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ASSESSING RISK IN INFRASTRUCTURE PUBLIC PRIVATE PARTNERSHIPS

Michael Regan[1], Jim Smith[2], and Peter Love[3]

Abstract

Public private partnerships are a method for the delivery of social and economic infrastructure services in over 80 countries worldwide. PPPs are a contractual arrangement between public and private entities through which the skills, assets and/or financial resources of both sectors are allocated in such a manner that provides optimal service delivery and good value to society. Central to the operation of public private partnerships is the systematic evaluation of the procurement options available to government, an output specification to encourage private design, risk transfer, construction and operational innovation, the detailed analysis of projects over their operational life-cycle, a rigorous and competitive bid process, and the selection of proposals that deliver value for money.

Value for money is enhanced with other features of the procurement process. These include the selection of projects for PPP delivery that offer scope for risk transfer, the preparation of an output specification that creates an incentive framework for sustainable service delivery to requirements, governance and approval arrangements, the pre-qualification of contractors, and a competitive bid process. Value for money principles enable governments to derive more from their public private partnership programs. This paper reviews risk in PPP procurement arrangements and considers how it is integrated into a value for money analysis. International experience of assessing and managing risk in PPP projects is presented to illustrate the dimensions of risk evaluation in various types of projects.

Keywords: risk, public private partnerships, value for money.

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1.0 Introduction

First introduced as part of the Private Finance Initiative in the United Kingdom in the 1990s, public private partnerships (PPPs) have come into wider use around the world as an important method for government procurement of economic and social infrastructure services. In contemporary practice, the PPP is a specialised form of procurement that changes the role of government from owner and manager of infrastructure assets to a buyer of infrastructure services. PPPs are a method of public procurement that employs a combination of private sector capital and management to deliver infrastructure services to, or on behalf of, government (Regan 2010). To determine which procurement method is best for government, a comparison of the procurement options is undertaken in the early stages of the procurement process.

Value for Money (VfM) enables government to measure two key dimensions of infrastructure procurement. First, it requires government to undertake a detailed *ex ante* quantitative evaluation of a project over its life cycle in order to compare and select the best procurement option. Second, with adjustment for risk and competitive neutrality, it provides a means of comparing the most efficient procurement mechanism available to government with proposals received from contractors in a competitive bid process. In this second application, VfM will also take into account the qualitative dimensions of a proposal thereby equipping government with the information to make an informed selection of the bid that best meets the service requirement contained in the specification, and offers the best financial return.

There are two important drivers of VfM in PPP contracts. First, the transfer of project and service delivery risks from government to the contractor. This may include risks associated with construction time and cost, life cycle costing, operations, finance, connectivity to support networks, industrial relations and environmental management. These risks are transferred when the contractor is in a better position to manage the risk at lower cost than government. Second, a competitive bid market also drives VfM because contractors compete on the basis of time and price, their experience and efficiency, track record, the innovation that they bring to the construction and operational tasks, and the added value that they can bring to the service delivery objectives of government.

2.0 Risk in the Public Sector Comparator (PSC)

The Public Sector Comparator (PSC) is an estimate of the risk-adjusted, whole-of-life cost of the project if delivered by the State. The PSC is developed according to the same output specifications included in the Project Brief and assumes the most likely and efficient form of conventional (i.e. non-PPP) delivery by the state.

The PSC is expressed in terms of the net present cost to the State, calculated using discounted cash flow analysis and seeks to take full account of the costs and risks of that method of procurement. The PSC includes amounts to cover the design and construction costs and the

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maintenance, operation and facilities management costs during the Project Term. The PSC plays an important role in the evaluation of proposals and the assessment of VfM. However, its accuracy depends on the assumptions used to establish costs, and to identify, measure and price risk. The PSC should be robust and consistent with the project scope issued to bidders (KPMG, 2011: p. 2). The elements of the PSC are the "base" or "raw" PSC, which is a costing of the asset or services under government ownership and management, an adjustment for competitive neutrality, the value of risk transferred to the contractor, the risk retained by government, and the discount rate. These are shown in Figure 1.

