Submission No 11

PROCUREMENT OF GOVERNMENT INFRASTRUCTURE PROJECTS

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Public submission to the NSW Parliamentary Inquiry into the Procurement of Government Infrastructure Projects

Update on progress with research arising from the ARC Major Infrastructure Procurement Research Project

11th February 2016

Purpose

The purpose of this submission to provide an update on progress with research arising from the Australian Research Council (ARC) Major Infrastructure Project (MIP) whose final report was published in 2014 (please see document appended to this submission and at: http://eprints.qut.edu.au/76520/).[1] This project sought to find more effective and efficient ways of procuring and delivering the nation's social and economic infrastructure by investigating construction capacity, competition, and finance constraints in public sector major infrastructure. The entire project is cited by the Productivity Commission (PC) in its final report on its inquiry into public infrastructure.[2] More specifically, this update refers to future research outlined on page 38 of the ARC MIP final report.

Major Outcomes

Procurement theme

1. A new Public-Private Partnership (PPP) decision model. This world-first model is based on Nobel prize-winning theory; experiential evidence and empirical testing (using completed major infrastructure projects). This model searches and configures design, construction, maintenance and operations activities into an efficient bundle of property rights (filtering-out activities that restrict competition and/or create undue variation costs to government post-contract arising from a lack of flexibility) to determine whether there is a viable bundle (or more) of activities in a project, that can be efficiently assigned to a PPP business case. The PC also specifically referred to a paper on this model.
2. Development and empirical testing of dominant international business theory, again for the first time, to explain the decision by overseas multinational contractors to bid for Australian public sector major road, bridge and tunnel projects.

Finance theme

3. New insights into the long-term benefits and risks of infrastructure financing and investment decisions.

Implications from the procurement theme

1. *PPP decision model* (please see pages 11-23 of ARC MIP final report). This model is expected to more than double the chance that the procurement approach is successful in setting the project on a path to deliver superior Value-for-Money. In so doing, the model identifies the optimum level of competition and ensures the market works as efficiently as possible to deliver the project. The model replaces conventional PPP suitability criteria/drivers and current practice guidelines ("Procurement Options Analysis"). The model also provides a transparent and public interest document that can be fully disclosed and supplement the Public Sector Comparator.
2. *Multinational contractors' decision to bid for Australian public sector major projects* (please see pages 24-31 of ARC MIP final report). This research demonstrates that there is significant room for improving the working of the market to increase competition through reform of institutional, governance and procurement policies and practices.
3. *Combining the outcomes from the procurement theme* (please see page 32 of ARC MIP final report). Benefits (including more competition) are summarised with guidance on using a multiple contract approach, particularly in mega projects.

Progress with recommendations arising from the procurement theme

1. *PPP decision model.* In collaboration with government, we are in the process of identifying a trial project and finalising an agreement to conduct the trial. The trial application of the model will allow government participants to see the benefits of the model first-hand and the trial will also allow the production of a practical user manual/guide as a public document.
2. We have developed a detailed proposal to conduct the first ever comparative assessment of whole-life costs and performance in PPPs and non-PPPs and we hope to receive funding to commence this research project this year.
3. In collaboration with colleagues from around the globe, including Stanford University, USA and The University of Hong Kong, we have a developed an outline proposal to investigate, worldwide, the efficacy of the model to engage a PPP Company.[3]

[redacted]

Associate Professor Adrian J. Bridge Ph.D.

Project Leader, ARC Major Infrastructure Procurement Research Project

Queensland University of Technology (authorised by Head of School of Civil Engineering and Built Environment)

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[1] This research was supported under the Australian Research Council's Linkage Projects funding scheme (project number LP0989743).

[2] Productivity Commission (2014) *Public Infrastructure*, Inquiry Report, No. 71, Canberra (please see Vol. 2 page 461).

[3] This outline proposal is based on a paper by Bridge *et al.* (please see document appended to this submission and at: http://eprints.qut.edu.au/91098/).

MAJOR INFRASTRUCTURE PROCUREMENT RESEARCH PROJECT 2009-2013

REFORMING THE PROCUREMENT OF CONSTRUCTION AND FINANCING OF AUSTRALIAN INFRASTRUCTURE: ADVANCING CAPACITY, COMPETITION AND INVESTMENT

FINAL REPORT

14th August 2014 (Version 2)

Prepared by

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and

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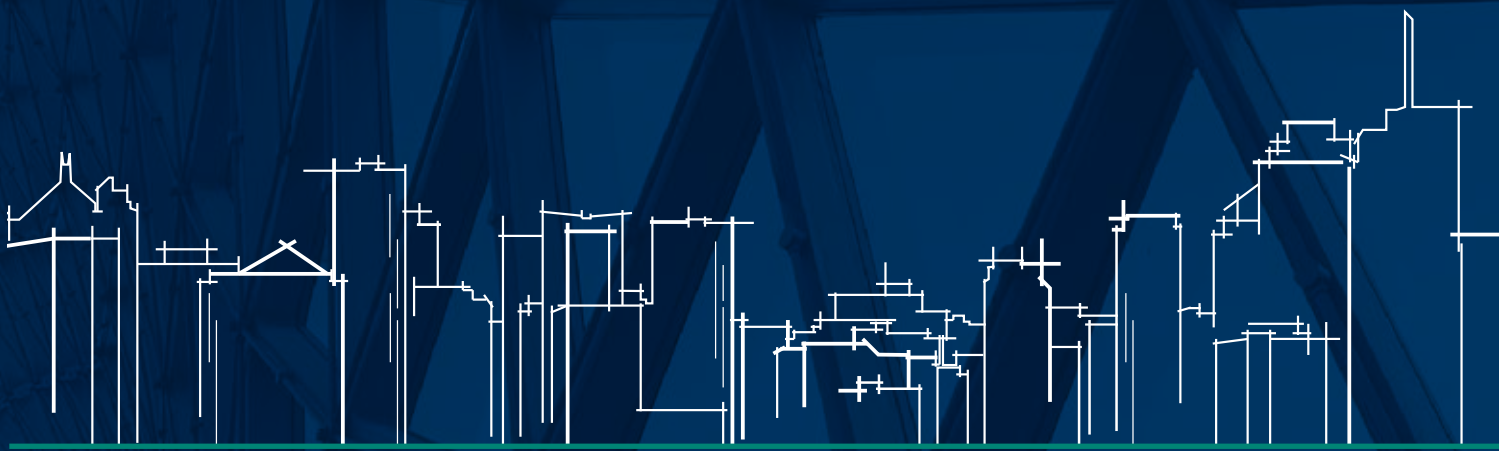

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Contents


ONLY

2008

> “We must find ways to make better use of existing infrastructure, remove the bottlenecks and gaps that are holding back Australia’s growth, and identify opportunities for new capital investment.”
>
> *(Source: Sir Rod Eddington, Chair, Infrastructure Australia, A report to the Council of Australian Governments, December 2008)*

2014

> “It is essential to reform governance and institutional arrangements for public infrastructure to promote better decision-making in project selection, funding, financing and the delivery of services from new and existing infrastructure.”
>
> *(Source: Productivity Commission: Public Infrastructure, Inquiry Report, Vol.1(71) May 2014)*

Executive Summary

Funded by an Australian Research Council (ARC) Linkage grant over four years (2009–13), the Major Infrastructure Procurement project sought to find more effective and efficient ways of procuring and delivering the nation’s social and economic infrastructure by investigating constraints relating to construction capacity, competition, and finance in new public sector major infrastructure.[1] The research team comprised researchers in construction economics and finance from Queensland University of Technology (QUT), Griffith University (GU), The University of Hong Kong (UHK), and The University of Newcastle (UoN). Project partners included state government departments and agencies responsible for infrastructure procurement and delivery from all Australian mainland states, and private sector companies and peak bodies in the infrastructure sector (see “Introduction” for complete list).

There are a number of major outcomes from this research project. The first of these is a scientifically developed **decision-making model for procurement of infrastructure** that deploys a novel and state-of-the-art integration of dominant microeconomic theory (including theories developed by two Nobel Prize winners). The model has been established through empirical testing and substantial experiential evidence as a valid and reliable guide to configuring procurement of new major and mega infrastructure projects in pursuance of superior Value-for-Money (VfM). The model specifically addresses issues of project size, bundling of contracts, and exchange relationships. In so doing, the model determines the suitability of adopting a Public-Private Partnership (PPP) mode.

[1] *This research was supported under Australian Research Council’s Linkage Projects funding scheme (project number LP0989743).*

The project has also developed **dominant international business theory on foreign direct investment (FDI)** to explain, for the first time, the overseas bidding decision of multinational contractors into Australia. This new theory has been successfully tested through case studies of the world's largest multinational contractors and their willingness to bid for public sector major roads, bridges and tunnels in Australia. This work demonstrates that there is significant room for improving the workings of the market to increase competition through the reform of a wide range of institutional, governance and procurement policies and practices, and the creation of more confidence in published pipelines. This major research outcome shows the effect of national culture on perceptions of attractiveness of public sector road, bridge, and tunnel projects in Australia. For example, if government wishes to attract new entrants from our region (such as Japan and China) into the National Prequalification System, then it needs to intensify efforts to reform transaction cost-related issues that generate risk (including high bidding costs) and to improve contractors' perceived project returns (without necessarily increasing prices, however). Collectively, these matters concerning risk and return speak to the location factor as the key determinant of FDI in the context of multinational contracting. In part, these outcomes could be achieved by exploring ways to ensure that any perceptions of bias – albeit subconscious and inadvertent – are avoided in the tender process, and very carefully examining ways in which government can avoid creating perceptions that they are a threat to profits.

Additionally, the major outcomes of the research project include **new insights into long-term benefits and risks of infrastructure financing and investment decisions**, including, for the first time, empirical evidence that supports the finance and investment characteristics of PPPs for infrastructure development. For example, the research has established evidence that:

- Investors do not earn additional returns by owning Australian PPP bonds in comparison to owning any other bonds in the Australian debt market;
- ASX-listed toll-road PPPs show an increase in company-specific (idiosyncratic) risk of these investments as the project shifts from the construction phase to the operations phase;
- A constant return of the risk-free rate plus 6% per annum is the best predictor of infrastructure and PPP one-month returns; and
- Governments, superannuation funds and private individuals interested in a broad and diversified exposure to infrastructure need to recognise that the long-term risks in these investments are similar to those of a diversified holding of US stocks.

Furthermore, the research project has **established a number of advances in knowledge that arise from connecting the outcomes of the procurement and finance themes**. For example, deployment of the new procurement decision-making model would address a number of perceived administrative barriers that are adversely affecting new entrants and, at the same time, configure and present new infrastructure projects to the market in a way that nurtures both local contractors and new international contractors. The research also sheds new light on the relationship between construction capacity/competition and available/affordable finance. For example, the finance outcomes support long-term investors including superannuation funds becoming engaged at an early stage of an infrastructure/PPP project. At the same time, the new procurement decision-making model reflects the long-term objectives of approaches that see the Operator as having greater influence over the design of the facility. That is, this new procurement model **searches for viable Design, Construct, Operate and Maintain bundles as a pre-requisite of a successful PPP**. In turn, it identifies the best projects for long-term investors to consider, and provides the best scope for the operator to influence design.

The major outcomes of this research project are critically important, particularly as **they relate to the terms of reference of the Productivity Commission's inquiry into public infrastructure, and to the Productivity Commission's (2014a, p.461) note (with respect to this research project)** that, " the Reforming the Procurement of Construction and Financing of Australian Infrastructure: Advancing Capacity, Competition and Investment project is examining a range of relevant issues, including the influence of competition during the tendering process on best value for money outcomes from procurement processes".[2]

[2] *Productivity Commission (2014a). Public infrastructure, Inquiry Report. Vol.2 (No. 71 May). Canberra: Australian Government.*

The Project

INTRODUCTION

The 2008 ARC Linkage project grant application noted that investing in and delivering new infrastructure plays a key part in the efforts of Australian federal and state governments to improve productivity, ensure continued economic growth, and reverse upward pressure on inflation. At the time of the application, all state governments were budgeting to increase infrastructure spending in real terms. Moreover, in the May 2008 budget the Federal Government announced the Building Australia Fund (BAF), which received an initial allocation of around $20 billion to fund critical infrastructure that was not being provided by the states or the private sector. In addition to the BAF, the Federal Government invested $22.3 billion in land transport infrastructure from 2009.

The key problem identified in the grant application was that the ability of federal and state governments to provide VfM in delivering infrastructure is severely constrained by the lack of construction capacity, competition, and finance in major infrastructure sectors. Indeed, as the 2008 project application noted, this situation is not surprising given that only two of the world's largest 225 multinational contractors are Australian-based (ENR, 2005)[3], and that the then federal minister responsible for infrastructure was reported as saying, "The world's biggest construction companies need to be attracted to Australia to cut the costs of building infrastructure".[4] Because governments had identified partnerships with the private sector (including leveraging private finance from PPPs) as an important part of their infrastructure delivery strategy, the credit crisis of 2008 also loomed as a key constraint in achieving VfM in infrastructure delivery. These two key constraints – construction capacity/competition and finance availability – were made more intractable by virtue of their close relationship.

The project, as formulated in 2008, aimed to deliver new procurement and financial modelling, and to explore the relationship between construction capacity/competition and finance availability/affordability as the basis for procurement reform to address these infrastructure delivery constraints. Since 2008, however, there have been key changes in the area of financing. Severe constraints in available finance have shifted from the private sector to government. The capacity of governments to finance projects through further public borrowing has for now and the foreseeable future become acutely difficult. Moreover, some states may also be concerned to protect their credit ratings. By contrast, conditions for the private sector since the Global Financial Crisis (GFC) have eased. As noted by the Productivity Commission (2014b), "There is no shortage of private sector capital that could potentially be deployed to finance public infrastructure in Australia" (p. 33). The key challenge in leveraging private finance has now shifted to accessing this finance at the 'right price'.[5]

On the other hand, construction capacity and competition constraints have not significantly eased since 2008 and, if anything, have worsened – particularly in the light of restructuring at Lend Lease, which means that Baulderstone and AbiGroup no longer exist as separate bidding entities. The Productivity Commission (2014a, p. 421) "...estimates that they (Leighton and Lend Lease) have been involved in just over 60 per cent of major infrastructure projects (by value)". The Productivity Commission (2014a) also observes that, "…international firms are yet to command a substantial share of the market. Moreover, in many cases, these firms find it necessary to partner with or join a consortium involving a local firm. The Commission estimates that international contractors have been involved in just over 18 per cent of infrastructure projects costing more than $50 million".[6] To the best of the research team's knowledge, there has been no significant advance in understanding the relationship between construction capacity/competition and the availability/affordability of finance since 2008. Clearly, the project's aims remain critically important, particularly as they relate to the terms of reference of the Productivity Commission's inquiry that seek to "conduct a broad ranging investigation into costs, competitiveness and productivity in the provision of nationally significant economic infrastructure and examine ways to: reduce infrastructure construction costs; address any barriers to private sector financing, including assessing the role and efficacy of alternative infrastructure funding and financing mechanisms, and recommending mechanisms and operating principles that may be applied to overcome these barriers" (2014a, p. v).

[3] *ENR: Engineering News-Record (2005). The top global contractors. ENR: Engineering News-Record, 255(8).*
[4] *Cameron, F. (2008). High bidding costs – not competition – blamed for building woes. Australian. April 18.*
[5] *Productivity Commission (2014b). Public infrastructure, Draft Report. Vol.1 (March). Canberra: Australian Government.*
[6] *Productivity Commission (2014a). Public infrastructure, Inquiry Report. Vol.2 (No. 71 May). Canberra: Australian Government.*

With respect to this research project, the Productivity Commission (2014a, p.461) notes that, "The Reforming the Procurement of Construction and Financing of Australian Infrastructure: Advancing Capacity, Competition and Investment project is examining a range of relevant issues including the influence of competition during the tendering process on best value for money outcomes from procurement processes".[7] This final report is also intended to assist the Australian Government's response to the Productivity Commission's inquiry into Public Infrastructure (May 2014). To this end, amongst the report's footnotes connections are made between the research project and a number of key points in the Productivity Commission's inquiry.

This final project report encapsulates the findings from four years of research conducted by four universities in partnership with 11 government (including all five mainland state treasury departments) and industry partners. This was an unprecedented collaboration in the field of infrastructure procurement and financing, not simply in scale, but also in intellectual scope. The multidisciplinary research team comprised researchers from QUT, GU, UHK, and UoN. The project partners were a unique and committed group of public and private industry partners representing the full spectrum of new infrastructure development and delivery:

- Government: Department of Treasury and Finance, Victoria; New South Wales Treasury; Queensland Treasury and Trade; Western Australia Department of Finance; South Australia Department of Treasury and Finance; former Queensland Department of Infrastructure and Planning.
- Industry: Construction Industry Institute Australia; Infrastructure Association Queensland; Aurecon; Infrastructure Partnerships Australia; and former Coffey Commercial Advisory.

A Research Advisory Committee (RAC), consisting of executives and senior managers from the partner organisations, was established to act as an advisory panel for the project. The combined expertise and experience of these panel members enabled the receipt of informed advice, stakeholder perspectives, and reviews of the functions and operations of the research. In particular, the RAC meetings provided a forum where the research team could present progress reports and test model development. RAC meetings were held two or three times a year for the four years of the project. The final meeting, which finalised the timeline for the approval and public dissemination of this final report, was held in May 2014.

In addition, the Core Management Team of senior university-based members of the project oversaw the implementation of the Research Plan and Program, which incorporated the Project Management Plan and Strategy (including ethics approval and compliance). The Core Management Team members were Adrian Bridge (QUT), Robert Bianchi (GU), Martin Skitmore (QUT), and Eduardo Roca (GU). The research team comprised the following chief investigators:

Associate Prof Adrian Bridge (Project lead/first-named investigator)

Associate Prof Robert Bianchi

Prof Martin Skitmore

Prof Eduardo Roca

Prof Steve Rowlinson (Partner Investigator, UHK)

Dr Tom Kwok (retired, formerly QUT)

Jason Gray (QUT)

Marcus Jefferies (UoN)

The project's findings are drawn from the Major Infrastructure Procurement research outputs, which are available at:

- https://wiki.qut.edu.au/display/arcmip/ or
- http://eprints.qut.edu.au/view/person/Bridge,_Adrian.html

The views expressed in this final report represent those of the research team but do not necessarily represent the views of any of the project partners.

[7] *Productivity Commission. (2014a). Public infrastructure, Inquiry Report. Vol.2 (No. 71 May). Canberra: Australian Government.*

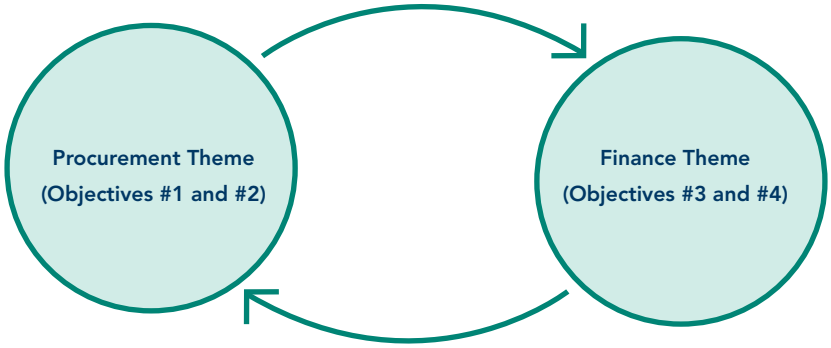
RESEARCH DESIGN AND METHODS

The four-year project was divided into two main themes: a procurement theme and a finance theme. Initially, the project studied the two themes independently. However, it then considered their interdependence, as depicted in Illustration 1.

