Public Private Partnerships in California

Phase II Report

Section II: Criteria for Evaluating P3 Projects

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1. Introduction

In this section of our report we develop criteria for evaluating the potential for a project to be delivered as a P3. We started by researching past attempts at P3 evaluation. We found no published research that offers a list of criteria for predicting the success of a proposed P3. Therefore, we reviewed studies of P3s and, developed a framework for evaluating P3s' potential for success. Using data from 100 P3 projects, we apply our framework to identify the attributes present in successful P3 projects. While we attempt to tease out the common attributes of successful P3s, the presence of said attributes in planned P3s will not necessarily induce nor predict success. We hope that our research will become part of a broader tool kit that public sponsors and private partners can use to evaluate potential projects' suitability as P3s.

Given significant P3 experience abroad, and a general lack of institutional familiarity with P3s in the United States, we saw both an opportunity and need to learn from prior experience with P3s across all transportation sectors. Specifically, we saw an opportunity to convert these lessons learned and "best practices" into a series of success indicators. By identifying where past P3s have succeeded (or gone astray), and by targeting particular sources of P3 success (or failure), we realized we could generate a set of success factors for transportation sector P3s. Such factors, given their *ex-ante* identification, will enable P3 sponsors to identify areas of risk, as well as project strengths, pre-implementation. As such, we will, in this paper, a) define a successful P3, b) develop a list of attributes that we expect will predict the success or failure of the project, and c) collect a data sample of P3s that both meet and fail our definition while comparing the attributes of successful projects to the unsuccessful ones. Our aim is to provide decision makers with a set of pre-implementation project attributes that may help identify projects in the planning stages for successful implementation as P3s. By identifying these attributes, and verifying their presence or lack thereof, decision makers can more effectively evaluate a P3's potential for success. Furthermore, much of the perceived risk surrounding

P3s stems from a lack of US institutional familiarity with P3 delivery. We believe the ability to identify pre-implementation success attributes should help to mitigate some of these perceived risks, particularly within the context of applying global lessons-learned, and the resulting pre-implementation attributes, to US P3 implementation (FHWA 2009, p. 5).

The structure of the report is as follows. In the second subsection we review the applicable literature. In the third subsection we describe our definition of a successful P3 and the facility attributes we studied. In the fourth subsection we discuss our sample of P3 facilities. In the fifth section we outline our results. In the final section we offer a brief conclusion.

2. Literature Review

Public-private partnerships (P3s) are widely promoted as an alternative to traditional procurement methods for transportation facilities. Many decision makers see P3s as way to build needed transportation infrastructure without raising revenues (Vining and Boardman 2006, p. 6; PwC 2010, p. 2; NCHRP 2009, p. 5; ACT 2007a, p. 3). But not all projects are suitable as P3s; some P3s have failed spectacularly while still a great number of others have fallen short of hopes and expectations.

No one P3 "model" or principal framework exists. Rather than an infrastructure procurement technique that can be easily replicated from the outset, P3s require a significant amount of specialization and adaptation to each individual project, as well as institutional familiarity with the processes (FHWA 2009, p.1; NCHRP 2009, p.2). Getting a given P3 "right," in short, is no easy task..

Previous attempts to evaluate P3s have compared attributes of successful and unsuccessful P3s in a global context. Furthermore, past P3 research has generally been very targeted and specific, limiting potential global applicability and use. Vining and Boardman (2006 and 2008) have focused on issues of public sponsor institutional capacity, exclusively within the Canadian context. Vining and Boardman 2006 was a cross-sectoral evaluation of Canadian P3s in transportation, education, and healthcare, among other fields. The analysis itself didn't generate attributes or attempt to generalize the lessons learned into indicators applicable outside of the immediate context of those P3s. Generally, the analysis also centered on the efficacy of each project's alternative financing, assessing whether the public sponsor captured a net financial benefit (or incurred a net cost) by procuring each project as a P3.

Vining and Boardman 2008 did seek to generalize past lessons learned from public sponsor implementation of P3s, but framed the analysis exclusively within the context of public sponsor institutional capacity and general P3 policy and management items. The analysis also focused on larger issues of P3-related benefits transfer and the efficacy of the P3 arrangement as a whole. By contrast, we seek to develop a specific set of success attributes for only transportation P3s – a targeted analysis for public and private sponsors alike. FHWA 2009 also focused on issues of public sponsor institutional capacity, however it dealt more or less exclusively with institutional learning and took mostly a case-study/P3 survey approach.

Oxford University project finance and management expert Bent Flyvbjerg (2004, 2005, and 2009) has conducted extensive research on major capital project outcomes. However, his analysis is generally focused solely on delivery/cost outcomes. In addition, his research has not focused on alternatively-procured projects *per se*. Some of the sampled projects were indeed P3s and other forms of alternatively-procured projects (concessions, DBOM, etc.), but the focus was not exclusively on these sorts of projects. Flyvbjerg 2004 focused exclusively on demand shortfalls and cost overruns incurred by a global sample of fixed-rail transportation projects, centering on the Copenhagen Metro project as a case study. Flyvjerg 2004 is a description of past outcomes rather than an explicit prescription for future projects, beyond emphasizing the risk of overruns and demand shortfalls associated with major capital projects, and suggesting such past performance be incorporated into project planning.

Flyvbjerg 2005 assessed the methodologies and techniques used for demand forecasting in transportation projects, comparing methods employed in a cross-sectoral sample of projects and corresponding use performance. Flyvbjerg 2009, much like Vining and Boardman 2008, focused on public sponsor institutional capacity, and analyzed the incentive structures underlying the capital project vetting process within government agencies. These conclusions were broad, generalized findings for public sponsors of all capital projects – not just P3s – and, as such, dealt with management and oversight policies more than specific strategies for the projects themselves.

Other research has focused exclusively on P3 case studies, both of overseas projects as well as what P3s have occurred in the US. ACT (2007a, 2007b, and 2007c) published a series of case studies on P3s – ACT 2007b includes case studies of several US P3s, ACT 2007c includes case studies of international P3s, and ACT 2007a combines the core lessons from both 2007b and 2007c, applying them to the US institutional context. The prescriptive volume of ACT's research (2007a) gives general guidelines for P3 public sponsors – not unlike Vining and Boardman 2008. It does not give guidance on specific project success factors, or any of the sort of attributes which we provide.