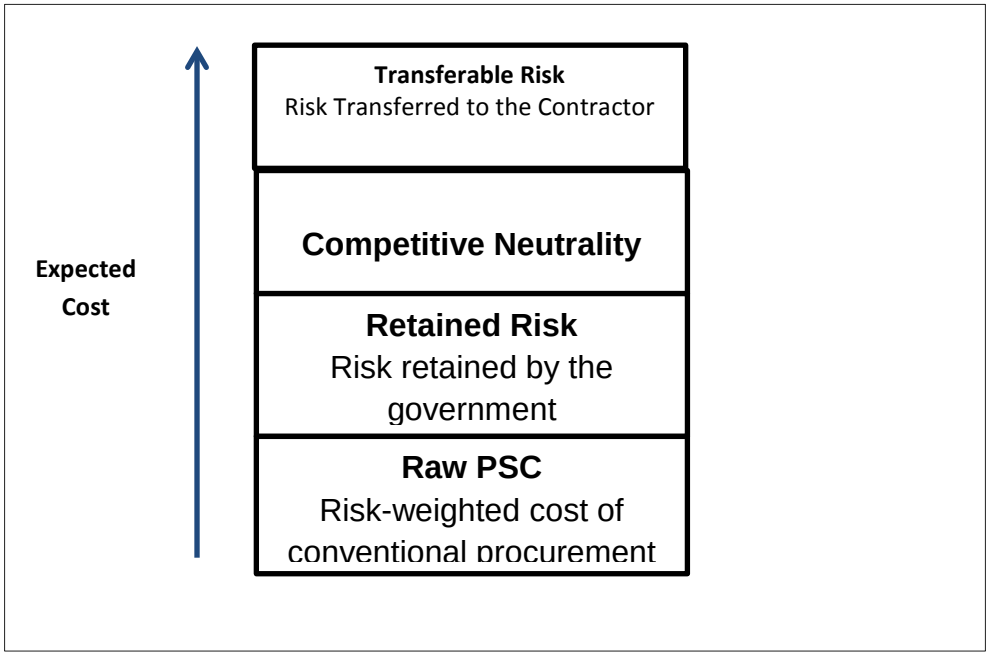

Figure 1 Composition of the Public Sector Comparator

2.1 Elements of Public Sector Comparator

The base PSC provides a costing for delivery of the project as a traditional procurement owned and operated by the government, including capital and life cycle costs and delivering services over the same period as the proposed term of the PPP and to the standard of service as defined in the output specification. The base PSC also includes the following elements in addition to the risk elements noted above:

- An output specification and scope of works;
- All capital and operating costs associated with building, owning, maintaining and delivering the services to the standard required in the specification;
- The application of discounted cash flow methodology at the recommended discount rate;
- Adjustments that reflect income from third parties.

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The costs included in the base PSC are land and development costs, professional fees for design and development approvals, building materials, the cost of professional advisers, plant and equipment, and raw materials. For the operating period, the costs will include employee wages and salaries, consumables, direct management costs and insurance, plant and equipment, rates and taxes. The base case PSC is not generally distributed to bidders although some policies recommend the agency distribute the base case as a guide to bidders in the request for proposal stage (for example, Partnerships Victoria, 2003: p. 9).

2.2 Competitive Neutrality

In a competitive market, government holds a number of advantages when bidding against private firms. Competitive neutrality is an adjustment that removes the net competitive advantage that accrues to a government business because of its public ownership. It is designed to recognise material advantage (and disadvantage) that government may hold in comparisons with non-government institutions, such as an exemption from stamp duties, income and payroll taxes, and the management costs of corporate and other services that government may not explicitly recognise such as accounting, human resources and administrative services. The purpose of this adjustment is to ensure elimination of competitive advantage in a like-for-like comparison of the two estimates.

