

Public-Private Partnerships in U.S. Transportation: Research Overview and a Path Forward

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Abstract: Public-private partnerships (PPPs) are contractual relationships between government and industry to deliver facilities or service for public benefit. In the United States, existing transportation infrastructure is aging and new infrastructure is underfunded. PPPs are considered one way to help meet this looming need. Although PPPs have a long history, interest in modern PPPs is renewed. The current debate over PPPs lacks theory and research to support the various views of PPPs. Promoters say they bring needed financing, technology, management, and risk sharing to infrastructure development. Detractors say government agencies are better positioned to finance and own infrastructure and protect the public interest. The unique contribution of this paper is to provide the results of a national survey on the state-of-practice of PPPs in transportation in the United States, and to provide a comprehensive overview of research on U.S. transportation PPPs in the areas of economics, law, and public opinion. Additionally, a path forward is offered to help organize and guide research in U.S. transportation PPPs in the future. DOI: [10.1061/\(ASCE\)ME.1943-5479.0000050](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000050). © 2011 American Society of Civil Engineers.

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Introduction

Transportation infrastructure is widely recognized as an essential feature of economic vitality and national security. The United States, as with many other countries, finds itself with an aging infrastructure and funding that is significantly lagging current maintenance and future growth (Mallet 2008; National Surface Transportation Policy and Revenue Study Commission 2007). Public-private partnerships, also referred to as PPPs, P3s, 3Ps, PFI (private finance initiative), or PPV (public-private venture), offer a potential mechanism to fund a portion of the ongoing transportation infrastructure needs. PPPs have been implemented successfully in the United States and in many parts of the world, such as Australia and Ireland (Chan et al. 2010; Soliño and Vassollo 2009; Deloitte 2007; USDOT 2005; USDOT 2007b). In the United States, transportation projects such as the interstate highway system have been built based on a public-public partnership between the federal and state governments. Adding a private partner to this mix can be challenging. A need exists to identify what factors will allow the U.S. to implement PPPs in transportation more effectively.

In general, a PPP can be broadly defined as a contract between a public agency and a private firm to provide a facility or service to

the public. This agreement seeks to involve the private sector in nontraditional areas of a project with risks and rewards shared in new ways (USDOT 2004c). For example, a public agency may provide right-of-way and the right to collect user fees, whereas a private firm provides financing, innovation in technology, and ongoing service. Researchers and practitioners identify many contract arrangements as PPPs, such as fee-based contract services, design-build (DB), design-build-operate-maintain (DBOM), design-build-finance-operate (DBFO), build-own-operate (BOO), and long-term leases (Mallet 2008; Abdel 2007; USDOT 2007b). Because the most pressing concern in U.S. transportation today is financing, this paper focuses on PPPs that include some element of private sector financing.

The U.S. has integrated private financing of public works throughout its history, although the term public-private partnership was not used in the beginning. The U.S. sometimes encouraged public infrastructure projects by offering land grants and franchises, typically for canals, railroads, and postal routes. By leveraging land assets the government could respond with flexibility to public needs. Garvin (2007) provides examples of transportation public-private partnerships throughout U.S. history starting in the 1790s to modern day, including projects such as: Zane's Post Road, Illinois Central Railroad, New York City Subway, New Deal public works projects, the Interstate Highway System, SR 91 express lanes in California, Dulles Greenway in Virginia, Pocahontas Parkway in Virginia, and the JFK AirTrain (light rail transit system) among others. Two projects that have attracted attention owing to their lengthy lease agreements with foreign-based private sector firms are the Chicago Skyway with a 99-year lease and the Indiana Tollway with a 75-year lease.

Advocates of PPPs commend the ability of PPPs to the following: advance projects with reduced upfront capital; advance projects on schedule and on budget; shift construction and maintenance risk to the private sector; reduce costs for construction, life cycle, and risk contingency; provide quality customer service; and enable public agencies to focus on core goals (Deloitte 2007). Detractors

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of PPPs are skeptical of PPPs citing concerns as follows: private funding will not increase transportation funding if public agencies merely redirect funding; risks are not truly shared because a PPP that fails will have to be bailed out by the public agency partner; the highway network will become a complex maze of varying ownership and pay schemes; travel costs will likely increase as toll roads expand; traffic will likely be diverted onto nontolled local roads; the financial burden to lower income travelers will likely increase with new toll roads; the difficulty of planning a comprehensive transportation system if PPPs focus only on facilities that can generate a profit without considering other connectivity needs; potential foreign ownership may not be in the best interest of the public; and long lease agreements may allow public agencies to divert transportation money to other public needs and leave future generations paying increased transportation costs (Mallet 2008). PPP advocates believe ways exist to manage each of these obstacles and point to the popularity and success of PPPs in other countries as proof of the viability of PPPs. Whether PPPs can establish a significant foothold on the U.S. transportation sector remains to be seen.

The unique contribution of this paper is to provide the results of a national survey on the state-of-practice of PPPs in transportation in the United States and to provide a comprehensive overview of research on transportation PPPs in the United States in the areas of economics, law, and public opinion. The introduction sets up the need and clarifies the working definition for PPPs. The next section presents findings from a survey of PPP practices of state departments of transportation (DOTs) in the United States. The issues identified in the survey results are explored through a literature review of transportation PPPs in the United States in the areas of economics, law, and public opinion. Additionally, challenges to advancing PPPs are described and a path forward is offered to help organize and guide research in U.S. transportation PPPs in the future. Conclusions from the survey, literature review, and suggested research path are summarized.

State-of-Practice of Transportation PPPs in the United States

To identify the current practices of PPPs in U.S. transportation projects, a questionnaire targeting state transportation planning engineers was prepared. The questionnaire consists of ten questions covering PPP issues such as: experience level with PPPs; types of PPPs used; reasons for implementing PPPs; success of PPPs; types of financing mechanisms; effectiveness of communication; schedule and budget performance; level of risk; overall satisfaction; and state legislation regarding PPPs. The questionnaire was sent to state DOT planning engineers with responses accepted through Adobe web submission, e-mail, and fax. A week after the questionnaire was sent, follow-up phone calls were made to every state DOT

planning engineer who had not yet replied; thus, several questionnaires were filled out over the phone. A total of 34 questionnaires were received: seven by phone, 22 through Adobe Acrobat, one by fax, and four through e-mail (Table 1). To facilitate analysis, results were coded to maintain uniformity. The following sections summarize the findings.