The only prior research similar to our own – that is to say, research which draws key success factors and attributes from a sample of P3s – were two independent initiatives, the first done by Virtuosity Consulting's David Stambrook (2005) and the second by University of Southern California PhD student Yin Wang (2010) . Stambrook took a small sample of ten transportation projects and sought to identify commonalities among each project's core descriptive statistics (cost, contract type, etc.). This research was extremely limited in scope – five successful projects and five failed projects – and did not attempt extend or apply findings beyond the scope of the included sample of projects. The analysis was descriptive in nature – rather than both descriptive and prescriptive, or even predictive.

Wang (2010) developed a decision-making model for the involvement of private finance in toll road development – the research did not address P3s beyond toll roads. Wang concluded that project initiation year, state debt limits, and the state's political climate all dictate the extent to which private investors deploy capital (or withhold it) for toll road development. We know of no other research which attempts to compare the attributes of successful P3s to those of failed facilities in a global context.

3. Background and definitions

As fuel tax revenues declined precipitously during the 1980s, governments were left struggling to fill a growing gap between infrastructure spending needs and funding capacity (NHCRP 2009, p. 9; ACT 2007a, p. 3). Virginia was the first state to authorize P3-enabling legislation in 1988, followed shortly thereafter by California in 1989. Both sets of legislation served as models for other states and collectively led to the implementation of the Dulles Greenway, Pocahontas Parkway, Southern Connector, SR-91, and SR-125 P3s (NCHRP 2009, p. 9).

Governments have been attracted to P3s as a way to bridge the gap between infrastructure financing capacity and needs for four principal reasons:

1) minimize on-budget project-related government expenditures and/or formal government debt;
2) provide infrastructure at a lower cost by leveraging the scale efficiencies of large firms and the presence of cost-minimization incentives of the private sector;
3) reduce the public sector's risk exposure to construction and maintenance costs, as well as demand downside through transferring those risks to the private partner; and
4) create a political climate more amenable tolling than traditional procurement or government tolls (Vining and Boardman 2006, p.6).

P3s themselves range from quasi-traditional procurement – such as design-build (DB) [1] delivery – to outright concessions and total asset privatization. The choice of which form of P3 to pursue is largely contingent upon the public sponsor's[2] desired level of anticipated cost savings, with governments in need of major savings leaning towards total privatization and build-operate-transfer arrangements (NCHRP 2009, p.8).

3.1. Definition of Successful P3s

Since each individual P3 is tailored specifically to that project's institutional context and environment, we experienced some difficulty in forming a general definition of a "successful" P3. As such, we have sought to define what constitutes a successful P3 by identifying five criteria of P3s that transcend differences of project contexts / environments and that are hallmarks of successful P3s, as observed by existing P3 literature.

We consider a P3 successful if it meets all five of the following criteria:

1) the project is completed at a minimum of on time;

2) the project is completed at a minimum of on budget;

3) the project has never entered bankruptcy or sought bankruptcy protection;

4) there is a measurable financial benefit / cost savings realized by the public sponsor;

5) the P3 has met initial demand projections .

We discuss each of these individual criteria in the five subsections that follow.

3.1.1 & 3.1.2. The project is completed on time and within budget at a minimum.

For our analysis, on time and on budget delivery are two distinct components of our definition; however, the following discussion applies to both. A successful P3 must be completed at least on-time and within the project's allotted budget. Successful P3 arrangements will have demonstrated an ability to maintain consistent progression of project construction and to achieve on-time and on-budget delivery. Completing a project on time and within budget are indicators of effective project management, good ex-anti cost estimation, and suitable contract mechanism. While "changes in plans and / or implementation are inevitable after the project has begun," the public sponsor and private investor must work together to mitigate the impacts of those changes on both the project's bottom line and its delivery schedule (Vining and Boardman 2008, p. 157). Flyvbjerg et al. cite a significant annual percentage increase in overall project cost for each year of project construction delay; a delayed project will cost more and threaten project viability (2004, p. 16). In a P3, the public sponsor and the private investor enter into a contract to guarantee the delivery of a facility by a certain date and within certain budgetary constraints. If those conditions are not met then the core tenets of the contract have not been met.

3.1.3. The project has never entered bankruptcy or sought bankruptcy protection.

A successful P3 will have never entered bankruptcy or sought bankruptcy protection, as successful projects are financially viable projects (ACT 2007c, p. 36). Financial viability is a basic requirement of success. Lack of financial viability adds to public sponsor financial risk and often results in additional public costs. (ULI 2005, p. 13). Secondly, for those projects funded by user fees, if a facility enters bankruptcy it presumably suffered from less-than-anticipated demand. Such an occurrence raises questions about the effectiveness of many components of the public sponsor's and the private investor's due diligence and planning elements (Giuliano, et al. 2010a, p. 37). Finally, an asset that goes bankrupt is a public relations, and political, challenge on a multitude of levels, damaging the acceptance of the P3 model.

3.1.4. There is a measurable financial benefit / cost savings realized by the public sponsor.

One of the chief purposes of a P3 is to leverage strengths from both the public sponsor and private investor i.e., to minimize costs while maximizing construction speed and overall asset productivity (ACT 2007a, p. 18; PWC 2010, p. 7; FHWA 2009, p. 2). If the public sponsor finds itself exposed to increased financial risk during a P3 (when compared to traditional procurement) the project cannot be considered a success. This increased risk exposure includes both outright financial risk (e.g., long-term availability payment or asset hand-back schedules) and residual financial risk as well; if the asset goes bankrupt, the state must assume control to keep the asset operational (ACT 2007b, c. 3 p. 61; Guiliano et at. 2010b, p. 36).

As such, P3s should work constructively towards achieving public sector financial savings. Some potential sources of financial savings from P3s are,

- decreased project financing costs;
- general reduction in public sector financial risk through transfer to private sector;
- reduction / elimination of public sector funding commitments;
- expedited delivery that decreases construction costs;
- "economies of scale" in the private sector during project design and construction;
- "cost-reduction incentives" in the private sector; and
- potentially-reduced private sector labor costs (Vining and Boardman 2006, p. 5).

In the absence of comprehensive, perfect information on most of the sources listed above, we chose to measure the overall percentage of private sponsor financing in a project as a proxy for the level of public sector financial benefit from delivering a project as a P3. Given that a major purpose ofP3s is to minimize both government spending and debt from projects, measuring the level of private sponsor financing seems the most appropriate, and practical, means of accounting for public sector financial benefits resulting from P3 delivery (Vining and Boardman 2008, p. 153).