2.2.1 Transferable Risk

The optimal allocation of risk is a key objective of PPP policy and maximising VfM. The decision to allocate risk to the contractor depends on whether the bidder is best able to manage the risk at least cost. This involves an optimal rather than maximum transfer of risk and requires assessment of the contractor's risk appetite and capacity to mitigate and manage risk determined on a case-by-case basis. Transferring risk that the contractor does not have the capacity to manage may result in excessive risk premiums being factored into the availability payment that contractors will charge government, and diminishing VfM in the process.

2.2.2 Retained Risk

This refers to risk retained by government and generally relates to the output specification and the core services delivered by government. For example, in a PPP project for a regional hospital, it refers to risks associated with the delivery of medical services, the selection and training of medical staff and the optimal utilisation of hospital facilities. Retained risk may also take into account the cost of insuring assets and operational risks, such as public liability risk premiums. Figure 2 shows the components of risk in the PSC and how the bids are managed to include the risk components.

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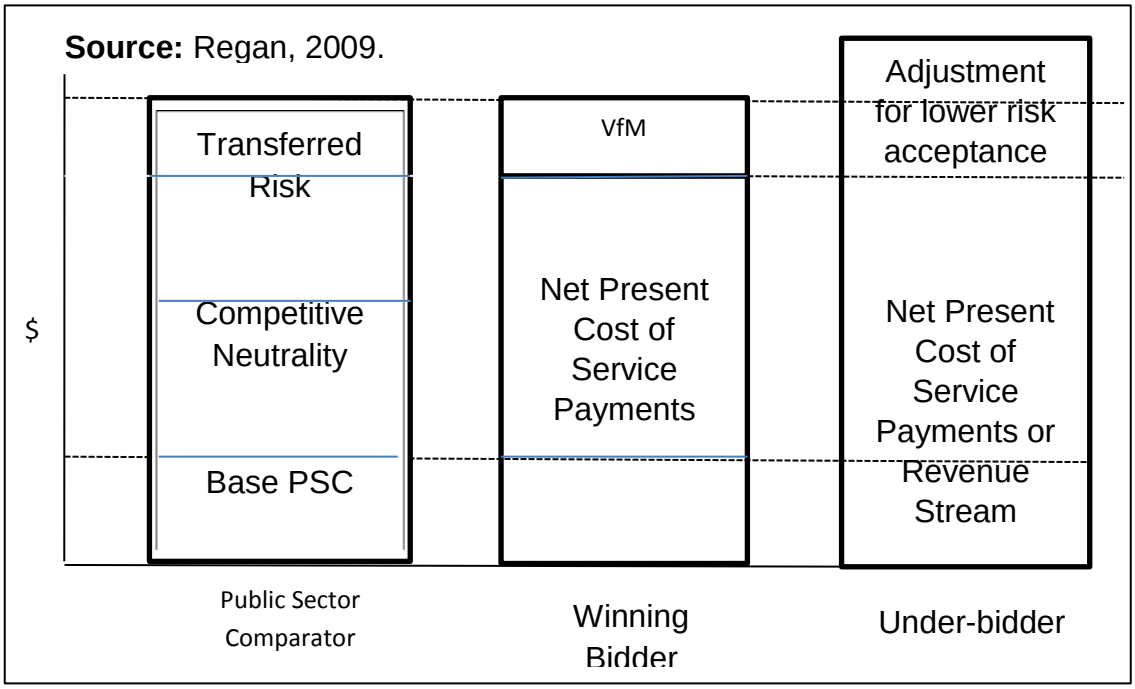

Figure 2 - Public Sector Comparator

2.3 The Discount Rate

The forecasting of future revenue and costs for the PSC or a shadow bid is based on standard investment principles and discounted cash flow (DCF) methodology. The DCF requires a cash flow forecast, underlying assumptions, initial and residual capital values and a discount rate. The selection of a discount rate for government investment is one of the more contentious areas of public economics and is essentially a government policy decision. Discount rates may be calculated using one of several methods: social time preference (a value calculated for the price the community will pay to defer immediate consumption), social opportunity cost (the marginal return on investment from alternative state investment opportunities), or a nominated proxy for both methods being the marginal cost of state debt (Harrison, 2010). Governments generally simplify this process by prescribing the discount rate to be used for public infrastructure investment from time to time.

