

Towards a Comprehensive Understanding of Public Private Partnerships for Infrastructure Development

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Public Private Partnerships (PPPs) have emerged as one of the major approaches for delivering infrastructure projects in recent years. If properly formulated and managed, a PPP can provide a number of benefits to the public sector such as: alleviating the financial burden on the public sector due to rising infrastructure development costs; allowing risks to be transferred from the public to the private sector; and increasing the “value for money” spent for infrastructure services by providing more efficient, lower cost, and reliable services.¹

However, the experience of the public sector with PPPs has not always been positive. Many PPP projects are either held up or terminated due to: wide gaps between public and private sector expectations; lack of clear government objectives and commitment; complex decision making; poorly defined sector policies; inadequate legal/regulatory frameworks; poor risk management; low credibility of government policies; inadequate domestic capital markets; lack of mechanisms to attract long-term finance from private sources at affordable rates; poor transparency; and lack of competition.²

Despite numerous negative experiences,³ many governments (e.g., the UK and Australia) continue to view PPPs as one of the key strategies for delivering public services and infrastructure. Therefore, understanding and enhancing knowledge of PPPs continue to be a matter of significance and importance. During the past decades, researchers have conducted studies that cover a wide range of topics, such as how to select an appropriate concessionaire, what are the critical factors for the success or failure of PPP projects, what roles the government should play in PPP projects, and more.

This article collects, codifies, and consolidates these previous research findings to facilitate a comprehensive understanding of PPPs. It discusses the definitions, types, examples of worldwide applications, benefits, and obstacles of

PPPs through an in-depth literature review on PPP-related research in the last 20 years. Key findings derived from various researchers and lessons learned are presented and recommendations for both public and private sectors are offered for the future of PPPs for infrastructure development.

Public-Private Partnerships

Definitions of a PPP

Infrastructure services can be delivered in a number of ways. Miller concluded that neither a purely public nor a purely private infrastructure development approach is likely to be sustainable in the long-term.⁴ A purely public approach may cause problems such as slow and ineffective decision-making, inefficient organizational and institutional frameworks, and lack of competition and efficiency, which are collectively known as government failure. On the other hand, a purely private approach may cause problems such as inequalities in the distribution of infrastructure services, an example of what is known as market failure.⁵ To overcome both government failure and market failure, a Public-Private Partnership approach can incorporate the strengths of both the public and private sector.

The PPP has been an important strategy in delivering public facilities and services in many countries. However, even with this wide adoption, the term “PPP” is still not clearly defined. Several definitions of PPPs have been used by

different scholars, governments, and international organizations (as summarized in Table 1). Although many more definitions could be found, Table 1 is sufficient to identify critical elements that define a PPP as follows: it is a partnership between the public and private sectors; the public and private sectors work cooperatively towards shared or compatible objectives (e.g., providing infrastructure services); and it involves sharing of risks and responsibilities between the public and private sectors. For the present purpose, a PPP is defined broadly as “a cooperative arrangement between the public and private sectors

that involves the sharing of resources, risks, responsibilities, and rewards with others for the achievement of joint objectives” to incorporate knowledge from literature that may be in different regions and countries worldwide.

Types of PPPs

Various types of partnerships have been implemented to reflect different project objectives and requirements. These PPPs generally vary in terms of the degrees of private involvement.⁶ At one extreme is the public provision, where the public sector is fully responsible for all aspects of delivering public services;

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TABLE 1. Various Definitions of PPP

Sources	Definitions
HM Treasury ^a	An arrangement between two or more entities that enables them to work cooperatively towards shared or compatible objectives and in which there is some degree of shared authority and responsibility; joint investment of resources; shared risk taking, and mutual benefit.
The World Bank ^b	The term “public-private partnerships” has taken on a very broad meaning. The key elements, however, are the existence of a “partnership” style approach to the provision of infrastructure as opposed to an arm’s-length “supplier” relationship... Either each party takes responsibilities for an element of the total enterprise and they work together, or both parties take joint responsibility for each element... A PPP involves a sharing of risk, responsibility, and reward, and it is undertaken in those circumstances when there is a value-for-money benefit to the taxpayers.
European Commission ^c	A partnership is an arrangement between two or more parties who have agreed to work cooperatively toward shared and/or compatible objectives and in which there is shared authority and responsibility; joint investment of resources; shared liability or risk-taking; and ideally mutual benefits.
Canadian Council for Public Private Partnerships ^d	PPP is a cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks, and rewards.

a. HM Treasury, *Partnerships for Prosperity: the Private Finance Initiative*, London, 1998.

b. The World Bank, *World Bank Group Private Sector Development Strategy Implementation Progress Report*, Washington, D.C., 2003.

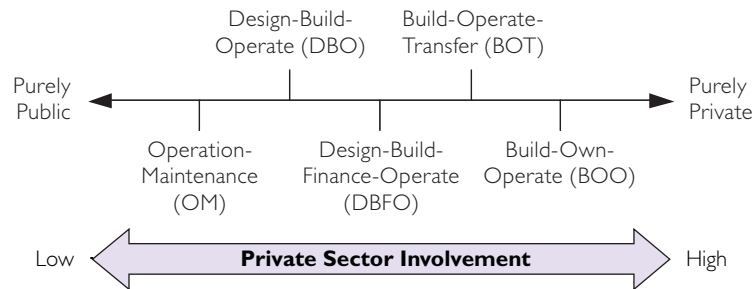
c. European Commission, *Guidelines for Successful Public-Private Partnerships*, 2003.

d. Canadian Council for Public-Private Partnerships, “About PPP,” 2004, available at <www.pppcouncil.ca/aboutPPP_definition.asp>.

while at the other extreme is the private provision, where the private sector assumes all those responsibilities. As the PPP move from the end of the purely public provision to the other, the degree of private involvement increases. These PPP also vary in terms of finance sources and ownership of properties.

A continuum that reflects the degree of private involvement of five possible PPP is shown in Figure 1. Definitions of PPPs shown in Figure 1 are further discussed and summarized in Table 2. It should be noted that although the research reviewed in this study covers several types of PPPs, the focus is on the concession-type PPP. According to the World Bank, a concession agreement is defined as “an arrangement whereby a private party leases assets for service provision from a public authority for an extended period and has responsibility for financing specified new fixed projects during the period. The new assets revert to the public sector at expiration of the contract.”⁷ Such arrangements have been found in infrastructure development in countries such as the UK, Spain, Portugal, the Netherlands, and the U.S.⁸

In this research, this definition is extended to cover projects where the private sector is allowed to obtain the property rights in addition to the development rights (e.g., Build-Operate-Transfer, BOT), and the concession periods are extended indefinitely without a fixed expiration date (e.g., Build-Own-Operate, BOO). Furthermore, the concept of financing is defined broadly to include other

FIGURE 1. Continuum of Types of PPP**TABLE 2.** Descriptions of Selected Types of PPP

Types of PPP	Descriptions
Operation-Maintenance (OM) ^a	<ul style="list-style-type: none"> The private sector is responsible for all aspects of operation and maintenance. Although the private sector may not take the responsibility of financing, it may manage a capital investment fund and determine how the fund should be used together with the public sector.
Design-Build-Operate (DBO) ^b	<ul style="list-style-type: none"> The private sector is responsible for the design, construction, operation, and maintenance of a project for a specified period prior to handing it over to the public sector.
Design-Build-Finance-Operate (DBFO) ^c	<ul style="list-style-type: none"> The private sector is responsible for the finance, design, construction, operation, and maintenance of a project. In nearly all cases, the public sector retains full ownership over the project.
Build-Operate-Transfer (BOT) ^d	<ul style="list-style-type: none"> The private sector is responsible for the finance, design, construction, operation, and maintenance of a project for a concession period. The asset is transferred back to the government at the end of concession period, often at no cost.
Build-Own-Operate (BOO) ^e	<ul style="list-style-type: none"> Similar to a BOOT project, but the private sector retains the ownerships of the asset in perpetuity. The government only agrees to purchase the services produced for a fixed length of time.

a. The World Bank, *Public-Private Partnership Units: Lessons for their Design and Use in Infrastructure*, Washington D.C., 2007.

b. E.S. Kelly, S. Haskins, and P.D. Reiter, "Implementing a DBO Project," *Journal of American Water Works Association*, 90/6 (June 1998): 34-46.

c. U.S. Department of Transportation, "PPP Options," Federal Highway Administration (FHWA), <www.fhwa.dot.gov/PPP/dbfo.htm>.

d. M.M. Kumaraswamy and X.Q. Zhang, "Governmental Role in BOT-led Infrastructure Development," *International Journal of Project Management*, 19/4 (May 2001): 195-205.

e. L.W. Chege and P.D. Rwelamila, "Private Financing of Construction Projects and Procurement Systems: An Integrated Approach," in *Proceedings of CIB World Building Congress*, Wellington, New Zealand, April 2001.

means of financial investments. In other words, only PPPs where the private sector also needs to contribute financially to the project, such as BOT and Private Finance Initiative (PFI), are within the focus of this article. However, for the clarity of the article, the term “PPP” is still used to represent these variations.