3.1.5. The project has met initial demand projections

Flyvbjerg (2005 and 2009) highlighted significant shortfalls in demand projection estimates across virtually all types of transportation infrastructure projects. Perhaps most alarmingly, demand projection accuracy has not increased over the course of the past three decades (Flyvbjerg 2009, p. 347). Demand forecasting is inherently complex and prone to a variety of quantitative errors and mathematical mistakes/misspecifications (Pickrell 1990, p. 22; Wachs 1990, p. 148; Nijland 2010, p. 4). However, evidence exists that the trend of consistent demand overestimation has more to do with planning fallacy, optimism bias, and intra-governmental incentive perversion to over-inflate the attractiveness of projects to give the project an "edge" in securing funding (Flyvbjerg 2009, p. 350).

As such, the fifth and final component of our definition of success is that projects must have met initial demand projections – or, phrased differently, that initial demand forecasts were accurate. The success (or failure) of infrastructure projects, especially P3s which are, on average, more reliant on traffic volume to drive revenue than "traditional" projects, is very much dependent on accurate demand forecasting (Pickrell 1990, p. ix; Richmond 2001, pp. 172-3).

3.2. Pre-Implementation Attributes for Identifying Successful P3s

Despite the rationales for supporting P3s, and the theory underpinning the purported strengths of the P3 model, research on prior outcomes has indicated a less than stellar track record. Vining and

Boardman (2006) pinpointed four major shortcomings of the P3 model as it has been implemented by public sponsors in Canada, highlighting how:

1) governments' have not effectively reduced their financial risk exposure through delivery of projects as P3s;
2) private partners have not captured adequate returns-on-investment to justify involvement in projects;
3) P3 contracts were regularly terminated much earlier than anticipated, be it by public sponsor buy-out, private partner bankruptcy, or for other reasons; and
4) "protracted conflict, with high contracting costs borne by one party or both" (p. 4).

In short, Vining and Boardman (2006) indicate that P3s have generated significantly more long term transaction costs than public sponsors had anticipated.

More generally, prior research has also focused on establishing the link between project outcomes and successful risk transfer. Past analysis of project outcomes has found that P3s have generally not led to the anticipated public sponsor risk allocation and transfer, and that in order to be truly successful P3s must distribute at least a modicum of that risk – financial, delivery, and use risk – to various parties involved (NHCRP 2009, p. 2; Vining and Boardman 2006, p. 30; ACT 2007a, p. 57; FHWA 2009, p. 2). That analysis has, however, not provided great detail over what an optimal transfer of risk would look like, generating a significant void in the field.

The purpose of our research is to establish whether or not the presence (or absence) of various attributes contribute to a particular P3 project's success. We saw a need to derive, from past experience and analysis of prior P3 outcomes, a number of *ex-ante* indicators of P3 success – attributes that would indicate increased likelihood of success if met before project implementation. We chose nine independent attributes of P3s. In the subsections below, we describe the attributes, including a rationale for selecting each and the hypothesized relationship between the attribute and our definition of P3 success.

3.2.1. a) "Alt. Finance (F)" / b) "Alt. Ops (O)" / c) "Alt Maint. (M)": P3 contains some form of alternative financing, operations, and / or maintenance

Failure to incorporate some form of alternative finance, operations, and / or maintenance provisions, is, ultimately, a public sponsor failure to leverage the key strength of the P3 model. If a project is simply design-build (DB), the government is merely contracting out a project and, in so doing, incurring all of the negative externalities and costs of P3s while gaining but a few minor benefits from the P3 model (Vining and Boardman 2008, p. 151). The presence of alternative F / O / M also signifies the private sector has significant "skin in the game," increasing incentives for on-time and on-budget delivery (Vining and Boardman 2008, p. 152). The presence of any private capital in the project's financing agreement is our measure of alternative financing (alternative F). Alternative O and alternative M would be constituted by the inclusion of a separate O&M contract within the larger P3 contract, or where a private firm assumes responsibility for operations and / or maintenance.

3.2.2. d) "Existing Capacity Constraints": Presence of adequate project demand

Delivery of transport infrastructure projects and improvements, however significant they may be on their own merits, take on an entirely new importance and criticality when the transportation network of which they are a part is suffering from capacity constraints. P3s can expedite delivery of such critical infrastructure projects and oftentimes allow for delivery of those facilities well ahead of what was considered possible through traditional procurement (ACT 2007a, p. 12; PwC 2010, p. 8; Iacobacci 2010, p. 2; USDOT 2007, p. 4; Duffield 2008, p. 4). Furthermore, existing capacity constraints indicate a large demand for travel, increasing the potential for significant incorporation of tolls/user fees into the project's long-term funding, reducing the need for public sponsor funding commitments. We use existing capacity constraints as a proxy for the presence of demand requisite for P3 success.

3.2.3. e) "Total Cost = >$500 mil": P3 total cost in excess of $500 million

FHWA (2009, p. 3) and PwC (2010, p. 11) both indicated that in order to be successful, transport P3s require requisite complexity and scale. Given that P3s incur significant transaction costs, this argument is intuitive – the larger the overall cost of the project, the smaller, by percentage share, the transaction costs. Furthermore, the more expensive a project, the greater the incentive of the public sponsor to seek some form of alternative procurement, all else equal, decreasing its risks. This is not to say that only larger projects should be considered as P3s, but rather that only larger projects will achieve sufficient economies of scale to justify alternative procurement in the first place. We estimated the quantitative definition of a "large" project to be at least $500 million; our estimate is consistent with other project finance research conducted by the Harvard Business School (Esty 2004, p. 218).

3.2.4. f) "Few Existing Substitutes": No direct competition with other nearby facilities

Bridges, tunnels, mountain highways, and other forms of specialized infrastructure assets are, by their nature, non-substitutable and do not compete with other facilities. Such assets are ripe to be tolled – or to levy user fees in some other capacity – and are very attractive as potential P3s (perhaps more for concession than initial construction) as a result of their profit potential. Assets with few substitutes, we hypothesize, are more likely to draw increased traffic than those with a large number of free alternatives. We consider a substitute to be a parallel or readily-accessible facility, allowing for consumer choice – a free road next to a tolled, higher-speed interstate, for example. While similar to "existing capacity constraints," few existing substitutes is quite separate and distinct. Existing capacity constraints relates to demand-side factors (the extent to which demand is evident for a given project) whereas few existing substitutes relates directly to supply-side project factors, and how much competition a given project stands to face.