An individual PhD study of each objective in the procurement theme (Objectives #1 and #2) and in the finance theme (Objectives #3 and #4) was conducted. Overall, the project adopted a mixed-method approach involving qualitative and quantitative data (sourced from surveys, case studies, in-depth interviews, comprehensive documents, and leading-edge financial data bases) and analysis (using a wide range of statistical procedures).

Illustration 1

Relationship between Procurement Theme and Finance Theme



THE PROCUREMENT THEME

The procurement theme investigated the potential of procurement policies and practices to increase construction capacity and competition. The theme was sub-divided into two objectives: the domestic major infrastructure construction market and the international major construction market. Each objective formed the basis of a PhD study.

Objective #1 was an investigation of the effect of procurement on VfM, including competition and flexible contracting arrangements to deal with changes to the works. It involved the development and testing of a new (first-order) procurement decision-making model to determine the suitability of PPPs in major and mega infrastructure projects.

To address Objective #1, data was collected and analysed from:

- A survey of major road and health projects that covered project scope, procurement and tendering procedure. (Government agencies submitted a total of 87 projects worth $32 billion, which were analysed as a representative sample. The projects were undertaken in the period 2005–2010, with an approximately equal number on either side of the GFC.)
- Case studies of major road and health projects. (These studies included access to all key documents that informed the actual procurement decision, and lengthy interviews with senior executives and senior managers involved in the actual procurement decision. A summary of the cases is given in Illustration 6.)
- A nationwide survey of civil and building contractors. (This survey covered structure-conduct-performance attributes of the major civil and building sectors, including construction capacity in the period 2005–2010. A total of 60 responses were received out of the 199 sent to all pre-qualified contractors across the five mainland states.)

Objective #2 aimed to reveal the determinants of multinational contractors' willingness to bid for Australian Public Sector Major Infrastructure projects. To this end, data was collected and analysed from:

- Case studies of nine Tier 1 multinational contractors headquartered outside of Australia. (These studies included the analysis of private documents, and lengthy interviews with contractors to obtain answers to the case study questionnaire that covered technical, service, financial and system management attributes; potential competitive advantages; threats to profits in home country and in Australia; the supply chain in Australia; attractiveness of the Australian market; barriers to entry; and business motivation. Interviews were held in Beijing, Madrid and Tokyo. With regard to the US multinational contractors, interviews were held in two state capital cities in Australia.)

- Seven studies of local contractors (Again, these studies involved analysis of private documents and lengthy interviews to answer a questionnaire that focused on the key resources and attributes of Tier 1, Tier 2, and Tier 3 contractors, with at least two contractors from each of the three tiers.)
- An extensive range of secondary sources (including contractors' websites, industry-related publications, Hofstede's cultural model, the Corruption Perception Index, the Euromonitor International, Transparency International, World Bank, IBIS World Australia, Euromonitor Country Ratings and others.)

THE FINANCE THEME

The finance theme investigated ways of improving the availability and affordability of private finance for infrastructure. The theme was sub-divided into two objectives that covered the finance and investment characteristics of PPPs and infrastructure investments (both equity and debt). Each objective formed the basis of a PhD study.

Objective #3 was an investigation into risk and return behaviour of Australian PPP (bonds and listed equities), and the cost of capital of Australian-listed PPP equities. To address Objective #3, data from the following sources were collected and analysed:

- PPP bonds in the UBS Australia Composite Bond Index, including Civic Nexus, Lane Cove Tunnel, Praeco, Royal Women's Hospital Partnership, and Axiom Education Qld (AEQ).
- ASX-listed toll road PPPs (Connecteast, Hills Motorway, Rivercity Motorways and Transurban).
- Australian stock returns, sub-divided into various categories (including their broad sectors, industries, infrastructure-based indices and a portfolio of PPP stocks).

Objective #4 was an investigation into the long-term US infrastructure returns and portfolio selection from 1927 to 2010. To address Objective #4, long-term US infrastructure index returns from 1927 to 2010 were collected and analysed.

RELATIONSHIP BETWEEN PROCUREMENT AND FINANCE THEMES AND FUTURE RESEARCH

During the project's application and scoping in 2008, there appeared to be a decline in construction capacity in some sectors of the major infrastructure market. This decline was inadvertently exacerbated post-GFC by government increasingly using PPPs in which only a small number of contractors were able to participate, mainly due to financial constraints including high bidding costs. There remains an urgent need to investigate this decline in construction capacity. This project, through its procurement and finance themes, offers the chance to consider more clearly the effect of improved availability and affordability of finance on construction capacity, and conversely the effect of reformed procurement practices and policies concerning construction capacity and competition on the availability and affordability of finance. The need for future research was also considered in light of the project findings.

Findings

The Major Infrastructure Procurement research project findings present world-first modelling of procurement decision-making and multinational contracting (procurement theme), along with new insights into debt and equity risk and return characteristics of Australian PPPs and long-term US infrastructure returns and portfolio selection (finance theme). These advances in knowledge also allow a new perspective on the relationship between procurement and finance and an improved foresight in the direction of future research. Findings are presented below according to theme and objective.

Procurement Theme

> “There is no clear data to conclude whether the use of PFI has led to demonstrably better or worse value for money than other forms of procurement.”
>
> *(Source: National Audit Office. 2011. Lessons from PFI and other projects (HC 920 Session 2010-2012). London: The Stationery Office.)*

> “The world’s biggest construction companies need to be attracted to Australia to cut the costs of building infrastructure.”
>
> *(Source: Cameron, F. 2008. High bidding costs – not competition – blamed for building woes. Australian. April 18.)*

Objective #1 The effect of procurement on value for money (competition and flexibility of contracting arrangement/s to deal with changes to the works) and development and testing of a new (first-order) procurement decision-making model to determine the suitability of Public-Private Partnerships in major and mega infrastructure projects.

BACKGROUND

The question of procurement is vexed because there is a dearth of cost and performance data across the whole-life of infrastructure facilities, both in PPPs and in non-PPPs. In particular, there is a very significant gap in our knowledge of the effect of facilities on front-line service. For example, we are yet to fully understand the way educational outcomes are affected by a school being built and delivered by a PPP or a non-PPP. This lack of knowledge is due largely to the intractability of data, including the difficulty of isolating the effect of the facility from other important factors on front-line outcomes. Again, in schools for example, we are faced with the difficulty of isolating the effect of the school facility on educational outcomes from factors such as the quality of teaching and the nature of the student cohort. In relation to non-PPPs, Thomas (2011) argues that a lack of transparency and accountability arises from widely dispersed budgets.[8] Moreover, although whole-life facility costs in PPPs may be more readily known at least to government (as they largely consist of service/availability charges and variation costs paid to the PPP Company), these costs only represent production costs (finance, design, construction, operation and maintenance costs) and ignore transaction costs. Transaction costs, materialise internally (for example, bureaucracy and supervision costs) and externally (for example, pre-contract including the process of establishing a price and post-contract including contract management), and are not fully recorded and reported anywhere in the world.

Despite this limited knowledge of whole-life facility costs, we do know much more about the differences in costs and performance of PPPs and non-PPPs to the end of the construction/start of operations of facilities. For example, Raisbeck, Duffield, and Xu (2010) present evidence to show that PPPs deliver less variation in time and cost to the start of operations.[9] That is not to say, however, that PPP outperforms traditional delivery and other non-PPP approaches in absolute terms of minimum time and/or cost. And again, these measures of time and costs are production-based only and ignore transaction costs.[10]

PPP suitability criteria/drivers and Procurement Option Analysis (that is known in academic literature as Multiple Attribute Utility Approach) are amongst the key tools used in current practice to determine procurement. The suitability criteria/drivers are vague indicators or filters and, given that our knowledge of the relative merits of procurement is largely restricted to production costs only and to the end of construction/start of operations, it is not surprising that Procurement Option Analysis amounts to matching some perceived feature of stereotypical procurement to some desirable outcome at the end of construction/start of operations. This often equates to cost and/or to time certainty or minimisation. By definition, this is a short-term approach and the process of going from required outcome at the end of construction/start of operations (read effect) to selection of the procurement mode (read cause) is tautological and non-scientific. This is because cause and effect are expressed in the same terms.

This current practice in procurement decision-making also becomes susceptible to non-economic forces, particularly in the public sector in many countries (including Australia). Illustration 2 indicates the possibility of a short-term tendency of public sector procurement, at least in the public road and health sector in Australia, where only five projects (mostly PPPs) out of the 87 major projects surveyed include operations and/or maintenance with construction as part of the contract bundle.

The short-term and circular nature of current procurement decision-making tools calls into question whether other procurement patterns are also counter-VfM. For example, other procurement patterns in the survey of major road and health include:

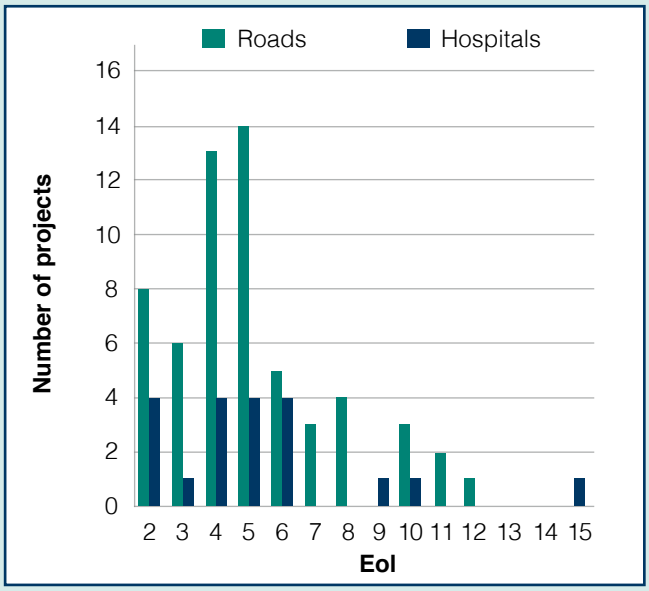
- A low number of higher value projects account for an appreciably higher proportion of the overall value;[11]
- The majority of road and health projects are delivered as single contracts;
- Larger value projects (over $100m) are dominated by Design and Construct, Alliancing, Early Contractor Involvement, and Managing Contractor approaches, which exclude operations and/or maintenance as part of the contract;
- The budget established in collaboration with the contractor (including a pain share/gain share regime) in the majority of health projects; and
- 57 percent of projects in the sample have EoI that lie below 5 or above 8 (the significance of this EoI range is explained later in these findings).

[8] *Thomas, P. (2011). The evidence for and against PFI, Infrastructure Journal [http://www.ijonline.com/genv2/Secured/printArticle.aspx?ArticleID=67975. Accessed 9 March 2011.*
[9] *Raisbeck, P., Duffield, C., & Xu, M. (2010). Comparative performance of PPPs and traditional procurement in Australia. Construction Management and Economics, 28(4), 345-359.*
[10] *PC Inquiry Report (May, 2014, p. 115).To clarify the PC's mention of relative performance of PPPs, we are data poor on both PPPs and non-PPPs in terms of their performance and relative effect on front-line service in operations and also data poor with regard to PPPs on many attributes other than time and cost variation during construction. We return to this point in the section on future research.*
[11] *PC Inquiry Report (May, 2014, p. 452). The PC noted a comment from Austrade who had been advised by international firms that contracts awarded in Australia are of a relatively large size.*

Illustration 2

Survey of major road and health projects

- **Project size/value**
  - The total value of the 87 projects is AUD 32.297 billion (comprising AUD 22.143 billion road projects and AUD 10.154 billion health projects) and across these projects **a low number of higher value projects account for an appreciably higher proportion of the overall value**
    - That is, in roads 40 of the submitted road projects (66 percent) comprise the two lower value/most frequently occurring categories (between AUD 50 to 100 million and AUD 100 to 250 million) and which account for AUD 4.164 billion (19 percent) of the total value of the submitted road projects. At the same time, 10 of the submitted road projects (16 percent) fall in the two higher value categories (between AUD 500 million to AUD 1 billion, and more than AUD 1 billion) and which accounts for AUD 13.847 billion (63 percent) of the total value of the submitted road projects
    - In terms of health projects, 17 of submitted the health projects (65 percent) comprise the two lower value/most frequently occurring categories (between AUD 50 to100 million and AUD 100 to 250 million) and which accounts for AUD 2.024 billion (20 percent) of the total value of the submitted health projects. At the same time, five of the health projects (19 percent) fall in the two higher value categories (between AUD 500 million to $1 billion, and more than $1 billion) and which accounts for AUD 6.593 billion (65 percent) of the total value of the submitted health projects
  - **The majority of road and health projects (62 projects, or 71 percent of the submitted projects representing AUD 19.406 billion, or 60 percent of the value of submitted projects) are delivered as a single contract** and in terms of projects delivered as multiple contracts, these tend to comprise the two lower value categories and below AUD 250 million.
- **Bundling**
  - With regard to the 61 road projects lower value projects ($50-100m) are dominated by Construct Only (24 projects) whilst the **larger value projects over $100m are dominated by Design and Construct (in 15 projects); Alliancing (in 14 projects); and Early Contractor Involvement (in 6 projects)**; Leaving only two projects that comprise Design, Construct; Operations and Maintenance (including a PPP)
  - On the other hand, **Managing Contractor in 13 projects (and of these projects eight were greater than AUD 100 million) dominated the health projects** submitted; Again only a small number of projects comprise Design, Construct; Operations and Maintenance (namely three PPPs)
- **Expressions of Interest (EoI)**
  - The following histogram shows that **57% projects in the sample of 87 projects (or 45 projects out of 79 projects, with missing data on 8 projects) have EoI that lie below 5 or above 8**



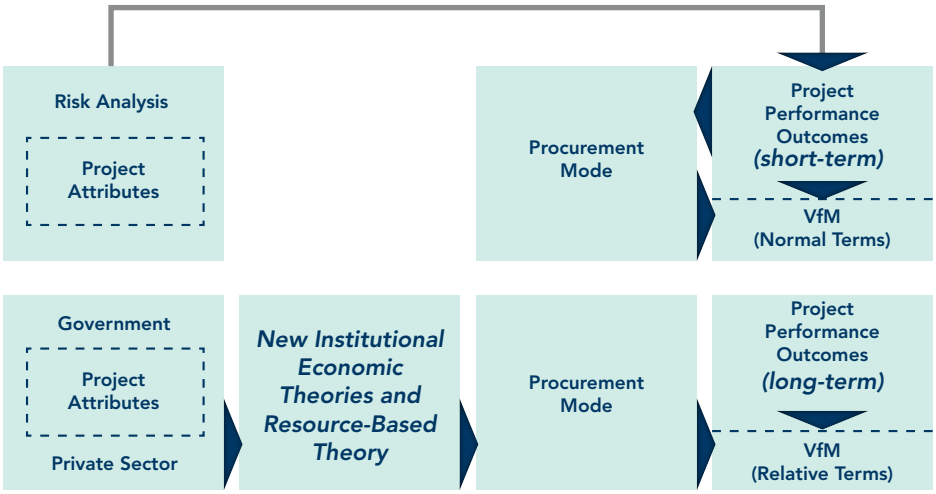
A NEW APPROACH

The UK National Audit Office (2004) defines procurement as "the whole-life process of the acquisition of goods, services and works..., beginning when a potential requirement is identified and ending with the conclusion of service contract or ultimate disposal of an asset".[12] HM Treasury (2008) defines VfM as "securing the best mix of quality and effectiveness for the least outlay over the period of use of the goods or services bought. It is **not about minimising upfront prices**".[13] The best mix can, in turn, be interpreted as the best ratio between benefit (utility/return) and cost, or VfM = *f* (cost/benefit). More specifically, benefits comprise largely front-line/user utility and given a whole-of-life concern, costs include both production costs (design, construction, operations and maintenance, DCOM costs) and transaction costs. In turn, transaction costs comprise both internal management costs to the buyer (in this case, government) and more tangible external transaction costs.[14]

The pursuit of VfM through the procurement of new infrastructure demands the deployment of state-of-the-art economic theory. However, such an approach has so far been overlooked by government agencies around the world. In particular, a substantial body of empirically tested and Nobel Prize-winning economic theory on procurement that draws on the New Institutional Economics (NIE) can be deployed to optimise VfM. Illustration 3 depicts this potential (bottom row), as opposed to current practice (top boxes).

The key point of difference for the new approach based on economic theory is the early identification of design, construction, operations and maintenance activity from an economic, rather than technical, perspective. Given the appreciable information gap at the schematic design stage, this approach facilitates a far more appropriate level of risk analysis; that is,

Illustration 3
Current practice (top boxes) versus new approach (bottom boxes)



the identification of economic activity within the project (government versus market specialisation), the assessment of each item of economic activity (using a novel integration of NIE theories and resource-based theory), and the analysis of bundles of activity (through a set of optimising procedures) avoid guesswork at this early stage of project design and allows for a meaningful allocation of risk.

Moreover, this approach is wholly scientific in that the procurement decision is informed by the upstream project attributes, including the unique buyer-supplier environment surrounding the project, rather than by downstream outcomes at the end of construction/start of operations. In other words, the analysis runs from cause to effect and cause, or the procurement mode is expressed in different terms from the effect, which is VfM or cost/benefit ratio.

The project has developed a procurement decision-making model based on this new approach that applies relevant economic theory to procurement. Illustrations 4 and 5 depict the key analytical tasks in this model.

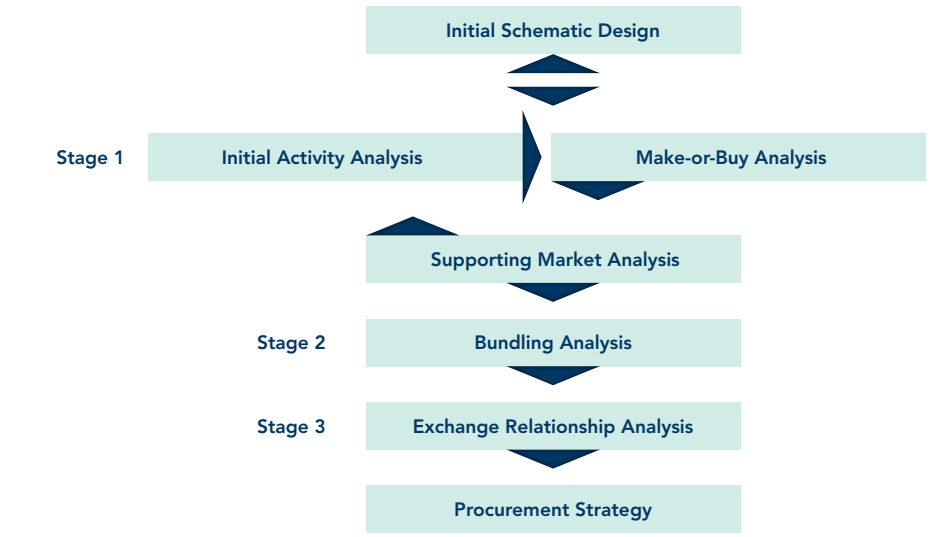
The model develops a procurement strategy based on identifying and sizing externalised activity, optimising and sizing bundles of this externalised activity, and choosing the most efficient type of contract to use with each bundle. More fundamentally, the model searches for viable DCM or DCOM bundles to realise benefits of design innovation in terms of minimising whole-life costs and enhancing front-line operations.[15]

[12] *National Audit Office (2004). Improving procurement: Progress by the Office of Government Commerce in improving departments' capability to procure cost-effectively. London: Office of Public Sector Information.*
[13] *HM Treasury (2008). Infrastructure procurement: Delivering long-term value. London: Office of Public Sector Information.*
[14] *PC Inquiry Report (May, 2014, p. 70). The PC recognise the key role of economic efficiency including competition in defining VfM.*
[15] *PC Inquiry Report (May, 2014, p. 26 and p.64). The new model is consistent with the PC's mention that allocating risks to the entity best able to manage them and that this depends on the project. The new model would more reliability allocate risks to the party best able to manage these risks. The new model would also deliver the right sizing and which corresponds to the PC comment concerning substantial dividends from scoping.*

The new (first-order) procurement decision-making model was tested on four major projects: two health projects and two road projects. For theorectical reasons, projects at either end of the EoI scale (Illustration 2) were chosen, a health project with 15 EoI (Health Case #2) and a road project with 2 EoI (Road Case #2). The other health project (Health Case #1) and road project (Road Case #1) were selected at random from projects within the band of 5-8 EoI. The new (first-order) procurement decision-making model closely matched the actual procurement strategy in two of the case studies, Health Case #1 (a PPP project with 5 EoI) and Road Case #1 (a Construct Only road project with 8 EoI). However, the new model generated an appreciably different procurement strategy from that actually used in Health Case #2 (a Managing Contractor project with 15 EoI) and in Road Case #2 (an Alliance project with 2 EoI). Some of the key lessons from these cases are highlighted in Illustration 6.[16]

Illustration 4

Schematic of new procurement decision-making model



[16] *PC Inquiry Report (May, 2014, p. 43 and p.44). The results from Health Case #1 and #2 are not consistent with the PC Recommendation #12.4 on the need to trial the early contractor involvement model. Indeed, there seems to be some tension between this recommendation and the PC Recommendations #12.1 and #12.5 concerning government investing more time and resources (including concept designs using Building Information Modelling) in the initial concept design specifications that allow contestability not just in price but also in design.*

Illustration 5

Procedure in new (first-order) procurement decision-making model

Stage 1 Initial activity analysis

The model prompts the user to first break down the project into key economic activities. That is, the user is prompted to identify key non-trivial production (design, construction, operation and maintenance) activities with distinct technology or knowledge/skill sets; i.e., activities that are of significant cost relative to the cost of the project. As a guide, the highest level of specialisation in the market is used to identify key activity or market firms whose cluster of goods/services include the activity concerned. Across the project, the scope of each activity is located and grouped.