Benefits and Obstacles of PPPs

The worldwide experience has shown that the PPP, if properly formulated, can provide a variety of benefits to the government. Several important benefits are:

- a PPP can increase the “value for money” spent for infrastructure services by providing more-efficient, lower-cost, and reliable services;
- a PPP helps keep public sector budgets, and especially budget deficiencies, down;
- a PPP allow the public sector to avoid up-front capital costs and reduce public sector administration costs;
- the project life-cycle costs and project delivery time can be reduced by using a PPP;
- a PPP can improve the quality and efficiency of infrastructure services;
- a PPP facilitates innovation in infrastructure development;
- the public sector can transfer risks related to construction, finance, and operation of projects to the private sector; and
- a PPP can promote local economic growth and employment opportunities.⁹

Despite their broad benefits and increasing usage in infrastructure development, PPPs have been criticized in several aspects, which include:

- PPPs are relatively new concepts that are not well understood in some countries;
- both public and private sectors still lack appropriate knowledge and skills to implement such long-term projects;
- competition in PPP projects is limited due to the high tendering costs;
- PPP projects are highly likely to be delayed by political debates, public opposition, and complex negotiation processes;
- PPP projects may cost more since the private sector cannot borrow capital to finance projects as cheaply as the public sector;
- Project accountability may be reduced in PPPs because a great deal of information can now be treated as “commercial-in-confidence”; and
- PPPs can result in a monopoly situation and higher costs to public users for using the infrastructure services.¹⁰

Worldwide Application of PPP

During the past two decades, PPP have become main schemes for delivering public services in both developed and developing countries. Between

1985 and 2004, there was a total of 2096 PPP projects worldwide with a total capital value of nearly US\$887 billion.¹¹ Countries worldwide with PPP experience include Australia, Germany, Hungary, Italy, Japan, Korea, Spain, the USA, and the UK.¹² Among these countries, the UK is widely viewed as the one with the most extensive PPP (or PFI, which is the equivalent term used in the UK) experiences. For instance, during 2003 and 2004, the UK was the country with the largest PPP investments.¹³ Although PPPs have been implemented in many countries, they are not applied equally to all infrastructure sectors. In most countries, PPP projects focus on transportation projects such as roads, bridges, tunnels, railroads, and airports. However, the use of PPPs has been expanded across various sectors in recent years. For example, in Korea, PPPs are used in the development of schools, hospitals, and public housing;¹⁴ in the U.S., PPPs are found in sectors such as prisons and water supply and wastewater treatment.¹⁵

PPP Infrastructure Development Research in the Last 20 Years

Research Approach

An extensive literature review was conducted to gain a comprehensive understanding of PPPs in infrastructure development. This review covered multiple disciplines, including construction and project management, public policy and public administration, and project finance.

Conceptual Classification Framework of PPP Infrastructure Research

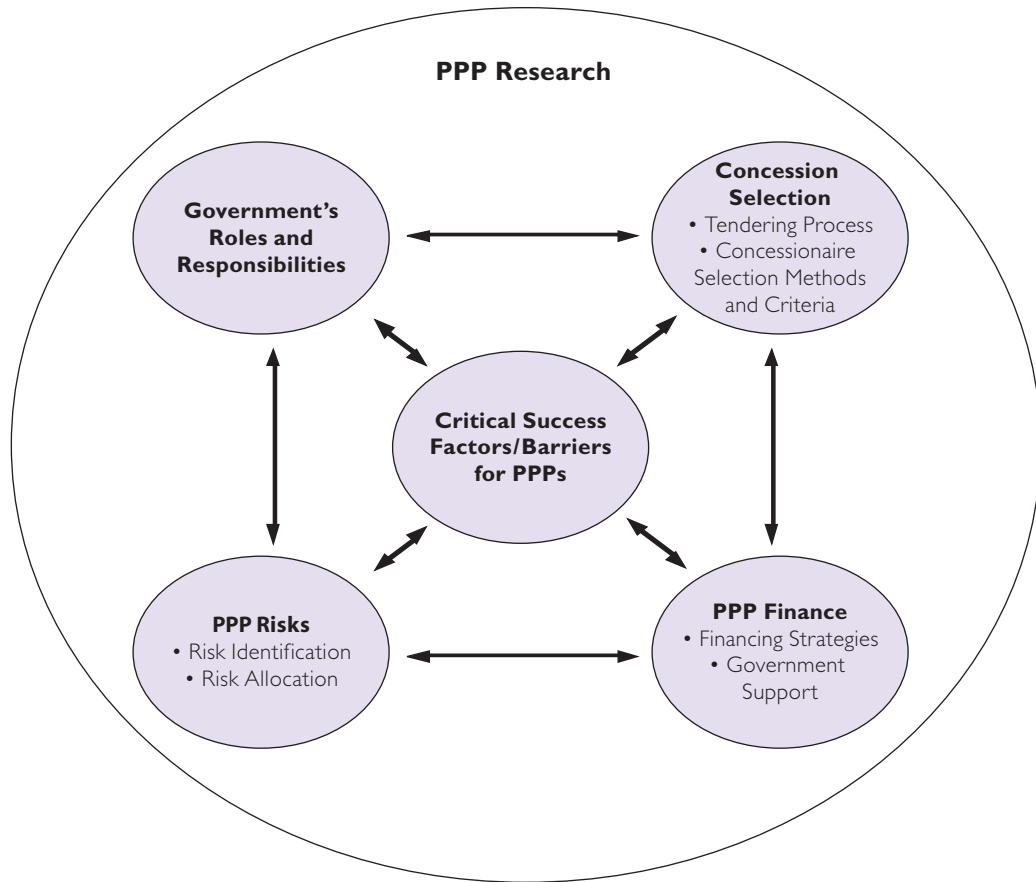
The complexity in contractual relationships between participants and the long concession periods make PPPs distinct from a traditional infrastructure development routes in that: there is a broad range of uncertainties and risks associated with the PPP; the concessionaire assumes far more responsibilities and much more and deeper risks than a traditional contractor; the financial issues in a PPP project are much more complicated; and the allocation of risks and rewards among participants is more difficult.¹⁶

These characteristics have led researchers to investigate five main aspects of PPPs: the government roles and responsibilities; the concession selection; PPP risks; PPP finance; and the critical success factors and/or barriers for PPP projects. A conceptual classification framework of PPP research is shown in Figure 2.

Critical Success Factors (CSFs) and Barriers for PPP Projects

Critical success factors are defined as “the limited number of areas, the result of which, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where ‘things must go right’ for the business to flourish.”¹⁷ The identification of such factors has been viewed as the first important step toward the development of a workable and efficient PPP procurement protocol.¹⁸ Researchers have proposed various lists of critical success factors for PPP projects through literature review, case studies, and interviews with industrial practitioners and experts (as summarized in Table 3).