3.2.5. g) "Gov't Availability Payments": P3 relies on shadow tolls or availability payments

Shadow tolls, availability payments, and public subsidies in general for P3s indicate – by their very nature – that the projects are not financially self-sustaining. Availability payment-based P3s are attractive to government sponsors, however, as the payments will come *after* the project is constructed and open for business. Availability payment-based P3s (and shadow tolls and other subsidy-based P3 as well) are popular because they enable governments to defer major capital expenditure, a primary consideration in how to deliver infrastructure (Vining and Boardman 2008, p. 153). In the long-term, availability payments, shadow tolls, and/or subsidies do not decrease public sponsor financial risk or funding responsibilities so much as they maintain or even increase risk (cite needed). Thus availability payments in a sense "crowd out" other government expenditures, as long-term financial risk is not transferred from public to private sponsor, because no new funding sources are involved. When paid over time to a private investor, availability payments may wind up being a high cost method of financing (Vining and Boardman 2006, p.29). With these financing mechanisms, the only potential savings to the public sponsor is reduced costs from using private providers. These savings may or may not offset the transactions costs associated with the project.

3.2.6. h) "Gov't Funding": Government funding supports P3 operations

While availability payments are effectively an "operating subsidy," government funding consists of the public sponsor explicitly expending capital for construction of the facility and (potentially) operation of it as well. This funding may occur even with the presence of alternative finance or O&M; small portions of government funding may be used even for projects with minimal public financing. In such cases, the funding would be expected to come in the form of debt service (in arrangements like GARVEE[3] financing) or other regulatory / mitigation-related payments. Government funding is used largely in conjunction with DB contracts, where primary risks involving project capital are retained by the public sponsor and secondary and tertiary risks are transferred to the private partner(s) (FHWA 2008). If the public sponsor is responsible for project funding, then public sponsor financial risk remains significant. Furthermore, maximal public sponsor cost-savings through the P3 arrangement have not been achieved.

3.2.7. i) "Contract Length": P3 contract length

Past research on P3s has shown increased contract length causes an inherent decrease in contract flexibility, locking all stakeholders into a contract highly vulnerable to macroeconomic shifts and capital markets fluctuations (Iossa et al. 2007, p. 75). Given the travails of long-term P3s like the Chicago Skyway, the Northwest Parkway in Colorado, and even the Virginia toll roads in Fairfax and Loudon Counties, lengthy contracts indicate an investment which requires a long-term investment vision; i.e. positive return on investment (ROI) is far from imminent. A shorter contract will create an incentive for the private stakeholder to increase equity in the project and, as such, increase the incentive to optimize asset performance to, in turn, optimize ROI (Vining and Boardman 2008, p. 156).

Table 1 below summarizes each of our nine ex-ante metrics and our expectation of how the presence or absence of each metric will influence success or failure of the P3.

Table 1: Expected effect of each metric (attribute) on success or failure

Alt. Finance (F) - A	Alt. Operations (O) - B	Alt. Maintenance (M) - C	Existing Capacity Constraints - D	Total Cost = >$500 million - E	Few Existing Substitutes - F	Gov't Availability Payments - G	Government Funding - H	Contract Length – J
+	+	+	+	+	+	-	-	-

+ : presence of metric pre-implementation will increase likelihood of project success

- : presence of metric pre-implementation will decrease likelihood of project success

4. The Sample

We reviewed 100 case studies of transport P3s worldwide. There is no significance to the number 100; we were merely able to find 100 P3s with enough quality information from which to compare to the rest of our sample. Of those 100 projects, we found 55 successful projects. This does not mean that only 55 successful transport P3s exist in the world, just that 55 percent of our sample met all five criteria in our definition. We reviewed all 100 case studies to identify, in each P3 project, the presence or lack thereof of the nine ex-ante success metrics to test our hypothesis. The successful projects are listed in and the unsuccessful projects are listed in Appendix B. Figure 1 is a graphical representation of the data.

We gathered our data based largely on availability of comprehensive and consistent information pertaining to our set of pre-implementation metrics. This information came from an array of sources including: a meta-analysis of existing academic literature; previous P3 case studies; local, regional, state, and multinational governmental agencies; private and nonprofit consulting and research institutions; and extra / non-governmental organizations such as the World Bank. This method may have led to an upward bias in project costs, as we found data much more readily available for multi-million dollar P3s as compared to much "smaller" and more-local scale projects.

In order to be included in the sample, projects must have been completely constructed and open to users. The 100 projects in our sample were all completed and opened over the course of roughly the last quarter-century, from 1986 to 2009. The projects were distributed across 29 nations, with the bulk of the projects occurring in the US, UK, Canada, and Australia; such a geographic bias is to be expected given how the British, Australians, and Canadians were among the first to pioneer and institutionalize alternative project financing.

All attribute data in our matrices (Appendices A and B) are binary with the exception of Total Cost (E) and Contract Length (I); an affirmative value of "1" is indicated by an "X" and gray cell shading while a value of zero is indicated by a blank space. Our five-point definition of success includes continuous and binary variables as shown in Table 2.

Table 2: Success variables

Variable	Units	Sample Min	Sample Max
On Time Delivery	Days ((early) or late)	(630)	2555
On-Budget Delivery	% Escalation	0%	306%
No Bankruptcy	Binary	0 (false)	1 (true)
Private Financing	% Private Financing	0%	100%
No Demand Shortfall	Binary	0 (false)	1 (true)

Before we continue and fully report our results, we feel it is necessary to clarify the classification of two particular projects, SR-91 Express Lanes[4] (SR-91) and the Chicago Skyway. The problems created by SR-91's non-compete clause resulted in OCTA (Orange County, California Transportation Authority) buying the facility following an effort by Caltrans to widen the adjacent road. This buyback potentially violates the third criterion in our five-point success definition (there is a measurable financial benefit / cost savings realized by the public sponsor). Nevertheless, we counted SR-91 as a successful P3 because it included the remaining four items in our five-point list. While OCTA is now exposed to some usage risk, the construction and initial operating risks were successfully transferred to the private firm. Moreover, OCTA had the benefit of knowing actual historical operating and maintenance cost and demonstrated revenue before it made its purchase.

Conversely, the Chicago Skyway lease came close enough to bankruptcy for us to consider it in violation of our second criterion (the project has never entered bankruptcy or sought bankruptcy protection) (Peterson 2009). The privatization of the Chicago Skyway does not make the overall transportation system more efficient so much as it re-allocates revenues and tolling proceeds. It does not create a viable long-term financial benefit for the public sponsor so much as a one-time cash infusion. In addition, there is long-term risk associated with the financial instability and excessively high debt load of the Skyway deal. Ultimately, the facility's revenue potential is limited, calling into question the viability of the 99-year lease and whether or not the public stakeholders truly got the most utility out of such a long-term deal in the form of a large, up-front lump sum payment. Therefore we classified the Chicago Skyway as a failure.