PPP Experience of the States

The experience with PPPs varies from state to state because it is still considered a newer concept in U.S. transportation projects. States that responded were grouped in four PPP user categories (Table 1; Fig. 1). Category 1 consists of states that responded that they are experienced with PPP projects including, California, Connecticut, Florida, Minnesota, South Carolina, Texas, and Virginia. Category 2 consists of states that responded that they are currently practicing PPP projects. Category 3 consists of states that responded that they are planning to implement PPP projects in the near future. Category 4 consists of states that responded that they have not yet planned to implement PPPs in the near future. States in Category 4 tend to be located toward the north central and western part of the U.S. and have not yet planned to implement PPPs primarily owing to relatively low traffic volume. Based on these categorizations, a number of observations were noted.

The data highlight various impacts between a state's legislation and a state's implementation of PPPs. Out of the eight states that have not yet planned to implement PPPs, seven states do not have legislation about PPPs and one of the states has a bill in process. Moreover, out of the 14 states that plan to implement PPPs in the future, five states have PPP legislation, eight states do not have legislation for PPPs, and only one state has a bill in process. Furthermore, approximately 60% (8 out of 14) of the states in Category 3 are planning to implement PPPs in the near future. This voluntary enactment of PPP legislation on the part of many states indicates an acceptance of PPPs by those states. As shown in Table 2, PPPs have been successful in achieving objectives for 82% (9 out of 11) of the experienced and practicing states (Categories 1 and 2). In contrast, Washington reported its PPP to be a failure and one state did not answer this question. There is no financing, operation, maintenance, and service involved in any of the Washington DOT PPP contracts. In Categories 2 and 3, 91% (10 out of 11) of the states indicated that the use of PPPs on their projects allowed them to remain under budget and within schedule. California considers PPPs to have been a success despite the fact that one project was behind schedule. Delaware is not considered experienced or currently practicing because of its variation in response to the questionnaire. The response from the state of Delaware indicates that they were disappointed with their PPP projects and could not find real value in most of the proposals for a variety of reasons.

The types of PPPs used in the U.S. were revealed in the survey. The build-operate-transfer type of PPP was not adopted for

Table 1. State-of-Practice of Transportation PPPs in the United States

State-of-practice	States	Percent of responding states
Experienced	California, Connecticut, Florida, Minnesota, South Carolina, Texas, Virginia	22
Currently practicing	Colorado, Nevada, Washington,	9
Plans to implement	Alabama, Arizona, Illinois, Kansas, Kentucky, Louisiana, Michigan, Missouri, Mississippi, North Carolina, New York, Pennsylvania, Tennessee, Vermont, West Virginia	47
Does not plan to implement	Montana, North Dakota, Oregon, South Dakota, Utah, Wisconsin, Wyoming	22
Did not respond	Alabama, Arkansas, Delaware, Georgia, Hawaii, Iowa, Idaho, Indiana, Massachusetts, Maryland, Maine, Nebraska, New Hampshire, New Jersey, New Mexico, Ohio, Oklahoma, Rhode Island	Not applicable

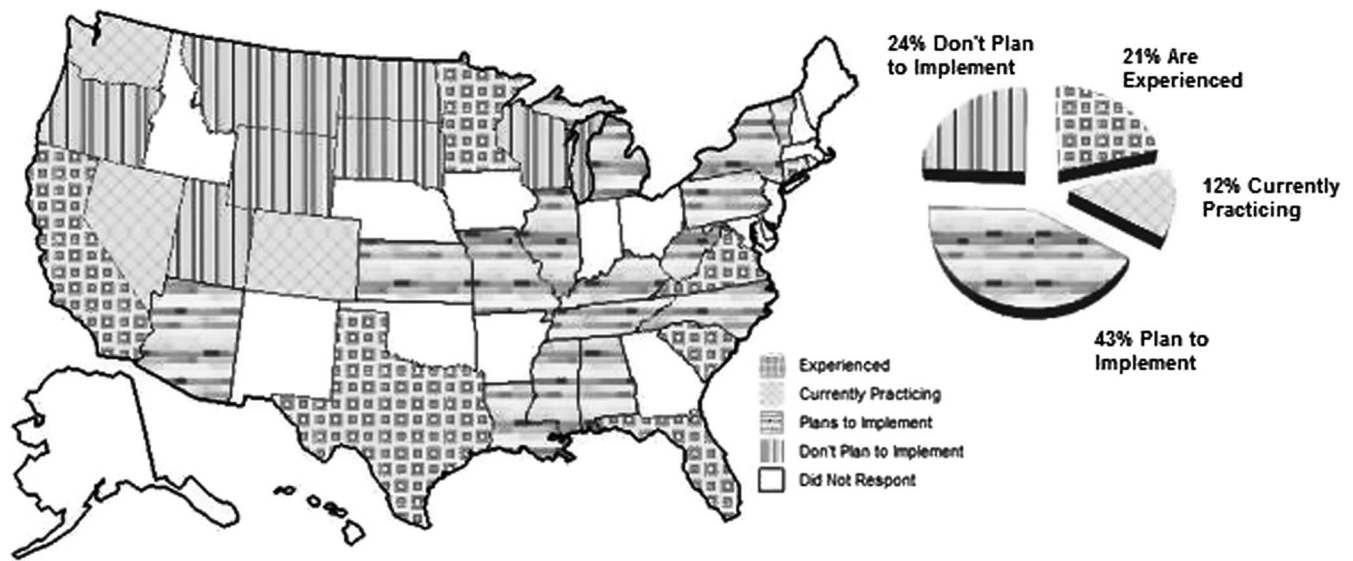


Fig. 1. State-of-practice of transportation PPPs in the United States

Table 2. States Considered Successful with Past or Current PPPs

	Successful	Unsuccessful
Experienced	California, Connecticut, Florida, Minnesota, South Carolina, Texas, Virginia	None
Currently practicing	Colorado, Nevada, North Carolina	Washington

projects, whereas the build-own-operate type of PPP was only adopted in the state of North Carolina. This contrasts with the popular use of build-operate-transfer in Asian countries. This unexpected response may stem from confusion or unfamiliarity in the meaning of build-operate-transfer and other types of PPPs in the U.S.