Stage 1 Make-or-buy analysis

Each key activity is then assessed in terms of whether government or the market has superior capability or competence with respect to the activity, and whether there is the potential for hold-up arising from the activity. These questions are derived from two Nobel Prize-winning transaction cost theories and Resource-Based Theory (the dominant theory pertaining to make-or-buy analysis from the field of strategic management), and are designed as objective questions to give objective and reliable answers in pursuance of transparency (both government and industry could run the model independently).

Having answered the set of questions relating to each activity, an empirical pattern is generated. This pattern is matched with the closest theoretical pattern in the table below (that reflects a novel integration of the three theories) to indicate whether the activity is internalised or procured as part of a network (internalised and/or externalised) or externalised as part of the project, based on the economic rationale associated with the pattern.

Pattern	Logic	Make-or-Buy
Pattern 1	Production and/or Organisational Capability	Internal
Pattern 2	Production Competence	Internal or Network
Pattern 3	Organisational Competence	Internal or Network
Pattern 4	Hold-up / Transactional Competence	Internal
Pattern 5	Hold-up / Transactional Competence	External
Pattern 6	Organisational Competence	External
Pattern 7	Production Competence	External
Pattern 8	Production and/or Organisational Capability	External

Stage 1 Supporting market analysis

A brief secondary data analysis of the market structure surrounding each activity assigned to one of the four patterns concerning externalisation, is undertaken (5; 6; 7; and 8). These patterns correspond with particular market structures, from perfect competition with a high level of price competition (Pattern 6), to market structures with much less price competition, such as oligopoly/duopoly/monopoly (Pattern 8). Hence, this analysis provides a check against the initial patterns arising from the previous analysis.

The model then prompts the user to consider any Pattern 8 activities arising out of the scale of the activity's work in the project, and guides the user to break down the activity concerned into two or more sub-activities. This is in order to avoid a lack of competition created by an unduly powerful market firm (e.g., a subcontractor) as part of supply chain managed by a different upstream market firm (e.g., a main contractor). Hence, this analysis possibly iterates back to activity analysis, and then to make-or-buy analysis, until any Pattern 8 activities arising out of scale have been filtered out before moving to the next stage.

Stage 2 Bundling analysis

In this analysis, the model prompts the user to consider any potentially troublesome activities that will lead to government becoming vulnerable, and to market firms becoming too powerful post-contract; i.e., a Pattern 5 activity (hold-up arising out of high asset specificity and uncertainty).

The model also guides the user to consider any residual Pattern 8 activities that remain because of rare technology (notwithstanding their scale), and which are likely to lead to a lack of competition and market power to set prices pre-contract, and again hold-up problems post-contract. More specifically, the model prompts the user to consider:

» Whether any potential opportunistic behavior by market firms associated with these troublesome activities can be checked by the firm being engaged at the head of the supply chain/contract that includes these activities (e.g., a main contractor that is coordinating/subcontracting these troublesome activities could use the threat of future work to address any potential negative opportunistic behaviour).

If this is unlikely, then the model prompts the user to consider either:

› A special tri-lateral relationship with the firms providing these troublesome activities through the firm being engaged at the head of the supply chain that includes these activities (e.g., use of Prime Cost Sum and a nominated subcontractor/ supplier arrangement, which then drops down into the next analysis concerning the exchange relationship) or

› A separate contract between the government and the market firm providing the troublesome activities (i.e., exclude these activities from any subsequent bundle).

The model then guides the user to bundle the remaining key activities into the main activities of:

» Design

» Construction

» Operations and

» Maintenance

Again, the model prompts the user to attempt to break down each main activity if its size and/or complexity leads to a Pattern 8 activity.

From here, the user is able to identify any potential major activities. That is, bundle(s) of DCO main activities, DCM main activities, or DCOM main activities that can be market sounded as PPP(s) or otherwise via contract(s). If this market sounding is not successful, then the default is: a separate D and/or C main activity (with either Construct Only or Design and Construct, with the performance specification given in whole-life terms); a separate O main activity; and a separate M activity organised by government (either directly and/or using market firm (e.g., Project Management consultant).

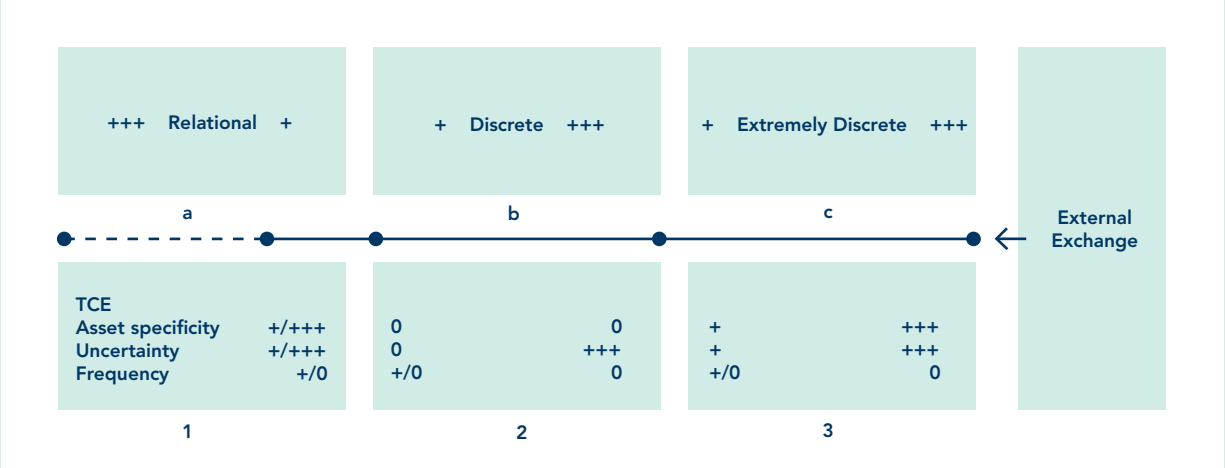
In other words, and in terms of the key mechanism being deployed to realise the benefits of the integration of Operations and Maintenance with Design and Construction in pursuance of increased benefits and lower whole-life costs, the model considers that private finance holds the greatest high power incentive, followed by contract. If the market is not responding positively to the use of these

mechanisms, then bureaucracy is used to perform the integrating role. The outcome of this stage comprises the delineation of multiple bundles of key activities and/or main activities, and/or major activities, to form the basis of one or more contracts to deliver the project.

Stage 3 Exchange Relationship Analysis

Finally, the model guides the user to consider crafting an efficient exchange between the buyer (government) and each firm or counterparty in the contract/s identified in the previous stage. To do this, the model combines the strengths of both TCE and Principal Agent Theory (PAT). That is, efficient governance in the exchange seeks to pre-empt vulnerability in an exchange, and negative opportunistic behaviour or hold-up – in this case, by the supplier. At the same time, it seeks to encourage positive behaviour through incentives that help align the interests of the principal (in this case, government) and the agent (in this case, the counterparty in each contract). In this way, both approaches reduce external transaction costs; that is, hold-up costs, as well as monitoring and shirking costs. Additionally, PAT concerns the development of an exchange that increases benefits beyond reducing costs.

In the first step in this stage, TCE is deployed by the model by prompting the user to answer a set of questions about each contract. Again, this generates a pattern that broadly steers the exchange in each contract towards an arms-length exchange (that is, a discrete exchange) or a relational exchange, as shown below.



On the continuum between relational exchange and discrete exchange, the model then prompts the user to make connections with three broad categories of contract expressed in PAT terms, as shown below.

Behaviour-based	Hybrid (Outcome-based and Behaviour-based)	Outcome-based
» Cost-plus » Low power incentive » Principal's risk to completion » Agency cost › specifying behaviour › monitoring behaviour › outcome uncertainty › very complex project › less goal alignment	» Target outturn costs/guaranteed construction sum linked with gain share/pain share regime » Risks balanced between agent and principal » Suitable for outcome uncertainty	» Fixed-price » High power incentive » Agent's risk to completion » Agency costs › specifying outcomes › verifying outcomes › risk premium › suitable for information asymmetry › outcome certainty › better goal alignment

The solid part of the line in the external exchange figure in this stage can be connected to contracts that are somewhere between Hybrid contracts (to the left of the solid line) and outcome-based contracts (to the right of the solid line). The further the contract has been located to the right of the solid line, the more it incorporates information asymmetry and favours the supplier (in terms of the lack of knowledge the government has to bring to the exchange collaboration) and, therefore, the greater the power held by the supplier. Thus, a greater level of credible threat is necessary to pre-empt hold-up. At the same time, however, such threats are costly to write and are priced by the supplier. Nonetheless, this is, overall, the most efficacious approach to governance in terms of addressing the risk in the exchange.

Illustration 6

Case Studies

Case study	Road Case #1	Road Case #2	Health Case #1	Health Case #2
Sector	Road	Road	Health	Health
EoI	Optimal EoI (8 EoI)	Sub-optimal (low – 2 EoI)	Optimal (5 EoI)	Sub-optimal (high – 15EoI)
Capital value in categories	$50-100 million	$250-500 million	$250-500 million	$250-500 million
Actual procurement mode	Traditional Construct Only	Alliancing	Public Private Partnership	Managing contractor
Actual payment terms	Fixed-price lump sum	Guaranteed construction sum with pain-share/ gain-share	Fixed monthly payment	Target outturn cost with pain-share/gain-share

Health Case Studies

The new model identified a PPP approach in Health Case #2 and it is considered this would have delivered significant improvements in VfM in contrast to the Managing Contractor approach actually used. The key lessons learned across Health Case Studies #1 and #2 is the potential for operational and maintenance efficiency to be delivered through the design of high technology services through the facility's Building Management System (BMS). Hence, large hospitals with a BMS promote the bundling of DCM or DC&OM in terms of operational and maintenance benefits and therefore the use of PPPs. The other key lesson from the health case studies is the imperative to fully develop and specify user requirements in pursuance of minimising transaction costs and avoiding costly post-contract variations and at same time maximising contestability. Hence, these case studies promote the development of the articulation of the performance specification mindful of long term goals. These cases did not then necessarily promote the imperative of early contractor involvement and negotiation of the budget for the construction works. These cases did promote the involvement of the contractor at the stage at which the client agency has developed and defined their requirements. Such that a price could be established efficiency and in competition with other contractors.

Road Case Studies

The new model developed a multiple contract approach to Road Case #2 and again, it is considered this would delivered appreciable VfM improvement in contrast to the single Alliance contract approach actually used. The key lessons learned across Road Case Studies #1 and #2 is the potential to separate sections of roads that have different levels of uncertainty associated with ground conditions; proximity to adjoining existing roads; and third party works that may affect the timeline. Because of these factors in Road #2, there were sections in this project that were highly unpredictable. More precisely, uncertain ground conditions in driven tunnel work; complexity of works alongside and across existing highways, as well as cut and cover tunnel works subject to progress of rail alignment work by others. However, around 50% of the remaining sections of Road Case #2 was relatively straightforward road on grade and elevated structures. In this case, the model confirmed the efficiency of treating the procurement of operations and maintenance of this new piece of road as part of a network approach given economies of scale and learning economies; along with marginal cost associated with an emergency response. As such, there was no viable DCM or DCO or DCOM bundle and the new model then developed four contracts, comprising:

- Contract #1: Design of the driven tunnel including fire safety design using a bespoke consultancy agreement with credible threats for non-performance;
- Contract #2: Design of the remaining part of project using a standard consultancy agreement;
- Contract #3: Construction of the tunnels both cut and cover and driven tunnel using a bespoke agreement including pain share/gain share regime; and
- Contract #4: Construction of the remaining part of the project using a standard construction contract.

The model also noted that subject to competitive bidding, Contract #1 and #2 could have been awarded to the same consultancy but as separate contracts/agreements and similarly subject to competitive bidding, Contract #3 and #4 could have been awarded to the same contractor but again with separate contracts /agreements. As an alternative to a separate design Contract #2 and separate construction Contract #4, these contracts could have been combined into a Design and Construct approach (with whole-life performance specifications) again with standard contract. However, the extremely specialist nature of design in Contract #1 (a Pattern 8 activity) indicated that it would be more efficient for government to directly engage the consultant concerned to monitor progress directly and avoid potential-hold being compounded and worsened as part of a Design and Construct approach. The model would also have seen the contractor in Contract #3 displaying flexibility in the works and timing at the junctions of the different sections of road between Contract #3 and Contract #4.

Experiential, theoretical and empirical support for the reliability and validity of the new (first-order) procurement decision-making model justifies acceptance of its outcomes including improved VfM outcomes for Health Case #2 and Road Case #2. In terms of experiential support, the new model is able to determine the suitability or otherwise of PPPs in delivering superior VfM by optimising the size of the contract/s, the level of bundling, and the exchange relationship/s in order to ensure sufficient construction competition and minimise the likelihood of costly post-contract variations.

Achieving optimal competition and minimising the risks of costly variations is critical in determining the suitability of PPPs. For example, the House of Lords (2010), while investigating the efficacy of PPPs in the UK (which has undertaken more PPPs than anywhere else in the world) concluded that size of contract and predictability of events within the PPP long-term contract are key drivers in delivering VfM within PPPs. However, these two factors can also be disadvantageous; therefore, the House of Lords recommends that PPP projects should not be too large (to avoid insufficient competition), and be capable of being clearly performance-specified (to avoid too much uncertainty in the long-term contract). In order words, market failure pre-contract due to a small number of bidders and market failure post-contract arising out the monopoly supply need to be avoided as part of the basis of a suitable PPP project.[17]

In terms of theoretical support, all of the theories used in the model are well established and empirically tested in mainstream economics and management. In particular, the integration of the theories to develop the questions that establish internalisation or externalisation of the activity in Stage 1 in the model deploys a novel integration of Nobel-prize winning economic theory. This novel integration has been published in a top-tier construction journal (Bridge & Tisdell, 2004), and is described as "ingenious" by Prof Michael Ball of The University of Reading (UK). In one of world's leading management journals, it is also cited as being part of the work that is leading the development of the integration of theory of the firm on construction activity (Brahm &Tarziján, 2014).[18]

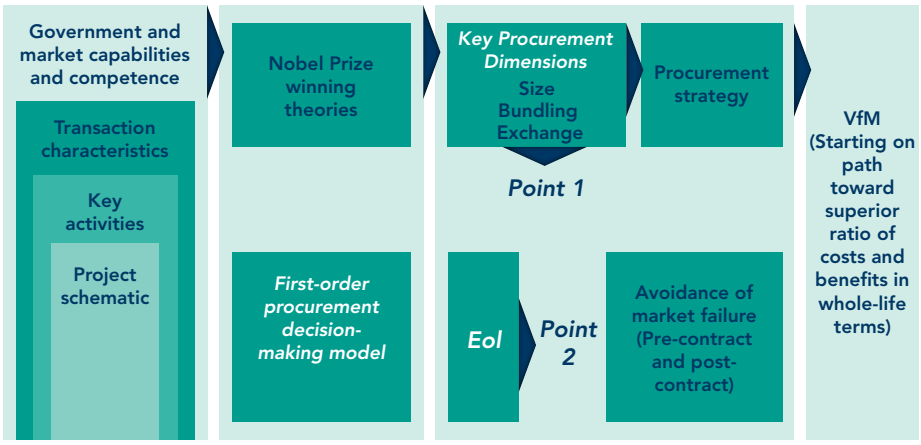
The approach to establishing the reliability and validity of the new model is shown in Illustration 7. In terms of reliability (Point 1 in Illustration 7), the survey of major road and health projects shows that a statistically significant relationship exists between EoI and:

- Size or project value;
- Bundling; and
- Exchange relationship (payment terms).

The representative sample of 87 projects comprised approximately equal numbers of projects before the GFC (42 projects) and after the GFC (45 projects). Given the extreme and rare conditions either side of the GFC, this provides strong evidence that these relationships are highly likely to endure in the long term.

Illustration 7

Establishing the reliability and validity of the new model



[17] House of Lords. (2010). Private finance projects and off-balance sheet debt: 1st report of Session 2009-10. Select Committee on Economic Affairs.
[18] Bridge, A.J. and Tisdell, C. (2004). The determinants of the vertical boundaries of the construction firm. Construction Management and Economics, 22(8), 807-825.; Ball, M. 2007. Markets and institutions in real estate and construction. New York; Wiley-Blackwell; Brahm, F. & Tarziján, J. (2014). Transactional hazards, institutional change, and capabilities: Integrating the theories of the firm. Strategic Management Journal, 35, 224-245.

In terms of validity, high EoI or the equivalent of open tender (over 8) has been empirically shown in extensive studies in both the civil and building sectors to yield little production improvement in terms of lower prices and inferred incentives for design innovations (Gupta, 2002; Skitmore, 2002). At the same time, high EoI can indicate the prospect of market failure post-contract, due to potential negative opportunistic behaviour as a result of a lack of flexibility associated with costly variations (Sweeney, 2009; Williamson, 1985).[19]

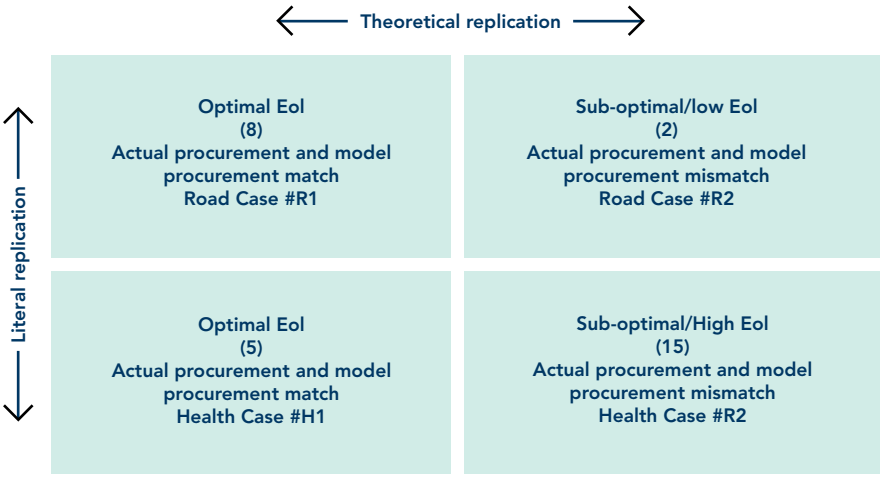
On the other hand, low EoI (4 or less) is not sufficient to avoid oligopoly pricing constraints and resultant ineffective competition (Beattie, Goodacre, & Fearnley, 2003; Selten, 1973). It can indicate market failure pre-contract, including failure as a result of the issue of size.[20] For these reasons, 5-8 (inclusive) EoI is derived as an optimal level of potential competition consistent with VfM. As such, the hypothesis for Objective #1 was stated as follows:

» Actual competition is expected to be in the optimum range of competition (5 to 8 EoI) in cases in which actual procurement matches the theoretical procurement (informed by the first-order procurement decision-making model) and outside the optimum range in cases where there is an appreciable mismatch between actual procurement and the theoretical procurement.