5. Discussion of results

5.1. Breakdown across Attributes

Figure 1 compares the percentage share of each of the attributes A-H in the successful group (shown in yellow) and the unsuccessful group (shown in red); Figure 2 shows the same breakdown for attribute I. Figure 3 shows the average cost of "large" successful and unsuccessful projects, with total costs in excess of $500 million.

Figure 1: Attribute Comparisons (A-H) Across Successful and Unsuccessful P3s

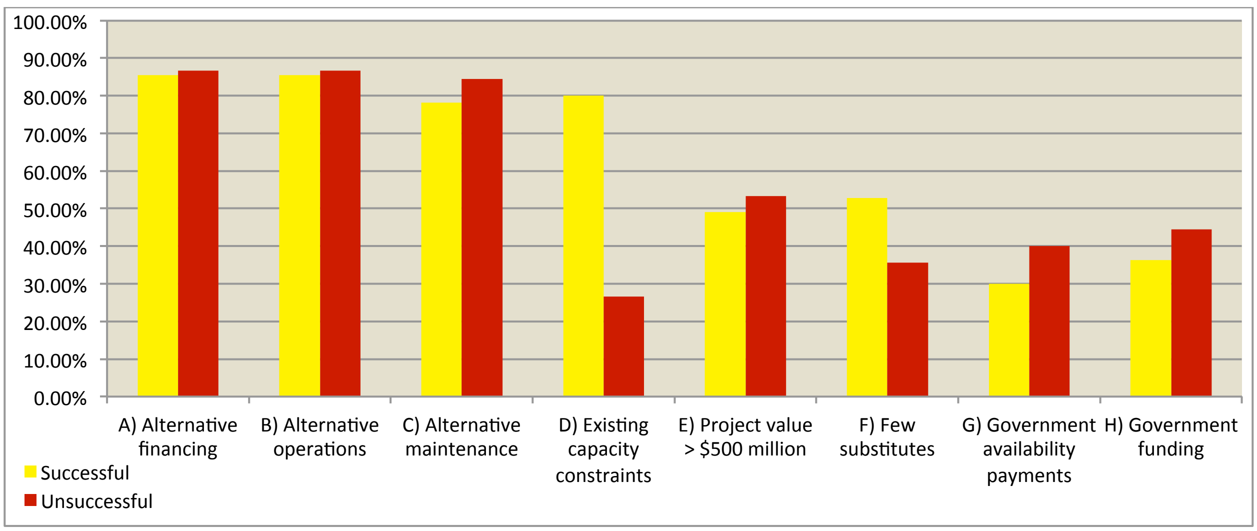


Figure 2: Attribute Comparison (I) Across Successful and Unsuccessful P3s

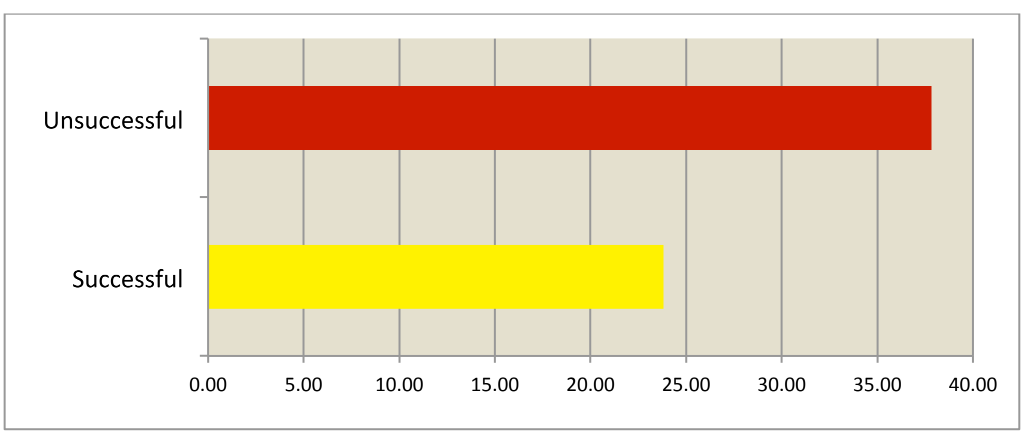
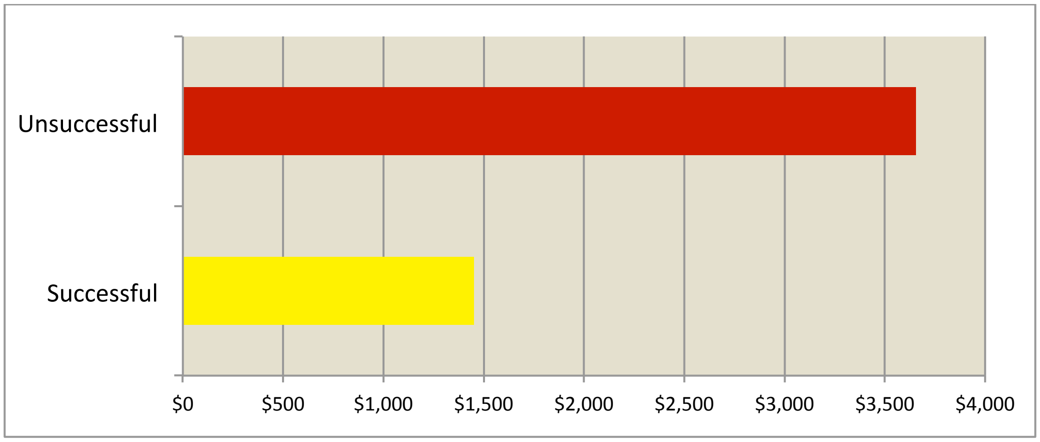


Figure 3: Average "Large" (>$500 million) Project Cost Across Successful and Unsuccessful P3s



The breakdown of successful and unsuccessful P3s across our set of attributes was surprisingly consistent – both project groups generally tracked one another closely. A very similar proportion of successful and unsuccessful projects (successful %/unsuccessful l%):

1) incorporated alternative financing (86%/87%);
2) incorporated alternative operations and/or maintenance (86%/87% for operations, 78%/84% for maintenance);
3) were "large" projects costing in excess of $500 million (49%/53%); and
4) relied on government availability payments and/or government funding (30%/40% for availability payments, 36%/44% for government funding).