Although PPP projects normally involve innovative financing, the majority of states indicate that their PPP projects have been performed using design-build. An abundant literature exists on the design-build method; therefore, this article focuses on PPP projects with innovative financing. States use a variety of terms to describe the same PPP methods. Federal Highway Administration (FHWA) terminology is used in this study for consistency, including predevelopment agreements, build-operate-transfer, long-term lease agreements, design-build-finance-operate, build-own-operate, and other types. The most common agreement types found in state transportation PPP projects are summarized in Table 3.

Texas and Virginia have each tried three different types of PPP projects and both the states have reported that the projects were under budget and ahead of schedule. Moreover, Texas reported neutral and Virginia reported very satisfied ratings for overall

Table 3. Common Transportation PPP Types Currently Used in the United States

P3 Type	States using PPP type
Predevelopment agreements	California, Colorado, Minnesota, Nevada, New York, Texas, Virginia
Long-term lease agreements	California, Colorado, Texas, Virginia
Design-Build-Finance-Operate	Florida, North Carolina, Texas, Virginia, West Virginia

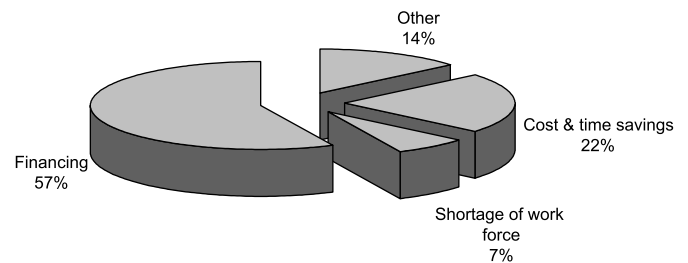


Fig. 2. Reasons for adopting PPP projects

satisfaction. The study also showed that all the states that have experience or are currently practicing have reported overall satisfaction ranging from average to highly satisfied levels.

Fig. 2 illustrates the primary reasons for which these states enter into PPP projects. Across all four categories of experience level, financing was the major reason for adopting PPPs (57%), followed by time and cost savings (21%). Moreover, all states in Categories 1 and 2 indicated financing as a major reason for employing PPPs. Surprisingly, none of the states indicated risk transfer as a reason for adopting PPP projects even though risk transfer is a main attribute of PPPs.

PPP Performance Evaluation

States were asked to rate the effectiveness of communication with the private sector on a scale of 1–5, where 5 means very satisfied. The majority of state DOTs were satisfied with the communication as shown in Table 4.

Table 4. States' Communication Rating

Rating	States
1 (not satisfied)	None
2	None
3	Missouri, Nevada
4	Colorado, Connecticut, Minnesota, New York, Texas, Virginia, West Virginia
5 (very satisfied)	Florida, South Carolina, Washington, North Carolina

Table 5. States with Transportation PPPs on Schedule and within Budget

On schedule, within budget	Not on schedule, not within budget
Colorado, Connecticut, Florida, Minnesota, Nevada, North Carolina, South Carolina, Texas, Virginia, Washington	California

Table 6. States' General Satisfaction Rating

Rating	States
1	None
2	Delaware
3	California, Colorado, New York, Texas, Washington
4	Nevada, South Carolina
5	Connecticut, Florida, Minnesota, Virginia

The effectiveness of communication with a private partner may impact the ability to complete projects on schedule and on budget. Schedule and budget performance have been identified as important PPP benefits (Deloitte 2007; AGC 2010). Table 5 illustrates which states have completed PPPs on schedule and within budget.

The state DOTs were asked to rate their general satisfaction of the PPP process by using the same scale discussed previously. As shown in Table 6, the overall satisfaction is moderate.

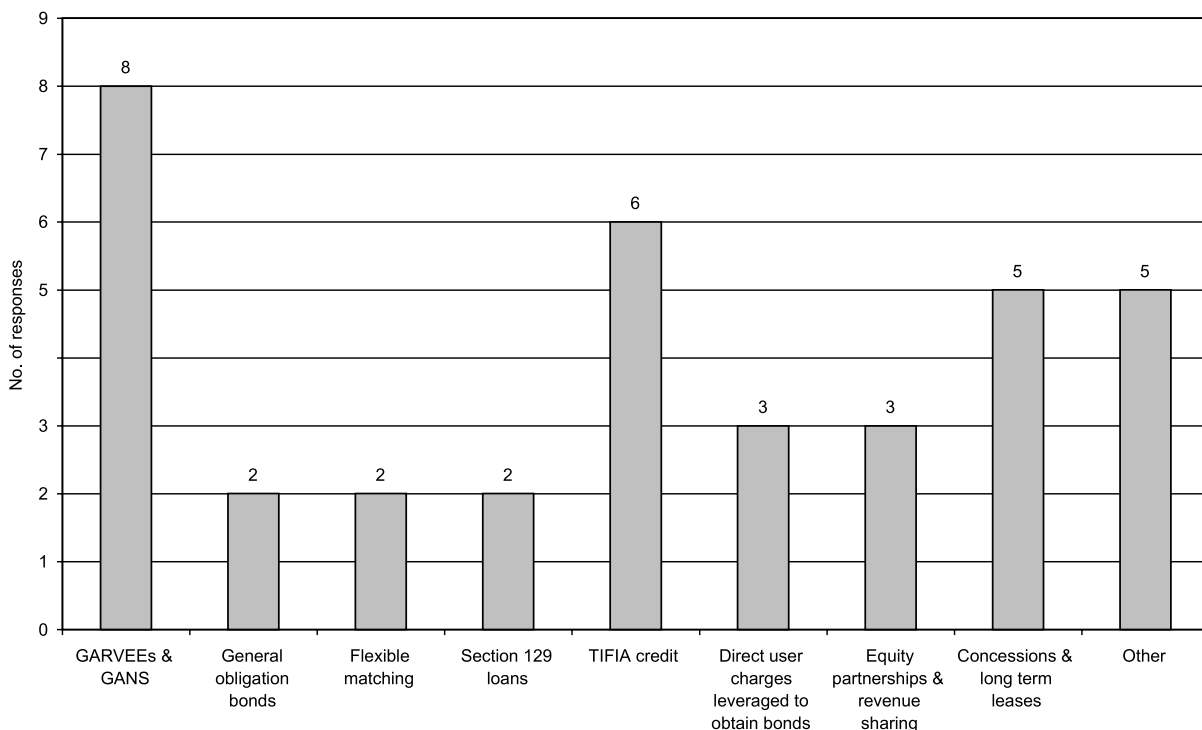
Some people prefer tolls over tax increases because tolls are associated with transportation infrastructure whereas taxes are not. As congestion increases, the public is willing to pay tolls to make their trip time quicker and more predictable. For example, Nevada's PPPs have consisted of private sector financing of individual highways that benefit the private sector and the public by reducing drive times. These projects have primarily consisted of interchanges that access business and residential developments.

