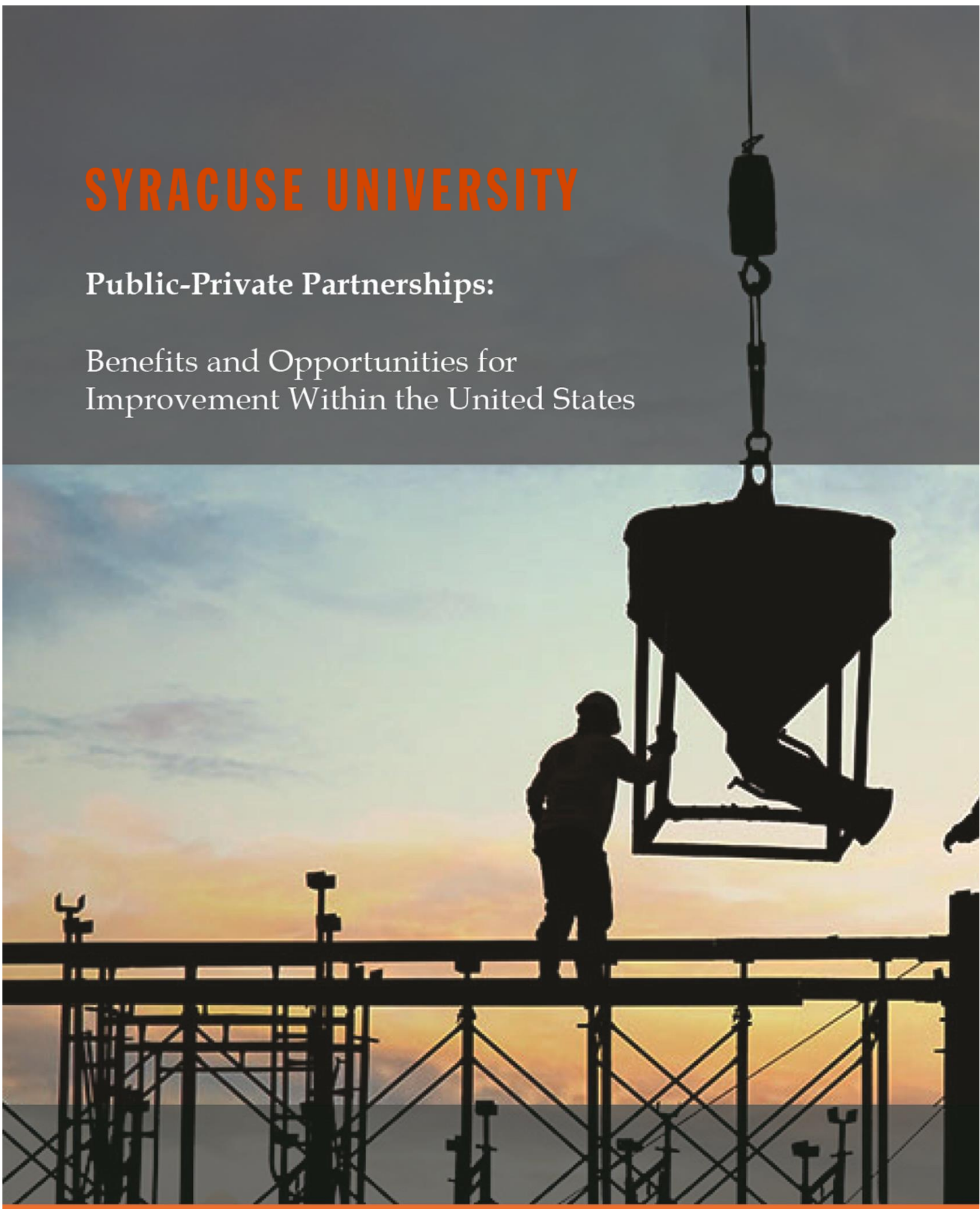
SYRACUSE UNIVERSITY

Public-Private Partnerships:

Benefits and Opportunities for Improvement Within the United States



Foreword

In January of 2016, Syracuse University assembled a team of undergraduate and Ph.D. students, along with multiple faculty members to investigate the characteristics and opportunities of the Public-Private Partnership delivery method within the United States of America. Terry Brown, the Executive Director of the Falcone Center for Entrepreneurship in the Whitman School of Management, directed the team's research because of his expertise in entrepreneurial business practices and from his experience in the engineering and construction industry by serving as the Chairman and CEO of O'Brien and Gere. Ossama "Sam" Salem, the Department Chair of Civil and Environmental Engineering, also helped develop and direct the scope of the work for the student's research. Song He was a Ph.D. student who worked alongside Sam Salem and whose doctorate focus was within Construction Management. Jackson Honis, a senior during this research opportunity, studied Civil Engineering and went on to work for Skanska Construction upon graduation. Scott Girouard, also a senior, majored in Civil Engineering with a minor in Architecture and he started working at Whiting Turner after graduation. Adam Higginbotham was a junior during the spring of 2016 semester who studied Civil Engineering. Upon completion of this report, Adam was promoted to manage a new group of students under the supervision of Terry Brown, who would continue this research initiative with a focus on empirical project data analysis throughout the 2016-17 school year. This new team involved Civil Engineering students Anna Tallarini, Katherine Racanelli, Cain Goode, Benedict Ferro, Jay Polakiewicz, Jeffrey Feirstein, Bryan Schnapper, and Teo DeLellis as well as Whitman School of Management student Dominic Weber.