However, four major differences between successful and unsuccessful projects emerged in terms of: d) existing capacity constraints; f) few substitutes; i) contract length; and the average cost of "large" projects (projects costing in excess of $500 million). Each of these four key differences is discussed in detail below.

D) Existing capacity constraints: While eight-in-ten of the successful projects face existing capacity constraints, less than 30% of unsuccessful P3s do. Whether or not a project is built due to existing capacity problems is itself a measure of market demand for the new facility. Demand for new infrastructure where capacity issues exist is clear; demand where no capacity constraints exist is less clear and requires more justification. Existing capacity constraints would indicate an ideal location for tolls, as high traffic volumes will be travelling through the facility; existing capacity constraints may ultimately signify long-term potential for the P3 to support itself on toll revenues rather than public sponsor funding. Given the significance of the presence of existing capacity constraints, we can extrapolate that where existing capacity constraints is lacking, consistently high demand is lacking as well. As such, facility revenue and P3 success both track closely to the extent of the presence (or lack) of existing capacity constraints.

F) Few existing substitutes: While 53% of successful projects had few substitutes, only about a third of unsuccessful projects did. If a P3 faces direct competition from a number of substitutes, demand is essentially watered-down, distributed across the various infrastructure assets. Unsuccessful projects, on average, were initiated within areas not facing capacity constraints and in areas that also had a number of substitutes for the proposed facility. What little demand existed for the assets was diluted; at the same time, however, the role of private finance (as mentioned earlier) was as significant in unsuccessful P3s as it was in successful ones.

I) Contract length: In terms of contract length, our initial hypothesis was proven correct when comparing the length of contracts between successful and unsuccessful P3s. The average successful P3 had a contract length of 23.8 years while the average unsuccessful P3 had a contract length of 37.8 years. Such a difference is largely accounted for by the inclusion of two unsuccessful P3s – the Chicago Skyway and Highway 407 Express (Toronto) – both leased for 99 years. Furthermore, the difference may also be accounted for by the fact that many unsuccessful P3s are forced to refinance or are, in fact, sold at a lower price to another stakeholder. Either course of action would generally require a lengthening of the P3 contract in order to allow enough time for the private partner to reap an adequate return on investment.

Average "large" project cost: While a similar proportion of successful and unsuccessful projects cost in excess of $500 million (49% and 53% respectively), the average cost of unsuccessful large projects ($3.66 billion) was more than double the size of successful large projects ($1.45 billion). These results suggest that while, to a degree, projects do attain economies of scale as size increases, at a certain point projects become too large and begin to suffer from diseconomies of scale. Increased capital for larger projects require increased revenues to generate sufficient return – and thus increased reliance on demand forecasts' accuracy – and a longer-time horizon in which to do so. In short, as project cost rises, an array of project risks seem to rise in step.

We now turn to how our two groups of projects score on our five point definition of success. Figure 4 compares the percentage of projects which met – and did not meet – rule 1 of our five-point definition; Figure 5 shows the same breakdown for rules 2-5.

Figure 4: Comparison of Successful and Unsuccessful P3s – Rule 1

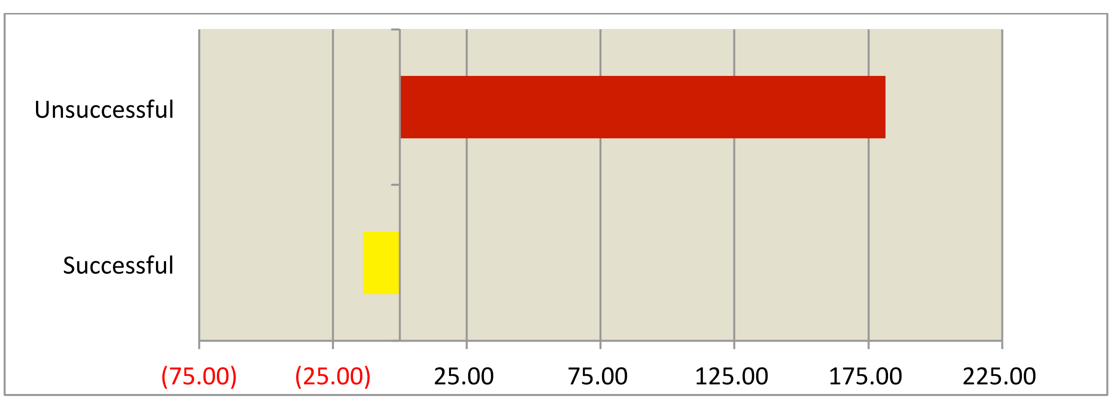
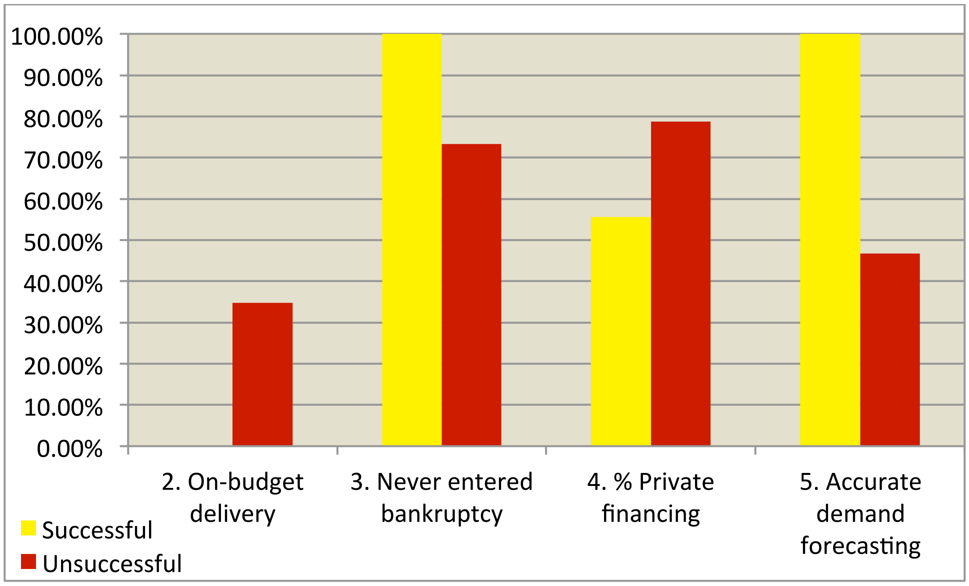


Figure 5: Comparison of Successful and Unsuccessful P3s – Rules 2-5



5.2. Breakdown Across Definition of Success "Rules"

Our sample of successful P3s was delivered, on average, two weeks ahead of schedule – with none of the successful projects in the sample either entering bankruptcy or succumbing to demand downside / use risk. This stands in stark contrast to our sample of unsuccessful P3s which were delivered, on average, about six months behind schedule – with 27% of projects entering bankruptcy and 53% experiencing a demand shortfall. In terms of public sponsor project benefits, successful projects incorporated private financing up to 56% of total project cost on average – in contrast to an average of nearly 80% for unsuccessful projects.