Financing Methods

A number of financial instruments are currently being used by states to fund transportation infrastructure including: grant application revenue vehicles and grant anticipation notes (GARVEEs and GANs); general obligation bonds; flexible matching (including toll credits); Section 129 loans; Transportation Infrastructure Finance and Innovation Act (TIFIA) credit; direct user charges (tolls and transit fares) leveraged to obtain bonds; equity partnerships and revenue sharing; concessions and long-term leases; and others methods, including private activity bonds and transportation infrastructure bank. Fig. 3 illustrates the different types of financial instruments that are currently in use in the United States to fund PPPs. The need for transportation projects is often present before the funding is available. The federal government of the United States has GARVEE bonds and GANs that allow eligible projects to advance to construction with federal aid reimbursements directed toward paying the project bond debt (USDOT 2004a, b). GARVEEs and GANs receive the highest usage with eight states, followed by TIFIA credit by 6 states, and concessions and long-term leases and other by five states each. These funding mechanisms at the federal level seem to have encouraged states to implement PPPs.

Types of Risks

A PPP is a risk sharing relationship between the public and private sectors. Ideally, the partner that is most qualified for a certain risk will manage that particular risk. The process of establishing PPPs involves a great deal of risk. The most common risk is if the private entity fails financially and does not complete the project. The risks reported by the states include traffic demand, right-of-way, environmental issues, operation and maintenance costs, political and governmental issues, loss of owner control, and delays because of legal issues. Risks vary by project and type of PPP. Each project will have risk components that should be discussed and assessed in a risk matrix. The public and private sectors negotiate the level

**Fig. 3.** Financial instruments used to fund transportation PPPs

of risk they are comfortable with. In several states, public acceptance and political factors play an important role for the implementation of PPP projects. In Texas, concern over long-term leases associated with “foreign” firms or developers, and concerns with risk transfer terms have stopped some privately-financed toll roads (Linderberger 2009).

Observations from the Survey Results

From the survey results, a number of observations can be made. Although many states have shown a willingness to implement PPPs, no federal mandate to do so exists. To provide context for this situation, the literature review looks at ways the federal government is encouraging PPPs and what legal issues are involved in advancing PPPs. Additionally, even states that are leaders in PPPs, such as Texas and Virginia, have not fully realized the potential of PPPs because risks, risk sharing, and the complexity of funding is not fully understood. To shed light on risk and funding, the literature review looks at the economics behind PPPs. Furthermore, the variety of contractual relationships that fall under the label PPP is diverse. There is lack of clarity among professionals as to what a PPP entails. This ambiguity is even more troublesome for the public. Public opinion impacts the spread of PPPs. To determine the current state of PPP external stakeholder views, the literature review looks at public opinion of PPPs.

Economics of PPPs

Over the past few years, PPPs have been used more frequently to fund capital projects. PPPs are still evolving and researchers and practitioners are trying to learn more about them (Grout 1997). Researchers have investigated the economic advantages and disadvantages of PPPs in areas such as the financial burdens on government agencies, transfer of risk, value enhancement, planning and construction duration, innovation, and the transfer of new skills.

Reduce Financial Burdens on Government Agencies

The basic structure of PPPs is such that capital projects are funded, developed, owned, and maintained by private organizations. With private financing, a government agency can get part of the project or several phases of the projects financed by private organizations, thereby reducing the financial burden on the government agency. PPPs can help governments reduce the large financial burdens of capital projects (Grout 1997). Grout explains that the traditional model of a capital project is the government contracting with the private sector to build an asset that will be owned and controlled directly or indirectly by the public sector to provide a flow of services. This requires the public sector to fund the project upfront, thus increasing the public sector borrowing requirement (PSBR). By using PPPs, the public sector allows the private sector to fund, build, and own the asset, whereas the public sector only receives the flow of services as they occur. This allows the public sector to avoid large investments, which in turn helps to keep the PSBR unaffected. PPPs are less dependent on capital budgets and may be seen as benefits that are “off-balance-sheet” depending on the balance of risk between the public and private sectors (DeCorla-Souza 2005; Thomson and Goodwin 2005; Luca 2000).

PPP can thus be viewed as providing a better value for tax payers (Grout 1997). The Private Finance Initiative (PFI 2008) believes that PPPs help to check the cost overruns and delivery slippage. A study by the National Audit Office (NAO) in February 2003 indicates that 24% of PPP projects were delivered late as compared with 70% late deliveries on conventional procurements. Additionally, 22% of PPPs had cost overruns as compared with

73% of conventional procurements. The NAO also found that where PPP cost overruns occurred, the public sector customers had changed their specifications. Moreover, PPPs have certainty in costs and also enable risks to be better managed. The NAO determined that PPP projects motivate contractors to plan and follow a consistent approach because the contractor will be maintaining the asset when construction is complete. PPPs also maintain transparency, which allows the public sector to know well in advance how much it will be paying (NAO 2003).