In OECD countries, the discount rate is generally the marginal cost of government debt, the so-called risk free rate of the country (HM Treasury, 2011). In other jurisdictions, the discount rate may include an adjustment for unsystematic risk, which refers to risks associated with the subjective circumstances of the project under consideration, such as supply chain or market demand risk. In sub-national jurisdictions, the discount rate may also be adjusted for systematic risk, which cannot be eliminated by diversification and affects all investment activity within the jurisdiction, such as political and fiscal risks (Partnerships Victoria, 2003).

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In non-OECD countries, Treasury will generally issue policy directives for agency application of investment discount rates. In most countries, this rate is the marginal cost of state debt.

3.0 Qualitative Analysis

The qualitative elements of contractor bids may be taken into account when determining VfM with PPPs. Typically; these are matters that bring benefits to government, such as unique construction technologies, innovation in construction or early completion for accelerated service delivery. The qualitative attributes of a contractor proposal that contribute to VfM may be complex and difficult to identify and specify in advance. The benefits to government are not always similar for different types of projects. The things that deliver qualitative performance include early completion of assets and early delivery of services, innovation in design and construction methods and materials, better service outcomes, improved capital productivity, third party revenue, and the expertise and capacity of the contractor to meet service delivery requirements over the life of the project. There are many additional factors that can be taken into consideration although this will depend on the particular characteristics of the project being procured. In some jurisdictions it may include social impacts such as access and amenity, and a public interest test that takes into account factors that are important for both social and economic infrastructure services and will generally be reflected in benefits to government not available with alternative procurement methods. Some examples from the literature are shown in Table 1.

Table 1: Qualitative Risk Factor Examples

Qualitative Risk Factors	Case Study Examples
Unquantifiable risk transfer to contractor	Berlin Wasser, Germany
Contractor experience, financial strength, expertise and capacity of project lender	Channel Tunnel Rail Link, United Kingdom Desalination Project, Victoria
Innovative design and construction management (example, off-site prefabrication)	Southern Cross Railway Station, Victoria Royal Children's Hospital, Victoria
User benefits over and above specification	NHS Romford, United Kingdom County Court Building, Victoria
Service sustainability without subsidy	ASA and Rethmann PPP, Hungary
Complies with a public interest test	Eastlink Toll Road, Victoria
Compliance with new environmental laws	Apa Nova Water, Romania
Improved community access	Southern Cross Railway Station, Melbourne
Access to expertise, efficiency and	Apa Novo Water Project, Romania

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technologies not otherwise available to government	Scottish Water Solutions, Scotland Dublin Wastewater Scheme
Compliance with environmental standards	Scottish PPP Water Projects, Scotland
Technology transfer	Berlin Wasser, Germany
Noise abatement at airports	Hamburg International Airport
Service performance	Darent Valley Hospital, United Kingdom

Sources: European Union 2004, National Audit Office 2005; European Commission 2004, *Resource Book on PPP Case Studies*, Directorate-General Regional Policy, Brussels; National Audit Office 2005, *Improving Public Services through better Construction*, HC 364-1, Session 2004-05, London, March.

Qualitative benefits may take several forms including non-conforming bids that accompany a conforming PPP proposal. Examples of qualitative benefits include additional works for a toll road project that increased the total distance by several kilometers (Victorian Auditor-General's Office, 2007), creative design work for a new transport interchange complex that improved visual and community amenity in its precinct (Victorian Auditor-General's Office, 2007); new school buildings that improved operational flexibility, air quality and sustainability in PFI schools (National Audit Office, 2005); contractor use of automated toll collection for a PPP motorway which improved traffic flow and trip times for users compared with conventional manual toll collection (Victorian Auditor-General's Office, 2006). Qualitative evaluation generally follows the quantitative assessment of bids. Qualitative factors such as lower user charges, improved service quality, improved asset utilisation and early completion may outweigh higher cost to government in some cases although the final assessment is best undertaken on a case-by-case basis.