Public-Private Partnerships: Benefits and Opportunities for Improvement Within the United States

Mission Statement

Our goal is to inform United States representatives of the benefits and opportunities to the public sector that the Public-Private Partnership (P3) delivery method exhibits as they consider implementing the P3 methodology to drive particular public sector projects. We will accomplish this goal by first identifying the perceived benefits and weaknesses of the P3 delivery method. We will then research P3 projects around the globe and analyze whether those perceived benefits and weaknesses are realized in connection with public projects.

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Executive Summary

A Public-Private Partnership (P3) is an arrangement between a public body or agency (federal, state, or local) and a private sector entity to deliver a service or facility for use by the public. While the public body and private sector entity share resources and expertise, both parties also jointly commit to an approach by which certain risks and rewards are shifted from the public body to the private entity. In many cases, P3 contracts provide multiple benefits compared to the traditional Design-Bid-Build (DBB) delivery method for public infrastructure works, including improved project cost certainty, improved schedule certainty, and improved project quality.

These perceived benefits, as well as opportunities for improvement, were researched by Syracuse University to better inform public representatives about the current state of and potential for P3 contracts in the United States. The research team conducted a survey and interviewed active P3 practitioners from different project types with varying project responsibilities, and on projects that demonstrated varying degrees of success. Particular attention was given to perceived benefits, potential opportunities and failure mechanisms, and project financing. Points discussed during interviews served as the basis for secondary research and further analysis.

Subsequently, the team compiled a quantitative and qualitative comparison of P3 projects versus the traditional design-bid-build project delivery.

The analysis showed that P3 infrastructure projects in the United States demonstrate significantly greater likelihood of meeting respective schedule and cost requirements as compared to conventional DBB approaches.

In the P3 model, private entities are responsible for the performance throughout the infrastructure's lifecycle so there's greater incentive to deliver better quality projects and employ more innovation in design and construction. P3 contracts also transfer a reasonable amount of risk to the private entity, which creates greater certainty with regards to potential design flaws, financial failures, and technology obsolescence.

The success of a P3 project is heavily dependent on the capabilities of private entities and the quality of the numerous contracts involved in performing under the P3 model.

The potential for P3 projects to perform satisfactorily and maintain desirable levels of success for both the public owner and the private entity (from inception through the operations & maintenance (O&M) phase), was found to be dependent on the following key factors:

- political commitment,
- favorable and complete value-for-cost analysis,
- supportive local and state legislation,
- the accurate assumption of interest rates, and
- other key financial parameters

The researchers concluded that the public sector should benefit from the continued and expanded use of P3s in the United States. In this regard, the researchers suggest placing further emphasis on increasing the awareness for P3s and better understanding the many key parameters utilized for choosing between P3 and traditional methods.

1. Background

1.1 What is a P3?

A P3 is a model for delivery of public infrastructure projects utilizing a contractual agreement between a public agency (federal, state, or local) and a private sector entity. The model differs significantly from traditional public project delivery in the United States. Under the P3 model, the skills and assets of each sector (public and private) are shared in delivering a service or facility for use by the general public, with a greater reliance upon the private entity. In addition to the sharing of resources, each party shares the potential risks and rewards of the delivery of the service and/or facility in a manner that differs from traditional DBB delivery [1]. Depending on the types of public project (transportation, wastewater treatment, water treatment, public building, solid waste facility, etc.), the P3 contractual model may be adjusted to reflect specific requirements [2]. For example, a transportation-related definition of P3 provided by Congressional Research Service (CRS) describes P3 as “an arrangement whereby the private sector assumes more responsibility than is traditional for infrastructure planning, financing, design, construction, operation, and maintenance”[3].

In a P3, the public entity does not pay for a project in the same manner as a traditional DBB project delivery. Within the P3 delivery method, the private sector finances the design, construction and often the operation and maintenance of the project.

For instance, under the design-build-finance-operate-maintain (DBFOM) P3 model, the private entity is responsible for the operation and maintenance of the facility for a period of time as specified in the contract, as well as the design and construction of the asset. The return on the investment (ROI), or payment, varies depending on the type of P3

project. Examples of payment methods, or ROI recovery, for the private sector under a DBFOM contract include:

- Transportation: Toll revenues upon completion of a toll highway or bridge during the time when the private entity is to operate and maintain the facility.
- Education: Housing payments from students upon completion of a dormitory for a state university, also during the time when the private entity is to operate and maintain the facility.
- Water/Wastewater: Water bills from customers.