FIGURE 2. A Conceptual Classification Framework of PPP Research



Similar lists of CSFs can also be found in other literature.¹⁹ Tranfied et al. further highlighted the importance of coordination across projects, across functions, and across organizations.²⁰ Reijniers argues that the causes of the problems of PPPs often arise when the projects are organized and managed, and therefore suggests critical success factors that include: having decision makers form part of the project team right from the start of the project; results should be measurable so that the progress of the project can be monitored; the project should be goal-directed and focus on results; there should be periodic progress monitoring during implementation; there should be an independent project team and an independent project leader, who report to a steering committee consisting of top representatives from both the public and private sectors; political and economic risks should be spread around at an early stage; there should be adequate and clear working methods and agreements; the private sector should be allowed to fulfill its entrepreneurial role; and there should be mutual confidence.²¹

TABLE 3. Selected Literature on CSFs for PPP Projects

Author(s)	PPP Types	Focused Regions	Key Findings
Akintoye et al. ^a	PFI	UK	<ul style="list-style-type: none"> Factors that contribute to the achievement of best value in PFI projects are detailed risk analysis and appropriate risk allocation, drive for faster project completion, curtailment in project cost escalation, encouragement of innovation in project development, and maintenance cost being adequately accounted for. Factors that impede the achievement of best value in PFI projects are: high cost of the PFI procurement process, lengthy and complex negotiations, difficulty in specifying the quality of service, pricing of facility management services, potential conflicts of interests among those involved in the procurement, and the public sector clients' inability to manage consultants.
Jefferies et al. ^b	BOOT	Australia	<ul style="list-style-type: none"> CSFs are identified from reflection of an Australian sports stadium project, which include: solid consortium with a wealth of expertise, considerable experience, high profile and a good reputation, an efficient approval process that assist the stakeholders in a very tight timeframe, and innovation in the financing methods of the consortium.
Li et al. ^c	PFI	UK	<ul style="list-style-type: none"> The most important CSFs, in descending order of importance, are: a strong private consortium, appropriate risk allocation, available financial market, commitment/responsibility of public/private sectors, thorough and realistic cost/benefit assessment, technical feasibility, a well-organized public agency, and good governance. CSFs are classified into five principle factor groupings: effective procurement, project implementability, government guarantee, favorable economic conditions, and available financial market.
Qiao et al. ^d	BOT	China	<ul style="list-style-type: none"> Eight independent CSFs include: appropriate project identification, table political and economic situation, attractive financial package, acceptable toll/tariff levels, and reasonable risk allocation, selection of suitable subcontractors, management control, and technology transfer.
Zhang ^e	PPP	International	<ul style="list-style-type: none"> Five main CSF aspects are identified: economic viability, appropriate risk allocation via reliable contractual arrangements, sound financial package, reliable concessionaire consortium with strong technical strength, and favorable investment environment.

a. A. Akintoye, C. Hardcastle, M. Beck, E. Chinyio, and D. Asenova, "Achieving Best Value in Private Finance Initiative Project Procurement," *Construction Management and Economic*, 21 (July 2003): 461-470.

b. M. Jefferies, R. Gameson, and S. Rowlinson, "Critical Success Factors of the BOOT Procurement System: Reflection from the Stadium Australia Case Study," *Engineering, Construction and Architectural Management*, 9/4 (August 2002): 352-361.

c. B. Li, A. Akintoye, P.J. Edwards, and C. Hardcastle, "Critical Success Factors for PPP/PFI Projects in the UK Construction Industry," *Construction Management and Economic*, 23 (June 2005): 459-471.

d. L. Qiao, S.Q. Wang, R.L.K. Tiong, and T.S. Chan, "Framework for Critical Success Factors of BOT Projects in China," *Journal of Project Finance*, 7/1 (Spring 2001): 53-61.

e. X.Q. Zhang, "Critical Success Factors for Public-Private Partnerships in Infrastructure Development," *Journal of Construction Engineering and Management*, 131/1 (January 2005): 3-14.

Instead of identifying success factors, Zhang identified six categories of barriers for PPP projects, including: social, political, and legal risks; unfavorable economic and commercial conditions; inefficient public procurement frameworks; lack of mature financing engineering techniques; public sector related problems (e.g., inexperienced government and lack of understanding of PPPs); and private sector related problems (e.g., most people, including investment banks still prefer traditional procurement routes).²² Similar barriers are also identified by the World Bank and by Akintoye et al.²³ In addition, Klijn and Teisman found that the inability to develop good partnerships lies in a combination of three factors: complexity of actor composition, institutional factors, and the strategic choices of public and private actors.²⁴

Although lists of CSFs and barriers for PPP projects vary from study to study, it appears that the success or failure of a PPP project is dependent on: the competence of the government; the selection of an appropriate concessionaire; an appropriate risk allocation between the public and private sectors; and a sound financial package. Most PPP-related studies focus on these four aspects (as shown in Figure 2).

Government Roles and Responsibilities

The government plays a critical role in the development and management of a PPP project. The inappropriate involvement of government or the incapability of government to manage PPP projects may lead to project failure.²⁵ Bangkok Elevated Transport System (BETS) in Thailand is one example. The BETS is a BOT-type PPP project, which was planned to construct a 60 km elevated rail system and a road through the heart of the capital. Hopewell, the concessionaire, was granted the right to collect tolls for 30 years and to develop 900,000 m² of land along the proposed route.²⁶ This project was ultimately terminated by Thai Government. Sudden changes requested by the government and the lack of governmental assistance in resolving the conflicts with a nearby competitive toll way have been identified as the causes to the project failure.²⁷

Researchers have attempted to clarify the roles of the government in facilitating PPP projects (as summarized in Table 4). Five main roles of the government can be concluded as follows from Table 4: to create favorable investment environment, to establish adequate legal/regulatory frameworks, to establish a coordinating and supportive authority, to select a suitable concessionaire, and to be actively involved in project life-cycle phases.

- ***Creating Favorable Investment Environment***—The willingness of private investors to participate in PPP infrastructure projects depends greatly on the environment in which these projects are operated. Therefore, for PPP to work, the government should create a favorable investment with stable social, legal, economic, and financial conditions. In addition, to increase the attractiveness of a PPP project to private investors, government may need to provide project-specific assistances and/or guarantees, such as the guaranteed minimum revenue and tax reduction for a certain time period.

TABLE 4. Selected Literature on Government Roles and Responsibilities

Author(s)	PPP Types	Focused Regions	Key Findings
Abdel Aziz ^a	PPP	UK and Canada	<ul style="list-style-type: none"> Principles that need to be addressed in order to ensure the successful implementation of a PPP program include: to understand the objectives of using private finance when selecting a PPP arrangement, to properly allocated risks to the private sector; to establish a broad and comprehensive PPP legal framework, to assess the value for money when selecting a delivery system, to create a PPP unit for policy development and/or implementation, to maintain the transparency in the selection process, to standardize the procedures and contracts, and to use performance specifications.
Durchslag et al. ^b	Various	Various	<ul style="list-style-type: none"> A set of conditions that must be met for PPP to be successful over the long term: ensure that the highest political authorities give their complete commitment and support to pushing the program, as fast as possible; maximize transparency and minimize the scope for discretionary decision making to ensure the integrity of the process; minimize government provision of guarantees, incentives and credit; empower a small committee of carefully selected individuals to oversee the privatization process across all sectors; develop and enact the legal and regulatory framework for the sector before conducting any actual securitization or privatization; ensure the integrity of the restructuring process; and maximize competition through the use of public tenders.
Koch and Buser ^c	PPP	Denmark	<ul style="list-style-type: none"> Roles of the Denmark government in managing PPP projects include: to establish a central counseling unit; to develop a set of guidelines, tools, and standard contracts; to select a set of pilot projects; to subsidize feasibility studies; and to investigate potential sectors for PPP.
Kumaraswamy and Zhang ^d	BOT	Not Specific	<ul style="list-style-type: none"> Issues that governments need to deal with for the BOT scheme to work smoothly include: establish adequate legal and regulatory framework, provide stable political environment, develop domestic capital market, ensure a fair and competitive bidding, provide adequate government assistance and guarantees, conduct project feasibility study, select the most suitable concessionaire, continuous assess project progress and performance.
Pongsiri ^e	PPP	Not Specific	<ul style="list-style-type: none"> The author emphasizes the necessity of establishing a well-defined, but not overregulated, regulatory framework.

a. A.M. Abdel Aziz, "Successful Delivery of Public-Private Partnerships for Infrastructure Development," *Journal of Construction Engineering and Management*, 133/12 (December 2007): 918-931.

b. S. Durchslag, T. Puri, and A. Rao, "The Promise of Infrastructure of Privatization," *The McKinsey Quarterly*, 1 (1994): 3-19.

c. C. Koch and M. Buser, "Emerging Metagovernance as an Institutional Framework for Public Private Partnership Networks in Denmark," *International Journal of Project Management*, 14 (2006): 548-556.

d. M.M. Kumaraswamy and X.Q. Zhang, "Governmental Role in BOT-Led Infrastructure Development," *International Journal of Project Management*, 19/4 (May 2001): 195-205.

e. N. Pongsiri, "Regulation and Public-Private Partnerships," *The International Journal of Public Sector Management*, 15/6 (2002): 487-495.

