

Value for Money Assessment for Public-Private Partnerships: A Primer

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1 Introduction

This primer addresses *Value for Money Assessment* for public-private partnerships (P3s). Companion primers on *Financial Assessment* and *Risk Assessment* for P3s are also available as part of this series of primers.

What are Public-Private Partnerships?

Public-private partnerships (P3s) for transportation projects are drawing much interest in the United States for their ability to access new financing sources and transfer certain project risks. P3s differ from conventional procurements where the public sponsor controls each phase of the infrastructure development process – design, construction, finance, operations and maintenance. With a P3, a single private entity (which may be a consortium of several private companies) assumes responsibility for more than one development phase, accepting risks and seeking rewards.

Design-Build procurement – under which private contractors are responsible for both designing and building projects for a fixed price – are considered by some to be a basic form of P3. Further along the P3 spectrum, the private sector may also assume responsibility for finance, operations, and maintenance, typically via a long-term (e.g., 30 years or more) concession from the public sponsor. With a *Design-Build-Finance* (DBF) structure, the private sector entity is in charge of financing and building the project, but leaves the O&M of the facility to the public agency. *Design-Build-Finance-Operate-Maintain* (DBFOM) adds private financing to the design, construction, and O&M of the project. The public agency may have to provide a public subsidy to the project which may require use of bond proceeds or budgetary authority, but the public agency will not usually finance the entire project under this P3 structure.

This document, as well as the series of FHWA primers on P3s, is concerned primarily with forms of P3s where the private sector partner (called the “concessionaire”) enters into a long-term concession to perform most or all the responsibilities conventionally procured separately and coordinated by the government.

Public agencies pursue P3s for a variety of reasons, including access to private capital, improved budget certainty, accelerated project delivery, transfer of risk to the private sector, attraction of private sector innovation, and improved or more reliable levels of service. However, P3s – like conventional projects – require revenue in order to pay back the upfront investment.

P3s are complex transactions, and determining that a P3 is likely to provide a better result than a conventional approach is not simple. There are many factors that must be considered when determining the best procurement approach for a given project, including long-term costs, myriad uncertainties, risks both now and in the future, and complicated funding and financing approaches.



For more information the reader is encouraged to refer to FHWA's primer on *Public-Private Partnerships*, available at: <http://www.fhwa.dot.gov/ipd/p3/index.htm>.

Using Value for Money Analysis to Evaluate Public-Private Partnerships

Value for money is defined as the optimum combination of life-cycle costs and quality (or fitness for purpose) of a good or service to meet the user's requirement. For example, in the case of highways, the user's requirement might be mobility and safety on a specific roadway. Value for Money (VfM) processes have been designed and utilized in many countries to help government officials determine if, when entering into a P3 agreement, they are likely to obtain a better deal compared to conventional approaches to procure the same project. A basic assumption is that a public procurement is possible with public financing. Also, benefits to users (if it is determined that a P3 could enable delivery earlier than with the conventional approach) are generally not quantified, although they may be considered in a qualitative evaluation.

The VfM analysis process is utilized on a case-by-case basis to compare the aggregate benefits and the aggregate costs of a P3 procurement against those of the conventional public alternative. Risks are present from the early development of a highway project through construction and operation. At the core of a P3 agreement is the allocation of project risks between the public and private partners in order to minimize the overall costs of risk by improving the management of risk. The VfM analysis may be used to assist in:

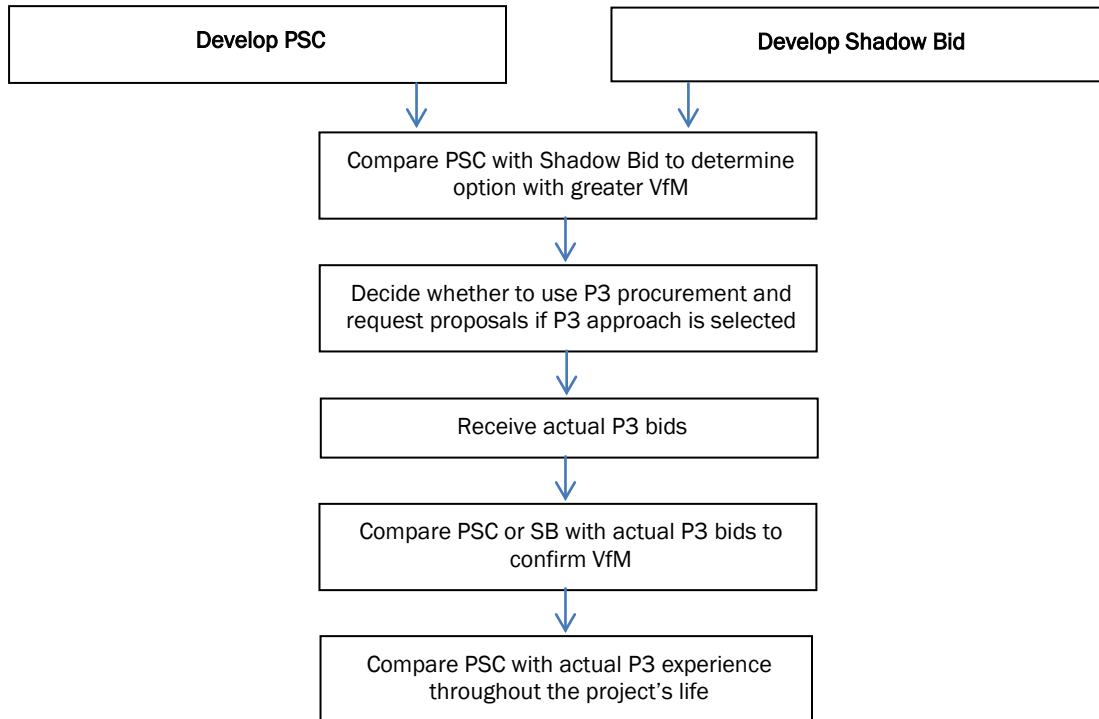
- ▶ Development of the transportation investment program, by indicating which projects are potentially suitable for P3 delivery;
- ▶ Selection of a project's preferred procurement option, i.e., conventional procurement or P3, and assessment of its affordability; and
- ▶ Selection of the preferred bidder and negotiations with the selected bidder (if negotiations become necessary) prior to finalizing the P3 agreement.

The methodology for carrying out a VfM analysis varies, but its major elements generally involve:

- ▶ Creating a Public Sector Comparator (PSC) which estimates the whole-life cost of procuring the project through the conventional approach, including operating costs and costs of risks, which are not typically considered in conventionally procured projects, except for major projects covered by FHWA's Cost Estimate Review (CER) process which captures a risk profile and challenges capital cost estimates using principles similar to those discussed in this primer;
- ▶ Estimating the whole-life cost of the P3 alternative, either as proposed by a private bidder or a hypothetical *Shadow Bid* (SB) at the pre-procurement stage which attempts to predict the bidder's costs, financing structure and other assumptions; and
- ▶ Completing an "apples-to-apples" risk-adjusted cost comparison, with appropriate consideration of qualitative factors.

The PSC not only assists in analyzing VfM, but also promotes an understanding of full life-cycle costs at an early stage in project development and creates confidence in the rigor of the evaluation process to decide whether a P3 would provide better value than conventional procurement.

Figure 1-1. How a PSC and P3 Alternative are Compared at Different Stages of Project Development



What Value for Money Analysis Does Not Evaluate

It is important to clarify that VfM assessment of P3s is distinct from the process of establishing whether a public sector project is a good use of society’s resources, which is done through a full benefit-cost analysis. Benefit-cost analysis involves a comprehensive assessment of the full range of economic costs, risks and benefits and takes into account less quantifiable impacts including external costs and benefits. In contrast, VfM analysis assumes that the decision has been made that a project is a good use of societal resources, and that the question that remains to be answered is which procurement method will deliver the greatest value.

VfM assessment of P3s is also distinct from the process of establishing whether or not a project is actually affordable to the government. There is no reason to presume that a project that represents good value for money will be affordable or that an affordable project will represent good value for



money. Financial assessment of a given project is more likely to address affordability. A separate primer in this series addresses *Financial Structuring and Assessment* of P3 projects.