Illustration 8 summarises the very strong support for this hypothesis from the four case studies.

Illustration 8

Hypothesis Testing



The hypothesis is further supported by the nationwide survey of civil and building contractors, which indicates that the approach identified by the new model in Health Case #2 was likely to have seen a reduced number of EoI downwards towards the optimum 5-8 EoI band. The approach in Road Case #2, on the other hand, was likely to have seen an increase in EoI upwards towards the optimum 5-8 EoI band.

RECOMMENDATIONS AND PRACTICAL IMPLICATIONS

» It is recommended that the new (first-order) procurement decision-making model be trialled on a current project, and that a practice/user guide be developed. This guide would replace the current PPP suitability criteria/drivers and Procurement Option Analysis (POA) in Infrastructure Australia's National PPP Policy and Framework and Guidance materials, and in its various state versions (further details in section "Future Research").[21]

» On the basis of the survey of 87 major road and health projects worth $32 billion, the new model is expected to more than double the chance that the procurement approach is successful in setting the project on a path to deliver superior VfM, and in determining whether this can be achieved through a PPP or non-PPP. This figure is based on only 43% of projects in the sample that achieved EoI in the optimal 5-8 band.

» It is logical to expect that the application of the new model will see the emergence of different approaches and innovations in patterns of procurement relating to the key procurement dimensions of size, bundling and exchange relationships. This is mainly because the new model is exclusively an economic one, with a long-term orientation. For example:

[19] *Gupta, S. (2002). Competition and collusion in a government procurement auction market. Atlantic Economic Journal, 30(1), 13-25; Skitmore, M. (2002). Raftery curve construction for tender price forecasts. Construction Management and Economics, 20(1), 83-89; Sweeney, S. (2009). Addressing market failure: Using transaction cost economics to improve the construction industry's performance PhD Thesis. University of Melbourne, Department of Civil and Environmental Engineering; and Williamson, O. E. (1985). The economic institutions of capitalism: Firms, markets, relational contracting. New York, London: Free Press, Collier Macmillan.*

[20] *Beattie, V., Goodacre, A., & Fearnley, S. (2003). And then there were four: A study of UK audit market concentration — causes, consequences and the scope for market adjustment Journal of Financial Regulation and Compliance, 11(3), 250-265; and Selten, B. (1973). A simple model of imperfect competition, where 4 are few and 6 are many. International Journal of Game Theory, 2(1), 141-201.*

[21] *PC Inquiry Report (May, 2014, p.2 and p. 461): This outcome would address significantly the key point made by in the report that there is scope to improve public sector procurement practices. The PC refers to a paper by Teo et al. (2012) on the new (first-order) procurement decision-making model (please see the section on "Publications" in this report).*

- On the basis of the sectors studied, the new model is likely to apply a single-contract approach to projects between $1.5 - 2 billion. Beyond this range, the model is likely to identify innovations using a multiple-contract approach to the project delivery. For example, in Road Case #2, a multiple contract approach would deliver both collaboration and more contestability. It is also conceivable that a multiple-contract approach can include more than one PPP contract in a project.[22]
- The new model is likely to suggest increasing rationalisation of procurement across sectors. It is likely to reveal greater scope for bundling operations and maintenance with design and construction in health projects, and for the consideration of more of these projects as PPPs. It is also likely to promote the use of PPPs for road projects that are very large and complex, and where a relatively high percentage of total cost are operations and maintenance costs. The relative efficiency gains achieved by procuring road maintenance on a network basis do create a significant hurdle for the availability payment approach to a road that is relatively straightforward in its maintenance requirements. An exception could be a relatively straightforward toll road of lesser scale than the remaining network for which the PPP Company assumes the demand risk, and absorbs any relative inefficiency risks involved in delivering maintenance to that toll road. To the extent that any inefficiency arises, receipts retained by the PPP Company could offset these inefficiency costs.
- Increasing rationalisation of procurement across sectors is also likely to lead to less reliance on stereotypical procurement that tends to create incentives to minimise capital costs, and/or minimise construction, and to establish the budget in collaboration with the supplier. For example, this rationalisation might be achieved through less Managing Contractor and Early Contractor Involvement. The new model is likely to display more finesse in deploying Alliancing so that this mode is only employed with regard to the new infrastructure project/ parts of the new project if/when it can be efficient.[23]

» The model is likely to guide these changes through cost improvements and benefits derived from allowing more time for planning and design development, and for the development of performance specifications to ensure that contestability is achieved and that the market is allowed to work as efficiently as possible.[24]

» Finally, the new model will also:

- Save time and costs to both government and industry by more reliably identifying the most suitable projects to be procured using a PPP approach, and by ensuring that the extra-over work involved in a PPP – including PPP procedure beyond performance specification and reference design up to financial close – is justified.[25]
- Provide a transparent and public interest document that can be fully disclosed mainly because the assessment in the model is semi-qualitative. That is, the questions in the model are designed to objectively capture known details concerning the market and project in a reliable fashion on the answer/ response scales (that are largely not monetised except in some instances in which broad monetary catogories are used). As such, the model can supplement the Public Sector Comparator (PSC) in projects in which parts of the PSC are not published due to comercial-in-confidence concerns. It can also entirely replace the PSC in terms of what is published as justification for a PPP approach.[26]

[22] PC Inquiry Report (May, 2014, p. 30 and p. 45). This research sees government as having substantial countervailing power and the new model identifies the most efficient threshold to sub-divide the project in multiple contracts. As such, this research supports the PC's Recommendation #12.8 and mention of developing smart procurement strategies including packaging major projects into smaller parts to increase the number of bidders and project scheduling and mindful of the PC's note that it sees some uncertainty remaining on whether the concentrated structure of the market appears to inhibit competition and increase construction costs.

[23] PC Inquiry Report (May, 2014, p. 122). This research is consistent with the PC's comments concerning Alliances and in particular this research cautions against its blanket use across an entire project and the new model would determine if/which parts of the project might be best delivered in alliance mode.

[24] PC Inquiry Report (May, 2014, p. 43). This implication of the new model supports the Recommendation #12.1 concerning investing more time and resources in the initial concept decision specifications and more generally that governments should not rush to market.

[25] PC Inquiry Report (May, 2014, p. 13). The expected outcomes of the model would be consistent with the PC's comment that PPPs "are not a magic pudding" and the new model would identify the best suited PPP only.

[26] PC Inquiry Report (March, 2014, p. 36 and p. 137). A further outcome of the model that speaks to the need for reform mentioned by the PC concerns facilitating the development of greater procurement competencies though the understating and deployment of the procedures in the new model. Finally, the new model would complement the PSC and help mitigate some of the concerns the PC mentions concerning the problematic nature of developing the PSC. That is, the new model would provide a check and balance to the PSC and details arising from the deployment of the new model are able to be fully disclosed.

Illustration 9

World's largest multinational contractors and Australia's National Pre-qualification System (NPS)		
#	Country	No of firms (transportation industry revenue is greater than USD 1 billion)
1	China	9
2	Japan	6
3	Spain	6 (2 are listed as prequalified road, bridge contractor in Australia's NPS, 2012)
4	US	4 (1 was listed in Australia's NPS, 2010)
	Sub-Total (1-4)	25 (around 60% of top 50 global civil contractors)
5	France	3
6	Austria	2
7	Brazil	2
8	Germany	2
9	Greece	2
10	Italy	2 (among these 1 listed in Australia's NPS, 2012)
11	Korea	2
12	UK	2
13	India	1
14	Luxemburg	1
15	Netherland	1
16	Sweden	1
Total no. of countries		46

Objective #2 The determinants of multinational contractors' willingness to bid for Australian public sector major infrastructure projects

BACKGROUND

One of the premises for this research was the need expressed by government to attract the world's biggest construction companies to Australia in order to cut the costs of building infrastructure. Illustration 9 shows that the world's largest multinational contractors headquartered in China, Japan, Spain and USA (which collectively account for more than half of the world's largest contractors) have no or very little representation in bids for new public sector major road, bridges and tunnels in Australia through the National Prequalification System (NPS).

This situation is puzzling as comprehensive research shows that multinationals, including those from China and Japan, tend to focus and expand first in their own region and then globally (Yin & Choi 2005; Delios & Beamish, 2005).[27] Thus, public sector major roads, bridges and tunnels in Australia seem to be an unusual case in terms of multinational enterprise and foreign direct investment (FDI). The limited presence of the world's largest contractors in this sector has existed for some time and been a concern to government as a factor that contributes to high construction costs in Australia (Infrastructure Australia, 2011; Hepworth, 2010; and Cameron, 2008).[28] According to the Structure-Conduct model, which describes the power to set prices associated with monopoly/duopoly and oligopoly pricing constraints, governments may have grounds to be concerned about the relationship between small numbers of large or Tier 1 contractors in the NPS and the costs of major roads, bridge and tunnels projects in Australia.

This research does not seek to address directly the relationship between limited involvement by multinationals and prices. Rather, it aims to understand the key factors that explain multinationals' perceptions of the focal sector (public sector major roads, bridges and tunnels) and the way this affects their willingness to bid for new projects in this sector. Indirectly, this research speaks to costs of construction, but only in so far as perceptions held by foreign multinationals of the level of prices in the focal sector may affect how much they are attracted to this sector. Identifying these key factors will enable government and regulatory authorities in Australia to undertake a new approach and develop more effective measures to attract more multinational contractors, including from our region, if it is felt that more competition is in the public interest. If so, the outcomes of the research can inform government and regulatory authorities in deciding where to focus their efforts and reform, and whether this includes a focus on upstream impact on costs of doing business in this sector in Australia, in so far these costs are affected by government and the institutional environment in Australia.

[27] *Yin, E., & Choi, C. J. (2005). The globalization myth: The case of China. MIR: Management International Review, 103-120; and Delios, A., & Beamish, P. W. (2005). Regional and global strategies of Japanese firms. Management International Review, 19-36.*

[28] *Infrastructure Australia. (2011). Communicating the imperative for action. A report to the Australian Government. Retrieved from Australian Government Infrastructure Australia website www.infrastructureaustralia.gov.au /2011_coag/files/2011_Report_to_COAG.pdf; Hepworth, A. (2010). Costs threaten to stymie infrastructure projects. Australian Financial Review. Retrieved from http://global.factiva.com.ezp01.library.qut. edu.au/ha/default. aspx; and Cameron (2008). High bidding costs – not competition – blamed for building woes. Australian. April 18.*

A NEW APPROACH

FDI forms the fundamental context for this research. Dunning's "OLI" theory is the dominant theory for explaining FDI, which is at the core of multinational enterprise and international business (Dunning, 1973; Dunning & Lundan 2008a; 2008b).[29] Here, the "O" represents resources and sources of competitive advantages owned by the firm (or *Why* multinational contracting); "L" depicts perceptions of costs and returns derived as a function of the home and host locations across which multinational enterprise is conducted (or *Where* multinational contracting); and "I' represents the decision the multinational firm makes to either export, licence or set-up business in the host country (or *How* multinational contracting). Despite the dominance of OLI theory, only six empirical studies (between 1987 and 2006) have attempted to deploy OLI theory to explain multinational contracting. All of these have investigated outbound FDI and none have concerned Australia. Moreover, these studies have not used the economic theories advocated by Dunning in measuring the OLI factors and have not fully accounted for the unique characteristics of construction, including location-specific matters associated with clients, local procedures and practices, and local supply chains, mainly because these studies have all been outbound studies and not fixed the host location. In contrast, this research deploys the economic theories recommended by Dunning, and is an inbound FDI study that fixes the host location (Australia) and a number of home countries (China, Japan, Spain, and US) with regard to FDI into the focal sector in Australia. In this sense, the study is a new approach and a world first in developing Dunning's OLI theory to explain multinational contracting, including the unique characteristics of construction activity.

Illustration 10

Theory on multinational contracting

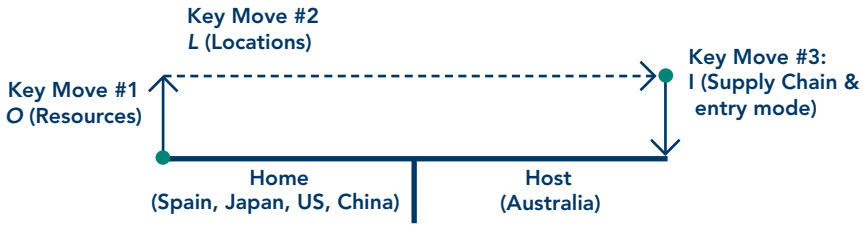
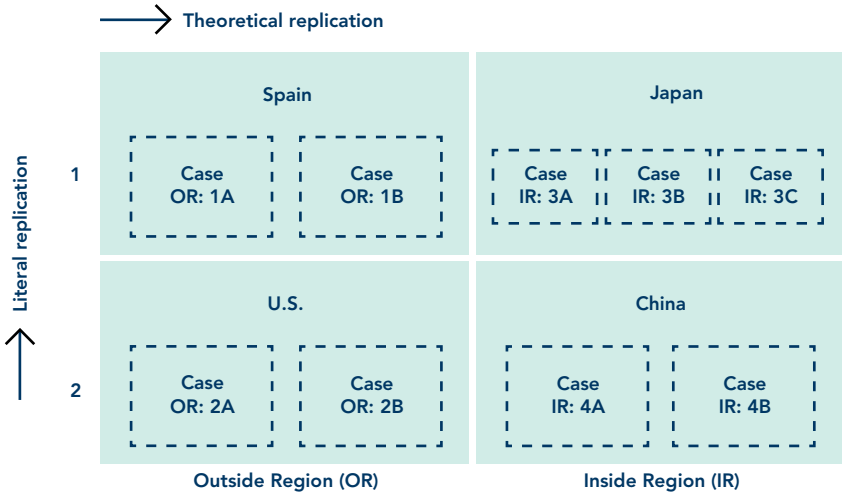


Illustration 11

Case study design for generalisability



The approach taken in the research was to translate the OLI factors into three key moves for the multinational contractor as shown in Illustration 10.

In order to measure the effect of each factor in each key move on bidding for a new project, a wide range of primary data from seven local contractors and nine of the world's largest multinational contractors, along with secondary data was collected.

The generalisability of the findings was achieved by choosing a multiple case study method that represents strong analytical generalisation (theoretical and literal replication) as shown in Illustration 11.

The selection of the cases first focused on FDI, and identified two pairs of contrasting countries from the four countries representing the greatest proportion of multinational contractors across the globe. Spain and the US was selected as one pair, with a known relatively high level of FDI into the Australian road, bridge and tunnel sector (across both public and private sectors, including mining); in contrast, Japan and China was selected as an opposing pair, with much less FDI in roads, bridges and tunnels in Australia (in terms of separate bidding entities). A further dimension of contrast in these pairs is their geographical contrast. The actual Tier 1 multinational contractors studied to represent each home country, as well as host country contractors studied, were all selected at random.

[29] *Dunning, J. H. (1973). The determinants of international production. Oxford Economic Papers, 25(3), 289-336; Dunning, J. H., & Lundan, S. M. (2008a). Institutions and the OLI paradigm of the multinational enterprise. Asia Pacific Journal of Management, 25(4), 573-593; and Dunning, J. H., & Lundan, S. M. (2008b). Multinational enterprises and the global economy (2nd ed.). London: Edward Elgar Publishing.*

The "O" factor

The "O" factor represents the *Why* in multinational enterprise. It mainly describes tangible assets owned by the multinational contractor that are not appreciably affected (neither enhanced nor diminished) by the location of the host country. As such, various systems across environmental management, community management, quality management, and health and safety management are excluded in the analysis of this factor and incorporated into the analysis of the "L" factor. That is, high standards in these systems in a home country could be a disadvantage in a host country with low standards, and vice versa.

A range of key resources was identified from the NPS, and an extensive analysis of multinational contractors' websites was undertaken. A standardised scale was derived from answers given by the three tiers of local contractors to questions concerning key resources, and was analysed by the use of radar-type mapping. This was then used to compare the answers from the nine case study Tier 1 multinational contractors from China, Spain, Japan and US. In brief, the home contractors were essentially self-assessing/estimating advantages on some resources and, at same time, the local contractors (largely the Tier-1 local contractors) were self-assessing/estimating advantages on some of the other resources.

The important point in the context of this research is not that these comparisons indicate the superiority of home over host contractors, or vice versa. Rather, this finding supports the view that the home contractors consider that they are more capable than Tier 2 and Tier 3 local contractors in the focal sector in the host market on projects exceeding $50 million and as well being at least as competitive (both resource advantages and disadvantages) with Tier 1 local contractors in projects exceeding $150 million, again in the focal sector in the host market. Hence, it was found that it is not the "O" factor/perceptions of relative capability that is the key determinant of these home contractors' willingness to bid for project in the focal sector in Australia.

In addition to this primary data, a wide range of secondary data was analysed to assess how much it corroborates this finding on the "O" factor. Secondary data comprised: 1) industry-related publications concerning firm-specific advantages lying directly behind the scores on the resources in the radar maps; and 2) data from Business Monitor International, Euromoney Country Risk, the OECD's Country Statistical Profile, and the World Economic Forum's Global Competitiveness Report. These data were used to construct a Porter's diamond model for each of the four home countries and to assess country-specific advantages that underpin firm-specific advantage. It was found that both these layers of the secondary data strongly corroborate the primary data on the "O" factor.

The "L" factor

The "L" depicts the *Where* in multinational enterprise. A favourable foreign location is required by the multinational contractor in order to successfully mobilise the tangible assets represented by "O" factor resources. There are two key dimensions that combine to explain a favourable location: risk and return. Risk is assumed in relation to all competing host countries; return is considered in relation to all competing host countries and is also mindful of returns in the home country. Risk is affected by the level of congruence or cultural distance between the institutional environment of the home and host countries, given that firms represent an imprint of their country in terms of management decision-taking, attitudes and behavioural norms. This is particularly manifest in systems across environmental management, community management, quality management, and health and safety management.

The greater the cultural distance, the greater the requirement for the multinational contractor to make location-specific investments or adaption costs, and vice versa. Co-joined with initial set-up costs, the costs of doing business and delivering new projects in the host country are affected by the host country's institutional environment, procurement policies and practices, and project compliance requirements. Collectively, set-up and delivery/compliance costs are manifest in a range of transaction-related requirements and systems across environmental management, community management, quality management, and health and safety management; in the other words, administrative distance. Costs arising from cultural and administrative distance and their risks are then compounded by spatial/geographic distance and economic distance and uncertainties, including trade across borders. Finally, the perception of the overall magnitude of costs is moderated by the extent to which there is confidence in a pipeline of projects that might justify these set-up and delivery/compliance costs, along with confidence in the tendering process.