Under the DBFOM model, the private entity returns the project to the public sector upon successful conclusion of the operations and maintenance (O&M) period, which is often 30 years or greater. The contractual agreements specify the physical condition, performance, or availability that the facility must meet at the time the facility is handed over to the public, at which time the public owner may renew the O&M provider or assume responsibility.

Since the basis of a P3 contract is to have public and private sector entities "partner" in the delivery of a public asset, differing degrees of responsibility can be assumed by the private sector. The amount of responsibility assumed by the private sector is often determined by the degree of responsibility that the public sector is willing to allow and the nature of the particular project or facility. One common element in P3 contracts is the near complete shifting of design and build responsibilities to the private entity with variations during the period following completion of the facility. Historically, the DBFOM model has been more common, which includes a shifting of responsibility to finance, operate and maintain the facility over a period of years, although variations exist within the finance, operations, and maintenance portions of the contract. Meanwhile, contracts with tax revenue bonds for up to 20 years were permitted for solid waste and energy infrastructure projects in 1997, leading to the possibility of establishing long-term management contracts between public and private sectors[4]. As funding of public agencies becomes increasingly constrained, more contributions from private sector entities are expected.

According to the Public Works Financing 2010 International Major Projects database, road and rail projects combined account for over 84% of the total cost of P3s in the United States, showing that the P3 delivery model has not been vigorously adopted by non-transportation infrastructure.

2. Methodology

This report uses quantitative and qualitative analysis to form a comprehensive view of P3s in comparison to projects using the traditional framework. The researchers conducted interviews with individuals and project team's representative of different project types, project roles, and overall project success. The discussion within these interviews focused on the perceived benefits and opportunities for improvement in the current P3 market. Particular attention was given to perceived benefits, potential opportunities and failure mechanisms, and project financing. Items discussed during interviews then served as the basis for additional secondary research and further analysis. Emphasis was placed on the DBFOM model, and in certain instances the availability payment model. Project metrics determined through the interviews and secondary research were also used to compare similar projects

3. Benefits of the P3 Delivery Method

P3s allow for a multitude of benefits to the public sector. Through the interviews with P3 practitioners, an industry survey, and research conducted for this report, the team determined that P3s present the following attributes:

- Overall Economic Benefits
- Effective Risk Sharing and Transfer
- Cost Certainty
- Schedule Certainty
- Innovations and Technology

These benefits are made possible by the partnership and transfer of risk between the public and private sectors. It was found that the private sector better utilized control systems throughout most aspects of a project, thus better utilizing provided funding. For this reason, P3 projects benefit from better cost certainty, schedule certainty, and quality through the use of more refined and innovative construction methods when compared to more traditional methods of project delivery.

3.1 Overall Economic Benefits of P3s

Public-Private Partnerships facilitate a number of advantages that can best be understood by focusing on economic benefits. By sharing risk between both the public and private sector, project teams better optimized cost savings both during construction and throughout the project's lifespan. In a study conducted in 2000, it was found that the

private sector achieved a 15-30% increase in costs savings over the public sector across the full life cycle of infrastructure projects.[8] These cost savings were attributed to the private sector's ability to achieve greater schedule certainty and cost containment throughout all phases.

Under a P3 framework, private entities implement innovations and project-specific technologies more often than the public sector. By design, technologies implemented by the private sector more effectively advance both the short- and long-term performance of an asset. While the private sector optimizes profit throughout the lifespan on the project via better design, the public sector beneficiaries (those who use the asset) experience a higher quality and better performing facility. Ultimately, when the facility is turned over to the public sector at the conclusion of the operations period, the public sector receives a better performing and more efficient asset than traditional project delivery would have yielded.

The private sector typically conducts a risk vs. benefit analysis of incorporating innovations in the P3, often with input from the public owner, and based on anticipated benefits both during construction and the O&M period. Additional benefits of P3s, such as effective risk transfer, and cost and schedule certainty, are addressed in the subsequent sections.

3.2 Effective Risk Sharing and Transfer

Inherent in the P3 delivery method is a substantial transfer of risk and reward from the public authority to the private sector as compared to a traditional delivery method. Table 1 compares the allocation of risks among public and private sectors for traditional (DBB) and P3 projects. At a glance, it is apparent that there is significantly greater public sector risk under the traditional delivery method.

Table 1: Effective Risk Transfer of P3 Delivery Method

	Type of Project			
	Traditional		P3	
Risk	Public	Private	Public	Private
Design Risks	✓			✓
Construction Risks		✓		✓
Entitlements and Utilities	✓			✓
Completion Risk	✓			✓
Disputes between Designer and Builder	✓		✓	✓
Landlord Risk and Shortfalls	✓			✓
Operation and Maintenance	✓			✓
Regulatory Compliance	✓			✓
Capital Maintenance	✓			✓
Technological Obsolescence	✓			✓
Excess Energy Consumption	✓			✓
Environmental Regulations	✓		✓	✓
Changes in Law	✓		✓	
Force Majeure Events	✓		✓	
Pre-existing conditions	✓		✓	✓
Commissioning Delays	✓		✓	✓
Inflation	✓		✓	

In the P3 model, the private developer takes full responsibility of both design and construction in accordance with the standards provided by the public owner. Since the private developer is often charged with operations and maintenance (DBFOM P3

model), the private developer will tailor the design to minimize maintenance and operational costs.