Structure of this Primer

This primer is structured as follows. Chapter 2 provides an overview of the VfM analysis process. Chapter 3 discusses discounting of future costs and revenues to facilitate comparison of the procurement alternatives in terms of present value. Two key components of the PSC are life-cycle costs and the costs or risks. They are discussed in Chapters 4 and 5 respectively. Toll revenue risk is discussed separately in Chapter 6. Chapter 7 discusses quantitative assessment of VfM and Chapter 8 discusses qualitative assessment. Finally, Chapter 9 presents a summary with cautionary notes based on experience to date.

2 Overview of Value for Money Assessment

Value for Money (VfM) analyses are prepared at multiple stages of project development and procurement, serving as a decision tool to ensure that the choice of a P3 procurement alternative is the best value proposition for the public sector at a given point in time based on the best information available.

Creating a Benchmark: The Public Sector Comparator

To understand the costs of a conventional public-sector approach, VfM analysts use a Public Sector Comparator (PSC). A PSC is developed as a baseline against which any P3 project, either hypothetical or as proposed by a private bidder, will be compared. A favorable comparison, in which the P3 achieves the same outcome for lower overall costs than the PSC, shows the P3's ability to generate value for money. An unfavorable comparison is evidence that the P3, as imagined or proposed, is unwarranted. An unfavorable comparison may also be taken to suggest that there is a better way of structuring a transaction and a better way of allocating risks between the parties. This can therefore help to inform the decision-making process with regard to the optimum type of transaction. The process of performing the VfM analysis should help the public agency to focus on the key risks and opportunities and decide whether to look again at the project scope and key risk allocations before starting a procurement.

The PSC estimates the hypothetical risk-adjusted cost if a project were to be financed, owned and implemented by the public sector. It is generally divided into five elements: the raw PSC, financing costs, retained risk, transferable risk, and competitive neutrality, each of which is discussed below.

The *Raw PSC* accounts for all life-cycle costs including public procurement costs, public oversight costs, and both capital and operating costs associated with building and maintaining the project and delivering the service over the pre-determined time. Chapter 4 discusses these costs in more detail.

Financing costs are the costs associated with arranging financing for a project, generally with bonds for a conventional procurement. Financing costs are discussed in Chapter 4.

Retained risk refers to the value of any risk that is not transferable to the bidder, and *transferable risk* refers to the value of any risk that is transferable to the bidder. Some risks may be shared, i.e., borne partly by the public agency and partly by the private entity equally or in some other proportion. Valuation of these risks and optimal allocation of risks between the public and private sectors is discussed in Chapter 5.

Competitive neutrality adjusts the PSC for any competitive advantages or disadvantages that accrue to a public sector agency by virtue of its public ownership. These adjustments are discussed in Chapter 7.



For toll-based projects, toll revenues reduce the net costs to government in pursuing the project through a conventional procurement. These revenues are deducted from the total costs. Chapter 6 discusses how toll revenues are forecasted and accounted for in VfM analyses.

Assessing the P3 Option

A VfM analysis typically consists of two major components:

- ▶ *Quantitative Assessment* - a comparison of estimated, risk-adjusted costs, as discussed above; and
- ▶ *Qualitative Assessment* - an assessment of key considerations that cannot be easily quantified (discussed in Chapter 8).

Once the cost of a PSC is determined, the public agency must estimate the total costs of the P3 option to the government over the life of the project. The estimate of the P3 option is called a *Shadow Bid*. It is important to assess the P3 option to determine whether beginning a P3 procurement process is advantageous, because the transaction costs of a P3 procurement are relatively high for the public agency as well as bidders. Therefore the public agency's intent to pursue P3 procurement must be fairly certain.

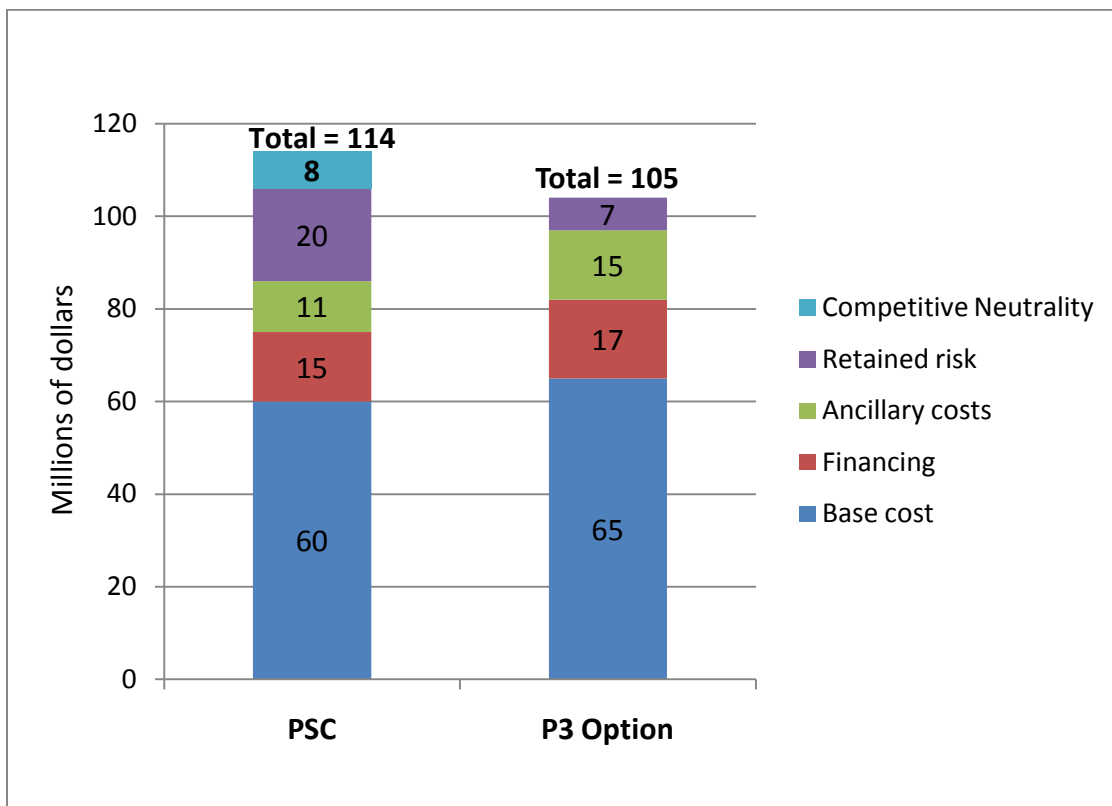
Armed with estimates of the whole-life costs and revenues for the PSC and the Shadow Bid (or actual bids), procuring agencies can compare them side by side. Discounting of cash flows (i.e., project costs and revenues over the proposed term of the P3 concession) is a key step in the process and is discussed in Chapter 3. Given that P3 and PSC scenarios often differ by small margins, small changes in the discount rates used in these analyses can tip the balance in the comparison. Figure 2-1 graphically shows a hypothetical comparison between a PSC and a Shadow Bid. Note that the public agency's procurement and oversight costs, which would not be borne by the private entity, would need to be included as a separate item for a fair comparison.

The PSC and the Shadow Bid are developed as part of the quantitative assessment of the VfM analysis conducted at the pre-procurement stage. They are typically developed using cost estimates developed early in the project lifecycle, and are continually updated and refined throughout the project assessment and the procurement process. Chapter 7 discusses the development of the PSC and the Shadow Bid and how they are compared for quantitative assessment of VfM.

After bids are received, the procuring agency is able to assess whether or not a private sector entity may be able to deliver the project with additional efficiencies and benefits relative to conventional procurement by conducting an updated VfM analysis using the bids received. There are other benefits of completing a VfM analysis at this stage, such as helping an agency to better understand the value of risks when considering changes to contract terms during contract negotiations once a preferred bid is selected.