- ***Establishing Adequate Legal/Regulatory Framework***—It has been emphasized that the establishment of a sound regulation framework is an prerequisite for PPP.²⁸ A well-structured regulation framework can not only increase the willingness of the private sector to participate in infrastructure development, but also increase benefits to the government by ensuring that the projects operate efficiently.²⁹ Such a framework is also needed to secure proper risk allocation and avoid potential corruption in the PPP implementation process.³⁰ However, over-regulation that may be burdensome and frustrate PPP should be avoided. An in-depth discussion on alternative regulatory strategies—such as concession contracts, private contracts, and discretionary regulation—can be found in Gómez-Ibáñez.³¹
- ***Establishing a Coordinating and Supportive Authority***—For a PPP project, objectives may vary between different public agencies (e.g., central and local governments) or among different governmental departments. It is therefore advisable to establish a central authority (e.g., the UK Treasury Task Force and Philippine BOT Center) that can coordinate and reconcile conflicts between these agencies or departments.³² Such authority may also be a place where experiences of different PPP infrastructure projects, and expertise and skills required for the PPP implementation, are stored and shared.³³ For example, in addition to advocate BOT policies, the Philippine BOT Center offers services of creating BOT project database, providing technical assistance and training courses.³⁴ In some developing countries, a central high-power authority also serves as a bridge to link foreign investors with local government agencies.³⁵
- ***Selecting a Suitable Concessionaire***—The selection of an appropriate concessionaire is also critical to the success of a PPP project. To ensure that a qualified concessionaire is selected, the government should establish a workable procurement framework. Miller suggested that such a procurement framework should be built on fundamental elements, including client-defined scope, head-to-head competition, fair treatment of actual competitors, transparency, a competition open to technological change, and a sound financial analysis over the project life cycle.³⁶ Additionally, it should also determine an appropriate tender evaluation method and a set of evaluation criteria that reflect the objectives of government. Because of its importance, much attention has been devoted to improving the tendering process and developing techniques and criteria for selecting a suitable concessionaire.
- ***Being Actively Involved in the Project Life-Cycle Phases***—Although the concessionaire is the principle participant that is responsible for the implementation of a PPP project, the government still needs to be actively involved in the project life-cycle phases to ensure that the project meets its quality and delivery objectives. This involvement can be achieved through the establishment of an interdisciplinary team that continuously monitors project progress, assesses and improves critical aspects, and

maintains timely and productive team communications and discussions of quality control and quality assurance measures.³⁷

Concessionaire Selection

A concessionaire is a consortium formed particularly for a PPP project. As a principle participant in a PPP project, its responsibilities include the financing, design, construction, operation, and maintenance of the infrastructure facilities and the transferring of the facilities to the client in operational condition at the end of the concession period. The success of a PPP project depends largely on the selection of the most suitable private concessionaire, which requires a well-structured tendering process, an appropriate concessionaire evaluation method, and a set of evaluation criteria.³⁸ Selected research on these aspects is summarized in Table 5.

Tendering Process

The tendering processes of PPP are more complicated and more costly than those of traditional infrastructure development approaches. For example, Birnie found that tender costs for PFI projects in the UK ranged from 0.48-0.62% of the total project costs, which are much higher than those for design-build projects (0.18-0.32%) and traditional design-bid-build projects (0.04-0.15%).³⁹ A well-structured tendering process that can minimize tendering costs and encourage competition is therefore necessary. Many governments adopt a multi-stage tendering process composed of stages such as inviting expression of interest, prequalifying tenders, evaluating tenders, and negotiating with the preferred tender(s) to select the most suitable concessionaire. The UK's PFI procurement process is one example (as illustrated in Figure 3).

Governments will also develop step-by-step guidelines and standardized tendering documents and contracts to facilitate the tendering process.⁴⁰

- ***Invite Expression of Interest***—This is the stage where the government advertises the project to potential private investors. Such advertisement is often published in a public gazette and on government websites. For instance, notices of PPP projects must be published in the *Official Journal of European Community (OJEC)* in the UK and in the government gazette in Hong Kong.
- ***Prequalify Tenders***—The aim of this prequalification stage is to reduce the number of interested tenders to a shortlist, which consist only of reputable and experienced tenders. This process can ensure that weaker tenders do not incur unnecessary tendering costs.
- ***Evaluate Tenders***—Tenders on the shortlist are invited to submit detailed proposals that are then evaluated in accordance with the pre-determined evaluation criteria. The evaluation in this stage focuses on technical and financial feasibilities of the proposals.
- ***Negotiate with Preferred Tenders***—The government may select one or a few preferred tenders to negotiate with. During the negotiation stage, provisions in agreements are carefully reviewed. Once the agreement

TABLE 5. Selected Literature on Concessionaire Selection

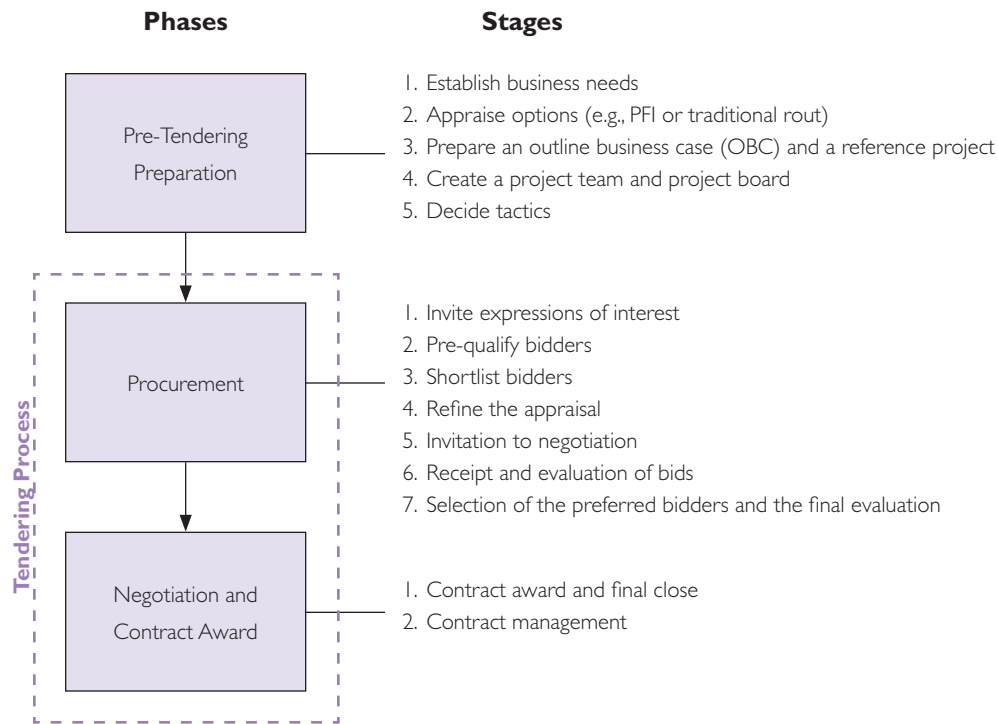
Author(s)	PPP Types	Focused Regions	Key Findings
HM Treasury, ^a Ahadzi and Bowles ^b	PFI	UK	<ul style="list-style-type: none"> The UK's PFI procurement process is discussed.
Zhang and Kumaraswamy ^c	BOT	Hong Kong	<ul style="list-style-type: none"> Hong Kong's framework to manage five tunnel BOT projects is introduced.
Zhang ^d	PPP	Intl.	<ul style="list-style-type: none"> Proposes a core concessionaire selection protocol that incorporates public procurement principles, best-value selection approach, competitive selection process, and multi-criteria tender evaluation.
Zhang ^e and Zhang ^f	PPP	Intl.	<ul style="list-style-type: none"> Identifies and compares some tender evaluation methods including simple scoring method, NPV method, multi-attribute analysis, Kepner-Tregoe decision analysis technique, two-envelope method, NPV method plus scoring method, and binary method plus NPV method. Generalizes four packages of tender evaluation criteria including: financial; technical; health, safety, and environmental; and managerial. Analyzes the relative importance of these evaluation packages and the relative significance of the criteria within each package.
Zhang et al. ^g	BOT	Hong Kong	<ul style="list-style-type: none"> Introduce the tender evaluation method, the Kepner-Tregoe decision analysis technique, and the evaluation criteria used to select concessionaires for BOT tunnel projects.