4.0 The Role of Risk in Value for Money

The primary driver of VfM in PPP projects is the transfer of project risks to private contractors. The principle underlying risk transfer is that risk should be borne by the party best able to manage the risk which implies the least cost. So, construction risk is best borne by the construction contractor and finance risk by the financier(s).

4.1 What is Risk?

Risk is any outcome at variance to expectation and is a particular problem with complex infrastructure projects in which the likelihood of cost and time overruns is high. In a PPP project, risks may include site risks such as pre-existing soil contamination and poor sub-soil stability, construction risks such as time and cost overruns and industrial disputes, and life cycle cost risk, which is the estimation of all capital and operating expenses to be incurred over service

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intervals of up to 20 years or longer. Risk may have a positive or a negative impact on project revenues and costs.

Most design and construction risks are well known to contractors, form part of the day-to-day management of a construction company and are factored into the cost structure of contractor bids. However, there are risks that the construction company may be asked to carry under a PPP contract that do not form part of their day to day core business, such as project finance risk, network, operational and life cycle cost risk. When these risks are allocated to the private sector, it is essential that bidders understand the risks that they are accepting, can measure and value those risks, and put in place controls for their monitoring, mitigation and management.

Table 2 shows typical PPP risks at the various stages of the project.

4.2 Valuing Risk

Before adjusting the PSC for retained and transferred risk, it is important to develop a risk valuation methodology. Risk is central to delivering a successful project and it is measured by assessing the probability and cost of an outcome at variance with expectation. Quantifying risk forms part of project risk analysis, which is a process for identifying, measuring, valuing and managing risk, and to some degree, anticipating and mitigating the uncertainty associated with infrastructure projects. Risk is a dynamic variable, its effects may be cumulative or spontaneous and the riskiness of projects increases with complexity and with time. Risk is also difficult to forecast and PPP procurement requires government agencies to develop a good understanding of risk analysis methods employed in delivering economic and social infrastructure services. For example, cost overruns, late delivery and force majeure events are risks that may have a negative impact on the contractor's financial economics or may delay the delivery of services to the community. An examination of the history of risk throughout human history is provided by Bernstein (1998). The distinction between risk and uncertainty is made in Knight, 2006 (a reprint of the original 1921 treatise) and Keynes (1921).

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Table 2: Typical Public Private Partnership Project Risks

Risk Category	Typical Risks
Pre-Design Risk	Suitability of the output specification Development consents, permits and approvals, stakeholder consultation Tenure, site access and network issues (connectivity to utilities and services)
Site Risk	Site conditions, contamination, environmental impact assessment and approvals Existing buildings
Design and Construction	Construction time and cost, fitness for purpose, weather, change in scope or specification, technology interface, quality of building for life cycle cost risk Hold-up risk, changes in scope or specification
Market Risk	Risk of insufficient market demand, tariff setting and escalation factors
Technology	Technology failure
Financial Risk	Interest rates, compliance with lender covenants, currency exchange rates
Technology Risk	Downtime and third party risk with technology failure
Operational Risk	Life cycle cost risk, repair and maintenance risk, accelerated asset deterioration
Network Risk	Access and pricing, regulatory interventions, interface relationship management
Industrial Relations	Delays caused by industrial action
Political Risk	Change of law, tax regulation
Force Majeure	Unanticipated exogenous events such as floods, earthquakes, war and riots

The proposals received from contractors will be based on recognition of a number of risks not included in the PSC. These may include the risk of government cancellation of the bid process, change of taxation and other laws that adversely impact the project and government appropriation of assets without fair compensation. Private bidders may need to consider risks not normally borne by government such as capital raising and underwriting costs, credit and

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sovereign risk insurance, expenses related to bond issues, compliance with lender covenants regarding financial management, the term of loans, refinancing risk, withholding taxes on foreign remittances, interest rate and currency exchange risks. The bidder proposals will include a risk acceptance schedule and a unitary or user pays charge based on its risk- weighted costing of the PPP project.