The example depicted in the bar chart in Figure 2-1 portrays a comparison between a public procurement with a baseline present cost of \$60 million and a P3 shadow bid for which the baseline present cost (net of financing costs) is \$65 million. While the baseline P3 cost is \$5 million more and imposes an additional \$6 million in ancillary and financing costs, the \$13 million reduction in the costs of risk due to transfer of some risks to the private sector and \$8 million in competitive neutrality adjustments overcome these cost differences and result in a net savings to the government of \$9 million overall, offering 7% in Value for Money. This example illustrates the central trade-offs that often characterize P3 procurement: the government trades away significant risks in exchange for higher baseline costs and financing costs in the P3 scenario.

Figure 2-1. Calculating Quantitative VFM



3 Discounting Future Cash Flows

How Cash Flows are Converted to Present Values

A public agency that chooses to undertake construction of a bridge might have to pay \$1.0 billion. The public procurement alternative might involve borrowing the full amount and paying it back over a 30-year period through debt service payments. On the other hand, a P3 procurement alternative might involve annual payments to the private entity over a period of 50 years. To compare the alternatives, these payments (known as “cash flows”) must be converted to present values. This is done by using discount rates that are applied to future cash flows to account for the time value of money.

One of the most significant decisions in a VfM analysis is the selection of a discount rate. The discount rate effectively represents the “exchange rate” between present and future sums of money. It is a percentage by which a cash flow element in the future (i.e., project costs and revenues) is reduced for each year that cash flow is expected to occur. A discounted cash flow (DCF) analysis allows a public agency to develop a net present value (NPV) for revenues and costs (including costs of risks) that are not expected to occur until far into the future. This practice can be very useful when comparing two procurement options where costs and revenues occur in different amounts and at different times. Public agency officials considering a P3 approach may find themselves comparing the costs of a publicly procured project, in which the public agency finances large-scale construction costs over the first few years, against a P3 in which the public agency makes smaller but steady annual payments for several decades. Utilizing discounted cash flows, the public agency can create a single overall cost estimate for each scenario even though their financial profiles are very different.

The present value formula to calculate the discounted cash flow (DCF) is simply the nominal (i.e., inflation-adjusted) cash flow amount (C) divided by the discount rate (R) plus one (1) raised to the power of the number of years (N) into the future. In mathematical terms:

$$DCF = \frac{C}{(1 + R)^N}$$

A discount rate may be “real” (i.e., not including inflation) and therefore applied to cash flows that do not account for inflation, or they can be “nominal” (i.e., including inflation) and therefore applied to cash flows that account for inflation. The real discount rate is made up of two elements:

- ▶ The basic *Social Time Preference Rate* (STPR), which represents the rate that society is willing to pay for receiving something now rather than in the future;



- ▶ An allowance for other factors, mainly to ensure that the public sector does not assess the future benefits of projects without taking account of the risk to which it exposes taxpayers in the process, e.g., the potential to incur additional costs if things go wrong.

The DCF calculation adjusts the value of a given cost, risk or revenue stream based on the number of years into the future that cost or risk is expected to occur. For example, a \$1 million cost expected ten years in the future might have a net present value of around \$615,000 using a discount rate of 5 percent. The same cost expected 25 years in the future would have a much smaller discounted present-day value of around \$295,000.

Assuming a real discount rate of 6 percent and an inflation rate of 2.5 percent, the nominal discount rate is calculated by applying the following equation:

$$\begin{aligned} \text{Nominal discount rate} &= (1 + \text{real discount rate}) \times (1 + \text{inflation rate}) - 1 \\ &= (1 + 6\%) \times (1 + 2.5\%) - 1 \\ &= 8.65\% \end{aligned}$$

Choosing a Discount Rate

Because the net present value (NPV) is a function of the discount rate, it can vary depending on the discount rate selected. A higher discount rate will give cash flows (i.e., expenditures and income, or costs and revenues) expected in the future less value after discounting. A lower rate, on the other hand, leads to greater weight given to future costs and revenues. Consider, as an example, the separate expenditures of \$1 million dollars, discounted at 5 percent in one scenario and at 8 percent in the second (see Table 3-1).

Table 3-1. Present Value of \$1,000,000

Discount Rate	Today	1 Year	5 Years	10 Years	25 Years	50 Years
5%	\$1,000,000	\$952,400	\$783,500	\$613,900	\$295,300	\$87,200
8%	\$1,000,000	\$925,900	\$680,600	\$463,200	\$146,000	\$21,300
Difference relative to 8%	—	+3%	+15%	+33%	+102%	+309%

For costs and revenues occurring in the years in close proximity to today, different discount rates produce moderate differences in discounted values. In this example, the discounted value at a 5 percent discount rate for a \$1 million cash flow 5 years in the future is higher than the value at an 8 percent rate by about 15 percent. The difference is more pronounced as the distance into the future increases. At 25 years into the future, the 5 percent discount rate produces a value twice as large as

the 8 percent discount rate. By 50 years out, the 5 percent discount rate produces a value that, while small, is 4 times as large as that produced by the 8 percent discount rate.

Thus the choice of the discount rate can have a heavy influence on which option appears to have a more attractive cost, and therefore, a heavy influence on the final result of the VfM analysis. Best practices recommend the utilization of multiple sensitivity tests using different discount rates to ensure that the outcome is not skewed or biased by the selected discount rate.

Because the discount rate has a large effect on the NPV of the procurement alternatives and therefore the final VfM analysis, public agencies have given much consideration to it. However, there is no international consensus on the appropriate methodology for calculating the rate to use and the risks that should be reflected in that rate. In some countries, fixed discount rates are used for all projects irrespective of their individual characteristics, while others determine project-specific discount rates. Each approach has its own challenges. Methodologies for determining the appropriate discount rate include:

- ▶ *Social Time Preference Rate*: As discussed previously, this approach is used in the UK.
- ▶ *Weighted Average Cost of Capital (WACC)* which incorporates the financing principle that the cost of obtaining finance is separate from the cost of using finance, risk is inherent in a particular asset, and investors in the marketplace are the best estimators of risk value. The WACC will be equivalent to the project's internal rate of return (IRR). Partnerships British Columbia uses this approach.
- ▶ *Capital Asset Pricing Model (CAPM)*: This approach applies different discount rates to the PSC and P3 delivery structure, utilizing the CAPM for P3 delivery to account for systematic risk within the project cash flows. With this approach, a risk markup is added to a risk-free discount rate to account for "risky" cash flows (i.e., distributions to equity investors), while the risk-free discount rate is used for the "non-risky" cash flows. The CAPM rate reflects systemic risks, i.e., risks that affect the market as a whole (such as the risk of recession) that are transferred to the private sector. The theory is that as the public sector transfers its systemic risk to the private sector, the private sector should be compensated through a higher rate of return. This approach is used by Infrastructure Australia.
- ▶ *Risk-Free Rate*: This approach uses the public sector's long-term borrowing rate if the project risks are reflected in the project cash flows. Historically, the rate on a federal Treasury bill or Treasury bond has been viewed as the risk-free rate in the U.S.

4 Life-Cycle Costs and Financing Costs

What are Life-Cycle Costs?

The VfM process establishes, for each procurement approach, an overall cost estimate for the sum of all project elements (including costs of risks) anticipated throughout a project’s life. This means accounting for not only a project’s construction or capital expenditures (known as “CapEx”), but also the costs associated with operating and maintaining it (known as “OpEx”) for the next 30 years or more, depending on the term of the concession. Costs for project development (including procurement costs) are also included. The sum of these costs is referred to as a project’s *life-cycle cost*.

VfM processes establish a consistent methodology that seeks to identify as well as estimate all of the life-cycle costs for both public sector and P3 procurement options. Table 4-1 lists a few items that are included in the project’s life cycle cost analysis.

Table 4-1. Life Cycle Costs

Cost Item	Description
Capital Costs	Referred to as the Capex, it includes costs for development of the project, including planning, environmental documents, design and procurement, right-of-way purchase and construction costs. These costs are incurred in the first few years of a P3 concession period (or term of the contract).
Operations Costs	Day-to-day costs of operating the project such as snow and ice removal.
Maintenance Costs	Items such as replacement of lighting.
Reconstruction and Rehabilitation	Items such as bridge or pavement replacement, also known as heavy maintenance, which are included as Capex.
Overhead Costs	Items such as administrative costs, office space, supplies, employee salaries, etc.

