	87	AquaSure	CEO			62
	88	AquaSure	Communications Director			0	

<i>Date (sorted)</i>	<i>Interview ID</i>	<i>Expert</i>	<i>Organisation</i>	<i>Job Position</i>	<i>New Organisation</i>	<i>New Position</i>	<i>Number of collected evidence</i>
8/10/2012	40	89	Department of Transport	Secretary			95
	41		Department of Transport	Director, Market and Product Development, Public Transport Victoria			0
			Department of Treasury and Finance	Secretary			50
			Department of Treasury and Finance	Deputy Secretary, Commercial Division			27
			Department of Treasury and Finance	Director, Partnerships Victoria			4
			Department of Treasury and Finance	Director, Infrastructure Risk Management			3
<i>PAEC Interviewer Team</i>							
<i>Attended all of the interviews</i>	90		Victorian Parliament	MP, PAEC Head	Resigned		82
	91		Victorian Parliament	MP	Victorian Parliament	MP	66
	92		Victorian Parliament	MP, PAEC Deputy	Victorian Parliament	MP & Attorney-General	45
	93		Victorian Parliament	MP	Victorian Parliament	MP	5
	94		Victorian Parliament	MP	Victorian Parliament	MP	10
	95		Victorian Parliament	MP	Government & Victorian Parliament	MP & Minister for Ambulance Services	8
96		Victorian Parliament	MP	Government & Victorian Parliament	MP & Minister for Finance	2	

11.2. Workshop of experts

The process of ethics approval at the University of Melbourne has been followed to organise and collect data from a workshop. The approval letter was received in March 2015. The Application ID is 1339987.1.

Among the experts who witnessed the parliamentary inquiry in 2012, 47 were communicated, 19 expressed their interest, and finally, 17 have attended the 3.5-hour session in Graduate House at the University of Melbourne, Carlton, 3053 Victoria, Australia. Table 27 shows the workshop agenda.

Table 27. the workshop agenda

Time	Agenda
08:30 – 09:10	Coffee & Tea
09:10 – 09:15	Introduction, by A/Prof. Colin Duffield
09:15 – 09:20	Presentation, “Current issues in infrastructure delivery”, Hamzeh Zarei
09:20 – 09:35	Discussion, moderated by Dr. Tim van Gelder
09:35 – 09:45	Feedback survey, managed by Dr Tim van Gelder
09:45 – 09:55	Presentation, “Why do projects sometimes disappoint? The theory of power asymmetry”, Hamzeh Zarei
09:55 – 10:20	Discussion, moderated by Dr. Tim van Gelder
10:20 – 10:30	Feedback survey, managed by Dr Tim van Gelder
10:30 – 11:00	Break - Coffee & Tea
11:00 – 11:10	Presentation, “Recommendations for better outcome”, by Hamzeh Zarei
11:10 – 11:35	Discussion, moderated by Dr. Tim van Gelder
11:35 – 11:45	Feedback survey, managed by Dr Tim van Gelder
12:00 – 01:00	Lunch & Concluding discussion

11.2.1. Cover letter

PLAIN LANGUAGE STATEMENT:

“Participants’ Power Asymmetry in Public Infrastructure Projects”

You are invited to participate in the above research project, which is being conducted by A/Prof Colin Duffield (supervisor), Dr Lihai Zhang (supervisor), and Mr Hamzeh Zarei (PhD candidate) of the Department of Infrastructure Engineering at The University of Melbourne. Your name is found in relation to the public inquiry of Victorian Parliament in 2012 “Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects” and your contact details are searched in free public domains. This project will form part of Mr Hamzeh Zarei’s PhD thesis, and has been approved by the Human Research Ethics Committee.

The aim of this study is to see why infrastructure projects do not always meet their full potential and how to prevent this in the future. The findings so far, confirm that the shortcomings in project outcome are overwhelmingly rooted in the early decisions that is when the business case is shaped. There is a significant relation between the quality of a business case and the corresponding project outcome. Although solutions such as gateway review, investment logic map, procurement strategies, and reference class forecasting, are already in place and somehow effective, none prove to be sufficient to get every project a reliable business case.

The research findings although keep consistent with the literature and supported by the observations from the case studies, need to be validated in order to dismiss any chance of researchers’ error or bias in data analysis. This workshop is proposed for that purpose with participants from variety of delivery units in public and private sector. Should you agree to participate, you are asked to attend a half day workshop on 12th of March held at Graduate House, Melbourne University, 220 Leicester Street, Carlton VIC 3053. The workshop has three segments each address part of the research questions: 1. Current issues in infrastructure delivery. 2. Why might infrastructure disappoint? 3. Solutions for better outcome. In each segment, first, a presentation summarizes the research findings. Then, a discussion is encouraged. And finally there is feedback survey. More emphasis will be given to the research case studies of Myki, HealthSMART, Melbourne Convention Centre, Royal Children’s Hospital, Melbourne Market Relocation, Regional Rail Link, and Victorian Desalination Plant. To minimise the effect of researchers’ bias, the session will be moderated by an external consultant. The workshop will not be recorded and only the content that is put on the board will be considered as outcome. It should take around 3.5 hours.