This breakdown suggests that successful projects incorporate less private financing, but leverage a diverse set of financing sources, distributing risk more evenly than projects that rely heavily on private financing. A diversity of funding sources may increase the scrutiny of the demand forecasts and the financial plan; this is a potential topic for further research. As discussed earlier, this increased reliance solely on private financing, in conjunction with increased likelihood of demand shortfalls and financial underperformance, is a potentially lethal mix for P3s, and was a very common trend throughout our sample of unsuccessful P3s.

Finally, successful projects were, on average, delivered with no overrun – as per our definition of success – while unsuccessful projects incurred, on average, a 35% overrun. Unsuccessful projects in this sample, then, are projects that rely heavily on private financing, are highly susceptible to demand/use downside risk, and experience both significant delivery delays as well as cost overruns.

6. Conclusion

We defined what constitutes a successful P3 facility and then found a pool of 100 facilities to study. We surveyed nine pre-implementation metrics in our sample, seeking trends in their distribution among both successful and unsuccessful P3s. Indeed, we found four pre-implementation success indicators for P3s. They are: 1) existing capacity constraints, 2) few existing facility substitutes, 3) contract length, and 4) average "large" project cost. We conclude that potential projects that face existing capacity constraints, have few existing substitutes with which they compete, have a contract term of approximately 24 years or less in length, and – should total cost exceed $500 million – cost less than approximately $1.45 billion will be more apt for success as a P3 than those that do not. Projects that meet these criteria (contract length rounded up to 25 years or less for ease of identification in sample) are in red text in Appendix A.

We found the early indicators of P3 trouble to be: 1) high levels of private financing, 2) few existing capacity constraints, 3) many facility substitutes, 4) an average contract length in excess of 38 years, and 5) average project cost in excess of $3.65 billion, should the project cost more than $500 million. In effect, unsuccessful projects are – according to our findings from this sample – on average larger in cost and scope than successful projects, occur where little demand is exhibited, and rely heavily on private financing. In order to generate adequate return on investment, contract terms must be longer, creating problems in accurately forecasting demand further out into the future.

Our sample of successful projects rely – on average – less on private financing than unsuccessful projects, indicating a diversity of financing sources and more even distribution of risk than unsuccessful projects. Additionally, we found that successful projects minimize delivery time – with an average delivery of successful projects two weeks ahead of schedule – while also eliminating cost overruns.

Our findings are, however, only suggestive in nature. Public sponsors should carefully consider whether P3 delivery is appropriate on a project-by-project basis. Public sponsors should evaluate P3 delivery for proposed projects with those metrics common to successful P3s.

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[1] Contract type in which one private firm is responsible for both design and construction of facility, instead of one firm for each individual phase.

[2] As used in this report, public sponsor refers to any public agency that might propose, build, and / or maintain a transportation facility, e.g., San Francisco Municipal Transportation Agency, California Department of Transportation, or the Gold Line Phase II Construction Authority.

[3] Grant Anticipation Revenue Vehicle. A form of debt financing in which more grants are allocated to state / local government than it can pay for at present, with debt service repaid with future formula grants and / or sales tax revenues. (e.g., Los Angeles' 30 / 10 initiative).

[4] A tolled facility located in the median of California State Road 91.

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Appendix A: List of Successful Projects

Project Name/ Location	Alt. Finance (F) - A	Alt. Ops (O) - B	Alt. Maint. (M) - C	Existing Capacity Constraints -D	Total Cost = >$500 mil ($mil) -E	Few Existing Substitutes - F	Gov't Funding - G	Gov't Availability Payments - H	Contract Length - I
2nd Severn Crossing Bridge: Bristol, UK	X	X	X	X	$1,080	X			30
A25 Montreal: Quebec	X	X	X	X	$614	X			35
Airport MAX LRT: Portland, Oregon	X						X		DB
Alameda Corridor, Los Angeles, CA	X	X	X	X	$2,400	X	X		n/a
Anton Anderson Memorial Tunnel: Whittier, AK		X	X	X		X	X		7
Atlantic Ciy Brigantine Connector: New Jersey	X			X		X	X		DB
Atlantic Station 17th Street Bridge: Atlanta, GA	X						X		4
Autostrade, Italy	X	X	X	X	$4,300	X			privatized
Avenida de America IES (Intermodal Transit Exchange Station): Madrid, Spain	X	X	X						25
Bina Instra Motorway: Croatia	X	X	X	X	$727	X		X	32
Bogota BRT: Bogota, Colombia	X	X	X	X	$3,300				n/a

Bremen GVZ (Rail Intermodal Facility): Germany	X	X	X	X	$500	X	X		BOO
CA-91 Express Lanes: Orange County, CA	X	X	X	X	$537		OCTA buy back of fwy	OCTA buy back of fwy	35
Central Texas Turnpike System: Austin, TX	X	X	X	X	$3,300				n/a
Charlottetown Transit: Prince Edward Island	X	X	X					X	5
CityLink: Melbourne, Australia	X	X	X	X	$2,000				34
Cochin International Airport: Kerala, India		X	X	X	$3,000	X			n/a
Country Park Motorway: Hong Kong, China	X	X			$930	X		Free ROW	30
Curitiba BRT: Brazil		X	X	X			Init. Capex		privatized
DC Streets: Washington DC	X	X	X						5
East Coast Road: Tamil Nadu, India	X	X	X	X					n/a
Edmonton Orbital SE: Alberta		X	X	X		X	X	X	30
Foley Beach Expressway: Baldwin County, AL	X	X	X	X		X	X		n/a
Golden Ears Bridge: Vancouver, BC	X	X	X	X	$746	X		X	33.5
Hamburg International Airport: Hamburg, Germany	X	X	X	X	$525	X	X		4
Heartland Corridor: Midwest US	X	X	X	X		X	X		D(B)B