Transfer of Risk

In some segments, the private sector manages some risks better than the public sector; hence, the risk premium is lower than when the public sector is carrying the risk alone. PPP projects on the one hand can reduce the financial burden of government agencies, and at the same time it can reduce the risks associated with financing capital projects because of the use of off-balance-sheet financing. Because a private firm becomes responsible for building, maintaining, owning, and transferring, the risks associated with getting appropriate returns are also borne by the private entity. Thomson and Goodwin (2005) divided the risks into the following types: funding; completion; operation and maintenance; termination (if the private entity fails to deliver); and revenue (risks related to direct, indirect, and availability payments).

The Private Finance Initiative (2008) documents that PPPs also have the potential benefit of transferring risks to the private sector. These risks have been classified as: cost of overrun risks during construction; timely completion of the facility; meeting the required standards of asset delivery; the underlying costs to the operator of service delivery; and risk of industrial action or physical damage to the asset. Moreover, PFI (2008) references guidance from the Treasury of the United Kingdom that states, “The benefits of PFI flow from ensuring that the many different types of risks inherent in a major investment program are borne by the party best placed to manage those risks.” Although a number of researchers affirm the ability of PPPs to transfer risks (Valila 2005; DeCorla-Souza 2005; Luca 2000), Grout (1997) points out that it is difficult to know the extent to which risks have been transferred to private organizations.

Value Enhancement

Different stakeholders may value project objectives differently (Yuan et al. 2010). The private sector partners in PPPs can add value to projects to make PPPs economically superior to traditional public provision (Valila 2005). The additional value is in improvements to production, or technical efficiency in production and supply of services. These gains arise from the following: specific ownership structure of the assets; bundling together of the different phases of service production and provision; and appropriate sharing of risks and rewards.

Planning and Construction Duration

Once the PPP partners have signed the contract, the administrative procedure related to the portion of work that has to be performed by the private organization gets transferred to the private organization. This can help to avoid some of the overly complex government procedures and political influences and thus expedite the process of project delivery. DeCorla-Souza (2005) affirms that PPPs are planned and constructed more rapidly than traditional projects. Similarly, Grout (1997) finds that PPP projects speed up the system and revamp government machinery.

Innovation

Because the private entity in a PPP bears many responsibilities and risks, private entities use innovative ideas (at their own risk) in an

effort to maximize project returns. When the private sector in a PPP searches for new ways to achieve targets, innovation is triggered (DeCorla-Souza 2005). In general, PPPs allow contractors to innovate in designing and building assets as long as the requirements of the project are met (PFI 2008). PPP projects give an incentive to contractors to deliver the product with reliability and maintainability.

Transfer New Skills

In a PPP, the private organization may have skills that are not found or are undeveloped in the public organization. A public agency can benefit from the exposure to skills associated with PPPs, and this exposure can lead to a transfer of skills from the private organization to the public body (DeCorla-Souza 2005; Thomson and Goodwin 2005). Alternatively, setting up successful PPPs requires specialized skills that public agencies may need to acquire before proceeding with PPPs.

Economic Concerns with PPPs

Researchers have identified a number of economic concerns about PPPs. To start with, the cost of bidding or transaction costs for PPPs is high. More research on the impact of the high cost of bidding a PPP compared with the overall benefits is needed (Valila 2005). Additionally, the public may possibly feel that the private partner in a PPP is attempting to maximize its profits, whereas the public agency does nothing to relieve congestion on free facilities (DeCorla-Souza 2005). Moreover, people may be unwilling to pay for services that were previously free to the public, although not free to the government agency (Luca 2000). Furthermore, the public may view the transfer of responsibility in a PPP from the public agency to the private entity as a failure in public accountability (Luca 2000). Finally, PPPs may increase monopolies by the private sector, thus enabling the private sector to increase the user charges (Luca 2000).

PPP Legal Issues and Public Opinion

Over the years, legislation in the United States has either facilitated or hindered PPPs. A legal framework that provides flexibility and certainty is required for transportation agencies to create PPPs and for private firms to be willing to show interest in PPPs. However, before specific legal issues can be addressed, the political will must exist to make PPPs happen. The political environment can be influenced by public opinion (Buxbaum and Ortiz 2007) and the opinion of professional organizations and lobbyists (Reason Foundation 2007). In addition to a political environment favorable toward PPPs, the government should consider key legal issues impacting PPPs including procurement, financing, project characteristics, and legal authority of the owner.

Political Leadership

Early examples of U.S. transportation PPPs include Zane's Post Road, the Illinois Central Railroad, and the New York City Subway (Garvin 2007). Later, the design-bid-build procurement method became institutionalized in federally funded projects through the Armed Services Procurement Act of 1947 (ASPA), the Federal Property and Administrative Services Act of 1949 (FPASA), and the Brooks Act of 1972. These laws effectively discouraged PPPs from gaining a foothold in 20th century United States (Garvin 2007). Political leadership is required for PPPs to achieve a stable status in the current U.S. transportation infrastructure landscape (Brown et al. 2008; Zhang 2005).

In recent years, the executive branch of the U.S. government sought to encourage PPPs, particularly in the area of transportation. Executive Order 12803 encouraged states and local governments to privatize public infrastructure. Privatization is identified as a method for public agencies to harness the resources of the private sector to adequately develop and maintain infrastructure for economic growth. Heads of executive departments and agencies are directed to facilitate privatization by simplifying federal requirements related to privatization of federally funded projects (Bush 1992). The U.S. Department of Transportation has praised California and Pennsylvania for their leadership in harnessing the power of private capital through PPPs and governors have been encouraged to take advantage of the opportunities the federal government is providing for accessing the innovation and investment the private sector has to offer (Toll Road News 2008).

To move the U.S. transportation system toward a public-private partnership model, the U.S. Department of Transportation has promoted policies to reduce government financing of transportation projects and eased government restrictions against privatizing transportation. Specific actions taken by the U.S. government include investing in tolling research, encouraging congestion pricing in urban areas, reducing competition between PPPs and rail projects, offering tax-exempt bonds for PPPs, and providing sample PPP legislation for the states (Layton and Hsu 2008). These actions are intended to attract investment money from private equity funds focused on transportation.