- a. HM Treasury Taskforce, "Step-by-Step Guide to the PFI Procurement Process," Private Finance Unit, 1999, available at <www.treasury-projects-taskforce.gov.uk>.
- b. M. Ahadzi and G. Bowles, "The Private Finance Initiative: The Procurement Process in Perspective," in *Proceedings of the 17th Annual Conference of ARCOM*, Salford, 2001, pp. 971-980.
- c. X.Q. Zhang and M.M. Kumaraswamy, "Hong Kong Experience in Managing BOT Projects," *Journal of Construction Engineering and Management*, 127/2 (March/April 2001): 154-162.
- d. X.Q. Zhang, "Improving Concessionaire Selection Protocols in Public/Private Partnered Infrastructure Projects," *Journal of Construction Engineering and Management*, 130/5 (October 2004): 670-679.
- e. X.Q. Zhang, "Concessionaire Selection: Methods and Criteria," *Journal of Construction Engineering and Management*, 130/2 (April 2004): 235-244.
- f. X.Q. Zhang, "Criteria for Selecting the Private-Sector Partner in Public-Private Partnerships," *Journal of Construction Engineering and Management*, 131/6 (June 2005): 631-644.
- g. X.Q. Zhang, M.M. Kumaraswamy, W. Zheng, and E. Palaneeswaran, "Concessionaire Selection for Build-Operate-Transfer Tunnel Projects in Hong Kong," *Journal of Construction Engineering and Management*, 128/2 (April 2002): 155-163.

is signed, a contract award notice will be published and the contract is implemented.

Concessionaire Selection Methods and Criteria

According to HM Treasury,⁴¹ a tender should only be selected as the preferred tender and subsequently awarded the contract when it satisfies criteria including: meeting output specifications, whole life value for money, acceptance of key contract terms and required transfer of risks, confirmation of access to

FIGURE 3. UK's PFI Procurement Process

finance, unitary charge affordable to the public client, and a cohesive consortium. A number of tender evaluation methods and criteria are developed to assist government in selecting such a right concessionaire.

- **Evaluation Methods**—Some tender evaluation methods that are currently in use include: the simple scoring method, NPV method, multi-attribute analysis, Kepner-Tregoe decision analysis technique, two-envelope method, NPV method plus scoring method, and binary method plus NPV method. The detailed descriptions and comparisons of these methods can be found in Zhang.⁴² Simply put, the binary method, simple scoring method, and two-envelope method may be more appropriate for small and simple PPP projects; the NPV method may be more appropriate for projects with no technical problems; and the multi-attribute analysis and the Kepner-Tregoe decision analysis technique may be more suitable for complex PPP projects. Different governments may use different methods or a combination of multiple methods to evaluate tenders. For instance, the Hong Kong government uses the Kepner-Tregoe decision analysis technique to select the concessionaire for its BOT projects; the UK government uses both the NPV method and the multi attribute analysis to evaluate tenders for PFI projects. Although different methods have their

TABLE 6. Significant Evaluation Criteria

	Top Significant Criteria
Financial Criteria	<ul style="list-style-type: none"> • Sound financial analysis • Net present value • Tariff/toll setting up and adjustment mechanism • Ability to address commercial risk (e.g., supply and demand risks) • Minimal financial risks to the client • Internal rate of return • Financial strength of the participants in the project company • Total investment schedule • Concession period • Strong financial commitments from shareholders
Technical Criteria	<ul style="list-style-type: none"> • Qualifications and experiences of key design and construction personnel • Conforming to client's requirements • Competencies of designer/subdesigners • Contractor/subcontractors • Conforming to design requirements • Construction programs and abilities to meet them • Design and construction quality control schemes • Maintainability • Design life • Design standard • Quality management and assurance systems
Safety, Health, and Environmental Criteria	<ul style="list-style-type: none"> • Conformance to laws and regulations • Control of air and water pollution • Past environmental performance • Protection of items of cultural/archeological values • Management safety accountability
Managerial Criteria	<ul style="list-style-type: none"> • Project management skills • Constitution of the management, their qualification and experience • Coordination system within the consortium • Leadership and allocation of responsibilities in the consortium • Working relationships among participants

advantages and disadvantages, among these methods, the NPV method and multi-attribute analysis are the two most commonly used methods. They are also the two that are most recommended by experts and experienced practitioners.⁴³

- **Evaluation Criteria**—A variety of tender evaluation criteria for PPP projects have been previously explored by researchers.⁴⁴ These evaluation criteria are classified into four packages: financial; technical; safety, health, and environmental; and managerial. The top ten criteria in the first two criteria packages and the top five criteria in the last two packages are summarized in Table 6.⁴⁵ A proper set of evaluation criteria should be determined on the basis of the public clients' objectives, the project characteristics, and the uniqueness of the particular PPP scheme. In addition, weights that reflect the relative importance of each set of criteria should also be assigned.

PPP Risks

A striking characteristic of the PPP is its high level of risks, due mainly to the long concession period, and the diversity of participants involved in the partnership. Extensive research on risks associated with PPP projects and risk allocation strategies has been undertaken by researchers. While these studies may focus on different types of PPPs, different infrastructure sectors, and/or different

regions, they are all of great importance in providing a comprehensive view of risks associated with PPPs (as summarized in Table 7).

Risk Identification and Classifications

The identification of risks is the first step to managing them appropriately.⁴⁶ As such, researchers have identified the potential risks associated with a PPP project and proposed several classification approaches for structuring these diverse risks. Merna and Smith classified the risks of PPP projects into two broad categories: global and elemental.⁴⁷ Risk factors in the first group are generally those outside the control of the project participants, including political, legal, commercial, and environmental factors. The later group contains mostly the project-level risks, such as construction, design, operation, finance, and revenue risks. Li et al. proposed a three-level meta-classification approach to classify PPP project risks.⁴⁸ The approach categorizes PPP risks into three levels: macro, meso, and micro. The macro-level risks are those risks external to the project itself; the meso-level risks are project-related risks; while the micro risks are party-related risks.⁴⁹ Another widely used approach is to classify risks according to the project-specific areas they are related to, such as political, construction, operation and maintenance, legal, market, and financial risks. On the basis of this categorization approach, Table 8 provides a list of risk associated with a PPP project synthesized from various literature sources listed in Table 7. It should be noted that risk factors identified in different literature are based on studies focusing on a particular type of PPP project (e.g., power plants or transportation) and/or in a particular area (e.g., the UK or China). Therefore, risk factors that are project and/or region specific are excluded from Table 8.