Hudson-Bergen Light Rail: New Jersey		X	X		$2,200		X		30
I-75 Expansion: Collier/Lee Counties, FL	X			X		X		X	DBF
Isaac's Canyon Interchange: Boise, ID	X			X					DB
JFK Terminal 4: New York City, NY	X	X	X	X	$1,450				n/a
Kicking Horse Canyon Phase 2: BC	X	X	X	X		X		X	25
M1-A1 Link: Leeds, UK	X	X	X	X	$544			X	30
M2 Motorway: Sydney, Australia	X	X	X	X					45
Maputo Port Rehabilitation: Mozambique, Africa	X	X	X	X		X	Retains 49% ownership of port during period		15
N4 Toll Road: South Africa and Mozambique	X	X	X		$660	X			30
New York Ave/ Florida Ave/ Gallaudet Univ. Metro Station: Washington DC							X	X	DB
North Luzon Expressway: North Luzon, Philippines	X	X	X	X		X			30
Northeast Stoney Trail Freeway Extension: Alberta	X	X	X	X	$652	X		X	32
Penang Bridge: Penang, Malaysia	X	X	X	X		X	Built by govt, then leased		25
Port of Aqaba Expansion: Aqaba, Jordan	X	X	X	X	$710	X			25

Port of Colombo Expansion: Colombo, Sri Lanka	X	X	X	X		X			30
Port of Galveston Cruise Terminal: Galveston, TX	X			X		X	X		DB
Queen Elizabeth II Dartford Bridge: London, UK	X	X		X					20
Rosario-Victoria Bridge: Rosario/ Victoria, Argentina	X	X	X	X		X			15
Sea-to-Sky Hwy Improvements: Vancouver, BC				X			X		n/a
Southeast Edmonton Ring Road: Edmonton, Alberta	X	X	X	X	$510				40
SR44 Corridor: New Mexico	X	X	X	X	$537			X	n/a
St. Lawrence Seaway Management Corporation: Quebec	X	X	X	X			X	GARVEE financing	DB
Sydney Harbor Tunnel: Sydney, Australia		X	X	X	$3,000	X	X		20
US-1 Improvements: FL	X	X		X	$750	X			30
Virginia Railway Express: Virginia	X	X	X					X	5
Warsaw International Airport: Warsaw, Poland	X	X	X					X	5
Westlink M7: Sydney, Australia	X	X	X	X		X			n/a
Yitzhak Rabin Highway: Tel Aviv, Israel	X	X	X	X	$2,300				34

York Bus Rapid Transit Phase I: Ontario	X	X		X	$1,300			80% of residual ONLY in case of demand downside	30

Appendix B: List of Unsuccessful Projects

Project Name/ Location	Alt. Finance (F) - A	Alt. Ops (O) - B	Alt. Maint. (M) - C	Existing Capacity Constraints -D	Total Cost = >$500 mil ($mil) -E	Few Existing Substitutes - F	Gov't Funding - G	Gov't Availability Payments - H	Contract Length - I
A2 Motorway: Poland	X	X	X		$1,270				40
Arlanda Express Rail Link: Sweeden	X	X	X		$650				40
Beiras Litoral/ Alta Toll Roads: Portugal	X	X	X	X	$1,500			X	35
Brisbane Airport Rail Link: Australia	X	X	X						35
Camino Colombia Toll Road: TX	X	X	X			X			Priv.
Channel Tunnel Rail Link: UK/ France	X	X	X		$9,000		Gov't takes over tnl	Gov't takes over tnl	n/a
Chicago Skyway: Chicago, IL	X	X	X		$1,830				99
Coimbatore Bypass: India		X	X	X		X	X		BOT
Confederation Bridge: New Brunswick, Canada					$640	X	X	X	35
Dulles Greenway: Loudon County, VA	X	X	X						42.5

Dutch High Speed Line: Netherlands	X	X	X		$3,750			X	30
Gautrain Rapid Rail Link: South Africa	X	X	X		$3,700	X	X		20
Highway 104: Nova Scotia, Canada	X	X		X		X	X	X	30
Highway 407 Express: Ontario, Canada		X	X		$3,100		X		99
I-394 MnPass: Minneapolis, MN	X						X	X	DB
Land Cove Tunnel: NSW, Australia	X	X	X		$1,100	X			33
Las Vegas Monorail: Las Vegas, NV	X	X	X		$650		Initial Gov't Debt Issue		Priv.
London Underground P3: London, UK	X	X	X		$25,600		95% Gov't Grnty on Invst	X	30
M5 Motorway: Hungary	X	X	X				Gov't takes over fwy	Gov't takes over fwy	n/a
Madrid Barajas Subway Extension: Spain	X		X				Gov't Ops	X	non-integrtd
Mexican Road Concession Program: Mexico	X	X	X		$9,900		Gov't buyback of 23/52 projects at $7.6 bil		BOT
Montreal Subway Extension: Canada					$745		X	X	DB
Northwest Parkway Lease: CO	X	X	X		$603				99

Oresund Bridge and Tunnel: Denmark / Sweeden					$5,400		X		DB
Pocahontas Parkway: Richmond, VA	X	X	X						30
Randstad Tunnel: Netherlands	X	X	X	X					30
Rapid Transit System: Bangkok, Thailand	X	X	X	X	$2,000				30
Rostock Tunnel, Germany	X	X	X			X			50
Route 3 North Rehab.: Burlington, MA	X	X	X					X	DB
SMART: Kuala Lumpur, Malaysia	X	X				X		X	25
Southern Connector: SC	X	X	X						50
SR 125: San Diego County, CA	X	X	X	X	$635	X			35
Sydney Airport Rail Link: Australia	X	X	X		$8,000		$700mil bailout	$700mil bailout	DB
Transjamaican Highway: Kingston, Jamaica	X	X	X	X		X	X		35
Tren Urbano: San Juan, Puerto Rico		X	X		$2,250		X		5
Yen Lenh Bridge: Vietnam	X	X	X				X		20
Zambia Railways (Freight): Africa	X	X	X			X		X	20

Zambia Railways (PAX): Africa	X	X	X			X		X	7
Cross City Tunnel: Syndey, Australia	X	X	X		$750				
Vasco da Gama Bridge: Portugal	X			X		X		X	DBF
Okanagan Bridge Replacement: British Columbia	X	X	X	X		X		X	30
M6 Tollway: Birmingham, UK	X	X	X	X	$1,700				53
Canada Line: Vancouver, BC	X	X	X		$2,054		X		35
Route 28 Phase II Expansion: Fairfax and Loudon Counties, VA	X	X	X	X		X	X		25
R1 Expressway: Slovakia	X	X	X	X	$895	X		X	25