To assist states in enacting effective PPP legislation in the 50 states, the FHWA identified 28 key elements (USDOT 2007b). To better understand these 28 key elements, they can be divided into four main areas: procurement (9 elements); financing (7 elements); project characteristics (3 elements); and legal authority of the owner (9 elements). The elements under procurement deal with how proposals are solicited and paid for; types of procurement methods; and the process for proposal submission, review, and confidentiality. The elements under financing deal with the combination of public and private funds; authority to set user fees; issue of bonds or notes; use of Transportation Infrastructure Finance and Innovation Act (TIFIA) loans; continuation of tolls after project debt is paid and the use of revenues for needs unrelated to the project; and formation of nonprofit authorities. The elements related to project characteristics deal with the number of PPPs permitted; allowable locations; and allowable modes of transportation. The elements related to legal authority deal with the conversion of existing transportation facilities; need for state legislation or local approval; establishment of long-term leases; employment of technical and legal consultants by the public agency; requirements to maintain comparable nontoll routes or noncompete clauses; which public agencies are allowed to enter into PPPs; and outsourcing of asset management. These elements suggest that when flexibility and certainty are introduced into issues of procurement, financing, project characteristics, and legal authority, then PPPs become more feasible.

FHWA identified 24 U.S. states/territories with significant transportation PPP legislation (USDOT 2006a). In contrast, more than 80% of the U.S. states have laws permitting design-build contracts (Fishman 2009). The degree of flexibility and certainty of PPP legislation varies by issue and by state. In some legislation, no specific guidance is given regarding solicited versus unsolicited bids. In other legislation, specific guidelines exist. For example, when Georgia receives an unsolicited bid, the legislation provides 135 days for competitors to submit responses. Alternatively, North Carolina restricts unsolicited bids. Most legislation grants the existing state DOT or transportation authority the right to enter into PPPs, but Missouri legislation creates a new special purpose

nonprofit entity, the Transportation Corporation, whereas Puerto Rican legislation establishes a toll transportation facility authority. Some states are entering the PPP arena cautiously. For example, Arizona established a pilot program allowing up to two solicited and two unsolicited projects. This pilot program was slow to start, so Arizona recently passed H.B. 2396, which provides a legal framework favorable to the establishment of PPPs (Holstege 2009; Horner 2009). Legislation in two states, Alaska and Indiana, allows site specific projects for PPPs, whereas some states prohibit certain types of projects. For example, California excludes tolling on state highways and Nevada excludes toll bridges and toll roads (Nossman et al. 2006; USDOT 2007a, b). In 2009, California authorized Caltrans and regional transportation agencies to enter into PPP contracts without the need for additional approval from the state legislature (Milbank 2009). These differences in what states allow in PPPs reflect the amount of political leadership and public support for PPPs.

Public Opinion of PPPs

Although the executive branch of the federal government has shown strong support for PPPs, support from the legislative branch, state governments, professional organizations, and the public has been mixed. Public concern has been raised in New Jersey, Pennsylvania, and Texas where PPPs have been put on hold (Layton and Hsu 2008). Many citizens are not persuaded that private firms will adequately watch over the public interest. Some fear that tolls or other revenues will make private firms wealthy instead of being reinvested into transportation infrastructure. Also, the danger exists that PPPs will be developed for the most favorable financial transportation projects, leaving unfavorable but needed projects without adequate resources (Buxbaum and Ortiz 2007).

The public hears different messages about PPPs from political leaders and industry. Public concern is raised when an agency like the Government Accountability Office indicates that private tolls tend to be higher than public tolls. Unfamiliarity with tolls in some states or reluctance to see toll rates raised are cause for some public concern. The future of tolling may be related to the gas tax. Without an increase in the gas tax, the national Highway Trust Fund will dwindle, and without the assistance of federal funding, states may be forced to transition to toll roads (Layton and Hsu 2008).

Legislative Branch Opinions of PPPs

The U.S. House of Representatives Committee on Transportation and Infrastructure sent a letter to governors, state legislators, and state transportation officials regarding PPPs. In contrast to the Executive Branch's support of PPPs, the purpose of the committee's letter was to "strongly discourage you from entering into public-private partnership (PPP) agreements that are not in the long-term public interest in a safe integrated national transportation system that can meet the needs of the 21st century." Although acknowledging the need for increased funding of transportation infrastructure, the committee expresses concern regarding the use of PPPs and the intent to undo PPPs that compromise national transportation interests. One of the committee's concerns is over the foreign and domestic management of highways, which they believe is in contrast to the way the national highway system began in 1956 based on federal-state partnerships. They caution against PPPs that "may favor parochial and private interests" at the expense of the national transportation network. The committee cites additional concerns such as concessions containing noncompete clauses that limit improvements to reduce congestion on adjacent highways and

streets; long-term leases that may favor private investors over public benefit; and sustainable financing. To counter the "model legislation" provided by the U.S. DOT to the states (USDOT 2008), the committee promised to provide a discussion paper outlining critical aspects to consider before moving forward with PPP legislation (Oberstar and DeFazio 2007; Berard 2007).

The National Surface Transportation Policy and Revenue Study Commission produced a report called "Transportation for Tomorrow." This study was mandated as part of "The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFTEA-LU). The report highlights the urgent need for policy and funding reforms. In addition to encouraging Congress to promote the use of PPPs, the Commission recommends the removal of barriers to tolling and congestion pricing (Schenendorf 2008; National Surface Transportation Policy and Revenue Study Commission 2007).

Professional Organizations' Opinions of PPPs

Organizations such as AASHTO and the Association of American Railroads have supported the need for PPPs to improve the transportation infrastructure in the United States. AASHTO noted that its own report, *Transportation: Invest in Our Future*, and the National Surface Transportation Policy and Revenue Study Commission's report *Transportation for Tomorrow*, identify a variety of potential funding methods including PPPs. However, with forecasts suggesting that tolling revenue could meet only 7–9% of future highway funding needs, other funding sources are also needed to support the highway transportation system (Rahn 2008; AASHTO 2007; National Surface Transportation 2007).