Risk is only one side of the coin. To complete the picture of a favourable perception of a foreign location, requires consideration of industry sector returns/profits (based on the structure-conduct-performance of the focal sector in the host location) and assessment of future economic threats to profits in the focal sector in the host location.

As is the case with the "O" factor, a mix of primary data (from the international case studies) and secondary data was used to assess the "L" factor. In terms of risk, Illustration 12 gives a summary of the cultural, administrative, geographic (adjusted from a study of the multinationals that had already established a presence in Australia) and economic distances, and the uncertainty developed, with reference to a range of secondary data and models (including Hofstede's cultural model; the Corruption Perception Index; Euromonitor International; Transparency International; World Bank; IBIS World Australia; Euromonitor Country Ratings).

Primary data from the case studies was used to establish the frequency element in the risk dimension. The Spanish contractors felt they should have a good chance of winning new contracts, as did the US; however, both Japanese and Chinese multinationals studied felt that due to client processes, they had less chance. Some contractors also expressed concern about barriers to entry arising from the process of tendering, in particular the Australian Government Building Construction OHS Accreditation Scheme, and the reliability of published pipelines.[30]

Primary data on administration barriers to entry into Australia showed a strong association between these barriers and culture, and demonstrated the range of transaction costs generated by the institutional environment and procurement policy and practice in Australia, as shown in Illustration 13. This finding on transaction costs corroborates the secondary data on the administrative distance element data (see "Admin" in the second column, Illustration 12).[31]

Illustration 14 summarises primary data on the perceptions of risk in Australia compared with other developed countries and developing countries.

Illustration 12

L factor: Risk elements (secondary data)					
Home Country	Risks based on home-host (Australia) induced distances				
	Culture	Admin	Geography	Economy	Uncertainty
Spain	Low	Mod	Low (adj.)	Low	Moderate
US	Low	Low	Low (adj.)	High	Moderate
Japan	Mod-High	Mod-High	Low	Mod	Moderate
China	High	High	Low	High	Moderate

[30] PC Inquiry Report (May, 2014, p. 27). The PC indicated the potential of shortlisting to select a contractor that does not give best VfM in terms of the way tenderers are shortlisted (and their number) and that it is important that shortlisting does not focus excessively on local experience. The views from some of the multinational contractors support at least the intent in PC Recommendation #15.1 concerning changes to the Australian Government Building and Construction OHS Accreditation Scheme.

[31] PC Inquiry Report (May, 2014, p.26). This data (Item g in Illustration 13) supports the PC comment that bidding costs are high and more generally that Australia's transaction costs are high.

Illustration 13

L factor: Administrative element (primary data)					
Administrative distance	Analysed average scores (entry)				Mean
	Spain	US	Japan	China	
a. Australia's National Prequalification System	2	5	5	1	3.25
b. Level of complexity in administration of projects	3	5	2	1	2.75
c. Level of legislation	4	4	4	1	3.25
d. Difference across different state jurisdictions in Australia	5	5	3	1	3.5
e. Australia's industrial relations	4	2	1	1	2
f. Australia's taxation system	7	3	3	1	3.5
g. Expectations of Australian government sector client	4	4	3	1	3
h. Risk allocation in complex road and bridge projects	6	5	2	2	3.75
i. Lack of large/comparable local contractors to partner with a new foreign entrant	4	4	3	5	4
j. Lack of subcontractors	5	4	2	3	3.5
k. Environmental management requirements	6	5	6	1	4.5
l. Community management requirements	6	4	3	1	3.5
m. Quality management requirements	6	6	7	1	5
n. Health and safety requirements	4	3	7	1	3.75

Legend: Scale 1 to 7; where

- 1 represents extremely high effect on entry
- 2 represents very high effect on entry
- 3 represents high effect on entry
- 4 represents moderate effect on entry
- 5 represents low effect on entry
- 6 represents very low effect on entry
- 7 represents extremely low effect on entry

To examine perceptions of return, Porter's Five Forces model (level of internal rivalry, barriers to entry, substitutes and complements, buyer power, and supplier power) was deployed, using both primary data and secondary data (sourced largely from industry-related publications) to assess threats to profits in both the home countries and in Australia. In general, both the Spanish and US contractors perceived moderate to high threats to profits in their home market, but low to moderate threats to profits in Australia. Conversely, Japanese and Chinese contractors perceived low threats to profit in their home country, and moderate to high threats to profits in Australia (with client/buyer power featuring as a strong threat to profits). This finding was again supported by secondary data.

Illustration 15 summarises primary data on the perceptions of returns in Australia compared with other developed countries and developing countries.

As mentioned previously, the "L" factor is the function of risk and return. Illustration 16 summarises primary data on perceptions of the relative size of risk and return in Australia, again compared with other developed countries and developing countries.

Illustration 14

L factor: Summary of risk (primary data)	
Home country	**Risk in Australia**
Spain	vs Developed Countries: Moderate vs Developing Countries: Moderate
US	vs Developed Countries: Moderate vs Developing Countries: Low
Japan	vs Developed Countries: High vs Developing Countries: Extremely High
China	vs Developed Countries: High vs Developing Countries: Extremely High

Illustration 15

L factor: Summary of return (primary data)	
Home country	**Return in Australia**
Spain	vs Developed Countries: Extremely High vs Developing Countries: Very High
US	vs Developed Countries: Very High vs Developing Countries: Very High
Japan	vs Developed Countries: Low vs Developing Countries: Low
China	vs Developed Countries: Moderate vs Developing Countries: Very Low

The "I" factor

The "I" factor depicts the How in multinational enterprise. All nine multinational-contractor case studies confirmed emphatically that export or licensing of their core service was impractical, given that location-specific considerations – and, therefore, a physical presence and FDI – are required to bid for a new project in a foreign location. All case study contractors advised, to varying degrees, that local subcontractors and suppliers need to be harnessed in order to win contracts and deliver projects profitability.

Illustration 17 summarises the primary data on perceptions of the local supply chain and whether it is considered as an advantage or a disadvantage. This data was again interesting, as only the US case study contractors saw their mobilisation of the local supply chain as an advantage. Thus, it was found that the "I" factor/perceptions of the local supply chain is not the key determinant of the home contractors' willingness to bid for projects in the focal sector in Australia.

Illustration 18 matches the results of the assessment of the OLI factors to primary data on Australia's attractiveness to each of the multinational contractors, compared with the attractiveness of other developed countries and developing countries.

Illustration 16

L factor: Summary of risk and return (primary data)			
Case Study Multinational Contractors	Return vs. Risk in Australia relative to developed countries	Return vs. Risk in Australia relative to developing countries	L Factor
Spain (Case 1A)	Return > Risk	Return > Risk	Favourable
Spain (Case 1B)	Return > Risk	Return > Risk	Favourable
US (Case 2A)	Return > Risk	Return > Risk	Favourable
US (Case 2B)	Return > Risk	Return > Risk	Favourable
Japan (Case 3A)	Return < Risk	Return < Risk	Unfavourable
Japan (Case 3B)	Return < Risk	Return < Risk	Unfavourable
Japan (Case 3C)	Return < Risk	Return < Risk	Unfavourable
China (Case 4A)	Return = Risk	Return < Risk	Unfavourable
China (Case 4B)	Return = Risk	Return < Risk	Unfavourable

Illustration 17

I factor: Summary (primary data)		
Home country	I Factor Australia relative to developed countries	I Factor Australia relative to developing countries
Spain	Disadvantage	Disadvantage
US	High advantage	Advantage
Japan	Disadvantage	High disadvantage
China	Moderate	Extreme disadvantage

Illustration 18

Summary results					
Home country	O Factor (Resources)	L Factor (Location)	I Factor (Supply Chain)	Australia vs. Developed Countries	Australia vs. Developing Countries
	'Why'	'Where'	'How'	Attractiveness	Attractiveness
Spain	Advantages & Disadvantages	Favourable	Disadvantage	Very Attractive	Very Attractive
US	Advantages & Disadvantages	Favourable	Advantage	Very Attractive	Very Attractive
Japan	Advantages & Disadvantages	Unfavourable	Disadvantage	Unattractive	Very Unattractive
China	Advantages & Disadvantages	Unfavourable	Disadvantage	Neutral	Extremely Unattractive

The summary in Illustration 18 shows that the only factor that matches perceptions of attractiveness is the "L" factor. The "O" factor mismatches attractiveness in the Japanese and Chinese cases, and the "I" factor mismatches in the case of Spain.

In total, the extensive data in this research establishes very clearly that the attractiveness of the focal sector is explained neither by perceptions of differences in capability of home country and local contractors, nor by the local behaviour of rivals and the supply chain in the local market. The strong message from this research is, therefore, that the Location ("L") factor is the key determinant of attractiveness, which is expressed in terms of perceptions of risk and return.

More fundamentally, although this research does not seek to address directly the relationship between the current market conditions and possibly high prices in the sector, the structure-conduct-performance of the local market is creating perceptions of reletively high returns, at least for the Spanish and US contractors studied and, therefore, contributing to attracting these firms. On the other hand, the Japanese and Chinese multinational contractors studied see returns as unfavourable and outweighed by risk.

PRACTICAL IMPLICATIONS AND RECOMMENDATIONS

- Illustration 13 shows that the local market (items i and j) only represents a moderate barrier to entry. Instead, the majority of relevant items and the key area for reform lies within the realm of the governance of projects, including procurement procedures and some institutional and federal-level issues.[32]
- Clear differences in perceptions of the focal sector in Australia arise between countries of different cultures, as demonstrated by the columns in Illustration 13. These columns show a much greater incidence of darkest spots in Japan's column and in all items in China's column, with the exception of two items concerning local contractors and subcontractors.[33]
- On the basis that government considers that a thin local market is contributing to high prices, and that it is in the public interest to attract new entrants and more competition, it is recommended that items a through h, and k through n in Illustration 13 are the subject of investigation, with a view to reform. Attention would also need to be paid to increasing confidence in published pipelines.
- If government wishes to attract and sustain new entrants from our region (including Japan and China) to the NPS, these reform efforts would need to be intensified in conjunction with reforms to improve perceptions of return, without necessarily increasing prices. For example, government could explore ways to ensure that any perceptions of bias (albeit subconscious and inadvertent) are avoided, and look at ways of avoiding perceptions that governments are a threat to profits. For example, Livesey & Bold, (2013) suggest a number of steps including changes to the EoI criteria and equal exposure to potential international and local bidders and structuring the project team with broad international experience.[34]

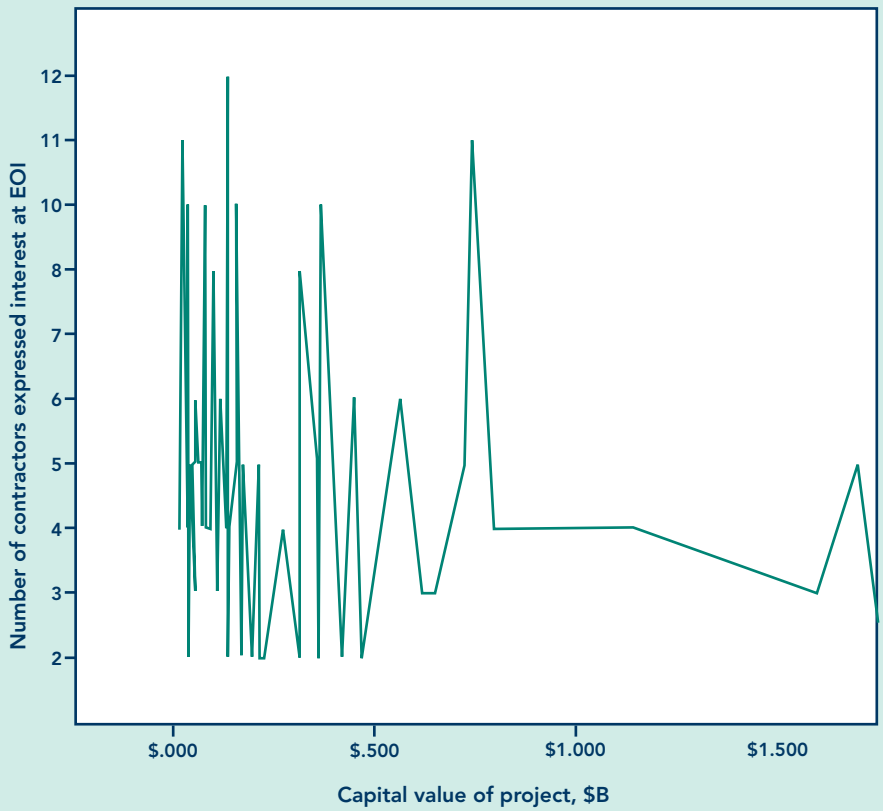
[32] PC Inquiry Report (May, 2014, p.2). This outcome speaks to the PC comment on the "workably competitive" nature of the market. The evidence in this research is that the market could be appreciably improved and opened-up further to new entrants subject to actions by government on procurement; tendering policy and practice and governance of projects.

[33] PC Inquiry Report (May, 2014, p.30 and p.428). Again, this outcome speaks to the PC comment on low-level barriers to new firms entering the market. The evidence in this research is that barriers arising from economies of scale are not the significant issue (the "O" factor results shows that multinational contractors have capabilities arising from scale elsewhere) and is consistent with the PC's comment on many international firms with significantly larger balance sheets than the major Australian firms. This research supports the PC's indication that barriers arise from transaction costs including government regulation. More than this, however, this research observes significant barriers arising from the administrative items in illustration 13 (items a through h, and k through n) along with a lack of confidence in pipelines and concerns on the part of government in the process of tendering.

[34] PC Inquiry Report (May, 2014, p.433): The PC's comments that "agencies often face incentives to take risk-averse approaches to contract selection and project delivery, which may favour the main players with established track record and relationship with the agency". Livesey, P. and Bold, J. (2013). Overcoming inadvertent barriers to entry in large infrastructure projects, Australian Journal of Construction Economics and Building.

Illustration 19

EOI in major health and road projects (2005-2010)



CONNECTING OUTCOMES FROM OBJECTIVE #1 AND OBJECTIVE #2

In relation to approaching mega projects, there is an important connection between Objective #1 and Objective #2 outcomes. One approach is via a single contract for mega projects, an approach that speculates on the possibility of attracting new entrants. However, this approach could have a number of disadvantages, including insufficient expressions of interest, oligopoly pricing constraints, interrelated consortia, short-term or project-specific new entrants in a consortium, and the need for government concessions to mitigate perceptions of risk and improve perceptions of return. All of these outcomes would be worsened if a number of mega projects are brought to market at around same time. This single-contract approach is also more likely to generate a win-lose outcome: that is, local contractors winning at the cost of undermining long-term prospects for new entrants, or vice versa.

A different approach is to use the new procurement decision-making model developed in Objective #1 for mega projects. This model could identify multiple contracts. Indeed, Illustration 19 shows that without new entrants and changes to the prevailing market structure in (at least) roads and health, the new procurement decision-making model is likely to divide a project that exceeds the range of $1.5 billion to $2billion into multiple contracts. However, this range is likely to be restricted to projects that are genuinely technologically complex and/or present proximity constraints; for example a lengthy tunnel. Again, based on the evidence in Illustration 19, the more usual upper range for major projects delivered as a single contract would be between $500 million and $800 million. Tier 2 and Tier 3 local contractors and new entrants might well find that the substantial majority of projects between $50 million and $500 million attractive in terms of a lead or head contractor role.

Such a change would create an improved pipeline of contracts for local contractors and new entrants wishing to make Australia a long-term proposition. In this way, a win-win scenario would be created arising from more and more widely distributed contracts to deliver mega projects; this would be particularly important for PPPs. In time, by widening the base of distinct bidding entities and increasing construction capacity, the new procurement decision-making model in Objective #1 is more likely to envisage a single contract approach to mega projects.[35]

[35] *PC Inquiry Report (May, 2014, p. 30 and p. 45). This is consistent with the PC's comments on governments packaging major projects into smaller parts to increase the number of potential bidders; and also consistent Recommendation #12.8.*

As another important connection between these objectives, the model is likely to guide changes to procurement on the basis of cost improvements, and benefits derived from the availability of more time for planning and design development. In particular, the model would promote the development of performance specifications to ensure that contestability is achieved, and that the market is allowed to work as efficiently as possible in providing a fixed price in the interests of whole-life VfM. This invaluable groundwork before going to the market will reduce risks for international contractors and help clarify government expectations.

Finance Theme

Objective #3 Risk and return behaviour of Australian PPPs (bonds and listed equities) and the cost of capital in Australian listed PPP equities

The risk and return behaviour of Australian PPP bonds

BACKGROUND

The recent introduction of the Basel III Accord in the global banking sector means that banks must maintain higher levels of liquid assets on their balance sheets in the future. As a result of the higher liquidity standards, banks are less willing to hold medium-term illiquid bank loans to PPPs on their balance sheets. Thus, the global banking sector will be a less reliable source of debt financing for PPPs in the future. One possible future solution for financing PPPs is the direct issuance of their own bonds in the marketplace. Issuance of bonds has been an important source of debt financing for a number of Australian PPPs over the last decade; however, little is known about this source of financing and there is a paucity of research on the behaviour of Australian PPP bond returns. In response to this gap in knowledge, this study examined the price behaviour of PPPs in the Australian bond market from 2002 to 2010. This analysis was based on publicly available bond issues only.

> There is a need to better understand the behaviour of infrastructure investments so that investors and financiers can make informed decisions about infrastructure projects of the future.

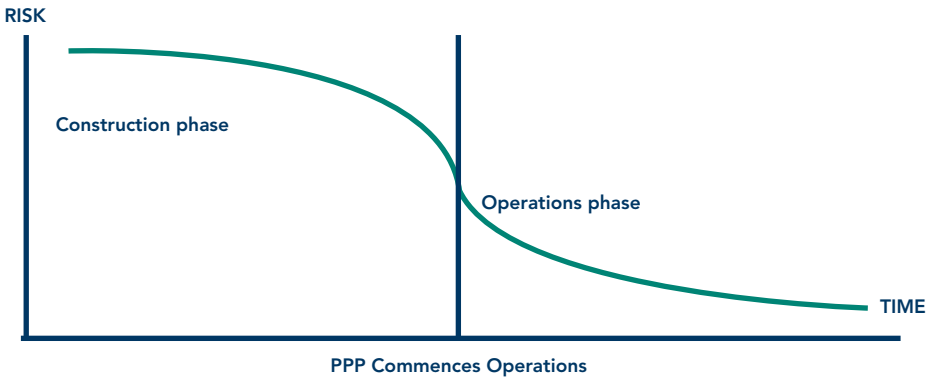
NEW INSIGHTS

The research design employed a three-factor bond asset-pricing model, using the systematic risk factors of Term, Default and Liquidity. Previous studies in the US and Australia have demonstrated empirical evidence to suggest that these three systematic risk factors explain the variation of bond returns. The Term premium measures the compensation to investors for owning longer maturity bonds in comparison to shorter maturity bonds. The Default premium measures the reward to investors for owning lower creditworthy bonds in comparison to Australian government bonds, while the Liquidity premium measures the additional return to investors to compensate them for owning illiquid bonds in comparison to bonds which can be more easily traded in the debt markets.

This study sample was six PPP bonds within the UBS Australia Composite Bond Index: Civic Nexus, Lane Cove Tunnel 1, Lane Cove Tunnel 2, Praeco, Royal Women's Hospital Partnership (RWHP), and Axiom Education Queensland (AEQ). The two major findings of the study are: 1) that the Term, Default and Liquidity systematic risk factors can explain the variation of Australian PPP bond returns (this suggests that PPP bonds behave in a similar manner to all other securities in the Australia debt market); and 2) that there are no excess (or additional) returns to be earned by owning or holding Australian PPP bonds. Put differently, investors do not earn additional returns by owning Australian PPP bonds in comparison to owning any other kind of bonds in the Australian debt market.