Appropriate levels of influence, however, can still be maintained by the public sector over that design. In fact, the public entity still maintains ownership and oversight over the project. For example, in connection with the South Fraser Perimeter Road Project located in British Columbia, Canada, the Fraser Transportation Group (private sector) provided the design, and thus bore the design risk, for the project. The shift of design responsibility, however, does not mean that the private developer is granted complete control over the project. For example, the Province of British Columbia still had authority (per the procurement documents) to review and require changes to design documents submitted by the developer.

O&M represents a key area of risk transfer from the public authority to the private developer. Such risk transfer is clearer in the DBFOM model, however that risk is also commonly transferred in the use of availability payment model as well. Under the availability payment approach, penalties are incurred by the private sector in the event that the project fails to meet set standards, which are subject to inspection. Penalties are also incorporated in the DBFOM method to ensure that the quality of the O&M function meets certain standard.

The Long Beach Courthouse project provides an indication of the effectiveness of the P3 model in yielding well performing facilities. On this project, 99% of service work orders (a measure of maintenance effectiveness) were responded to in a timely manner post completion. In other words, whenever there was an issue that dealt with the functionality of the courthouse, 99 out of 100 times the issue was addressed quickly. The level of response is much higher than in similar courthouse facilities that did not use the P3 model.

Since the private entity has a financial stake in the project after construction, maintenance generally occurs at closer intervals when provided by the private entity and the facility is designed and built to avoid such failures. Inspections of facilities are made more frequently and any infractions found are fixed nearly instantaneously.

This experience runs contrary to publicly financed projects. A publicly financed DBB project will require maintenance, but there is no financial private sector incentive to keep the finished project better maintained, such as with revenue streams, financial penalties and availability payments. Consequently, projects maintained by the public sector tend to deteriorate in quality and value over time, in clear contrast with a project that receives the maintenance offered by the P3 delivery method.

Another key risk often shifted to the private sector under a P3 model is the success of the overall enterprise in generating revenue.

Documents from the I-95 HOV/HOT lanes project in Virginia are an example of the assurance that such financial risks are completely transferred to the private sector. The procurement documents state, “Except for its specific obligations to the Concessionaire under the terms and conditions of this Agreement, the Department will not have any risk or liability related to actual traffic volume and revenue.”

Although the ROI for the private sector relied upon toll revenue, the liability provision dictates that the public authority is not responsible for an eventual lack of demand if an alternative to this project is provided. Such a provision protects the public authority from revenue shortfalls and puts the private developer at risk for future economic developments related to the demand of the asset. Although the private sector bears this significant risk, the public sector may retain more extraordinary risks, for example, the risk that unanticipated inflation could increase the cost of operation and maintenance of the project in the future.

If a P3 asset faces drastic economic failure, the public body is generally protected. If, for example, the concessionaire does not have money to maintain the project after completion, contractual stipulations dictate that the project will be turned over to the public, yet the financial risk of designing and building the facility will have been absorbed by the private sector. This ensures that the public authority is financially protected from situations threatening the project company (such as bankruptcy) and the project (such as a decreased use of a toll road).

Although the P3 model clearly shifts risks from the public to private sectors more so than DBB, there are reasonable limitations. The specific level of risk shifting may vary depending on the nature of the project. For example, some P3s include a requirement that the public authority provide a minimum guarantee of revenue generation of the completed facility. Such requirements are more common where the public authority has an ability to affect the revenue stream or certain risk factors.

Pre-existing conditions that arise during construction of a project, such as subsurface conditions, may allocate risk differently in the P3 model as compared to DBB delivery. In a DBB, the public sector often faces greater exposure to the cost of pre-existing conditions. A P3 facilitates a greater sharing of these risks among the public and the private sector than the DBB, with reasonable limitations. For example, on the Long Beach Courthouse project in Long Beach, California, the public owner retained the risk of “Archeological Finds.” However, the private sector retained other subsurface risks,

such as geotechnical conditions, for example, unexpected subsurface water or poor soils.

3.3 Cost Certainty

Data reveals that a major advantage of P3 project delivery is cost certainty, both to the public owner and the private entity. Cost certainty pertains to both the construction budget and annual fixed payments for operation and maintenance. After reviewing data from various P3 projects and other studies, analysis revealed that the final construction costs of P3 projects compared favorably with initially anticipated costs.

Examples of projects researched that were on or under budget include the South Fraser Perimeter Road in British Columbia, the Long Beach Courthouse in California, the I-95 HOT Lanes in Virginia, and the I-595 Corridor Road Improvements in Florida. On these projects, savings when compared to original projections ranged from $8 million to $600 million.