There is no list of risks that is applicable to all PPP project and there is also no risk classification approach that is universally agreed to as best. The risks a PPP project may be exposed to are affected by a number of factors, such as the type and scale of a project, the country where the project is located, and the type of PPP implemented. Different PPP projects may therefore have different risk profiles. In addition, the importance of a particular risk factor may also differ from project to project and/or from country to country. For example, political risk is more important in developing countries than in developed markets. In this regard, the risk factors listed in Table 8 can only be viewed as a reference from which a risk profile can be developed.

Risk Allocation Strategies

Ward et al., Edwards, and Flanagan and Norman suggested that participants first need to identify and understand all potential risks associated with the project to ensure risks are properly allocated.⁵⁰ Risks should then be allocated to a party with the best financial and technical capabilities to manage them, and that party must be willing to take the risks. On the basis of these principles, researchers have explored risk allocation strategies in PPP projects. Charoenpornpattana and Minato identified risks associated with PPP transportation projects in Thailand, and suggested risk allocation strategies.⁵¹ Most risk fac-

TABLE 7. Selected Literature on PPP Risks

Author(s)	PPP Types	Focused Regions	Key Findings
Charoenpompattana and Minato ^a	Not Specific	Thailand	<ul style="list-style-type: none"> Suggest risk allocation strategies for five risk categories: political, economic, legal, transaction and operation risks.
Grimsey and Lewis ^b	PPP	Scotland	<ul style="list-style-type: none"> Present a framework for investigating and carrying out an analysis of the risks. Systematically review project risk from the perspectives of the procuring entity, the project sponsors, and the senior lenders.
Li et al. ^c	PFI	UK	<ul style="list-style-type: none"> Identify three levels of risk: macro-, meso-, and micro-level. Explore preference in risk allocation: macro- and micro-level risks should mainly be retained within the public sector or shared with the private sector; while the majority of meso-level risks should be allocated to the private sector. There are a few risks where unilateral allocation is not always obvious.
Nisar ^d	PFI	UK	<ul style="list-style-type: none"> Discusses two risk transferring strategies, implicit and explicit transfer of risks, for design, construction and development, performance, operating cost, variability of revenue, termination, and other project risks.
Thomas et al. ^e	BOT	India	<ul style="list-style-type: none"> Identify eight types of risks: traffic revenue risk, delay in land acquisition, demand risk, delay in financial closure, completion risk, cost overrun risk, debt servicing risk, and direct political risk. Discuss risk perception of project stakeholders and factors influencing risk acceptance.
Wang et al., ^f Xenidis and Angelides ^g	BOT	Various	<ul style="list-style-type: none"> Discuss risk factors within political, foreign exchange and revenue, financial, and legal risk categories.

a. S. Charoenpompattana and T. Minato, "Privatization-Induced Risks: State-Owned Transportation Enterprises in Thailand," in *Proceedings of Joint CIB Symposium on Profitable Partnering in Construction Procurement* (London: E & FN Spon, 1999), pp. 429-439.

b. D. Grimsey and M.K. Lewis, "Evaluating the Risks of Public Private Partnerships for Infrastructure Projects," *International Journal of Project Management*, 20/2 (February 2002): 107-118.

c. B. Li, A. Akintoye, P.J. Edwards, and C. Hardcastle, "The Allocation of Risk in PPP/PFI Construction Projects in the UK," *International Journal of Project Management*, 23/1 (January 2005): 25-35.

d. T.M. Nisar, "Risk Management in Public-Private Partnership Contracts," *Public Organization Review*, 7/1 (March 2007): 1-19.

e. A.V. Thomas, S. N. Kalidindi and K. Ananthanarayanan, "Risk Perception Analysis of BOT Road Project Participants in India," *Construction Management and Economics*, 21/4 (June 2003): 393-407.

f. S.Q. Wang, R.L.K. Tiong, S.K. Ting, and D. Ashley, "Evaluation and Management of Political Risks in China's BOT Projects," *Journal of Construction Engineering and Management*, 126/3 (May/June 2000): 242-250; S.Q. Wang, R.L.K. Tiong, S.K. Ting, and D. Ashley, "Evaluation and Management of Foreign Exchange and Revenue Risks in China's BOT Projects," *Construction Management and Economics*, 18/2 (March 2000): 197-207.

g. Y. Xenidis and D. Angelides, "The Financial Risks in Build-Operate-Transfer Projects," *Construction Management and Economics*, 23/4 (2005): 431-441; Y. Xenidis and D. Angelides, "The Legal Risks in Build-Operate-Transfer Projects," *Journal of Construction Research*, 6/2 (2005): 273-292.

TABLE 8. List of Risks Associated with PPP Projects

Category	Risk Factors
Political Risks	<ul style="list-style-type: none"> • Expropriation, reliability and creditworthiness of the government • Change in law and government policies • Political opposition • Corruption • Delay in approvals • Political force majeure events
Financial Risks	<ul style="list-style-type: none"> • Unfavorable economy in the host country • Rate of return restrictions • Lack of credit worthiness • Inability to service debt • Bankruptcy • Complex financial structure of PPP projects • Lack of guarantees • Financing risks • Loan ability • Fluctuation of the inflation rate, interest rate, foreign currency exchange rate • Unfavorable international economy
Construction Risks	<ul style="list-style-type: none"> • Land acquisition and compensation • Construction cost overrun • Construction time delay • Material/labor availability • Project site conditions • Contractor's failure • Construction force majeure events
Operation and Maintenance Risks	<ul style="list-style-type: none"> • Operation and maintenance cost overrun • Operator's incompetence and low operating productivity • Availability of material • Force majeure events
Market and Revenue Risks	<ul style="list-style-type: none"> • Insufficient revenue • Government restriction of profit and tariff • Inaccurate pricing and demand estimate • Fall of demand • The competition risks • Force majeure events
Legal Risks	<ul style="list-style-type: none"> • Prejudiced and unfair process of awarding the project • Host-country's interference in choosing subcontractors • Overprotective control/supervision by the host government • Disapproval of guarantees by the government • Change of host-country's fiscal regime • Change of host-country's consideration of the project's scope • Non-cooperation between public agencies • Actions or omissions of the public authorities that prevent the project to be completed • Unsteady legal and regulatory framework • Poor legislation • Non-enforcement of legislation • Lack of a stable project agreement • Vague and inconsistent clauses and specifications and inaccurate phasing • Non-accordance between all contracts in the BOT framework • Language barrier for the contract • Breach of contract provisions • Revision of the contract clauses • Unanticipated change of the concessionaire scheme • Lack of confidentiality and trust in the concession company • Risks of early termination • Legal force majeure events

tors under the political (e.g., uncertainty of government policy and instability of government), financial (e.g., inflation risk and interest risk), and legal (e.g., changes in law and regulation, and inefficient legal process) categories should be assumed by the government. Most operation-related risks should be retained solely by the private sector (e.g., technical and management risks) or shared by the public and the private sector (e.g., demand and supply risks).

Focusing on the PPP/PFI projects in the UK, Li et al. conducted a questionnaire survey with people and organizations with experience or expressed interest in PPP/PFI projects with regard to how risks should be allocated between project participants.⁵² The results show that site availability and political risks should be retained by the government, while relationship risks, the risks of legislation changes, and force majeure risks should be shared by both the public and private sectors. The majority of the remaining project-related risks, risks that are directly associated with the project itself, should be assumed by the private sector. In this study, Li et al. also found four risk factors (level of public support,

project approval and permits, contract variation, and lack of experience) that could not be clearly allocated to a specific party.

Many studies related to risk identification and allocation in PPP projects can also be found in Arndt and Maguire⁵³ and Abednego and Ogunlana.⁵⁴ Although risk allocation strategies in the real world may vary from project to project and from country to country, in general, risks that are related to the environment within which the project is implemented should be retained by the government, while the risks that are directly related to the project are mostly allocated to the private sector. Some risks that are beyond the control of both the public and private sectors should be shared by both parties. The implementation of these principles in the real world, however, is very difficult. There is considerable evidence indicating that risks have not been managed and/or risk allocation strategies have not been enforced properly.⁵⁵

PPP Finance

A sound financial plan is critical to the success of a PPP project. This importance is reflected in the higher weight assigned to the financial criteria in evaluating PPP proposals. For example, the Hong Kong government adopts three sets of criteria (financial, engineering, and planning of operation and transport) to evaluate tenders for its BOT tunnel projects. Weights allocated to these three criteria sets are around 65%, 20% and 15% respectively.⁵⁶ Zhang found that the concessionaire's financial capability can be measured by four dimensions: strong financial engineering techniques; advantageous finance sources and low service costs; sound capital structure and requirement of low-level return to investments; and strong risk management capability.⁵⁷ Selected literature on topics related to the three dimensions is summarized in Table 9.