A relatively simple method of risk valuation for infrastructure projects is the qualitative probability approach which requires the analyst to identify a risk event, measure the cost of the impact, and multiply the cost of the impact by the probability of its occurrence. The formula for risk-weighting an expenditure estimate is as follows:

Risk weighted cost = Original prime cost + (Cost of a risk event x Probability)

Assume a prime cost of $100, a risk that would add $25 to the prime cost if it occurs and a 20% probability that it will occur:

Risk weighted cost = $100 + ($25 x 20%) = $100 + $5 = $105

The importance of risk-weighting is that it quantifies risk for the purposes of risk allocation and preparation of the project budget.

4.3 Risk Allocation

Most design and construction risks are well known to construction firms, and form part of the day to day management of a construction company. However, risks that the construction company may be asked to carry under a PPP contract that are not part of their day to day activities, such as project finance risk, operational and life cycle cost risk may be absorbed by the company and managed internally or sub-contracted out to others such as insurance companies. They may also be rejected by the company in which case the VfM outcome may be weakened because of the value placed on risk transfer for the PSC and VfM assessment. Table 3 summarises the PPP risk allocation responsibility on a typical project identifying some of the risks noted earlier in Table 2.

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Table 3: Typical Public Private Partnership Risk Allocation Schedule

Risk Category	Description	Responsibility
Existing Structures	Suitability of existing buildings for use in redevelopment	• Government
Site Conditions	Pre-existing contamination Construction contamination	• Government Contractor
Environmental Risk	Compliance with Environmental Management Plan for redevelopment	• Contractor
Design	Fitness for Purpose	• Contractor
Construction	Responsibility for time and cost risk	• Contractor
Industrial Relations	Labour disputes and hold-ups	• Contractor
Commissioning	Delays and rectification costs	• Contractor
Demand for Services	Derivation of third party revenues	• Contractor
Network Risk	Connectivity to supply chain	• Contractor
Life cycle Cost Risk	Responsibility for cost blow-out	• Contractor
Political Risk	Change of Tax Law	• Government
Financial Risk	Interest and exchange rate risk	• Contractor
Force Majeure	Non-insurable calamity	• Contractor

5.0 Informal VfM Assessment

In some countries, PPP policy may endorse VfM principles without providing specific criteria to determine how VfM will be calculated. The reasons for this may be that government needs to fast-track projects or the government's fiscal position limits public investment options. The informal assessment of VfM uses systematic approaches to the procurement process that embeds VfM principles in project evaluation and procurement methodologies.

In jurisdictions where a formal VfM process is not required, a comprehensive procurement process that embeds VfM principles may achieve a similar outcome. The elements of a VfM procurement process include a detailed feasibility or procurement options analysis, a pre-qualification procedure, competitive dialogue, technical and administrative requirements that incorporate quantitative and qualitative performance benchmarks, and adoption of a gateway system that prescribes the stages through which a project must pass before it is finally approved. Delmon (2009: p. 13) describes this approach as "… a holistic assessment of the project delivery and the marginal benefits provided by private investment and the competitive procurement process used". The procurement measures commonly used to improve VfM outcomes include:

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- Comprehensive evaluation of the service needed to guide agency decision-making during the investment and procurement stages of the project;
- The preparation of technical requirements for the project;
- A framework for the systematic identification, measurement and optimal allocation of risk particularly life cycle cost and operational risks, force majeure, finance and construction risk;
- An experienced and well-trained agency PPP project management unit;
- A two stage bidding process requiring pre-qualification before the request for proposal is issued;
- A competitive bid market;
- Bidder selection criteria incorporating quantitative components (risk transfer, cost to government, technical requirements) and qualitative components (contractor expertise and track record, design and construction innovation, early completion).