Other studies have also concluded that cost certainty of the P3 delivery method is achieved with greater frequency in comparison to DBB projects. For example, a study performed by the Allen Consulting Group and the University of Melbourne completed a study of 54 projects with a mixture of public and private procurement. Cost overruns were evident on both sides. However, the P3 method only contained cost overruns of 1.1% in comparison to the overruns of 15% when the traditional DBB method of project delivery is deployed.

Similar findings were reflected in a survey by the Auditor General in Ontario as well. By 2014, there were 37 P3s completed in Ontario. The study showed that 97% of P3s were completed below budget at the time of the study. These results emphatically suggest that P3s have a remarkably high likelihood of meeting budget and schedule requirements.

A study directed by the Syracuse University research team reflected these favorable results as well. A survey was sent to representatives of engineering and construction firms that are experienced in both DBB projects and P3s. The survey asked what percentage of their projects completed under the different delivery methods (DBB and P3) were on budget and on schedule. According to the survey, it was shown that a much larger percentage of P3s were on budget in comparison to DBB projects. A visual representation of this survey can be seen in Appendix A. The survey results show that the private sector typically experiences more positive results regarding cost and schedule certainty when operating in a P3 framework as compared to traditional framework DBB.

Aon is a company that promotes the realistic possibility for P3 use with its effective P3-Point survey that was shared with more than 1,000 major P3 industries in February 2016. The survey, which tangentially reflects the financial rewards of P3 experience, found that 93% of private sector respondents were very likely or likely to pursue P3s within the next year (2016-2017). Although these results only accounted for construction firms with P3 experience, the survey shows that the private sector responds positively to P3 projects.[9]

Positive performance metrics include an appropriate transfer of risk to the private sector. As well, the P3 method eliminates the conventional lowest construction bid approach (with often rigid and non-innovative specifications) and the separation of design and construction responsibility. Under the P3 model, the private sector is accountable for all of the phases the design and construction of the project. Consequently, issues that would have typically resulted in additional costs or change orders paid by the public owner are included within the private developers responsibility and cost projections.

In certain P3s, the owner may award the project to a higher priced bidder based on an exceptional technical proposal. However, most P3s are still awarded to the lowest bidder.

Under the traditional DBB delivery method, a contractor is motivated by the need to submit the “lowest bid” and there is little incentive to consider the life cycle cost of the project to the public owner. Under the P3 delivery method, the private sector is motivated by overall construction cost, not merely the need to submit the lowest bid. This difference, in turn, increases the certainty of cost and the accuracy of estimates for a project.

There are, however, some examples of projects that have resulted in much higher costs than anticipated at the time of the award to the private entity. One such project is the Brampton Civic Hospital in Ontario, Canada. The capital cost estimate for construction of this project was $357 million, while the actual cost of the project’s construction reached $614 million.

Our review of this project reveals that there were a number of mistakes that led to cost overruns. Key cost items not fully considered included the cost of utilities and public insurance, which totaled $88 million. As well, the private entity did not appear to have dedicated sufficient attention to preparing an accurate estimate of cost. Mistakes or problems similar to the ones that plagued this project can occur on any project,

regardless of delivery method, and did not appear to have been caused by unique factors that would not have been present if the P3 delivery method had not been utilized.

The additional cost of the Brampton Civic Hospital project was absorbed by the private entity, not the public owner, as may have been the case in traditional DBB delivery.

Cost certainty depends on a variety of factors influencing the pre-construction, construction, operations and maintenance phases of each project. Experienced P3 project managers, report that cost certainty is heavily dependent upon the competence of the professional team involved on the project, from engineers to lawyers, as well as ample communication between the public sector and the private sector parties. A simple communication misstep on a P3 project can lead to the loss of millions of dollars to the private entity. In turn, great care must be taken by the private entity to avoid such missteps. Conversely, in a traditional DBB project, the multiple private companies involved do not face the same consequences of the failing public project. In fact, a simple miscommunication during a DBB project delivery often results in cost consequences that are borne by the public owner or authority.

Our study has revealed that the P3 delivery method, when compared to traditional DBB, affords the benefit of greater cost certainly and less risk to the public owner, while also resulting in greater cost certainty to the private sector.

3.4 Schedule Certainty

P3 projects have a remarkable record of on time or early delivery.

As noted earlier, the private entity in a P3 delivery method is highly motivated to complete a project on time so that it can begin revenue generation or reduce the accrual of debt financing. Unlike a typical design-build project where the contractor is paid in milestones based on percentage of completion, payments under the P3 model typically occur when the project is completed. This motivates the private entity to complete the project and, in turn, either receive availability payments from or commence revenue-generating operation of the project.

The previously mentioned study performed by the Allen Consulting Group reports a distinct schedule certainty advantage in comparison to public procurement projects. The study indicated that the P3 projects reviewed were ahead of schedule by an average of 3.4%. The public projects reviewed averaged a 23.5% late completion of projects. In the UK, there were similar findings. Before the introduction of P3s, 70% of projects were

behind schedule. P3s had much better results. Only 24% of P3s ran behind schedule in the UK.