The Association of American Railroads (AAR) gave testimony to the U.S. House of Representatives Committee on Transportation and Infrastructure Subcommittee on Railroads, Pipelines, and Hazardous Materials regarding the value of PPPs for freight and passenger rail and related impacts to highways. On a network of over 140,000 rail miles, railroads comprise approximately 40% of U.S. freight ton-miles. Even with spending \$420 billion on railroad infrastructure and equipment between 1980 and 2007, financing is lagging behind the need. The AAR suggests PPPs as a way to bridge the gap to the benefit of both the public and private entities noting that "without a partnership, projects that promise substantial public benefits in addition to private benefits are likely to be delayed, or never started at all, because it would be too difficult for either side to justify the full investment needed to complete them" (Moller 2008). The AAR believes that Class I railroads could contribute up to \$96 billion of the \$148 billion required by 2035, creating an opening for PPPs to fund the \$39 billion remaining. Public benefits of PPPs with railroads include lower pollution, lower energy consumption, lower greenhouse gas emissions, less highway congestion, lower shipping costs, increased competitive advantage for farmers, manufactures, and minors in the global economy, and overall enhanced mobility, safety, and security. Examples of PPPs in the railroad industry include the Alameda Corridor (Long Beach to Los Angeles), the Chicago Region Environmental and Transportation Efficiency Program, the Heartland Corridor (the East Coast to Chicago), the Reno Trench, and the New Orleans Gateway. AAR agrees with AASHTO's statement that "realizing the public benefits of a strong freight-rail system at a national level will require a new partnership among the railroads, the states, and the federal government... Relatively small public investments in the nations' freight railroads can be leveraged into relatively large benefits for the nation's highway infrastructure, highway users, and freight shippers" (Moller 2008;

AASHTO 2007). In contrast to AASHTO and AAR, the American Public Transportation Industry has raised concerns that PPPs will detract from needed investment in rail and bus projects (Layton and Hsu 2008).

Laws Impacting PPP Financing

Financing is an important area of PPP agreements. Before 1997, government agencies could not contract with private firms for more than five years without loss of government tax-exempt bond status. This created a large barrier for PPPs because PPPs generally involve long-term agreements. In January 1997, Internal Revenue Service regulations changed allowing public debt to be tax-exempt for up to 15 years for transportation projects (Commonwealth Competition Council 2000).

In the mid-1980s, state DOTs and transit agencies slowly began to increase outsourcing various planning and development activities to private sources. Examples of PPP procurements include design-build, design-build-operate, design-build-maintain, and design-build-operate-maintain. By 1998, federal assistance for PPPs was available in the Transportation Equity Act for the 21st Century. Additionally, the Transportation Infrastructure Finance and Innovation Act (TIFIA) established state infrastructure banks (SIBs) to attract private investment in public transportation projects. SAFETEA-LU of 2005 further encouraged PPPs. For example, TIFIA programs were improved, SIBs were extended to all 50 states, and federal income tax exemptions of up to \$15 billion were applied to private activity bonds (PABs). Texas is the first state to implement PAB funding. SAFETEA-LU also impacted PPP opportunities under the Federal Transit Administration (FTA) through the Public-Private Partnership Pilot Program, or Penta-P. This was considered a pilot program to identify advantages and disadvantages of PPPs for transit. The first project under this program is the Oakland Airport Connector, a fully automated train system providing a three-mile link to the Coliseum Bay Area Rapid Transit station.

The FHWA (USDOT 2007a) identifies legal factors impacting PPPs in the areas of state legislation, agency authority, and contract negotiation. A strong legal foundation for PPPs is necessary before potential public and private partners will be willing to enter into partnerships. If a partnership is formed and projects undertaken that are later determined to be beyond the jurisdiction of the public partner, then the partners could find themselves in a situation in which they have invested time and money in a project that must be abandoned or totally restructured. Uncertainty as to how the law will interpret the ability of PPPs to set tolls or hold intellectual property rights of specially designed electronic tolling systems, for example, creates a barrier to PPPs. The FHWA outlines a list of legal issues (USDOT 2007a) ranging from the legal basis for cost recovery and tolls to land acquisition issues such as condemnation, use, and disposal. These issues, as with FHWA's list of key elements for legislation, emphasize flexibility and certainty as it relates to the legal framework. Predictability and reasonableness of the legal framework was identified by Zhang (2005) as one of 47 subfactors for PPP success in infrastructure with particular impact on creating a favorable investment environment.

In contrast, the domination of design-bid-build procurement in most public agencies has left a legal environment that is uncertain how to handle many aspects of PPPs. To eliminate legal uncertainties, the FHWA has developed a number of recommendations regarding the authority the states should grant to transportation agencies including bundling many types of services, partnering early in the planning, and utilizing various project delivery systems

(USDOT 2007a). Without the certainty that a transportation agency has the authority to establish flexible PPPs as outlined in this study, agencies and private firms will tend to avoid establishing PPPs.

In addition to instituting legislation that permits PPPs and provides guidelines for various aspects of PPP agreements, it is important that PPP contracts are negotiated to have clearly defined responsibilities and risks that are shared fairly. PPP contracts may extend over long periods of time. The public may have fears that the government should not give up control over valuable infrastructure. Private partners may worry that public agencies may not be flexible when future travel demands or technology change more than predicted. The FHWA outlines important issues to be negotiated in PPP contracts ranging from oversight and monitoring procedures, to contract renegotiation, to agreements regarding competing facilities. The goal of clear negotiations on the spectrum of issues is intended to reduce uncertainty and define risk (USDOT 2007a).

Although the legal environment in the U.S. has improved for PPPs, it still lags behind other parts of the world in which PPPs have found wider public acceptance. The long lists of recommendations published by the U.S. Department of Transportation emphasizes just how much of a barrier legal issues are to the development of PPPs.

PPP Challenges, Opportunities, and a Path Forward

In recent years, many parts of the world have implemented transportation PPPs more widely than the United States. This suggests both challenges and opportunities. Challenges are the barriers that prevent PPPs from taking hold as a viable procurement method. The opportunities lie in identifying and developing suitable PPPs.