FHWA’s *Major Projects Cost Estimation Guidance* provides guidance in developing capital cost estimates. Though the capital cost of a new road project certainly attracts focus, a project’s life-cycle cost is a superior measure of true cost. New projects in the transportation sector are characterized not only by large-scale capital costs, but by a variety of other expenses. These other expenses can be difficult to fully understand or quantify with certainty.

Impact of Innovation on Life-Cycle Costs for a P3 Option

Assuming the same base costs under the PSC and the Shadow Bid may lead to a less favorable comparison of the value for money under the P3 option, because it assumes that the private-sector party does not introduce any value-added innovations to reduce costs. Such innovations can occur when the responsibilities for design, construction, financing and maintenance are assumed by a



single party, who will then optimize the trade-offs that are available between these different project cost elements. This is not possible in the case of a conventionally delivered project.

However, sufficient empirical data regarding the probability and magnitude of such innovations will be needed to factor in the impact of these innovations. Unless such data is available, VfM analyses will generally assume that there are no cost reductions due to efficiencies or innovations. It is often a public owner and industry goal to have the transaction structured in a way that will maximize the potential for cost saving innovation. This may include items such as a design that is better integrated with construction methods, better material or construction techniques, tolling and ITS systems that use proprietary technologies and O&M items such as a design that makes major maintenance safer and easier to perform. The qualitative assessment should describe the potential areas for these kinds of innovations, even though there may be insufficient evidence to quantify the benefits.

Financing Costs

Financing costs are the costs associated with arranging financing for a project, with debt and equity for a P3 option, and generally with bonds for a conventional procurement. It can include items such as arrangement fees, commitment fees, and “swap” credit premiums. The processes of arranging financing and servicing the debt over the loan period represents significant costs which will be incurred as part of the investment in transportation infrastructure. These costs are incorporated into the PSC and the Shadow Bid as cash flows separately from the types of life-cycle costs discussed above.

Debt financing is obtained either through bank debt or bonds in a typical P3. When bank debt financing is used, a lender approves the maximum amount of debt for a project, and draw-downs occur through the construction period until this maximum is reached. Interest is accrued periodically on the outstanding balance as the debt is drawn down through the construction period, with a commitment fee applied to the unused portion. When construction is complete and the public agency begins payments to the private partner (or when tolling begins), the debt is repaid via fixed payments of principal and interest.

Alternatively, when bond financing is used, the full amount of the required funds is raised up front and interest starts accruing right away. To lower overall carrying costs of bonds, the public or private entity may borrow several “tranches” of debt (i.e., portions of the full amount of debt needed) over the construction period. The repayment of bonds is similar to bank debt financing, as fixed payments of principal and interest are paid after project construction is complete.

Equity providers structure their investments to be as efficient as possible. In addition to conventional equity investment, an efficient structure may also include a letter of credit or a “bridge” loan as a means of financing construction. (A bridge loan is interim financing until permanent financing can be obtained. Money from the new financing is generally used to “take out” (i.e. to pay back) the bridge loan). Payments to equity holders are not constant, with the Shadow

Bid allowing for a minimum equity return to be specified. This required equity return becomes the cost of equity to the project and is the internal rate of return (IRR) to the equity investor.

5 Risk Valuation and Allocation

Accounting for Risk

Under conventional public procurement, while contractors assume significant risks such as labor supply and weather risks, the public agency retains a significant portion of the risks. Yet outside of a VfM analysis or FHWA's Cost Estimate Review (CER) process for major projects, these risks are not usually quantified, nor are their costs always included in the project costs. For example, when project cost is calculated, the assumption usually is that there will be no delays, and cost increases due to potential delays are not taken into account.

A key component of P3 procurement involves the transfer of certain risks from the public agency procuring the project to the private sector partner. The concept of "transferring risk" requires that the private partner will be responsible for cost overruns or expenses associated with the occurrence of that risk.

Risk transfer can include, among others, construction risk (i.e., risk that the project will not be completed on time or on budget), usage or traffic demand risk (i.e., risk of lower than expected revenues from users of the project) and operation and maintenance (O&M) risk. For example, if the public agency transfers the risk of construction to the private sector partner, then any cost overruns or delays during construction will be borne by the private sector partner, except for certain "compensation events" and "relief events" that may provide the P3 concessionaire with eligibility for additional compensation during construction, e.g., the discovery of unidentified pre-existing hazardous materials, which is generally an owner risk under P3.

Although the identification of project risks can be detailed and varied, typical project risks include technical, political and environmental issues, as well as financial variables such as interest rates and inflation.

The application of risk management techniques can make enormous contributions to the cost effectiveness of a project. They also make VfM easier to conduct and a more reliable decision tool. Risk management begins with identifying the risks in a structured way, including looking at similar projects, using standard risk checklists, interviewing the various stakeholders and end users, and brainstorming or workshop sessions. In P3 projects, a risk register is often prepared in advance, with public officials choosing among four options for each risk element:

- ▶ Retain certain risks;
- ▶ Insure against them;
- ▶ Transfer risk to the private sector partner; or
- ▶ Attempt to mitigate or share the risks.



In choosing among these options, the public agency values each risk, and then evaluates which partner is better able to control, retain or mitigate the risk factors at the lowest cost. This Chapter discusses the processes generally used for risk valuation and allocation.

The Risk Register

Risk analysis is used in the development of a P3 project for a number of reasons:

- ▶ To develop commercial terms that optimize value for money;
- ▶ To calculate risk adjustments as part of value for money assessments;
- ▶ To help determine project contingency amounts; and
- ▶ To identify and monitor mitigation actions (i.e., risk management).

A series of risk workshops is generally conducted to develop a project risk register, also called a “risk matrix,” which is used to manage risks throughout all phases of the project. An example of a risk register is presented in Table 5-1. The risk register will usually comprise the following components:

- ▶ *Risk Category* – type of risk;
- ▶ *Risk Topic* – identifying the specific risk;
- ▶ *Risk Description* – including a summary of the potential loss if the risk event occurs;
- ▶ *Risk Probability* – the likelihood of a risk occurring (e.g., high, moderate, low);
- ▶ *Potential Consequence* – impact of the risk, should it occur;
- ▶ *Allocation of Risk* –whether the risk will be transferred, shared or retained; and
- ▶ *Treatment Options* –actions that can reduce the likelihood or consequences of a particular risk (i.e., risk mitigation).

The risk register may also include the results of *Risk Valuation* – either a qualitative priority ranking or a quantitative estimate of the potential financial cost or “risk premium” based on the consequence and likelihood of a risk occurrence. This Chapter focuses on quantitative risk valuation methods and on allocation of risk between the public and private sectors. Note that risk may have an upside as well as a downside, e.g., in the case of toll revenue (discussed in Chapter 6).

Quantitative risk analysis is conducted to quantify risks in terms of both cost and time impact. Two alternative levels of quantitative risk analysis may be undertaken:

- ▶ *Formula-based analysis* using a simple formula to calculate average risk impact using minimum, maximum and most likely cost and schedule impacts;
- ▶ *Monte Carlo simulation* using specialized software for simulation of expected cost and schedule impacts of each risk to get a range of aggregate risk values along with their probabilities.

Table 5-1. Example of Risk Register

Example 1	
Risk Category	Right of Way (ROW) / Utilities
Risk Topic	ROW Acquisition
Impact Phase	Construction
Risk Description	The project is to be constructed in an area that is developing rapidly so land prices are highly volatile. As a result, the cost of ROW acquisition could be significantly higher than in the current estimate.
Consequence of Risk	Higher prices in future would result in increase in project costs
Ability to Transfer Risk	It may be possible to transfer this risk in a PPTA contract but a high risk premium may be included by Offerors if they feel unable to control or influence the underlying economic drivers. It may be more cost effective for the Agency to accept this risk and try to mitigate it.

Source: Virginia DOT’s PPTA Risk Analysis Guidance, September 2011

Formula-Based Quantitative Risk Analysis

With the risk assessment approach used by Virginia DOT, workshop attendees determine specific values for:

- ▶ The probability of occurrence (between 5% and 90%) of each risk; and
- ▶ A Minimum (Min), Maximum (Max) and Most Likely (ML) cost and/or delay impact of the risk in terms of dollars.