The Syracuse University research team also found that P3s have a high frequency of completion on schedule and by the date indicated in the contract. It has been shown that similar projects delivered in similar time periods suggest P3s are more favorable in regard to timely completion that traditional DBB. The Long Beach Courthouse project, as an example of a P3 delivery, was completed in a far less time period than that of a similar project, the San Bernardino Justice Center, that was delivered by a DBB contract.

The study performed by the Syracuse University research team (mentioned in the cost certainty section) displays results similar to the previous paragraph. The survey asked inquired of firms regarding the percentages of their DBB and P3 projects that were completed on schedule. Similar to the conclusion drawn in the Cost Certainty section of this report, P3s were shown to be on schedule far more often than traditional DBB projects.

The survey results were overwhelming in establishing that P3s within the United States perform much better with respect to key measures of cost and schedule certainty. A visual representation of this survey can be seen in Appendix A.

Of note, the Syracuse research team could not find a comprehensive database that compares scheduling advantages of P3s to traditional DBB public projects. There are multiple reasons to explain why this has not been performed to greater analytic certainty. The biggest reason is that every project is different in size, scope, location, access and site conditions, as well as the political atmosphere and weather.

While direct comparison of specific project types is challenging, the extent of the overall disparity in the findings between the two delivery methods suggests that the P3 model has performed significantly better in terms of cost and schedule predictability.

3.5 Innovation

3.5.1 Risk Allocation

One of the main differentiating factors between P3s and traditional contract frameworks is the allocation of risk between project partners. A contractor under a traditional DBB assumes the risk of constructing the asset per plans and specifications prepared by the public owner, but little more. Under a P3 framework, greater risk is typically allocated to the contractor, including the risks associated with schedule delays, cost overruns,

operations and maintenance, and the obligation to thereafter turn the facility over to public owner in a state of repair that meets requirements after a period of time.

To manage this increased risk, the private P3 developer will engage in a cost analysis that spans the life cycle of the private entity's responsibilities for the facility. In a traditional DBB delivery, such an analysis is rarely performed by the contractor, since the contractor's role in connection with the project essentially concludes upon completion of construction. Under the P3 model, the private entity seeks to minimize the cost of conducting operations and maintenance, including avoiding the occurrence of undesirable events that would give rise to replacement costs or penalties. The P3 developer is therefore incentivized to utilize project specific technologies that increase the efficiency of the project beyond the construction phase.

3.5.2 Economic Emphasis

The use of innovative technologies enhances long-term economic performance of P3 projects. Under a P3 framework, the contractor’s ability to maintain profitability is often dependent on operational efficiency. Reduced operating and maintenance costs insure the profitability of the private investment, whereas the public sector generally focuses on construction cost (capital expense) and operating cost independently. Similar incentives exist for projects based on availability payments, because the public owner may impose operational standards in a P3 that may not have been included had a focus on reducing capital cost been considered. Given the exposure to penalties that the private sector may if the project does not meet operational standards. Economic incentives remain for the project to be designed in a manner that greatly reduces the potential for it to fail at any time.

3.5.3 Innovation

The increased allocation of risk to the contractor acts as an incentive for the contractor to then focus on the long-term performance of the project. With traditional contract frameworks, the contractor is presented with a set of specifications that must be met in the construction of the project. These specifications represent the minimum required criteria under which the project will meet the client's desired project quality.

Under the P3 framework, contrary to the DBFOM model, the concessionaire looks beyond the minimum specifications to avoid issues within the operations and maintenance portion of the contract. The contractor is focused on meeting and sustaining a level of quality and operational capacity through the entire project lifecycle. These innovative measures encompass a wide variety of design and construction methods to best control the quality of each specific project.

Some examples of project specific innovations include the following:

- Incorporation of redundant mechanical system in the Long Beach Courthouse to allow for scheduled maintenance and equipment failures.
- Use of more advanced HOV lane monitoring systems and advanced traffic monitoring system on the I-95 HOT lanes.
- Utilization of full sized mock-ups in the Long Beach Courthouse and Abbotsford Hospital and Cancer center in British Columbia, Canada.

4. Opportunities for Improvement in P3s

Despite the many benefits that P3s present to the public sector, there are perceived limitations that must be addressed going forward. Through the interviews and research conducted for this report, it was determined that the following areas can be seen as opportunities of improvement:

- Lack of Political Fortitude
- Existing and Potential Legislative Setbacks
- Federal and State Funding

These identified areas pertain directly to the political will, viability under existing legislation and funding provided by the public sector. By creating a better understanding of P3 from a public perspective, some of these identified areas may become more minimal issues going forward.

4.1 A Need for Increased Political Understanding

Although the P3 method has been gaining acceptance within the United States in the last decade due to its beneficial characteristics, adoption has been slow. Part of the problem is that every state has its own unique set of regulations regarding public construction projects, and not all authorize the use of the P3 model.

Currently, 36 states and the District of Columbia have passed legislation allowing for P3s in some form and for certain assets like transportation, but not always for public buildings. For instance, New Hampshire recently enacted P3 legislation to improve transportation infrastructure.