One key challenge is to get states to consider PPPs as one of many possibilities for procurement. Some agencies will not consider PPPs, whereas others identify a project as a PPP without comparing other procurement methods for the project. Instead of prematurely identifying a project as a PPP, advance study is needed to determine the trade-offs of a variety of procurement methods. States need evaluation tools to accomplish this. Experts who can evaluate PPPs objectively are needed. Evaluations must consider a range of criteria, including performance, maintenance, tolls, economic impact to a region, environmental impacts, impact over generations, and uncertain future transportation needs.

Legal authority and flexibility is an area some states have addressed to make PPPs possible. The question arises whether ways exist to make other procurement methods less uncertain and more flexible to achieve similar results to what PPPs can achieve. For example, environmental assessments can slow down projects under a traditional procurement method. If environmental assessments can be streamlined for PPPs, can they also be streamlined for other procurement methods?

Finding an appropriate balance of risk and rewards is a challenge for all projects, including PPPs. Transportation projects always carry a certain amount of risk. When PPPs generate long lease agreements, noncompete clauses, or triggers for midcontract changes, risk increases. Future use and future inflation can be a challenge to predict. Risk analysis must be completed not only by the private entity, but by the public agency also. Organizations are willing to take risks when there are opportunities for rewards. An imbalance of either risk or reward will cause concern with stakeholders.

Transparency with the public is important for public projects, especially when newer methods like PPPs are used. PPP agreements tend to be complex and thus tend to cause confusion or

misunderstanding with the public. Federal policy or laws providing guidance on infrastructure for national security could alleviate some public concerns.

Opponents, proponents, and those neutral on transportation PPPs in the United States can agree that more research is needed to better understand PPPs. One limitation of PPP research currently is the wide range of procurement methods that fall under the label PPP. The current interest and controversy surrounds PPPs that involve private funding. A taxonomy that distinguishes between PPP procurements on characteristics such as funding, lease agreements, risk allocation, and maintenance would allow researchers to better interpret PPP research.

Another key area is economics. PPPs need a more fully developed economic theory to underpin decision making. Without well-grounded theory, evaluations of PPPs depend on loosely interpreted case studies. Any economic theory should also address the cost of risk allocation to each party. Research can shed light on who is better able to raise capital for transportation projects—governments with the ability to raise money through tax-exempt debt or the private sector. One appeal of PPPs is the raising of tolls. Research is needed to determine ways for governments to obtain support from the public for raising tolls without turning to PPPs. Analysis is warranted to determine if using initial payouts from PPPs to lower government debt and raise bond ratings is preferable to reinvesting PPP money into public infrastructure.

PPP require expertise in analysis of finance and risk. Public agencies can use inside experts or hire outside experts. Another model is for the federal government to develop an expert staff that could consult with local agencies pursuing PPPs.

If PPPs in the United States do not share the same priorities as PPPs overseas, care must be taken in applying lessons learned from one context to another. Other nations in which PPPs have been successful may be emphasizing different aspects of PPPs, such as performance or limited increases in tolls. What are the major reasons that move public agencies toward PPPs? If it is funding, is it the difficulty of the agency as a political body to raise tolls or is it the bureaucracy of political institutions that cause inefficiencies and higher costs? Rather than avoid these core issues, can they be faced head-on resulting in a transformation of public agencies to better compete with PPP proposals?

Transportation infrastructure is too important for local and national economies and national security to be left to trial and error. Some valuable lessons can be learned from national and international cases. However, a fuller understanding of PPPs will come with a clear taxonomy, a strong economic framework, and analysis of risk.

Conclusion

This paper provides survey results, a literature review, and a path forward for research on transportation PPPs in the United States. PPPs have been implemented in various forms in transportation throughout U.S. history. A survey of the current state-of-practice of PPPs in state transportation departments indicates that states have varied experience, with more than 40% of states planning to launch PPP projects. States with PPP experience tend to have legislation that is favorable toward PPPs. A majority of states with PPP experience rate the PPPs they have implemented as successful. The primary reason for PPPs is financing, followed by time and cost savings, whereas risk transfer was not named by any state as a primary reason. States rated the importance of communication with the private sector as a key attribute in successful PPPs. States use a variety of financing methods with PPPs, the most prevalent

including GARVEEs and GANs, TIFIA credit, and long-term leases. States' satisfaction with PPPs is moderate over all.

The literature on PPP economics covers financing, risk management, value enhancement, project duration, innovation, and transfer of new skills. Economic concerns requiring additional research include bidding cost, neglect of free alternative public facilities, unwillingness to pay for a previously free public service, the loss of public accountability, and the potential for private monopolies and the increase in user fees.

The literature on PPP legal issues indicates that the types of laws in existence can impact whether PPPs are viewed as viable. In addition to laws, the government can encourage PPPs by making financing available or terms more favorable to PPPs. For state governments to create a climate conducive to PPPs, PPP legislation must address areas of procurement, financing, project characteristics, and legal authority. Currently states address these issues to varying degrees.

In addition to economics and legislation, public opinion can influence PPPs. In every PPP, the public is a stakeholder; however, the public consists of a diverse group of people, organizations, and interests. Stakeholders want to know whether PPPs will put public interest over private profits and whether money generated from transportation facilities will be reinvested into transportation. Some legislators are concerned that PPPs will compromise the national transportation system. Professional organizations for highways to railroads support the use of PPPs not as the sole engine of transportation infrastructure but as one piece in the program.

Research is critical in advancing effective implementation of transportation PPPs in the United States. Research is needed on tools for evaluating the viability of projects for PPPs and to evaluate PPP proposals. Evaluation criteria must be broad enough to address the range of concerns but manageable enough to implement effectively. Research is also needed to develop policy for maintaining an integrated infrastructure system for national security. One factor that limits the usefulness of PPP literature is the wide spectrum of procurement methods that fall under the term PPP. A taxonomy that better defines the types and characteristics of PPPs would allow research on PPPs to advance more systematically. Although economic characteristics of PPPs are widely discussed, there is no overarching economic theory of PPPs on which to base decisions. Research to develop an economic theory of PPPs is foundational for understanding the risks, rewards, and limits of PPPs. Further research offers promise for a better understanding of the many facets of PPPs.

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