Illustration 20

Conventional expectation of project risk through time



PRACTICAL IMPLICATIONS

» In a post-Basel III world, where regulated banks are required to hold additional "capital buffers", PPPs are less likely to be debt financed by banks, and are more likely to issue their own bonds. This research provides new knowledge to the public sector, PPPs and superannuation fund investors on the pricing and behaviour of these investments.

The risk and return behaviour of Australian-listed PPP equities

BACKGROUND

The commencement of a PPP project is characterised by a long gestation period, as the construction phase of the underlying assets requires a considerable amount of time. This study examined the time-varying risk of these PPPs from the construction phase to the operations phase. This knowledge is important for investors, including superannuation funds, who have an interest in understanding the risk dynamics of PPPs as they progress from the construction phase (greenfield-type investments) to the operations phase (brownfield-type investments). As per Illustration 20, convention suggests that the construction phase of a PPP is riskier for investors than the operations phase for the following reasons:

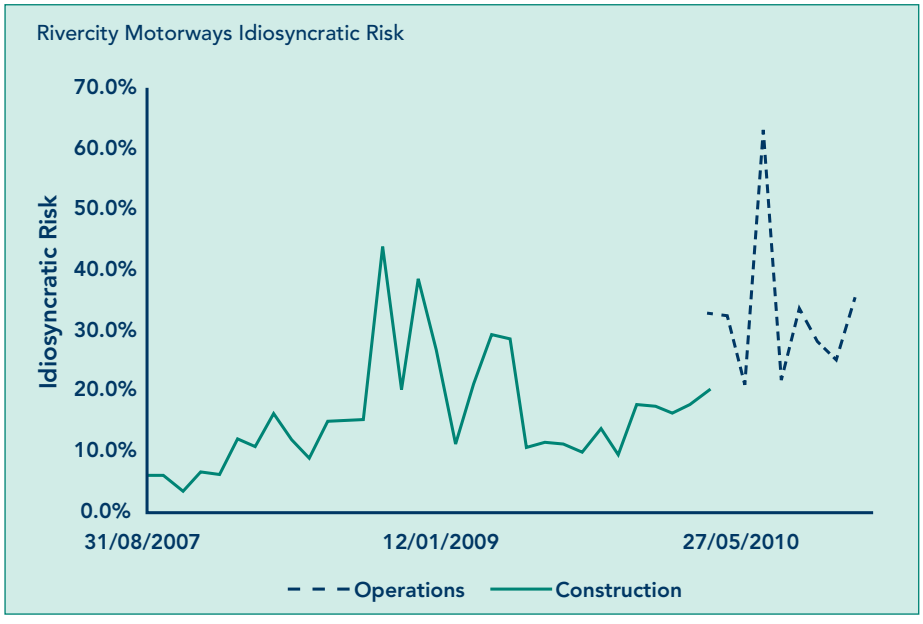
» There are no cash inflows in the project during the construction phase, as no customers can utilise the infrastructure; and

» Cost overruns in the PPP can occur in the construction phase, and can cause the project to experience unexpected cost escalations.

NEW INSIGHTS

To examine Australian-listed PPP equities, data was collected from the Australian Securities Exchange (ASX) on all four ASX-listed PPPs, which are all toll-road projects: Connecteast, Hills Motorways (no longer listed, acquired by Transurban), Rivercity Motorways, and Transurban. The data sample was for the period 1996 to 2010. Case studies show a dramatic increase in the company-specific (idiosyncratic) risk of these investments as the project shifts from the construction phase to the operations phase, typically as depicted in Illustration 21. At this point, there is a sudden decrease in the value of the underlying assets for a majority of the projects. Regardless of whether the PPP is owned by the private sector or public sector, when actual demand statistics do not meet expected demand forecasts, PPP owners experience dramatic downward revaluations in their PPP assets due to lower than expected revenues and net free cashflows [36].

Illustration 21



[36] *PC Inquiry Report (May, 2014, p. 130). The PC include a reference to Bianchi and Drew (sub.33) in relation to patronage (demand) risk for new toll road projects, as potential impediment to private sector financing of public infrastructure.*

PRACTICAL IMPLICATIONS

Future PPP infrastructure projects must be constructed to deliver genuine improvements in economic growth and productivity, or the underlying value of the project will dramatically decrease. This has implications for federal and state governments that are commencing new infrastructure projects. "Recycling capital" by the public sector over a long-term (10-year) time horizon can only be implemented if the underlying PPP project delivers on its expected usage or demand, in respect of user-pays PPPs. If the PPP demand is not realised, the owners of the PPP will suffer substantial financial losses. This outcome does not apply to PPPs receiving availability payments from the public sector.

Cost of capital of Australian-listed PPP equities

BACKGROUND

This study examined the predictive performance of various asset-pricing models and constant return benchmarks on ASX-listed infrastructure and PPP returns. Both public sector and private sector participants employ asset-pricing models to estimate the cost of equity of various industries and companies in Australia. The most famous framework used to explain the behaviour of the cost of equity capital is the seminal Capital Asset Pricing Model (CAPM). Recent research by Simin (2008) in the US shows that asset-pricing models are poor predictors of future returns. In fact, Simin (2008) finds that a constant excess return benchmark model is a better predictor of future returns than competing asset pricing models.

NEW INSIGHTS

The study examined the nine variations of the most used asset pricing models available; that is, both unconditional and conditional variants of the CAPM, the Fama and French (1992, 1993) three-factor model, and the Carhart (1997) four-factor model.[37] The study employed Australian industry-, size- and value-based portfolio index returns from 1991 to 2010, and studied the largest 300 ASX-listed firms by market capitalisation (including 778 companies) in the analysis. These firms were allocated into more than twenty industry-based portfolio indices, including both infrastructure and PPP indices.

The findings reveal that a constant return of the risk-free rate plus 6% per annum is the best predictor of infrastructure and PPP one-month returns. This compares to a constant return of the risk-free rate plus 5% per annum, which is the best predictor of all other Australian industry returns. The finding of the higher constant fixed excess return model for infrastructure and PPPs reflects the marginally higher return and risk associated with Australian-listed infrastructure and PPP investments in comparison to broad Australian stocks. This empirical evidence in Australia supports the recent findings by Simin (2008) in the US context. [38]

PRACTICAL IMPLICATIONS

- Asset-pricing models are useful tools in explaining the behaviour of ex-post (historical) cost of equity in Australian publicly listed companies; however, they are less effective at predicting ex-ante (future) return behaviour.
- Participants in both public and private sectors currently employ various methodologies to estimate the cost of equity and weighted average cost of capital (WACC) of new infrastructure and PPP projects. Participants should be cognisant of the fact that the asset-pricing tools they are using to estimate the appropriate cost of equity and WACC of a project are poor at forecasting expected returns. These risks in the predictability of future returns are common for both the public and private sectors.

Objective #4 Long-term US infrastructure returns and portfolio selection (from 1927 to 2010)

BACKGROUND

Superannuation funds have a natural interest in infrastructure due to the long-life characteristics of these investments, which match the long-term obligations and liabilities of their fund members. One of the challenges in better understanding the return and risk behaviour of infrastructure is the relatively short empirical history available on these investments. The current understanding of infrastructure investments suggests that they exhibit low systematic risks, and high company-specific (idiosyncratic) risks.

NEW INSIGHTS

This study analysed the return and risk behaviour of current infrastructure index returns in the US by mapping these returns to well-known systematic risk factors and industry returns. By employing a five-factor asset-pricing model, the behaviour of these infrastructure indices was mapped to construct a monthly time series of infrastructure index returns in the US from 1927 to 2010 – a period covering the Great Depression in the 1930s, World War 2, the oil shocks of the 1970s, the October 1987 stockmarket crash, 9/11, and the 2008 GFC.

[37] *Carhart, M.M. (1997). On persistence in mutual fund performance. The Journal of Finance, 52(1), 57-82; Fama, E.R. & French, K. R. (1992). The cross-section of expected stock returns. The Journal of Finance, 47(2), 427-465. Fama, E.R. & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. Journal of Financial Economics, 33(1), 3-56.*

[38] *Simin, T. (2008). The poor predictive performance of asset pricing models. Journal of Financial and Quantitative Analysis, 43(2), 355-380.*

Illustration 22

U.S. Listed Infrastructure-Long Term Measures of Return and Risk

This table presents the long-term behaviour of the MSCI U.S. Infrastructure Index (MUSII), Dow Jones Brookfield Americas Infrastructure Total Return Index (DJBAITRI), Macquarie Global Infrastructure North America Total Return Index (MGINATRI), MSCI U.S. Broad Utilities Index (MUSBUI), MSCI U.S. Small Utilities Index (MUSSUI), the Fama and French U.S. market raw monthly returns and the U.S. Government 1 month Treasury-Bill monthly returns for the period from January 1927 to December 2010. The statistics are calculated from splicing the long-term constructed monthly returns and the short-term empirical monthly return data for each respective index. Panel A reports the mean, standard deviation, skewness and kurtosis. Panel B presents the empirical VaR and CVaR estimates at the 95% and 99% confidence intervals, respectively.

	MUSII	DJBAITRI	MGINATRI	MUSBUI	MUSSUI	Stocks	T-Bills
Panel A: Moments of the distribution							
Mean	0.07	1.02	0.99	0.48	0.83	0.92	0.30
Std. Dev.	4.70	5.17	6.16	5.73	4.71	5.47	0.25
Skewness	0.35	-0.05	0.61	0.14	0.24	0.13	1.02
Kurtosis	12.84	9.93	13.60	11.07	11.10	10.38	4.23
Panel B: Empirical Tail Risk Measures							
95% VaR	-7.26	-7.36	-8.67	-8.11	-6.48	-7.85	0
99% VaR	-13.83	-14.22	-16.21	-14.86	-13.04	-14.93	0
95% CVaR	-11.20	-11.63	-13.54	-13.23	-10.45	-12.24	0
99% CVaR	-17.94	-19.29	-22.58	-21.95	-17.51	-20.05	0

The findings show: 1) that infrastructure returns in the US exhibit low to moderate market beta, and a significant risk factor to the US utilities industry [These results provide empirical evidence to suggest that infrastructure investment returns can be explained by systematic and industry-risk factors, and are less exposed to company-specific (idiosyncratic) risks]; 2) that US infrastructure index returns exhibit similar return, volatility and tail-risk characteristics to broad US stocks over the long term. Put simply, the return and risk characteristics of US-listed infrastructure index returns are commensurate with broad US stock returns, thereby demonstrating that they are not a low-risk proposition; and 3) that there is evidence of high correlations and betas between US-listed infrastructure and broad US stocks, showing that this type of infrastructure investment is not a distinct asset class, but rather, a sub-set of the US share market universe. These findings are summarised in Illustration 22.

PRACTICAL IMPLICATIONS

» Public sector (governments) and private sector (superannuation funds and private individuals) interested in a broad and diversified exposure to infrastructure need to recognise that the long-term risks in these listed investments are similar to those of a diversified holding of US stocks.[39]

Connecting outcomes from Objective #3 and Objective #4

» Tradeable infrastructure/PPP bonds and equities exhibit similar return and risk characteristics as other listed securities in their respective asset classes.

» The new knowledge from this research will assist governments, policymakers and investors to make better and informed financing and investment decisions.

[39] *This research has been published by Bianchi, R.J., Bornholt, G., Drew, M.E. & Howard, M.F. (2014). Long-term U.S. infrastructure returns and portfolio selection, Journal of Banking and Finance 42, 314-325.*

Procurement and finance relationship

From a finance perspective, this research promotes the use of approaches that ensure that all parties are acting in the best interests of the "collective". As part of this process, there are benefits to long-term investors including superannuation funds being engaged at an early stage of an infrastructure/PPP project. These dynamics allow, for example, superannuation funds (i.e., one of the beneficiaries of the infrastructure/PPP project over the long term) to moderate the interests of the short-term participants in the transaction. This results in a better alignment of interests and, in turn, a more efficient allocation of capital and risk in future infrastructure/PPP projects.

From a procurement viewpoint, the new (first-order) procurement decision-making model in Objective #1 is consistent with the long- term objectives in approaches that see the Operator having greater influence on the design of the facility. That is, the new procurement decision-making model searches for viable Design, Construct, Operate and Maintain bundles as a pre-requisite of a successful PPP. In turn, it identifies the best projects for long-term investors including superannuation funds to consider, and promotes best scope for the Operator to influence design.

The Productivity Commission (2014a, p. 250) refer to an "Inverted Bid Model" proposed in a submission to the inquiry by Industry Super Australia. Though the Productivity Commission note that the current PPP model may favour banks, it considers that there may be merit in exploring a further alternative, a "hybrid" approach. Whilst both alternatives to the current PPP model may widen access to long term equity investors, both alternatives may not see any appreciable increase in the influence the Operator has on design and whole-life costs, along with promoting other innovations to enhance the effect of the facility on front-line service. In the PPP context, the Operator has a key role and can potentially greatly contribute to VfM. In the Inverted Bid Model, and to the extent that the design needs to be detailed beyond performance specification and before the selection of the long-term equity investor to mitigate the risk of the bid varying after the equity investor is selected, then this would reduce the scope for Operator to influence the design. Moreover, if the tender for construction (and perhaps including any residual design) is prioritised ahead of the tender for operations and maintenance, then this overlooks the potential for the Operator to improve VfM outcomes. On the other hand, the hybrid approach may suffer in the same way as the current model. That is, in cases where the PPP consortium tenders the construction and the remaining design development as a Design & Construct contract and separate to a contract for operations and/or maintenance, and does not fully involve the Operator in the design development. This situation is most likely to occur where there is limited competition amongst PPP consortia.[40]

The new (first-order) procurement decision-making would identify the projects best suited to a PPP and notwithstanding the approach to delivering the PPP project. Despite, however, the contribution by the new (first-order) procurement model, the eventual VfM outcomes depend on the efficacy of the delivery of the PPP. There is much scope for further empirical research (arising from this research project) to examine challenges associated with not just widening access to long-term investors but also facilitating the greater influence of the Operator on design (as noted in "Future Research", below).

As mentioned when connecting outcomes between Objective #1 and Objective #2, the greater involvement of multinational contractors from China (with more likely cash reserves), of US multinational contractors already established in Australia (with cash receipts from the mining sector, and who may be looking to diversity into public sector infrastructure), and of more multinational contractors with access to finance from Japan, would assist accessibility to affordable finance and create a stronger appetite for PPPs.

[40] *Productivity Commission (2014a). Public infrastructure, Inquiry Report. Vol.2 (No. 71 May). Canberra: Australian Government.*

Future research

Procurement theme

- Further details on the proposed trial application of the new (first-order) procurement decision-making model:
  - Ideally, the model will be trialled during the investment decision (business case/ preliminary evaluation) or project development phase (both as part of a more specific PPP business case, or as part of a more specific traditional business case development).
  - The trial application could replace the usual approach, or operate alongside it. It is envisaged that the latter approach is the more realistic, however, not least because of the time taken to implement the model's procedures under trial conditions (that is, longer than the time taken for the future application of the post-trial refined model).
  - One of the key outcomes of the trial application will be a user guide, including software that confirms/finalises the model's detailed procedures. This guide will include an appendix that comprises the trial project, and documents and reports arising from the trial project (subject to approval from the state government participating in the trial).
- Assessment of differential costs and performance in PPPs and non-PPPs, and in the operational stage of facilities:
  - As indicated in the background to Objective #1, this assessment is of urgent importance and could be applied, for example, to the provision of school infrastructure.
  - This assessment would address a number of the Productivity Commission's (2014a) concerns pertaining to the benefits of ex post value for money assessments and a number of the points under the Productivity Commission's Recommendation #7.1.

Finance theme

- New insights in the return and risk characteristics of unlisted infrastructure investments:
  - The rewards and risks associated with unlisted infrastructure. Many infrastructure and PPP projects are financed with privately held equity that is not traded on a centralised stock exchange. Future research can examine whether unlisted infrastructure equity exhibits similar return and risk characteristics as listed infrastructure shares that is readily accessed and traded on a publicly listed stock exchange.
  - There is an expectation that privately owned infrastructure equity deliver higher rates of return than listed infrastructure shares as finance theory suggests that this additional return reflects the illiquditiy premium, that is, the compensation to investors for owning and holding an asset that cannot be readily sold or quickly converted into cash. Future research can examine the level of additional return in owning unlisted equity and the additional risk borne by investors in owning these types of illiquid assets in comparison to publicly traded equity and/or debt securities.
- Social infrastructure:
  - There is an interest by government and the private sector (superannuation funds) in better understanding the return and risk characteristics of 'social infrastructure' assets such as schools (and higher levels of education), hospitals, prisons and cultural assets (such as museums and art facilities). There is scope to better understand the differences in the risk properties of these assets in comparison to conventional or 'economic infrastructure' assets.
  - The non-profit focus of social infrastructure remains a challenge in the future. There is an opportunity for new research to discover new financing models to promote and encourage higher levels of private sector participation in social infrastructure and PPP projects.

Procurement and finance relationship

- On the basis that the current PPP model, Hybrid and Inverted Bid Model have potential relative merits with respect to different project characteristics, then exploring the role and outcomes of the Operator - with more or with less design influence and associated with the extent to which the Operator is appointed early, would be invaluable research in the deployment and development of the current PPP model and various alternative approaches being considered.
- Research into VfM outcomes from the Hybrid, Inverted Bid Model – or the like and other approaches to delivering a PPP as alternatives to the current model could be explored in due course.

Project outputs

PRESENTATIONS

- Associate Prof Bridge presented at the Department of Infrastructure: BITRE Colloquium, Parliament House, Canberra. 2009. "Delivering value for money in procuring infrastructure: towards addressing construction and financing constraints".

SYMPOSIUM AND WORKSHOPS

- Two-day symposium dedicated to this research grant (3 and 4 December 2009) comprising:
  - Private meeting of COAG IWG Subgroup and National PPP Forum Working Party
  - Government-Industry lunch
  - Private project RAC meeting
  - IAQ and QUT networking event with national PPP Forum members and industry guests as panellists
  - A full-day seminar and workshop
- International Workshop (3 December 2010) on behalf of the International Council for Research and Innovation in Building and Construction (Working Commission W092 – Procurement Systems and Task Group TG72 – Public Private Partnerships), also dedicated to this research grant; *"Major Infrastructure Procurement: Addressing the constraints".*

PUBLICATIONS

LIST OF PUBLICATIONS AND WORKING PAPERS (AVAILABLE AT THE PROJECT WEBSITE)

Objective #1 Publications (or see: http://eprints.qut.edu.au/view/person/Bridge,_Adrian.html)

- Teo, P., Bridge, A.J., & Jefferies, M. (2010). Delivering value for money in the procurement of public sector major infrastructure: A new first-order decision making model, Proceedings of ICCREM 2010, Queensland University of Technology, Brisbane.
- Teo, P., Bridge, A.J., Gray, J., & Jefferies, M. (2011). Developing a research method to test a new first-order decision making model for the procurement of public sector major infrastructure, Proceedings of ARCOM, 5-7 September 2011, University of the West of England, Bristol.
- Teo, P. Bridge, A.J. Gray, J., & Rowlinson, S. (2012). Towards testing a new first-order decision making model for the procurement of public sector major infrastructure, Proceedings of CIB W70, W92 & TG72, 23–25 January 2012, University of Cape Town, Cape Town.
- Teo, P., Bridge, A.J., & Gray, J. 2013. A new first-order decision-making model for the procurement of public sector infrastructure: Procedures and testing. In Kajewski, S. L., Manley, K., & Hampson, K.D. (Eds.) Proceedings of the 19th CIB World Building Congress, Brisbane 2013: Construction and Society, Queensland University of Technology, Brisbane, Australia, pp. 1-13.
- Teo, P. (2014). The effect of procurement on competition and flexibility of Public-Private Partnerships in major Infrastructure projects. PhD Thesis. Queensland University of Technology. (Also see: http://eprints.qut.edu.au/view/person/Teo,_Pauline.html)

Objective #2 Publications (or see: http://eprints.qut.edu.au/view/person/Bridge,_Adrian.html)

- Rahman, A., Bridge, A.J., & Rowlinson, S. (2010). The determinants of multinational contractors' willingness to bid for Australian public sector major infrastructure projects: Towards deploying the eclectic paradigm of internationalization. In Y. Wang, J. Yang, G.Q.O. Shen and J. Wong (Eds.), Proceedings of 2010 International Conference on Construction & Real Estate Management, 1-3 December, Brisbane, Australia.
- Rahman, A., Bridge, A.J., Rowlinson, S., & Kwok, T. (2011). Developing the eclectic paradigm of internationalization on the issue of multinational contractors bidding for Australian infrastructure. In R. Best and C. Langston (Eds.), Proceedings of 36th AUBEA Conference, 27-29 April, Gold Coast, Australia.
- Rahman, A., Bridge, A.J., Rowlinson, S., & Kwok, T (2011). Towards testing the eclectic paradigm on multinational contracting: An approach to reviewing and analysing secondary data. In Y. Wang, Y. Pang, and G.Q.O. Shen (Eds.), Proceedings of 2011 International Conference on Construction & Real Estate Management, 19-20 November, Guangzhou, China.