Legislators, within each state and at the federal level, have varied opinions on the use of P3s. Some have no knowledge of P3 and are inherently wary. This can be seen as critical to the deployment of P3s during the early stages of their consideration in the

United States. However, as the understanding and awareness of the effectiveness of the P3 model increases, misconceptions and preconceived notions may erode.

4.2 Existing and Potential Legislative Setbacks

A major limitation that the P3 movement faces is due to a lack of local legislation. Political resistance could be reduced with a standardized legislative framework for evaluating P3s for public projects. Also for states that have existing local legislation, additional insight on how to adequately conduct the P3 delivery method could be beneficial in achieving the maximum value.

In Canada, where P3s have been more widely used, there is a much better understanding of how P3s can be utilized for a benefit of the public sector. Canada has a history of requiring all large infrastructure projects to be evaluated using the P3 model. By forcing this assessment, public officials are required to learn more about how P3s work and what value for money the approach may bring to the public sector. The U.S. has no similar requirement for evaluating large infrastructure project.

One of the ways that P3s can overcome legislative friction is by overcoming the policies that stand in the way, or by creating new laws. The Public-Private Partnership in Infrastructure Resource Center (PPPIRC) stated, “a government may decide to enact a PPP law or a concession law for a number of reasons, such as to give priority to a process of developing, procuring and reviewing PPP projects that will take priority over sector laws, or to establish a clear institutional framework for developing, procuring and implementing PPPs.”

The PPPIRC further claims that, “PPP laws can (also) be used to close gaps in the laws of a host country that may be required to allow for successful infrastructure PPP projects, such as enabling the grant of step-in rights to lenders and requiring open and fair procurement processes.”

If public officials understand the attributes of this delivery method coupled with the reduced risk to the public sector, P3s should continue to experience shrinking legislative friction.

4.3 Federal and State Funding

The P3 delivery model may offer advantages where the ability to secure **initial** public funding is weak. However serving as a source of funds is not necessarily the key driver to pursue the P3 model.

The P3 delivery method allows the public sector to fund infrastructure projects over a longer period of time than under a traditional framework, and drastically reduces the **upfront** funding burden placed on the public sector. The fundamental shift of financing responsibility to the private sector inherent in the P3 model yields this clear benefit, which can be ideal where a specific state is encountering budgetary constraints.

A lack of funding from the public sector is not always relevant. The state of Texas currently is not facing budgetary constraints that stand in the path of public construction. For this reason, the incentive for using a P3 does not stem primarily from a short term economics standpoint. P3s are currently being evaluated in Texas for their ability to provide a superior infrastructure that performs to specified standard criteria over the long term [6].

5. P3 Financing

The fundamental structure of public-private partnerships includes its unique financing allocation. Unlike traditional project contracts, a P3 incorporates a long-term financing component that typically incorporates operations and maintenance after completion. Special financing items that P3 projects must account for are as follows:

- Revenue Sources - Availability payments and Toll Collection
- Early Project Financing
- Long-Term Financing
- Sensitivity to Interest Rate Environments
- Cost of Capital

The end goal of a P3 project is to provide a high quality asset for public use, which is the same overall goal as any traditionally contracted infrastructure project. It is the financial aspect and life cycle savings of P3 projects that help differentiate it from traditional counterparts. The unique financing aspect provides some interesting benefits to the public sector.

5.1 Revenues Sources - Availability Payments and Revenue Collection Projects

The primary P3 revenue sources are: availability-based payments and revenue generation.

Availability payments are fixed periodic payments made by the public sector to the contractor on condition that the facility meets the agreed upon completion and performance specifications [12]. Availability based payments are agreed upon at the outset by the Public Authority and the developers build their teams and design the building and construction plans will the goal of obtaining the availability payment(s) promised.

Revenue collection projects entitle the developer to collect a percentage of the income generated by the finished asset. Typically, the contractor collects this payment for as long as they are responsible for the operation and maintenance of the asset. For example, if the private sector holds the contract for the completion of a toll road and is responsible for the O&M for 30 years, the revenue-collecting stream could be the tolls collected over the specified time.

The revenue collection method is riskier than an availability based model for the private sector because revenue is based on forecasts. The private investor's assessment of the value of a project will depend on the projections of potential revenue collection. If these assessments are overestimated, the public sector will not be affected.

5.2 Early Project Financing

The first challenge for developers constructing a P3 project is early financing. Because the structure of P3 contracts provides no revenues until the project is completed and in use, developers must find ways to fund the project without any revenue streams to offset costs. In the case of the Long Beach Courthouse, the Long Beach Judicial Partners secured funding through a loan syndicate comprised of foreign banks to finance the project through the 32(28)-month construction phase.

A secondary option that would be available to some projects is a bond issuance by either the developer or the public sector sponsoring the project. However, bond issuances face several hurdles as the developer may struggle to obtain a favorable bond rating to keep borrowing costs under control and a sovereign entity may need to enact special legislation allowing the use of public debt to fund private projects. Additionally, any changes in the rating for either a corporate or sovereign bond would cause borrowing costs to increase and impact the developer's ability to successfully execute the project. Once the project is completed and consistent revenue is generated, the developers will often seek a shift to a long-term financing structure.