Financing Technique, Instruments, and Strategies

To finance PPP projects—which are often characterized as being large, complex, and capital-intensive—requires innovative financial engineering techniques. Project financing is one such technique. In project financing, a project is considered as a distinct legal entity and the financing of a project is repaid from the cash flows generated by the project.⁵⁸ PPP projects are generally funded with both equity (e.g., common stock) and debt (e.g., loans). One philosophy that is commonly followed is to utilize as much debt as the project cash flows permit to generate an attractive return for shareholders. In this regard, the capital structures in most PPP projects are highly leveraged, with equity financing covering 10-30% of total project costs and debt financing covering the remaining 70-90%.⁵⁹ Although the higher debt may allow for higher rate of return to equity investors, too much can provide more risks to the project. Therefore, an appropriate mix of equity and debt is necessary when financing a PPP project.⁶⁰

In addition, project risks, project conditions, and financing sources need to be taken into account when selecting an appropriate financing strategy for a PPP project. Schaufelberger and Wipadapisut recommended financing strategies for PPP projects according to four risk conditions (as shown in Table 10).⁶¹

TABLE 9. Selected Literature on PPP Finance

Author(s)	PPP Types	Focused Regions	Key Findings
Merna and Dubey ^a	PPP	Not Specific	<ul style="list-style-type: none"> Discusses the concept of financial engineering and how it may be used to structure financial packages for infrastructure projects. Outlines the instruments, markets, sources and risks associated with the procurement of privately financed infrastructure projects and demonstrates how financial engineering techniques can be used to tailor lending packages to suit projected cash flow.
Levy ^b	BOT	Intl.	<ul style="list-style-type: none"> Provides a comprehensive examination of the engineering, construction, and financial skills required for the implementation of a BOT project.
Schaufelberger and Wipadapisutand ^c	BOT	Intl.	<ul style="list-style-type: none"> Suggests alternate financing strategies considering project risks, project conditions, and availability of financing.
Ye and Tiong ^d	BOT	China	<ul style="list-style-type: none"> Discusses the role of government support in a BOT project.
Zhang ^e	PPP	Not Specific	<ul style="list-style-type: none"> Develops a method for capital structure optimization and financial viability analysis.
Devapriya ^f	PPP	Intl.	<ul style="list-style-type: none"> Looks into nature, form and unique governance issues in debt and equity arrangements in regulated PPP organizations.

a. T. Merna and R. Dubey, *Financial Engineering in the Procurement of Projects* (Hong Kong: Asia Law & Practice, 1998).

b. S.M. Levy, *Build, Operate, Transfer: Paving the Way for Tomorrow's Infrastructure* (New York, NY: Wiley, 1996).

c. J.E. Schaufelberger and I. Wipadapisutand, "Alternate Financing Strategies for Build-Operate-Transfer Projects," *Journal of Construction Engineering and Management*, 129/2 (March/April 2003): 205-213.

d. S. Ye and R.K.L. Tiong, "Government Support and Risk-Return Trade-Off in China's BOT Power Projects," *Engineering, Construction and Architectural Management*, 7/4 (2000): 412-422.

e. X.Q. Zhang, "Financial Viability Analysis and Capital Structure Optimization in Privatized Public Infrastructure Projects," *Journal of Construction Engineering and Management*, 131/6 (June 2005): 656-668.

f. K.A.K. Devapriya, "Governance Issues in Financing of Public Private Partnership Organizations in Network Infrastructure Industries," *International Journal of Project Management*, 24/7 (October 2006): 557-565.

Government Supports

The financial viability of a PPP project is affected by a number of factors, including market need, tariff structure, concession period, credibility of the project, and force majeure events. Several types of government support are sometimes required to improve the financial viability and/or to enhance the attractiveness of a PPP project.⁶² Some examples are:

- **Minimum Guaranteed Revenue** —To secure minimum guaranteed revenue from the government is a way for the private sector to mitigate market demand risk. Such government support can be in a form of the guaranteed minimum purchase of the services. For example, in Shajiao B power project in China, the government provides a minimum guaranteed

TABLE 10. Recommended Financing Strategies for Different Risk Conditions

Risk Conditions	Financing Strategies
Low Risk	<ul style="list-style-type: none"> • Use high debt-to-equity ratio for maximum leverage and maximum return on invested equity. • Establish minimum contingency credit facilities to minimize financing costs. • Use capital markets to procure debt financing to reduce interest costs. • Procure long-term financing early to reduce financing costs.
High Political Risk	<ul style="list-style-type: none"> • Involve international firms or organizations to create leverage with local government authorities. • Seek assistance from influential individuals or organizations who have rapport with local government authorities. • Seek local government support and guarantees. • Procure insurance from government organizations such as the Overseas Private Investment Corporation. • Establish contingency credit facilities to cover unanticipated expenses.
High Financial Risk	<ul style="list-style-type: none"> • Obtain loans from international lending institutions. • Use fixed-rate or standardized-rate debt financing. • Denominate loans in local currency. • Structure debt financing in the same currencies as anticipated revenues. • Structure revenues in both local and foreign currencies. • Seek government support and guarantees. • Insert revenue escalation provision into the contract. • Establish a contingency credit facility to cover unanticipated expenses.
High Market Risk	<ul style="list-style-type: none"> • Finance early phases with equity and temporary loans and refinance during the operation phase with lower-cost long-term debt. • Structure the debt repayment schedule to start low and escalate during the initial years of operation. • Negotiate contract terms that allow increases in user fees. • Establish a contingency credit facility to cover unanticipated revenue shortfalls. • Restructure debt, if necessary, to solve cash flow problems during the concession period.

Source: Adapted from Schaufelberger and Wipadapisut, 2003.

purchase of 3697.2 million kWh electricity (approximately 60% of the installed capacity).

- **Flexibility in Tariff Structure**—The tariff structure and its adjustment have significant impacts on the project cash flows. Hence, some flexibility in tariff structure may be required to enhance the financial viability of a PPP project. Take the aforementioned Shajiao B power project as an example. For the guaranteed minimum quantity of electricity, the fixed tariff is RMB 0.114/kWh; while for the excess over the minimum quantity, the tariff is RMB 0.0748/kWh. In some cases, tariff adjustment mech-

anism will be determined in advance, under which the concessionaire will be allowed to increase tariff under some circumstances.

- **Financial Supports**—Different types of financial supports, both directly and indirectly, can be used to increase the return of the project, which in turn enhance the attractiveness of a PPP project. Direct financial support may include the investment of capital (e.g., grants or loans), free use of project sites and facilities, and tax incentives. For example, the concessionaire of Laibin B power project in China was granted the allocated land use rights to the site free of charge. Indirect financial supports often involve providing assistance to the private sector in financing process. One way is to provide a loan guarantee for the project concessionaire, which assures lenders that the debt will be fully or partially repaid by the government if the project fails.
- **Force Majeure Protection**—Force majeure events may have significant negative impacts on the project performance, such as causing delay in completion or termination of the project. To extend concession periods or to make compensation for some force majeure events are two possible government supports that can protect the concessionaire from the loss caused by such events. For example, in Shajiao B power project in China, the government agrees to extend construction and operation periods if the delays are resulted from force majeure events.

Other government supports include foreign exchange rate protection and early completion bonuses. An appropriate level of government support can improve the financial viability and enhance the attractiveness of a PPP project. However, too much government support may raise a concern that the private sector will make too much profit at the cost of the public. To avoid such concern, the government should adjust the level of its support and choose appropriate types of supports according to the viability of a PPP project.