- Rahman, A., Bridge, A.J., Rowlinson, S., & Kwok, T. (2012). A first stage test of Dunning's framework on multinational contracting into Australia: Reviewing secondary data. In K. Michell, P. Bowen, K. Cattell. (eds.), Proceedings of Joint CIB W070, W092 & TG72 International Conference on Facilities Management, Procurement Systems and Public Private Partnerships, 23-25 January 2012, Cape Town, South Africa.
- Rahman, A., Bridge, A.J., Rowlinson, S., & Kwok, T. (2012). Multinational contracting into Australia. In S. Smith (ed.), Proceedings of ARCOM, 3-5 September, University of Edinburgh.
- Rahman, A. (2014). The determinants of multinational contractors' willingness to bid for Australian public sector major infrastructure projects: Deploying the eclectic paradigm of internationalisation. PhD Thesis. Queensland University of Technology. (Also see: http://eprints.qut.edu.au/view/person/Rahman,_Azmeri.html)

Objectives #3 and #4 Working Papers and Publication

- Bianchi, R.J., Bornholt, G., Drew, M.E. & Howard, M.F. (2014). Long-term U.S. infrastructure returns and portfolio selection, Journal of Banking and Finance 42, 314-325.
- Bianchi, R.J., Drew, M.E., & Whittaker, T. The Behaviour of Listed Toll Road Public-Private Partnerships: A First Look at the Australian Evidence. (working paper, latest version: 26th July 2013).
- Bianchi, R.J., Drew, M.E., Roca, E. & Whittaker, T. Systematic risk factors in the return of Australian Bonds. (working paper, latest version: 24th April 2013).
- Whittaker, T., Bianchi, R.J., Drew, M.E., & Roca, E. Idiosyncratic risk and returns: Australian evidence. (working paper, latest version: 18th January 2013).Whittaker, T., Bianchi, R.J., Drew, M.E., & Roca, E. Idiosyncratic risk of PPPs. (working paper, latest version: 14th January 2012).
- Whittaker, T., Bianchi, R.J., Drew, M.E., & Roca, E. Conditional asset pricing and predictive returns: Australian evidence. (working paper, latest version: 12th November 2012).
- Whittaker, T. (2013). Essays in infrastructure financing. PhD Thesis. Griffith University.

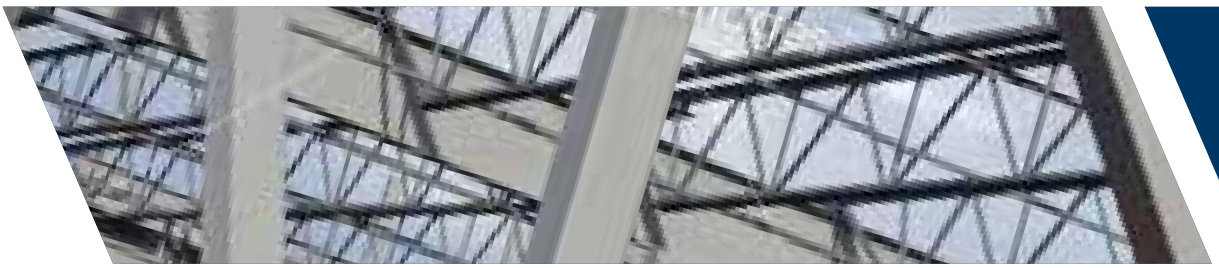
LIST OF UPCOMING WORKING PAPERS/ PUBLICATIONS (TO BE AVAILABLE AT THE PROJECT WEBSITE AND/OR TO BE AVAILABLE AT OTHER WEBSITE ADDRESS/ES MENTIONED BELOW)

Objective #1 (or to be available at: http://eprints.qut.edu.au/view/person/Bridge,_Adrian.html)

- Bridge, A.J. The determinants of the vertical boundaries in construction activity: Testing an integrative framework of vertical integration.
- Bridge, A.J. The nature of the exchange relationship in construction activity: Testing alternative Transaction Cost Economics and Resource-Dependency View.
- Teo, P. & Bridge, A.J. Deploying theories from the new institutional economics and the capability perspective on the suitability of Public-Private Partnerships: A (first-order) procurement decision-making model.
- Teo, P., Bridge, A.J. Skitmore, M., & Gray, J. Operationalising the concept of value for money and testing the reliability of a (first-order) procurement decision-making model to determine the suitability of Public-Private Partnerships.
- Teo, P., Bridge, A.J. Skitmore, M., & Gray, J. Testing the validity of a (first-order) procurement decision-making model to determine the suitability of Public-Private Partnerships.
- Bridge, A.J. & Teo, P. Developing and testing the Structure-Conduct-Performance Model: The case of civil engineering and building contractors in the major economic and social infrastructure sector in Australia.

Objective #2 (or to be available at: http://eprints.qut.edu.au/view/person/Bridge,_Adrian.html)

- Bridge, A.J., Rahman, A., & Rowlinson, S. Developing the eclectic paradigm of internationalisation in multinational contracting.
- Rahman, A., Bridge, A.J., & Rowlinson, S. Operationalising the eclectic paradigm of internationalisation on the case of multinational contracting into Australian public sector major road, bridge and tunnel projects.
- Rahman, A., Bridge, A.J., & Rowlinson, S. Testing the eclectic paradigm of internationalisation on the case of multinational contracting into the Australian public sector major road, bridge and tunnel public sector: Analysis of Ownership advantages.



» Rahman, A., Bridge, A.J., & Rowlinson, S. Testing the eclectic paradigm of internationalisation on the case of multinational contracting into the Australian public sector major road, bridge and tunnel public sector: Analysis of Location advantages.

» Rahman, A., Bridge, A.J., & Rowlinson, S. Advancing the eclectic paradigm of internationalisation in multinational contracting: The relative importance of Ownership-Location-Internalisation advantages.

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Models for Engaging Public-Private Partnerships in Civil Infrastructure Projects: A Case of 'Having Your Cake and Eating It Too'?

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MODELS FOR ENGAGING PUBLIC-PRIVATE PARTNERSHIPS IN CIVIL INFRASTRUCTURE PROJECTS: A CASE OF 'HAVING YOUR CAKE AND EATING IT TOO'?

Adrian J. Bridge[1], Soh Young In[2], Steve Rowlinson[3]

ABSTRACT

Public-Private Partnerships (PPP) are established globally as an important mode of procurement and the features of PPP, not least of which the transfer of risk, appeal to governments and particularly in the current economic climate. There are many other advantages of PPP that are claimed as outweighing the costs of PPP and affording Value for Money (VfM) relative to traditionally financed projects or non-PPP. That said, it is the case that we lack comparative whole-life empirical studies of VfM in PPP and non-PPP. Whilst we await this kind of study, the pace and trajectory of PPP seem set to continue and so in the meantime, the virtues of seeking to improve PPP appear incontrovertible. The decision about which projects, or parts of projects, to offer to the market as a PPP and the decision concerning the allocation or sharing risks as part of engagement of the PPP consortium are among the most fundamental decisions that determine whether PPP deliver VfM. The focus in the paper is on latter decision concerning governments' attitudes towards risk and more specifically, the effect of this decision on the nature of the emergent PPP consortium, or *PPP model*, including its economic behavior and outcomes. This paper presents an exploration into the extent to which the seemingly incompatible alternatives of risk allocation and risk sharing, represented by the orthodox/conventional PPP model and the heterodox/alliance PPP model respectively, can be reconciled along with suggestions for new research directions to inform this reconciliation. In so doing, an important step is taken towards charting a path by which governments can harness the relative strengths of both kinds of PPP model.

KEYWORDS: Pubic-Private Partnerships; Risk; Consortia; Value for Money

INTRODUCTION

HM Treasury (1998) define Public-Private Partnerships (PPP) as "an arrangement between two or more entities that enables them to work cooperatively towards shared or compatible objectives and in that there is some degree of shared authority and responsibility, joint investment of resources, shared risk taking and mutual benefit". According to the Infrastructure Journal online database, there were 1,376 PPP worth a total of approximately USD 485 billion between 2005 – 2012, and more than 40 countries have adopted a PPP mode to procure infrastructure (Haran et al. 2013). The World Bank's Infrastructure Economics and Finance Department and Public-Private Infrastructure Advisory Facility project database (Private Participation in Infrastructure 2014) also recorded more than 5,000 PPPs in 139 low and middle income countries in the last thirty years from 1984 to 2012. Cleary, PPP are established as an important mode of procuring infrastructure and the persistent global economic downturn

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indicates that we are likely to see an increasing incidence of PPP. That is, the OECD (2006) estimates USD 53 trillion is required globally in the period 2007-2030 to address the desire for new infrastructure creating an infrastructure deficit and at the same time governments are facing acute fiscal constraints. Moreover, in many developed countries there is an associated loss of capacity to deliver projects using government agencies and which promotes PPP–as substantially more risks for the design, construction, operations and maintenance can be transferred to the private sector, than in traditionally procured government financed projects.

Beyond the transfer of risks, there are many other advantages of PPP that are claimed as outweighing the costs of PPP and affording Value for Money (VfM) relative to traditionally financed projects or non-PPP. HM Treasury (2008: 35) define VfM as, "securing the best mix of quality and effectiveness for the least outlay over the period of use of the goods or services bought. It is not about minimizing upfront prices..." And in terms of the period of use of goods or services, the UK National Audit Office (2004: 3) defines procurement as, "the whole-life process of the acquisition of goods, services and works..., beginning when a potential requirement is identified and ending with the conclusion of service contract or ultimate disposal of an asset". Generally then, VfM can be seen as an economic concept incorporating productive efficiency and which, among other things, includes project finance principles (The Productivity Commission 2014: 70). In the context of this paper, VfM distils to achieving the best ratio between cost and benefits or *f(costs/benefits)* through the acquisition of infrastructure in whole-life terms, including an efficient financing vehicle. Furthermore, HM Treasury (2008) adds that VfM is a *relative* concept and can be measured in comparison with other outcomes. Again, in the context of this paper, that is the cost and benefits delivered by PPP versus non-PPP procurement.

However, there are severe challenges in attempting to directly assess VfM and which arise largely from the intractability of data and particularly measuring costs and benefits in the operations and maintenance stage of a facility. That is, costs are whole-life and include both internal and external transaction costs that are much less observable than the production costs (comprising finance, design, construction, operations and maintenance costs). Meanwhile, benefits comprise largely the effects of the facility on the core activity and which may be difficult to isolate and evaluate in an objective manner. For example in schools, the effects of the facility on educational outcomes need to be isolated from other key factors that affect educational outcomes including the quality of the teaching personnel and nature of the students.

As evidence of the difficulties in attempting to directly assess VfM, KPMG and University College London (2010) have started to generate comparable and quantitative data on the costs and benefits of various operational arrangements across both PPP and non-PPPs in the health and educational sectors. However, this work has a number of key weaknesses and KPMG and University College London (2010) acknowledge their work is a first step. Consistent with this, the National Audit Office (2011) note that "There is no clear data to conclude whether the use of PFI has led to demonstrably better or worse value for money than other forms of procurement." At the same time, Thomas (2011) suggests that non-PPPs are equally responsible for the uncertainty concerning the relative merits of PPPs versus non-PPPs given non-PPPs' lack of transparency and accountability in particular "currently the form of public accounts means that the overall costs of infrastructure – capital, life cycle and maintenance costs – are shown in a number of different budgets and there is no single point of control for these budgets". In summary, whilst we await comparative whole-life empirical studies of PPP and non-PPP and mindful of the likely continued pace and trajectory of PPP, the virtues of seeking to improve PPP seem incontrovertible.

The decision about which projects or part of projects to offer to the market as a PPP and the decision concerning the transfer, or allocation of risks, as opposed to sharing risks and as part of engagement of the PPP consortium, are amongst the most fundamental decisions that determine whether PPP will deliver VfM. The focus in the paper is on latter decision concerning government's attitudes towards risk and, more specifically, the effect of this decision on the nature of the emergent PPP consortium including its economic behavior and outcomes. Consortia for PPPs encompass the entire financing structure including the Special Purpose Vehicle (SPV) or PPP Company and which comprises the project manager and the project's sponsors. *Prima facie*, allocating risks (in terms of those risks retained by government or transferred to the PPP consortium) as opposed to sharing risks (between government and the PPP consortium) presents as a largely dichotomous decision and in conjunction with a corresponding choice between fundamentally different kinds of stereotypical PPP consortia and their associated relative merits. That is, it is conventional to see the use of risk matrices or tables summarizing the allocation of various kinds of risk between government and the PPP consortium and in which design, construction and operations and/or maintenance risks are predominantly transferred to the PPP consortium (Grimsey & Lewis 2004). Although in this conventional approach, some kinds of risks may be shared, for example, *force majeure*, it is much less common to see the sharing of risk across the majority of different categories of risk and in an alliance fashion (including government engaging in a pain/gain share regime). Indeed, a key feature of PPP is bundling and which involves the allocation or transfer of a significant level of design, construction, operations and/or maintenance risks to the PPP consortium, in order to create the highest powered incentive to contain or reduce projects costs and/or enhance utilization of the facility (Iossa & Martimort 2015: 23).

This paper presents an exploration into the extent to which the seemingly incompatible alternatives of risk allocation and risk sharing, represented by orthodox/conventional PPP consortia and heterodox/alliance PPP consortia respectively, can be reconciled along with suggestions for new research directions to inform this reconciliation. In so doing, an important step is taken towards charting a path by which governments can harness the relative strengths of both kinds of PPP model. For the purposes of this paper, and so as to avoid confusion with individual firms that make-up a consortium, the term 'PPP model' is used to represent PPP consortia (comprising financiers and the SPV or PPP Company).

The problem of competing choices of PPP model is first described in terms of an explanation of the way in which the PPP model contributes to VfM along with an account of the economic behavior, key features and the outcomes of the conventional PPP model and the alliance PPP model. This is followed by suggestions to improve the ratio of cost and benefits delivered by both these kinds of PPP model and which informs research directions to advance the PPP model, specifically, and PPP more generally.

CHOOSING A PPP MODEL

The Role of the PPP Model in Contributing to VfM

The PPP model contributes towards improving the ratio of costs and benefits and subsequently VfM in terms of the extent to which it represents an efficient financing vehicle comprising the cost of finance (the numerator) and production benefits (the denominator) and whose determinants are as follows (The Productivity Commission, 2009):

- Costs of finance is driven by: Project risk management (assignment of non-diversifiable projects risks and management of the overall project risk); Transaction costs (costs of arranging and managing finance, and costs associated with delay or uncertainties with available finance); and information asymmetry (how much borrowers and lenders share, signal and can act on information on project prospects and risks in the investment decision); Information discovery that can add substantially to transaction costs. Here, uncertainties will be reflected in higher premiums required by investors and the finance vehicle can influence the incentives for the parties to share their information and hence the allocation of resources.
- Production benefits comprise whole-life cost savings arising from improvements in construction, operations and maintenance and/or enhancements to front-line service and which are driven by opportunities for innovations in the bundle of works in conjunction with incentives to innovate, including competition at bid stage and an environment that is conducive to innovations post-bid.

The economic behavior of conventional and alliance PPP models and the manner and extent to which these kinds of models contribute to VfM, and in turn, define their contrasting key features. These differences and features emerge in response to governments' decision to either allocate risk or share risk.

The Conventional PPP Model

When risks are allocated by the government to the PPP Company, in conjunction with an established rate of remuneration/availability charge or a concession by government to allow the PPP Company to collect and retain receipts directly from users, the PPP consortium will respond by seeking to prioritize containing risks - in pursuance of protecting its internal rates of return. Examples of behavior consistent with the PPP consortium seeking to contain risks and which produce signature features of this model are evident in the arrangement of the project's capital structure and in the management and governance of the project.

With regard to project finance, Williamson (1988) treats debt and equity mainly as alternative governance structures and argues that debt finance is efficient in the case of assets that are redeployable because debt finance works out of rules. In contrast, Williamson sees equity in project finance as more efficient when the asset is non-redeployable because equity exhibits discretion. As such, a predominantly debt-based approach to the capital structure of many civil infrastructure projects appears to be efficient as these assets are largely redeployable, in so far as, they are likely to generate a pool of interested buyers and can be sold-on, for example, a toll road. Indeed, it is usual for debt to comprise the substantial component of the capital structure of civil infrastructure PPP (usually over 70 percent) and this is a key feature of the conventional PPP model (Asenova & Beck 2003). Senior debt determines the bankability of project including seeking to satisfy itself that the PPP Company can deliver the project on time and to budget in order to start to generate the revenues and in such a way that it can service the

debt (Ye 2009). Among other things, this determines the nature and extent, or balance of any subordinate debt and equity from sponsors with the PPP Company. These downstream outcomes are driven by the requirements of senior debt that reduce the overall cost of senior debt but which are not necessarily best for VfM (that reflects the whole-life of the asset).

The project management of the PPP Company that emerges in response to governments' decision to allocate risk is also consistent with containing risks. That is, it often the case that the PPP Company is led by either a contractor or an investment bank (Grimsey & Lewis 2004). Furthermore, it is not uncommon for these kinds of initial project managers to sell their equity in the project and exit the PPP Company. These kinds of entity managing the PPP Company and their economic behavior, is driven by short-term realization of profits and another trait of the conventional PPP model. Whilst this behavior is conducive to containing risks, in particular construction risks, and delivering the asset on or before schedule and on budget, again, it is not necessarily best for VfM.

The governance and contractual structure that the project manager develops within the PPP Company accordingly promotes time and cost certainty and compliance with service requirements. As evidence of this, a further defining feature of the conventional PPP model is a rigid structure including a heavy reliance on Turnkey or Design & Construct agreements *within* the PPP Company's main concession agreement (Tiong & Anderson 2003). Turnkey or Design & Contract contracts have advantages in reducing the overall period of time for construction and minimizing construction costs (Ive & Chang 2007). These approaches to completing the design and construction works achieve benefits in time and cost through the development of *tried and tested* techniques and processes that contribute to containing risks. At the same time, innovations in design and construction rarely appear (Duffield & Clifton 2009; Eaton & Akbiyikli 2009; Leiringer 2006). Not surprisingly then, Turnkey and Design & Construct agreements are notorious for delivering standard design outcomes and which may not fully exploit the potential of the Facility Manager/Operator to influence the design to reduce whole-life costs and/or enhance the user's core activity (Baldwin 2003; Brewer et al. 2012; McDowell 2003). Hence, we can expect the conventional PPP model to similarly deliver routine designs.