A PPP policy that adopts most of these principles has a greater likelihood of achieving VfM outcomes for government than a PPP policy that does not. However, informal VfM methods do not provide government with sufficient data with which to improve the procurement process, document lessons learnt, raise the skill levels in line agencies and optimise risk transfer with future projects. These outcomes can only be achieved with the adoption of a formal approach to VfM assessment.

A number of countries use a competitive bid market to enhance VfM outcomes. The competitive bid market approach is based on the assumption that private infrastructure procurement delivers projects at lower cost and in shorter periods of time than traditional public procurement methods and represent a better VfM option for government. Competition between private contractors in a well-managed bid market is considered the one of the key drivers of VfM with PPPs (Ismail, et al., 2011).

VfM is more likely to be produced by a competitive procurement process over one that is not. However, competitive bidding alone does not ensure VfM outcomes. When this option is chosen, the government will generally prepare an output specification, consult widely with the market ahead of the bid, make an allocation of project risks and proceed with a competitive bidding process. This is the practice adopted with many concessions and BOT contracts and it relies on a competitive bid market to deliver a better outcome for government than could be achieved with traditional procurement, which is widely accepted as the benchmark for measuring procurement performance. Unlike a PPP, a traditional contract based on an input specification is an adversarial contract and contractor selection employs criteria heavily weighted toward lowest cost. Policies that use competitive bid markets rely on bidder depth, transaction flow, risk transfer, and rigorous management of the bid process. Procurement method is also important and policies may require a minimum number of bidders, pre-qualification, open or closed bids, and competitive dialogue during negotiations. In some jurisdictions, a best and final offer may be requested from short-listed bidders although this may

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contribute to hold-up delays and rapid escalation of bid costs if not carefully managed. Experience in a number of OECD countries suggests that VfM outcomes are determined by the efficiency with which government manages the competitive bid process, an appropriate risk allocation strategy, and post-selection negotiations to ensure achievement of the best VfM outcome (Delmon 2009, pp. 13-15). Most international PPP policy frameworks now require competitive bidding for PPP projects.

6.0 Conclusion

The PSC is a standard measure for assessing VfM across all disciplines and agencies provides a methodology for comparison between proposals. The PSC contains a significant element of embodied risk; retained risk by the government or agency, risk-weighted cost of conventional procurement, and transferable risk to the contractor. The advantages to government of using a PSC is that it develops agency skills and experience in activities such as options analysis, risk-weighting financial forecasts of projects for risk allocation and management purposes, life cycle cost measurement, discounted cash flow analysis of government investment activities, and a better understanding of optimal methods for financing major projects. The PSC also requires government agencies to take into account the qualitative dimensions of procurement decision-making including the contractor's experience and track record, the identification of efficiencies through contractor design and construction innovation, and indirect benefits in the form of improved productivity, technology transfer, improved services and compliance with international environmental and other standards.

The PSC plays an important role in the evaluation of proposals and the assessment of VfM. However, its accuracy depends on the assumptions used to establish costs, and to identify, measure and price risk. The PSC should be robust and consistent with the project scope issued to bidders (KPMG 2011, p. 2). A review of the international evidence (Regan, et al., 2011) suggests PPPs that use the PSC with integrated VfM evaluation criteria are achieving improved procurement outcomes for government. This is more prevalent with larger and more complex projects that make greater use of risk transfer, innovation, technology, and a competitive bid market. International evidence suggests that PPPs are lowering the cost of services to government, improving regional economic performance, and are making a significant contribution to improved service quality. Examples include reduced in-patient stays and faster recovery times in public hospitals, better educational performances in state schools, improved efficiency in waste management, water supplies and recycling, better asset utilisation and faster delivery of services.

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