The following formula is then used by Virginia DOT to calculate the risk value of each individual risk:

$$Risk\ Value = Probability\ of\ occurrence \times (Min + Max + 4 \times ML) / 6$$

The formula simulates in a very simple way the type of result that might be obtained through use of more sophisticated analyses using probability distributions (discussed in the next section). A contingency amount may be added to account for unknown risks that have not been identified.

Many risk events are likely to have an impact on both cost and schedule. Schedule impact is quantified in units of time, but delays also have a cost associated with them. The direct cost impact of risk events are accounted for under the analysis of cost risk but indirect costs from delays are not. Indirect costs from delays include the added interest costs for financing, and the cost of running site offices, utilities and the time cost of engineers, inspectors and administration staff. Indirect costs will include agency indirect costs (including independent oversight / construction management) and the contractor’s indirect costs. The total cost of delay is the sum of the agency indirect costs and the contractor’s indirect costs. Additionally, in the case of tolled facility, there will be a loss of revenue that will also need to be accounted for.



Sensitivity analysis may be used to evaluate financial outcomes when critical assumptions are changed. A number of likely scenarios such as low, middle and high cases may be tested. This will provide a more accurate reflection of the potential spread of the total cost to the public agency.

Quantitative Risk Analysis Using Monte Carlo Simulation

A “Monte Carlo” simulation (named after the Monte Carlo Casino where the uncle of one of the creators of the technique gambled away his money) produces a deterministic sample set of likely project outcomes and the probabilities of their occurrence. The sample set is then used to develop distributions and ranges for aggregate cost and schedule impacts. The simulation provides a range of aggregate risk values that the agency may choose from, depending on what confidence threshold is required. This is not possible with a formula-based analysis.

However, Monte Carlo methods require knowledge and training for their successful implementation. Input to Monte Carlo methods also requires the user to know and specify exact probability distribution information, including mean, standard deviation, and distribution shape. The process is as follows:

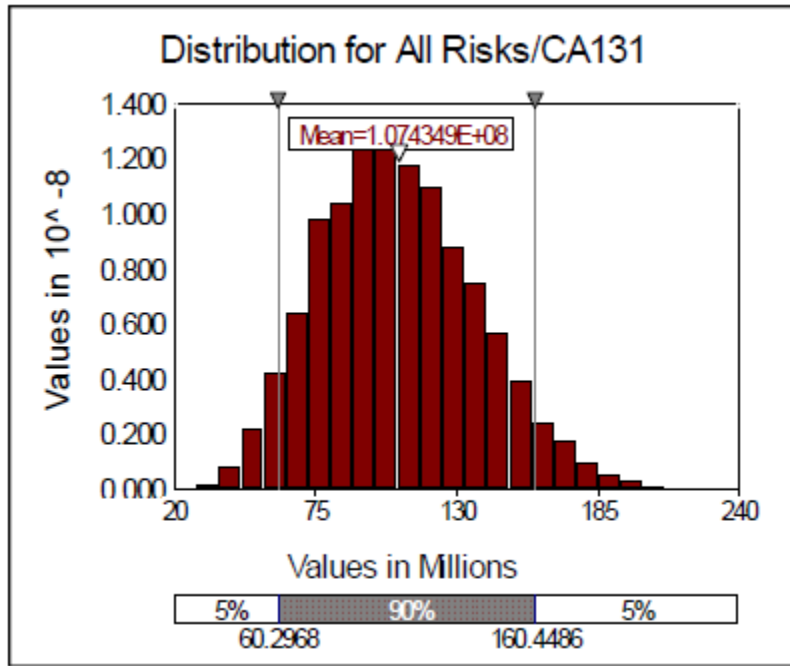
1. Quantify probability, cost and schedule impact as per the formula-based analysis described above.
2. Select a distribution type (also known as an assumption curve) according to the nature of the risk being analyzed. Risk modeling software allows the selection of many different assumption curves.
3. Perform a Monte Carlo simulation of cost and schedule risk using specialist software such as @RISK or Crystal Ball.

The main output of the simulation is total values for retained, transferred and shared risks. Several types of charts may be generated automatically by the Monte Carlo simulation software. Figures 5-1 and 5-2 show examples of impact distribution graphs. Figure 5-1 displays cumulative risks through the use of a histogram. Figure 5-2 shows an alternative method of displaying cumulative risks with an S-Curve.

The S-Curve allows values to be used based on the confidence level required for the project. In Figure 5-2, the 50th percentile (also known as the P50), mean and 80th percentile (P80) are shown since these are the most commonly reported statistics. The mean represents the average of all generated outputs which is not the same as the P50 unless the distribution is symmetrical. The confidence level selected will depend on the stage of assessment, confidence in cost estimates and complexity of the project. The P80 is widely used by public agencies in risk analysis at earlier stages when project information is less well developed in order to show a confidence level of 80% that risk costs will not exceed the estimated value. It should be noted that the public and private sectors have different preferences with regard to the confidence level. For example, a risk averse public

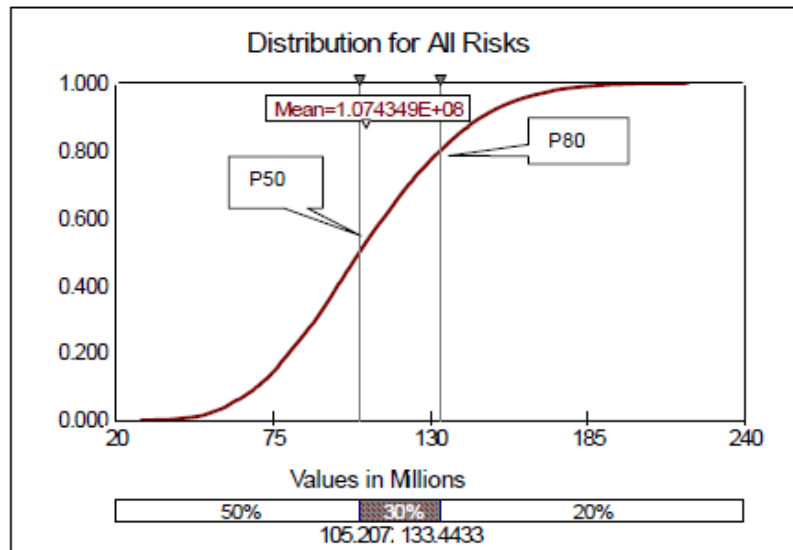
agency may use P90 as its confidence level preference, while private entities may be more comfortable using a P50 confidence level.

Figure 5-1. Risk Distribution Histogram



Source: Virginia DOT's PPTA Risk Analysis Guidance, September 2011

Figure 5-2. Risk Distribution S-Curve Showing Confidence Levels



Source: Virginia DOT's PPTA Risk Analysis Guidance, September 2011



Risk Allocation

Risks identified in a risk register may be categorized in one of three ways:

1. *Transferrable* risks - risks fully transferrable to the private sector.
2. *Retained* risks - risks for which the government bears the costs, e.g., the risk of delay in gaining project approvals.
3. *Shared* risks -, risks that are shared based on a combination of the above two allocations due to the nature of the risk, e.g., earthquake risk. (If the facility were to be damaged by an earthquake, the private sector may be only partially responsible for repairing the asset, depending on the extent of damage.)

Risk allocation is at the core of P3s, which are structured around the sharing of risks (and rewards) between the public agency and private sector entity. It is the transfer of risks that provides incentives to the private entity to innovate in the approach it takes to delivering a project under a P3. One study of 17 P3 projects found that risk transfer valuations accounted for 60% of the total forecast cost savings under a P3 approach¹.

Transferring too little risk to the private sector would constrain the value for money that could be achieved. Conversely, transferring too much risk (e.g., risk that the private sector is unable to manage) will result in high risk premiums, making the project more costly and driving down the value for money. For example, in the U.K., public agencies retain archeological risks at construction sites since these risks are high and not something that can be managed by the private sector. On the other hand, allowing the private sector to take on part of the geotechnical risk helped bring in VfM for the Port of Miami tunnel project in Florida.