Although there is a lack of comparative whole-life empirical studies of PPP and non-PPP, there is evidence that the conventional PPP model delivers superior outcomes to non-PPP procurement in terms of time and cost certainty to the end of construction and start of operations (for example, Raisbeck, Duffield & Xu 2010). This study and others provide strong corroborative evidence of the theory given in this section on the effect of government's decision to allocate risk and the subsequent economic behavior and defining features of the conventional PPP model. As such, we can anticipate the conventional PPP model, as a financing vehicle, to be strong in terms of cost of finance (numerator) and also in terms of production costs (part of the denominator) – *to the extent* that whole-life cost savings can be achieved using tried and tested techniques and processes. On this point, there is evidence that significant reductions in whole-life costs can be achieved through the accumulation of many small scale improvements and arising from the smart deployment of tried and tested approaches (Grimsey & Lewis 2004). Grimsey and Lewis (2004: 2) define a PPP as "arrangements whereby private parties participate in, or provide support for, the provision of infrastructure, and a PPP project results in a contract for a private entity to deliver public infrastructure-based services". It is interesting to contrast this definition with that of the HM Treasury's definition in the introduction, and it seems that Grimsey and Lewis's version is much closer to the conventional PPP model.

However, in projects attempting to deliver outcomes that are extremely complex and unusual (for example, infrastructure of an iconic nature) and when current technology is insufficient and which necessitates technological innovations including experimental technology, then we can anticipate that the conventional PPP model will fall short of delivering required outcomes in these cases. That is, taking risks and experimenting is a prerequisite to innovation and which is the opposite to the *modus operandi* of the conventional PPP model that seeks to contain risks. Hence, we expect this conventional PPP model to be weak in terms of production benefits (the other part of the denominator) and, correspondingly, weak in extremely complex and unusual projects requiring innovations. In contrast, we can expect the alliance PPP model to be superior in these kinds of projects.

Alliance-Based PPP Models

Clifton & Duffield (2006) consider that alliancing will address the weakness of the conventional PPP model in terms of fostering ongoing innovation. An alliance contract is a form of relational exchange and Clifton & Duffield select Gallagher & Hutchinson's (2003) definition of an alliance contract as: "an agreement between parties to work cooperatively to achieve agreed outcomes on the basis of sharing risks and rewards". Clifton & Duffield then refer Ross (2001) who considers that alliances have the following features:

- The proponent or owner underwrites projects costs;
- All parties win or lose together;
- Reimbursement to the non-owner participants (NOPs) is 100 percent open book and structured so that the NOPs receive an equitable sharing of gain and pain depending on how actual outcomes compare with pre-agreed targets in costs and non-cost performance areas;
- All decisions are made by the Project Alliance Board (PAB) and are to be unanimous. The PAB comprises representatives from each participant;
- All members of the integrated project team are selected on a 'best for project' basis, headed by a Project Manager;
- There is a strong commitment to resolve issues within the alliance with no recourse to litigation, except in a limited class of prescribed 'Events of Default'; and
- All aspects of the project delivery are focused on high performance teamwork and *breakthrough* (authors emphasis) outcomes founded on an alliance charter that sets out the mission, objectives and behavioral commitments of the participations.

As such, it seems that a PPP model based on alliance principles is much closer to the HM Treasury definition of a PPP than that developed by Grimsey & Lewis in relation to the conventional PPP model. Clifton & Duffield (2006) propose an alliance PPP model including changes during construction and service delivery managed by a gain and pain share mechanism as per typical alliance contracts. More specifically, they propose that the gain share regime involves time, cost and production measures or enhanced revenues, as well as subjective performance objectives including stakeholder advocacy, end user satisfaction and team member satisfaction. Clifton & Duffield note that these measures are established by the process of workshops including the target price (rather than established through a competitive bid) and that alliances are only suitable for a few project types that are high risk and complex and in which the project scope is not clearly defined. Forward and Aldis (n.d.) propose a similar alliance-based PPP model and reach similar conclusions on the application of this kind of PPP model that turn on the extent to which the project is likely to exhibit change.

All of this speaks to the maxim 'place the risk with the party best able to manage it'. This has less application in projects that suit alliancing, as the conditions surrounding the project are uncertain and/or the technology to be deployed in the project is not tried and tested and hence *ex ante* competencies across government and private sector are levelled and unable to inform which party is best placed to manage risk. Such that risk allocation in these cases, will result in unduly high prices incorporating a premium for risks that can't be adequately identified and assessed. There are now many examples of projects claimed as successful and delivered by alliancing using government finance and including iconic buildings, such as the National Museum of Australia that incorporated innovation in design and construction and opened in 2001.

In terms of PPP, however, Clifton & Duffield acknowledge limitations arising from the alliance PPP model that amount to serious impediments to adopting this alternative to the conventional PPP model and *even in projects that suit alliancing*. Key amongst these impediments are governments' desire for cost certainty associated with risk transfer and a lack of willingness of financiers to engage in a model with open-ended exposure. Since Clifton & Duffield's article, however, there has been positive movement in terms of private sector finance. More specifically, equity to engage in an alliance-based PPP model for greenfield projects. For example, in Australia (that is ranked fourth globally, in terms of superannuation funds under management - at over USD 1.3 trillion) Industry Super Australia (ISA, 2014) has proposed a new "Inverted Bid Model" (IBM) on behalf of Australia's largest industry super funds but also to reflect other sources of equity including sovereign wealth funds and equity from overseas. ISA's IBM has a number of features consistent with those listed above including an 'open book' for the tender of design and construction, operation and maintenance and residual debt. This approach is similar to the Aggregator Model in the UK and unsolicited bids more generally.

Although there are examples of progress with equity's appetite to accept an open-book environment in terms of greenfield infrastructure, governments' desire for cost certainty associated with risk transfer, as mentioned in the introduction, has though increased since the Global Financial Crisis and it would appear set to increase further, as many developed countries continue to face severe fiscal challenges. In which case, the uptake of alliance-based PPP may well remain muted. Beyond this, governments do have good reason to be cautious when considering committing to an alliance-based contract. That is, it's important to appreciate that alliance contracts for the delivery of infrastructure is only a form of relational contracting and falls short of a genuine relational exchange. To illustrate this, Bridge (2008) develops a trust-commitment-relationship (TCR) trinity to clarify the relationship between Transaction Cost Economics (TCE) and nature of exchange relationship, as shown in Figure 1.

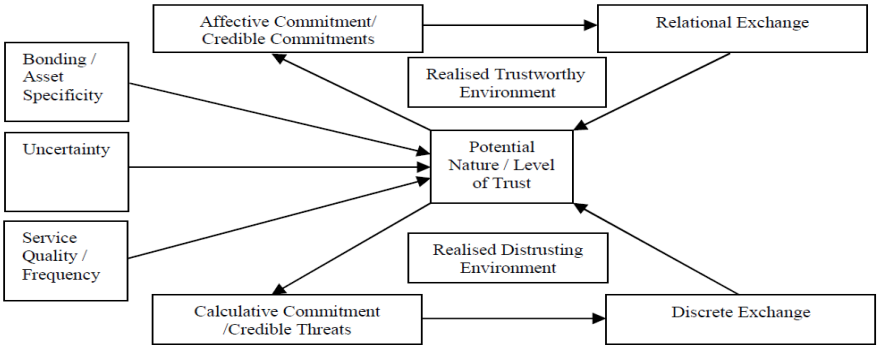

Figure 1: The TCR trinity (Bridge 2008)

Bridge (2008) then operationalize the TCR trinity in conjunction with conceptualizing the nature of the external exchange relationship as a continuum from relational exchange to discrete exchange, as per Figure 2.

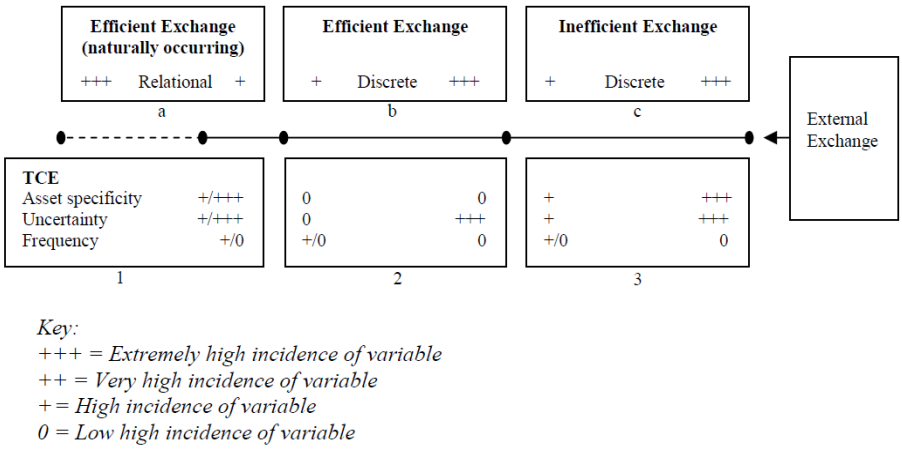

Figure 2: Operationalizing the TCR trinity (Bridge 2008)

Figures 1 and 2 indicate that in the presence of high levels of asset specificity, uncertainty and frequency, a high level of trust and commitment can ensue and with a lesser reliance on contractual safeguards; hence, TCE predicts a naturally occurring relational exchange. At the other extreme and in the absence of a high level of frequency, a distrusting atmosphere with the likelihood of negative opportunism can prevail. Here, the exchange relationship is highly discrete and it becomes appropriate to deploy credible threats, such as penalties for non-performance. Returning to the issue of alliance-based contracts in infrastructure falling short of a genuine relational exchange, we can see that the kinds of projects that best suit the alliance PPP model are likely to be rare and therefore governments are not able to generate follow-on projects for the alliance-PPP consortia delivering the focal project. Even if government could generate a pipeline of these kinds of projects, transparency and accountability prevents governments from generating a genuine relationship with PPP consortia, as government needs to tender and appraise bidders on the same criteria on the occasion of each new project. In other words, frequency will remain very low in terms of the procurement of alliance PPP and the prospect of negative opportunist behaviour on the part of the PPP consortia will remain very high.

As such, the best that government can achieve in terms of an alliance PPP model is a contrived relational exchange. In pursuance of this, there remains a lack of empirical tested theory to guide optimum incentive design in the context of major infrastructure and so government needs to exercise high levels of skill and judgment in this regard. More specifically, Rose and Manley (2010) highlight the importance of striking the right balance across a range of matters concerning motivation including stakeholder involvement; contract and relationship intentions; price negotiation; performance and incentive goals and fair and flexible performance measures. Clearly, this is not a straightforward task and Rose and Manley note that the cost is high in failing to achieve the best balance of incentives and measurement. This would be exacerbated in the case of an alliance PPP that is likely a very large project and with a natural tendency for the PPP consortia to resort to negative opportunistic because of the lack of preconditions for a naturally occurring relational exchange.

In summary, we can anticipate that the alliance PPP model, as a financing vehicle, is weak in terms of cost of finance. That is, even if private finance in form of equity is extended to comprise the majority of the capital structure, the required returns and costs of this finance are likely to be high and quite possibly prohibitive in all cases except perhaps some projects in which the demand and revenues can be estimated with a very high level of precision and confidence. In projects in which demand and revenue are less predictable, government could consider underwriting equity's Internal Rate of Return but then this adds to governments' on-book contingent liability that affects governments' credit ratings, and ultimately government then absorbs the lion's share of the project's risk and which runs counter to genuine relational exchange. Even in projects in which demand and revenues can be predicted with a high level of confidence, the lesser track record and incidence of the alliance PPP model, compared to the conventional model, coupled with the alliance PPP model's 'open book' environment, is likely to generate a high cost of debt finance – and perhaps worse, forcing institutions providing debt away from considering involvement in these projects. We also consider the alliance PPP model to be weak in terms of production costs and more specifically the level of whole-life costs - as prices, or the budget, is established in negotiation and not under competitive tension. Transaction costs in arranging finance and establishing and maintaining the consortia may also be higher in an alliance PPP model. There is also always going to be the lurking prospect of market failure *ex post* and resulting from negative opportunistic behaviour on the part of the PPP consortia in appropriating quasi-rents and super profits from variations in the works – if government does not strike the right balance in terms of incentives and performance measures. Here, governments could consider developing a guaranteed contract sum, in conjunction with a gain-pain share regime, as is common in alliance construction projects. Again though, this would increase the already likely high level of production costs. All that said, the potential for the alliance PPP model to leverage its environment that fosters innovations and, in so doing, go far beyond the reach of the conventional PPP model in terms of production benefits that include delivering outcomes that radically enhance the front-line service and/or deliver shifts in technology and new ways of working, cannot be ignored.

Reconciling the seemingly irreconcilable

The idiom *'You can't have your cake and eat it'* is mostly interpreted as you can't have the best of both worlds and two incompatible things. In the context of this paper, this is presented above in terms of choosing between the conventional PPP model (driven by risk allocation) or the alliance PPP model (associated with risk sharing). That is, risk allocation and risk sharing are considered as effectively incompatible and so at the level of individual projects it's considered substantially a choice of either one of the two PPP models. However, at the level of a portfolio of projects government can deploy both models by choosing (supported by theory, for example TCE) the alliance PPP model when the project is extremely unusual and complex and requires advances in technology and/or new ways of working – driven by innovations, and in all other projects (likely to be the substantial majority of cases) governments can select the conventional PPP model.

Other interpretations of the idiom relax the issue of strict incompatibility and convey opportunity costs or trade-off. This version of the idiom is worth of exploring in the context of this paper and in terms of individual projects. That is, the imperative of seeking to improve the cost and benefits delivered by the PPP model is heightened when the VfM hurdle is increased

with governments' low cost of borrowing and when government agencies demonstrate competence in the project management and governance of an unbundled project (that is, separate contracts for design; construction; operations and maintenance direct to government). The VfM hurdle is also increased where there are economies of scale in activities in the project that are common with ongoing activities elsewhere in the jurisdiction. For example, routine maintenance of roads across a county or a state that can yield economies of scale when government procure this activity across a network of roads and which then increases the need for the PPP Company to work harder to find efficiencies to offset these economies of scale and justify undertaking the maintenance of the road it has constructed - as separate to other roads in the network maintained as part of an area-wide contract.

A paradox then develops in countries in which these conditions prevail, especially in those countries whose governments are experiencing record low levels of cost of borrowing and have access to public agencies with procurement competencies across the range of projects suited to the conventional PPP including more straight forward projects. That is, these governments may *want* more PPP but find they *need* to present a much higher VfM hurdle to potential PPP consortia. Therefore, there is a strong and urgent case for seeking to improve, in particular, the conventional PPP model. And as the alliance PPP model will suit certain type of projects, however rare these may be, there must also be merit in seeking to improve the alliance PPP model. At this point then, there is value in being speculative in beginning to articulate potential improvements to both PPP models and as a stepping stone towards identifying research directions that are the most likely to deliver the greatest return.

POTENTIAL IMPROVEMENTS AND RESEARCH DIRECTIONS

All PPP models

The literature on PPP models is patchy. However, it can be pieced together to present the PPP model as a problem of substantially two competing choices. The first is the orthodox or conventional model based on risk allocation and whose strength lies in certainty of defined outcomes for government including budget certainty, but whose weakness is thought to arise from a lack of innovations that pertain to production benefits and which limit how much the conventional PPP model will deliver a facility that enhances utilization or front-line activity. The second is the heterodox alternative or alliance-based PPP model that whilst expected to be strong in terms of innovations and potential to enhance front-line activity, lacks budget certainty.

Given the lack of veracity of the literature and the dearth of empirical studies on the efficacy of the PPP model, there appears to be much value in firstly developing a wide-ranging and deep data base or baseline of data that explores the key underlying position developed in this paper. That is, this data base would establish across the globe the prevalence of the majority risk allocation approach or conventional PPP model, as opposed government engaging in a risk sharing approach including a gain/pain share regime as part of an alliance-based PPP model and including surfacing the proportion of models that differ by degree between these extremes (albeit expected to be the least represented category). Additionally, this baseline data would test the expected relative of strengths of the conventional PPP model in terms of time and budget certainty and the expected relative strengths of the alliance-based PPP model with regard to innovations.

The Conventional PPP Model

Again, given the weaknesses in the literature and lack of depth and breadth of empirical studies on the efficacy of the PPP model, the following suggestions and corresponding research are *a priori* and seek to enhance the efficiency of the conventional PPP Model by building on its expected strengths in terms of containing risk and seeking to address it expected weaknesses by developing a more conducive environment to innovations. More specifically, the following are suggestions for empirical investigations and include the need to assess their effect on VfM;

- The role of finance: Optimizing the capital structure, including the most appropriate balance of debt and equity (across differences project sizes and sectors); the effect of different sources of equity; and the extent to which equity is at risk.
- The role of project management: Composition of sponsors; which sponsor leads the PPP Company; and the extent to which performance of the project manager is moderated by lock-in requirements that prevent the project manager selling their equity and exiting the PPP Company.
- The role of government and contract administration: Ways to allow the Operator or Facility Manager greater influence on the design, for example, ruling-out the use of Turnkey and Design & Construct contracts within the PPP Company.
- Explicit incentives for innovations: Mechanisms to encourage innovations, for example, a fund or bonuses for innovation.

Alliance-Based PPP Models

The most obvious avenue for investigation in the alliance PPP model concerns establishing the right balance of incentives and seeking to optimize the drivers of this balance surfaced by Rose and Manley (including stakeholder involvement; contract and relationship intentions; price negotiation; performance and incentive goals and fair and flexible performance measures). This research is being developed in a construction context and so there are opportunities to explore this work in a PPP context.

Hybrid PPP Models?

We can gaze even further into the possible improvements in the PPP model that combine features of the conventional PPP model and the alliance-based PPP model to seek to harness the relative merits of risk allocation and risk sharing. For example, we can explore conventionally procured PPP models in terms of the extent to which the PPP Company applies alliancing principles with its company. To the extent that alliancing principles applied by the PPP Company under the conventional model are in isolation from the government, there may well be room for improvement including again the issue of striking the right balance of incentives. We can also investigate the effects of competitive alliances, in which the budget is established in competition amongst a number of PPP consortia and not as a result of negotiation between government and one PPP consortia. More radically, we can examine government combining the conventional PPP model and the alliance-based PPP model albeit in a sequential fashion. For example, the government might commence a PPP with an alliance approach and perhaps to end of construction but then revert to the conventional PPP mode in operations. Imagining new ways of configuring PPP models enlightens the search for examples or informative outliers in practice

that match or might be close to these hybrid types of PPP models and the basis of developing and testing new hypotheses.

CONCLUSION

Based on a thin literature on the efficacy of competing PPP models and in theory, the conventional PPP model is expected to be relative strong in terms of time and budget certainty whilst the alliance-based PPP model relatively strong with regard to innovations. Furthermore, the conventional PPP model is assessed as having greater appeal in terms of its application to a far wider range of projects but appears to be under great stress and under conditions in which government has access to low costs of borrowing; is concerned to protect its credit rating and retains procurement competence in delivering an appreciable proportion of the types of project to which the conventional PPP model is suited.

Whilst we await clearer direction from comparative whole-life empirical studies of VfM in PPP and non-PPP infrastructure and mindful of the global pace and trajectory of PPP, the virtues of seeking to improve PPP generally, and both the conventional and alliance PPP models more specifically, seem incontrovertible. As such, what is now clear is that there is an urgent need to develop a deep and wide-ranging set of data through a global study that delivers this rich data in a coordinated and coherent manner, and with a view to creating a framework to facilitate the empirical investigations suggested in this paper.

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