We intend to protect your anonymity and the confidentiality of your responses to the fullest possible extent, within the limits of the law. Your name and contact details will not be recorded in any of the produced data, however, you should note that as the number of people we seek to interview is very small, it is possible that someone may still be able to identify you.

Once the thesis arising from this research has been completed, a brief summary will be sent to you from the Department of Infrastructure Engineering. It is also possible that the results will be presented at academic conferences and publications. The data will be kept securely in the Department of Infrastructure Engineering for five years from the date of publication, before being destroyed. A short report will also be sent to you shortly after the workshop.

Please be advised that your participation in this workshop 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.

You will be asked to complete a one page consent form during the workshop that you have read and understood the information in this plain language statement.

Should you require any further information, or have any concerns, please do not hesitate to contact either of the researchers; A/Prof. Colin Duffield: (03) 8344 6787, Mr Hamzeh Zarei: 0406 220 189. Should you have any concerns about the conduct of the project, you are welcome to contact the Executive Officer, Human Research Ethics, The University of Melbourne, on ph: (03) 8344 2073, or fax: (03) 9347 6739.

Regards,

Mr Hamzeh Zarei, PhD candidate
Department of Infrastructure Engineering
The University of Melbourne, VIC 3010
M: 0406 220 189
Email: hzarei@student.unimelb.edu.au

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11.2.2. Consent Form



Consent form for participation in a research workshop

RESEARCH TITLE: *Participants' Power Asymmetry in Public Infrastructure Projects*

Name of participant:

Name of investigator(s): Hamzeh Zarei, A/Prof. Colin Duffield, Dr. Lihai Zhang

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 a **workshop** and I agree that the researcher may use the results as described in the plain language statement.
4. I acknowledge that:
 - (a) the scope of the **workshop** have been explained to my satisfaction;
 - (b) I have been informed that I am free to withdraw from the workshop 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 **produced data and information** will be stored at University of Melbourne and will be destroyed after five years;
 - (f) my name **will not** be referred to in any publications arising from the research; However, as the number of participants is small, it is possible that someone may still be able to identify me;
 - (g) I have been informed that a copy of the research findings will be forwarded to me, should I agree to this.
 - (h) some of the information that is given by other participants and discussed in the workshop is confidential and I agree not to share such information outside the workshop.
 - (i) my participation in this workshop is completely voluntary.

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 6215
W: <http://www.ie.unimelb.edu.au/>

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unimelb.edu.au

11.3. Online repository

More than 1170 evidence were generated from reviewing and processing public hearings. Moreover, the expert workshop ran a survey and produced a dialogue map of expert discussion. The outcomes and conclusions of the analysis have been presented in chapter 5, 6, and 8 of this thesis. Nonetheless, the raw data are too large to be included in an appendix.

An online repository is established with read-only access to the raw data. The following links connect to an online folder over Microsoft OneDrive. Two subfolders comprise the data as Figure 76 shows the hierarchy. For tech savvies, a MS Access™ database comprising the generated summaries from public hearing are placed in the repository. Data is also transformed into MS Excel™ that offers easier access for a general reader. It is also published in PDF format as a booklet.

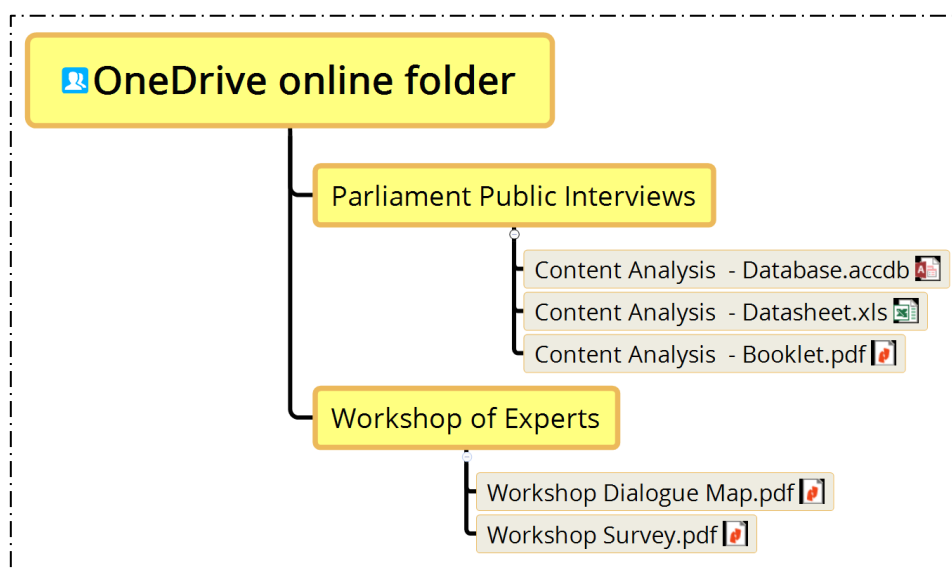


Figure 76. Structure of online repository

The link for a read-only access to the online repository is here:

<https://1drv.ms/f/s!AjW4HDKOEasYhPoIJXjMXRNftTdhDg>



Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Zarei, Hamzeh

Title:

Participants' power asymmetry in public infrastructure projects

Date:

2017

Persistent Link:

<http://hdl.handle.net/11343/208863>

File Description:

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