To determine the optimal allocation of risk, an agency compares the public sector's ability to manage each risk to the ability of a potential private partner to do the same. Risks that the private sector is more capable of managing are transferred; risks that the public agency is more capable of managing are retained. Where possible, the party with responsibility for managing the risk will seek to mitigate or avoid that risk. If a risk is difficult to assess or manage, it may be appropriate that it should be shared between the public and private sectors (e.g., earthquake risk). An effective risk allocation should create incentives for the private sector to supply quality and cost-effective services.

While the concept behind optimal risk allocation is clear, the practice of how agencies allocate risks is more of an art than a science. Typically, the public sector will be expected to take on site risks and regulatory risks. The private sector will be expected to take on risks arising from the building, operation, finance, and management of the project. The concessionaire may choose to transfer risks

¹ Source: Study by Andersen and LSE Enterprises for the Treasury Task Force, UK. *Value for Money Drivers in the Private Finance Initiative*. January 17, 2000..

to other private parties by selling equity stakes, holding subcontractors responsible for performance, and/or insuring against certain risks.

Public agencies strive to ensure that this optimal allocation is achieved at the lowest possible cost for taxpayers. Under an optimal risk allocation scheme, risks are generally allocated as shown in Table 5-2, which shows how risk allocation differs for DBFOM projects relative to conventional procurement (Design-Bid-Build) and Design-Build.

Table 5-2. Common Risk Allocation Under Conventional and P3 Procurement

Risk	Design Bid Build	Design Build	Design Build Finance Operate Maintain
Change in Scope	Public	Public	Public
NEPA Approvals	Public	Public	Public
Permits	Public	Shared	Private
Right of Way	Public	Public	Shared
Utilities	Public	Shared	Shared
Design	Public	Private	Private
Ground Conditions	Public	Public	Private
Hazmat	Public	Public	Shared
Construction	Private	Private	Private
QA / QC	Public	Shared	Private
Security	Public	Public	Shared
Final Acceptance	Public	Private	Private
O&M	Public	Public	Private
Financing	Public	Public	Private
Force Majeure	Public	Shared	Shared

Source: Virginia DOT's PPTA Risk Analysis Guidance, September 2011

6 Toll Revenue

Toll Revenue Risk

Traffic and revenue (T&R) studies are used to forecast traffic on toll facilities under various toll rate structures and macroeconomic scenarios. T&R studies are important in determining how to structure toll rates, in deciding whether to transfer, retain, or share revenue risk, and in understanding what to expect from private sector bids. T&R forecasting involves subjective estimates of the future behavior of people and businesses with respect to housing and business location decisions and choices of transportation. There is tremendous uncertainty associated with these forecasts, and a good study will be transparent about pointing out the uncertainties.

The traffic and revenue history of a project also has a significant impact on the revenue risk assessment and the corresponding return required by an investor. Traffic demand risk can vary significantly based on whether the proposed project is a new construction project (i.e., a greenfield project), an expansion of an existing facility, a conversion of an existing facility from unrestricted public access to a tolled facility, or an existing toll facility with a proven history of traffic demand. Restrictions on changes in toll rates and performance standards can also impact the return that would be required by an investor in the project.

Quantitative risk analysis using Monte Carlo simulation (see Chapter 5) may be used to assess overall toll revenue risk, which is a function of a variety of individual risks such as population and economic growth rates, pricing structure, costs of alternative travel options and price of fuel. The output of the analysis would be a probability distribution of the likely revenues for different confidence intervals, and the risk of revenue falling below a specified level can be assessed.

Incorporating Toll Revenues in a PSC and a Shadow Bid

For toll-based projects, toll revenues reduce the net costs to government in pursuing the project through a conventional procurement. These revenues are deducted from the total costs in the PSC. Similarly, toll revenues are also used to develop the Shadow Bid. However, there may be differences in the ability of the private and public sectors to maximize toll revenue yield over the term of the agreement due to differences in their abilities to effectively collect and efficiently price toll charges across all vehicle classifications within any toll caps that may apply. (This difference in ability to maximize toll revenue may partly be due to political constraints that public agencies are faced with in regard to toll increases.) If this is so, forecasts of toll revenue can be different for the PSC relative to the Shadow Bid.

7 Quantitative Value for Money Assessment

Developing the Public Sector Comparator

The PSC is expressed in net present value (NPV) terms and is based on the actual public sector method of procuring the project in question. This means that if the public sector would procure the project as a design-build then the design-build method is the procuring option to be considered in the PSC. The PSC also includes any reasonably foreseeable efficiency which the public sector could achieve and takes full account of the risks which would be encountered by that style of procurement.

The public agency typically uses financial and statistical modeling techniques to develop the PSC and the Shadow Bid for a project. For example, a Monte Carlo simulation, a commonly used mathematical modeling technique, uses statistical sampling to provide a range of estimates for the cost of risk for the quantitative assessment. These modeling techniques may assess a range of potential outcomes for the PSC and/or Shadow Bid.

During the development of a PSC, several assumptions are made, including the assumption that the public sector can complete the project to the same quality and standards anticipated by private sector delivery. As the PSC presents a baseline cost of whole-life project delivery for the government, it can also be a useful tool that assists governments in forecasting the full costs associated with conventional procurements.

Competitive Neutrality Adjustments

In order to calculate an appropriate competitive neutrality adjustment, the agency developing the PSC must identify those ways in which the public sector and a potential P3 private sector partner would be treated differently on the basis of their differing status as public and private-sector entities. Because competitive neutrality components will usually represent cost adjustments to the PSC, they will be discounted to a NPV just like other components.

Taxation is the most obvious differential treatment. Taxes are costs to a private partner that ultimately result in revenues to the public sector. Public sector authorities are usually not subject to the same sales, payroll or property taxes that a P3 contractor would face. These differentials would require an increase to the PSC to represent a true “apples-to-apples” comparison. It might be possible to distinguish among the various levels of government to whom taxes are paid, so that taxes paid to the Federal Government could be treated differently from state and local taxes. It is an important policy decision whether or not to draw such a distinction. It is clear that the State and local governments will benefit from state and local taxes, but the benefits from taxes paid to the Federal government are more diffuse. Adjusting for Federal taxes paid by investors in commercial debt neutralizes the advantages of tax-exempt public debt. However, the tax advantage of public



debt represents a real savings to the state or local agency issuing that debt, so the agency may decide not to make adjustments for Federal taxes paid by private investors.

An adjustment may be required with respect to insurance costs paid by a private entity if the risk that is being insured against is not already accounted for under retained risks. When the government chooses to self-insure, there is a perception that the government has saved on insurance premiums. In fact, the government is taking on risks otherwise covered by insurance, and the government should account for this additional risk. An adjustment is made to the PSC by adding an amount equivalent to the premium otherwise paid by the private sector under a P3 to protect against the additional risks.

Regulatory differences in treatment are also a significant category, but the benefits can go both ways. Public sector authorities are often subject to reporting, transparency and/or process requirements that can impose significant burdens in terms of labor and cost. Conversely, private sector entities often face more rigorous performance reporting and higher levels of scrutiny than a public agency would have faced for the same project.

Developing the Shadow Bid

A Shadow Bid is described as the estimated cost to the public sector if the same project were to be delivered by the private sector as a P3. A Shadow Bid is the public sector's estimate of the bid price that it may receive if the project is structured as a P3.

A PSC and Shadow Bid can be developed and compared (see Figure 2-1) during the initial project financial assessment and feasibility study, prior to determining the procurement method and issuing the solicitation.

A financial model is a tool that is used by the public agency to create the Shadow Bid. It attempts to predict the bidder's costs, financing structure and other assumptions. Outputs of the model include upfront public subsidies needed, and the amount of toll revenue or availability payments required throughout the P3 term. Financial modeling is discussed in FHWA's primer on Financial Structuring and Assessment for P3s.