5.3 Long-Term Financing

Once a P3 under the DBFOM model is completed, developers will use revenue predictions to issue a long-term bond or other long-term financing. The need for long term financing is less of a factor or challenge under the availability payment model, where future cash flows may be guaranteed by a public body or where no long-term financing may be required. Under the availability payment model, bond structure and lower borrowing costs given the certainty of future cash flows may be more readily available.

Under the DBFOM model, the primary financing risk is facility maintenance and operational continuity to avoid penalties. Fortunately for the public entity, the private sector will bear this risk.

5.4 P3 and Sensitivity to Interest Rate Environment

As mentioned earlier, the current interest environment has a significant impact on the ability to finance a P3. Low borrowing costs of sovereign entities like state or municipal bonds are a more attractive form of financing than the more expensive cost of capital associated with equity investors.

Additionally, higher borrowing costs constrain a developer's ability to finance the early stages of a project as the long-term net present value (NPV) of the project will drop and a higher portion of availability payments are used to pay back debt, thus leaving a smaller portion of profits? to the equity investors. As interest rates increase, the costs associated with borrowing may become prohibitive. Regulation and legislation may need to be created to improve the interest rate environment regarding P3s.

6. Summary

The American Society of Civil Engineers rated the United States at a D+ for the quality of its infrastructure. [11] In the upcoming years, it's vital for the United States to implement the necessary tools to improve and expand its aging infrastructure. The P3 delivery method is one tool that can shift the focus of the public sector to establishing a better infrastructure, in a manner that benefits from being relieved of various burdens, including financial risks, while placing those risks on the shoulders of the private sector participants.

Research has shown that the risk transfer greatly benefits the project and the public sector.(Two References) P3 projects are largely completed on schedule and on budget when compared to traditional DBB projects. These attributes, coupled with the transfer of risk

to the private sector, can allow for the public sector to focus less effort on completing the current project and more on improvement of our infrastructure for the long term.

As a tool for delivering potential projects, P3s are not a one-size-fits-all solution. Various attributes of a P3 project, such as the cost of capital and state/local legislation, are largely dependent on the location and nature of the project. Careful decision making by experienced professionals must be made when choosing a P3. However, when a P3 is appropriate for a project, it can greatly benefit the public sector and provide an important means for delivering high quality projects on time and on budget.

7. Recommendations

The use of P3s in the U.S. offers the public sector the potential to take on infrastructure projects, large and small, while enjoying a greater value for money proposition than would be possible with traditional procurement methods.

Many states, as well as the federal government, could benefit from the use of P3s, but are limited by existing legislation, an unsupportive political environment and a general lack of familiarity, experience or comfort with the P3 delivery method. Consequently, under current conditions, infrastructure projects in the United States are not always able to utilize the P3 approach or benefit from favorable results under a P3 framework.

The identification of perceived shortcomings and methodologies for addressing those concerns has the potential to increase public sector confidence in favor of selecting the P3 option. Given the benefits that P3s may provide the public sector, it is suggested that greater emphasis should be placed on addressing misconceptions that stand in the way of broader acceptance of the P3 model.

Legislatively, the U.S. has large voids in the ability to pursue P3s. Each state is responsible for the determination of its own regulations regarding P3 use. And where legislative authorization exists, public officials should evaluate the use of a P3 framework for individual projects.

Aon, a global leader in corporate risk management, illustrated how U.S. states could be mapped according to their existing P3 willingness. [9] The report draws the conclusion that states with clearly written laws regarding P3s have the greatest potential to procure P3 project in the future. Aon reports, not surprisingly, that states with non-existent, lacking, or unclear regulations regarding P3s are far less likely to procure projects under a P3 framework and are more likely to encounter resistance to the P3 model.

Further impediments, such as the quality of drafted contracts, limitations on the ability to project revenue collection, and other evolving capabilities in conducting value for money analyses, are also factors that can be seen as obstacles to P3 use in the U.S. market and which should be addressed.

With further deployment of the P3 model, as has occurred outside of the United States, including stronger legislation and better standardization of workable contract forms, together with continued research, an increase in the public sector's awareness and acceptance of the benefits of the P3 approach should be the result.

8. Conclusions

This study concludes that the public sector's ability to effectively and efficiently respond to infrastructure demands would benefit from greater deployment of the P3 model.

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Appendix A
(a)
(b)

(a)
(b)

Appendix B

Table 3. Projects researched and discussed during interviews.

Project Name	Location
University of California West Village	Davis, CA
University of California Merced	Merced, CA
Eagle P3	Denver, CO
US 36 Express Lanes	Colorado
Texas State Highway 130	Texas
Long Beach Courthouse	Long Beach, CA
South Frasier Perimeter Road	Vancouver, CA
Abbotsford Hospital and Cancer Center	Abbotsford, BC

[1] (NCPPP 2014).
[2] (Martin 2015)
[3] (Mallet 2014)
[4] Interview specific information provided upon request
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