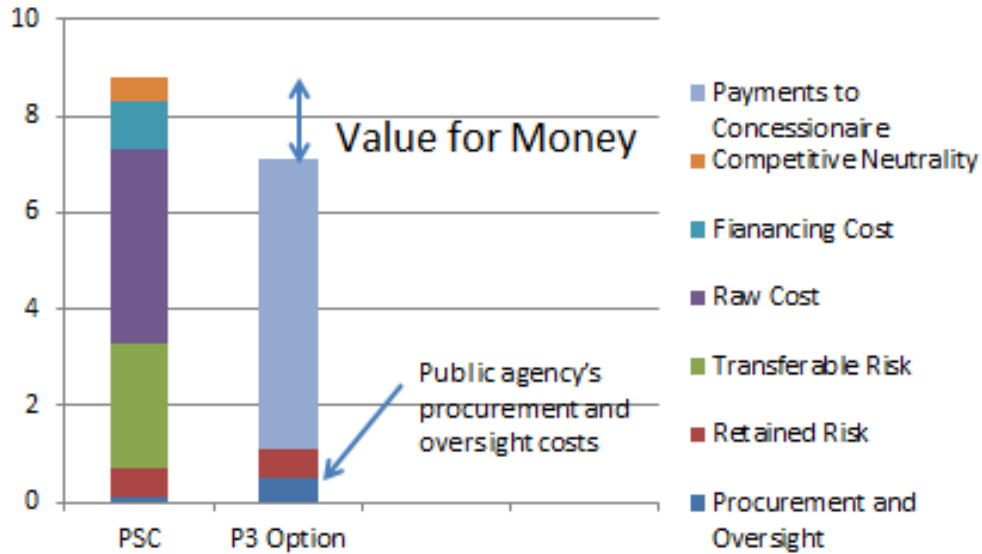
Comparing the Public Sector Comparator to Actual Bids

After bids are received in response to an RFP, the PSC may be compared to the actual bids received to assess if VfM is still achieved prior to awarding the contract as a P3.

Figure 7-1 shows how the PSC and an Actual Bid are compared. The present value of payments to be made by the public agency to the private entity under the Actual Bid include compensation to the private entity for life-cycle costs (including costs incurred by the private sector for the procurement process), financing costs, and costs of risks to be transferred to the private entity,

which are generally included within financing costs in the form of higher rates of return on debt and equity investment.

Figure 7-1. Comparison of PSC and Preferred Bid for an Availability Payment Concession



A P3 may offer better value for money if the total costs calculated by the preferred actual bid are less than the costs calculated by the PSC or the Shadow Bid.

Table 7-1 presents an example of results from a VfM analysis. As shown in the table, the raw PSC was first calculated based on life-cycle costs (discussed in Chapter 4), including capital, O&M and asset replacement costs. Costs of transferred risks were independently calculated (as discussed in Chapter 5). Retained risks were not included, since they were the same for both the PSC and the Shadow Bid. Finally, a cost was added to account for competitive neutrality. When total PSC costs are compared with the costs of the preferred bid, an AU\$9 million savings was estimated, indicating that value for money was achieved. Note that the savings are marginal and amount to only about one percent of the total cost, i.e., within the margin of error that might be expected in this type of analysis. This is not unusual in quantitative VfM analyses, and often qualitative factors (discussed in Chapter 8) are more important in making the final VfM determination. Together, the quantitative and qualitative assessments inform the overall VfM analysis and decision-making process.

**Table 7-1. Peninsula Link Project PSC**

Components of the Public Sector Comparator (PSC)	NPV (AU\$mil.)
Capital Costs	\$680
Lifecycle Asset Replacement Costs (25 years)	\$43
Operating Costs (25 years)	\$80
Raw PSC	\$803
Transferred Risks (Capital and Operating)	\$47
Competitive Neutrality	\$8
PSC (excluding retained risk)	\$858
Preferred bid total costs	\$849
Savings (Value for Money estimated)	\$9

Source: Adapted from Partnerships Victoria Peninsula Link Project VfM Analysis (May 2010)

8 Qualitative Value for Money Assessment

VfM extends beyond the quantitative assessment of project costs and the final outcome is not based solely on this component. VfM may involve substantial qualitative factors that could greatly influence the final decision. Public agencies set goals and objectives for the project (e.g., safety, capacity, reliability, service quality, etc.), which guide them through the planning and procurement stages. Some of the objectives are more qualitative than quantitative. Thus, for those objectives, the qualitative assessment is given equal or more importance relative to the cost factors. The results of the qualitative assessment may be weighted more heavily than the results of the quantitative assessment when the differences between the quantitative results for the conventional option and the P3 option are marginal, or when there is a high level of uncertainty around input variables used in the quantitative assessment and the outputs are highly sensitive to those input variables.

Multiple Criteria Analysis (MCA) may be used to evaluate options based on numerous criteria, including value for money. The MCA approach provides a framework for evaluating potential investment options by evaluating choices against criteria considered critical for the project's success, e.g., the project's goals and objectives.

The outputs of quantitative value for money analysis discussed in Chapter 7 are presented in an MCA process as one of several elements considered in determining the optimal procurement approach for a project.

Other procurement-specific considerations include the ability to address stakeholder interests, meet environmental obligations and ensure a fair and transparent procurement process. Factors that should be addressed in a pre-procurement VfM assessment include any differences in the specifications and service expectations between the PSC and Shadow Bid; whether there are any regulatory or legal restrictions; whether there are any affordability issues; whether there are sufficient opportunities for the private sector to deliver high service quality through innovation; and the robustness of the information used in developing the PSC.

Procurement options that are demonstrated to be clearly inappropriate can be eliminated at an early stage before significant resources are expended on developing detailed quantitative analyses for them. The main output from MCA is a matrix that summarizes how each procurement option being considered scores against the criteria. The comparison between the procurement options usually requires an explicit judgment or "importance weighting" of each criterion. Typically, the results from the MCA are summarized as shown in Figure 8-1.



Figure 8-1. Multi-Criteria Analysis (MCA) Matrix

CRITERIA	PSC	Shadow Bid
Competition	Good	Best
Innovation	Limited	Best
Service Delivery Outcomes	Good	Good
User Satisfaction	Best	Good
Risk Adjusted NPC	\$763M	\$698M

Source: *Methodology for Quantitative Procurement Options Analysis*, Discussion Paper. Partnerships British Columbia, January 2010

It is up to decisionmakers to decide which criteria are the most important. Using the matrix in Figure 8-1 as an example, if allowing for innovation is the most important criterion, the Shadow Bid option would be the preferred option, but if user satisfaction is deemed to be the most important, the PSC option might prevail. The most common quantitative criterion is the Net Present Cost (NPC) of the project cash flows under each procurement option.

The VfM qualitative assessment is revisited at every stage of the project. In general, it will seek to identify factors which will influence the project in terms of:

- ▶ Viability – the ability to formulate a sound contract;
- ▶ Performance – the opportunity to encourage risk sharing and innovation; and
- ▶ Achievability – the capability of the public agency and the private sector to deliver the project.

These factors are discussed further below. Examples of additional qualitative:

- ▶ **Viability:** The public agency identifies its objectives and desired outcomes and assesses its ability to translate them into output specifications that will form the basis for a P3 contract agreement, including setting the performance standards and the incentives in the payment mechanism. The procuring agency will also determine if there are any regulatory, social equity, efficiency, or accountability issues that may affect the appropriateness of the P3 option to meet the agency's objectives.
- ▶ **Performance:** If not already quantified in the quantitative VfM analysis, the qualitative assessment will determine whether the P3 option can provide an improvement over the

conventional procurement with regard to risk management and innovation in delivery. This assessment will gauge whether the benefits from the P3 option (e.g., innovation or faster delivery of service) will outweigh the potential costs and disadvantages of pursuing the project as a P3.

- ▶ **Achievability:** This assessment will determine whether the P3 is achievable given a study of the market, the public agency's available resources and experience, and the competitiveness or attractiveness of the proposed project. The procuring agency must determine if there is enough evidence to show that the preferred private consortium is capable of delivering the desired outcome(s) of the project. It will also determine whether there is a sufficient number of private entities interested in the project and the likely strength of competition in the market between private sector entities that submit proposals. It can also include an evaluation of the capabilities of the procuring agency to determine whether or not they have the resources to manage a P3 procurement. The public agency may also want to consider whether its procurement process allows it to effectively execute an efficient procurement plan without causing a significant adverse impact on delivering VfM. Lastly, the procuring agency will determine whether or not the risk transfer it hopes to achieve is feasible based on the market interest and the agency's own limitations.

9 Summary and Closing Comments

Whether a project can deliver value for money through a P3 approach can be significantly affected by the project's characteristics, such as opportunity for better risk management or combined services. P3s may be a suitable procurement option if the following VfM drivers are present:

- ▶ *Sufficient scale and long-term nature* to attract market interest and justify the sizable transaction costs to government of procuring the project as a P3.
- ▶ *Complex risk profile and opportunity for risk transfer* to the private sector of those risks it is best able to manage.
- ▶ *Assignment of responsibilities for multiple elements to a single entity* to deliver improved efficiency as design and construction become fully integrated up-front with operations and asset management.
- ▶ *Potential for innovation* by focusing on output specifications to provide a wider opportunity to use competition as an incentive for private parties to develop innovative solutions in meeting the service specifications.
- ▶ *Measurable outputs* that enable output specifications and a performance-based contract, with payments to the private sector linked to the quality and timeliness of the delivery of the outputs to ensure that the standards set in place through the contract will be implemented.
- ▶ *Competitive bidding process* to ensure market price and encourage private entities to develop innovative means of service delivery while meeting government cost objectives.
- ▶ *Private sector skills* to effectively manage the delivery and operations of the project.

VfM is a tool that can assist governments in selecting between public and private delivery options for highway projects. A systematic and transparent analysis for P3 projects such as a VfM analysis can increase overall confidence in the P3 market and add clarity for government agencies, private investors, banks, and other stakeholders seeking to invest and deliver P3 projects.

While there are several approaches to assessing VfM, they are much more alike than different – all measure the public sector costs of a conventional procurement in similar ways, all have identified similar drivers that are likely to make a P3 worthy of consideration, and all assess P3 proposals by quantifying risks and determining if the risk transfer is worth more than any price premium charged.

The experience gained with utilizing a Value for Money approach shows that the process of assessing the public-sector and private-sector costs of a project is both time-intensive and resource-intensive. Risk quantification workshops and special steering committees require time and expertise to achieve an accurate analysis. Agencies without the in-house capacity to do this work adequately may need to utilize consulting assistance. Quantification of risks is the hardest and most complex



step in estimating the values of the alternate approaches to a project, but it is a crucial step in determining the appropriateness of a P3.

The reader should be cautioned that quantitative VfM analysis results are entirely dependent on the assumptions made, particularly regarding the crucial element of risk transfer to the private sector. The appropriateness of competitive neutrality calculations and selection of the discount rate can also significantly affect the outcome of the analysis. With long-term contracts, financial evaluations related to cost estimates, discount rates and risk allocation are subject to uncertainties, and thus any conclusions will not be definitive. Thus, while quantitative VfM analysis is intended to aid in decision-making, it is just one of several factors that decision-makers may consider in determining how to proceed with procurement.

Appendix A: Glossary

Term	Description
Bidder	A respondent to a request for Expressions of Interest or an invitation to submit a bid in response to a Project Brief. Typically, a bidder will be a consortium of parties, each responsible for a specific element, such as constructing the infrastructure, supplying the equipment, or operating the business. Government normally contracts with only one lead party (bidder) who is responsible for the provision of all contracted services on behalf of the consortium. ²
Brownfield	Brownfield projects focus on improving, operating and/or maintaining an existing asset (contrast to greenfield). P3 brownfield projects in transportation typically are long-term operation and maintenance contracts or lease concessions. Blended greenfield-brownfield projects also exist—for example, improving an existing asset by adding new capacity (e.g., more lanes).
Concession Period	Total construction and operating periods.
Concessionaire	Private entity that assumes ownership and/or operations of a given public asset (i.e., train station, bus operation) under the terms of a contract with the public sector
Contingency	An allowance included in the estimated cost of a project to cover unforeseen circumstances.
CPI	Consumer Price Index
DB	Design-Build: Under a DB, the private sector delivers the design and construction (build) of a project to the public sector. The public sector maintains ownership and operations and maintenance of the asset. Build refers to constructing the road, which includes reviewing conditions at the building site, providing construction staff and materials, selecting equipment, and, when necessary, amending the design to address problems discovered during the construction phase.
DBFOM	Design Build Finance Operate Maintain: Under DBFOM, the private sector delivers the design and construction (build) of a project to the public sector. It also obtains project financing and assumes operations and maintenance of an asset upon its completion.
Debt Financing Percent	Active financing percentage.
Debt Tranche Interest Only Period	Interest only period for project bond.
Debt Tranche Maturity	Maturity date for project bond.
Discount Rate	The discount rate is a percentage by which a cash flow element in the future (i.e., project costs and revenues) is reduced for each year that cash flow is expected to occur.
Discount Rate Nominal	Discount rate factoring in the inflation rate.
Discount Rate Real	Discount rate that does not account for inflation.
DSCR	Debt Service Cover Ratio
Finance	Finance refers to the phase or delivery aspect of the project that includes providing capital for the project, which may include issuing debt or equity and verifying the feasibility of plans for repaying debt or providing returns on investment.
Greenfield	Greenfield projects focus on developing and/or building a new asset (contrast with brownfield). Many P3 structures are available for greenfield projects, including design-build, design-build-operate-maintain (DBOM), design-build-finance-operate-maintain/manage (DBFOM) and others. Blended greenfield-brownfield projects also exist.
Inflation Consumer Price Index	Inflation Consumer Price Index used as a base rate for inflation assumptions.

² The Transportation Infrastructure Finance and Innovation Act (TIFIA) program provides Federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance.



Term	Description
Leveraging	Leveraging is the degree to which an investor or business is utilizing borrowed money.
Maintenance	The maintenance phase includes keeping the project in a state of good repair, which includes filling potholes, repaving or rebuilding roadways, and ensuring the integrity of bridges and highways.
Net Present Cost (NPC)	Net Present Cost is the estimated present value of expected future cash flows associated with PSC and Shadow Bid analysis without considering revenues.
Net Present Value (NPV)	Net Present Value is the present value of the expected future revenues minus the Net Present Cost.
OIPD	The Office of Innovative Program Delivery, a part of the FHWA, provides tools and expertise in use of different P3 approaches.
PAB	Private Activity Bonds refer to a new type of financing that provides private developers and operators with access to the tax-exempt bond market, lowering the cost of capital significantly.
Public Sector Comparator (PSC)	The Public Sector Comparator (PSC) represents the most efficient public procurement cost (including all capital and operating costs and share of overheads) after adjustments for Competitive Neutrality, Retained Risk and Transferrable Risk to achieve the required service delivery outcomes. This benchmark is used as the baseline for assessing the potential value for money of private party bids in projects.
Retained Risk	The value of those risks or parts of a risk that government proposes to bear itself under a partnership arrangement.
Revenue Leakage	Assumed annual revenue losses for a tolling facility.
RFP	Request for Proposal
ROW	Right of Way (in reference to a type of Project Cost in the Assumptions sheet of the VfM Tool).
Risk Allocation	The process of assigning operational and financial responsibility for specific risks to parties involved in the provision of services under P3. Also see risk transfer.
Risk Transfer	The process of moving the responsibility for the financial consequences of a risk from the public to the private sector.
Routine Maintenance	Routine Maintenance is defined as work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service.
Technical Risk	Risks arising from deviations from the project's original technical assumptions, specifications, or requirements.
T&R	Traffic and revenue.
Transportation Infrastructure Finance and Innovation Act (TIFIA)	The TIFIA program provides Federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance. ³
Transferrable Risk	The value of any risk that is transferrable to the bidder.
Value for Money (VfM)	The procurement of a P3 project represents VfM when - relative to a public sector procurement option - it delivers the optimum combination of net life cycle costs and quality that will meet the objectives of the project. ⁴

³ FHWA, Office of Innovative Program Delivery, <http://www.fhwa.dot.gov/ipd/tifia/index.htm>

⁴ Virginia Office of Transportation Public Private Partnerships, *PPTA Value for Money Guidance*