Discussions: Lessons Learned and Recommendations

A comprehensive review of existing literature has advanced our understanding of PPPs. The key findings from the literature review and lessons learned are summarized and discussed in Table 11. In addition, recommendations to management communities in both public and private sectors are provided.

Overall Lessons Learned

- **Adopting a PPP scheme is not easy.** PPPs are not easy to apply to infrastructure projects due to their complexity in contractual arrangements and the high level of uncertainty that arises from the long concession period. To ensure the success of a PPP project, both the government and the concessionaire must be competent to implement the partnerships. In addition, the project risks should be properly allocated between participants and a sound financial plan should be secured.

TABLE II. Key Findings from the Literature and Lessons Learned

Aspects of PPP	Key Findings	Lessons Learned
Success Factors and Barriers	<ul style="list-style-type: none"> The success or failure of a PPP project is dependent on a number of factors that can be classified into four groups: the competence of the government, the selection of an appropriate concessionaire, an appropriate risk allocation between the public and private sectors, and a sound financial package, 	<ul style="list-style-type: none"> Adopting a PPP scheme is not easy.
Government Roles	<ul style="list-style-type: none"> Roles of the government include: to create favorable investment environment, to establish adequate legal/regulatory framework, to establish a coordinating and supportive authority, to select a suitable concessionaire, and to be actively involved in the project life-cycle phases. 	<ul style="list-style-type: none"> The credibility and competence of the government plays a critical role in PPP infrastructure development.
Concessionaire Selection	<ul style="list-style-type: none"> A multistage procurement process composed of inviting expression of interest, prequalifying tenders, evaluating tenders, and negotiating with the preferred tender(s) is widely adopted by governments. Some tender evaluation methods that are currently in use include: the simple scoring method, NPV method, multi-attribute analysis, Kepner-Tregoe decision analysis technique, two-envelope method, NPV method plus scoring method, and binary method plus NPV method. Evaluation criteria generally cover four aspects: financial; technical; safety, health, and environmental; and managerial. 	<ul style="list-style-type: none"> A financially strong, technically competent, and managerially outstanding concessionaire is required for the success of PPP.
Risks of PPP	<ul style="list-style-type: none"> Risks associated with PPP projects can be categorized into: political risks, financial risks, construction risks, operation and maintenance risks, market and revenue risks, and legal risks. Risks that are related to the environment within which the project is implemented should be retained by the government, while the risks that are directly related to the project are mostly allocated to the private sector. Some risks that are beyond the control of both the public and private sectors are shared. 	<ul style="list-style-type: none"> All risks should be identified and a fair risk allocation should be secured.
Finance of PPP	<ul style="list-style-type: none"> A sound finance plan for a PPP should have an appropriate mix of equity and debt and a financing strategy that is based on the considerations of project risks, project conditions, and financing sources. Some government supports such as the minimum guaranteed revenue, the flexibility in tariff structure, the financial supports, and force majeure protection may be required to make a PPP project financially viable. 	<ul style="list-style-type: none"> A sound financial plan is necessary. Reasonable financial incentives and stable revenue are critical to attract private investments.

- ***The credibility and competence of the government plays a critical role in PPP infrastructure development.*** A PPP project cannot be successfully implemented unless the government establishes an adequate legal framework, creates a favorable investment environment, and provides necessary assistance and/or supports to ensure a reasonable return on the investment. It also requires the government to select a suitable concessionaire and to be actively involved in the whole process of the project to

ensure quality and efficiency of the project. A central PPP unit should be established to foster these government's roles.

- ***A financially strong, technically competent, and managerially outstanding concessionaire is required for the success of a PPP project.*** The selection of such an appropriate concessionaire requires a well-developed tendering process, a suitable tender evaluation method, and a set of evaluation criteria that reflect project characteristics and objectives. Unlike other traditional project delivery systems, the tender evaluation criteria in a PPP project should at least cover financial, technical, safety, health, environmental, and managerial aspects.
- ***All potential risks of the project should be identified and an appropriate risk allocation should be secured.*** There is frequently a misunderstanding about the risk transfer in PPPs. PPPs are not devices for governments to develop infrastructure projects by transferring all the risks to the private sector. Rather, it requires a clear consideration of all risks and how these risks are allocated between the public and private sectors. One commonly followed principle is to allocate risks to parties that are best positioned to manage them.
- ***Reasonable financial incentives and a stable revenue stream are critical to attract private investments.*** A PPP project will never materialize without the participation of a private entity. A private entity, with the goal of making profits, will only participate in a PPP project that can provide a reasonable rate of return. Therefore, for projects that have great economic and/or social value but are not financially viable, the government may provide necessary supports and/or guarantees to make them financially viable.

Recommendations to the Public Sector: Policy Implications

- ***Identify and prioritize pilot PPP projects.*** The public sector should be aware that a PPP is not a panacea and may not be appropriate for all infrastructure projects. The government should conduct a comprehensive feasibility study to examine the applicability of the PPP approach to a specific infrastructure project before it is implemented. Additionally, when several projects are intended to be developed under PPP, the government should also prioritize these projects by considering their financial strengths and weaknesses.
- ***Develop a database for historical PPP projects.*** A database of historical information on PPP projects can be very useful in: selecting a suitable infrastructure project for the PPP, assessing the potential risks associated with the PPP, and avoiding similar mistakes in the future. Data stored in this database should include project background information, concessionaire selection methods and criteria, and project performance. The database should also include information on various types of PPPs throughout the world, and it should allow users to retrieve information on the basis of infrastructure sectors and the regions where projects are located.

- ***Standardize PPP procurement process and contract documentation.*** The government should standardize its PPP procurement process, provide general and/or industry-specific PPP guidelines,⁶³ and standardized tender documents and model contracts for a range of infrastructure sectors. Such measures can significantly reduce not only the tendering costs to the private sector, but also the tender evaluation costs to the public sector. Furthermore, the negotiation time can also be shortened.
- ***Provide training at all levels for government staff.*** The successful implementation of PPP requires its participants to possess diverse skills and expertise in procurement, legal, and financial management. Therefore, the government should provide training in these areas to its employees, especially those at the regional and local level agencies. This training can be done by an established central PPP unit, if available, or by professional training institutions. The government should also hire advisors who have actual experience in PPP projects to assist in their development.
- ***Establish two-way communication channels with the private sector.*** The government should establish two-ways communication channels with the private sector, such as hosting regular meetings to share updated information about PPP policies and potential projects. Early feedback from the private sector can be expected to improve the quality of the policies and increase the possibility of success for a PPP project.

Recommendations to the Private Sector: Management Implications

- ***Knowledge sharing with the public sector.*** The private sector should share its knowledge and expertise with the government in creating PPP-related policies and a favorable investment environment.
- ***Early involvement of the financial institutions.*** It appears that a sound financial plan is critical to the success of a PPP project. Therefore, the private entity that is interested in pursuing a PPP project should get the financial institution involved early in the bid preparation process. This early involvement of financial institutions provides the private entity an opportunity to verify the feasibility and soundness of its financial plan, which in turn may increase its possibility of winning the bid. In addition, it reduces the possibility that a project might fail due to the financing issues.
- ***Maintain long-term relationships with industrial partners.*** Due to its complexity, implementation of a PPP project often requires a consortium of multidisciplinary companies. In such a consortium, all participating entities need to work cooperatively, share information, make decisions collectively, share benefits, take corresponding responsibilities, and resolve disputes. This would not be possible if there is trust between these participants. Having a long-term relationship with potential industry partners is the best way to build this trust.

Notes

1. B. Li, A. Akintoye, P.J. Edwards, and C. Hardcastle, "Perceptions of Positive and Negative Factors Influencing the Attractiveness of PPP/PFI Procurement for Construction Projects in the UK," *Engineering, Construction and Architectural Management*, 12/2 (2005): 125-148.
2. *Asian Business*, "Special Report on Asia's Infrastructure Boom," (March 1996), pp. 60-69.
3. Y.H. Kwak, "Analyzing Asian Infrastructure Development Privatization Market," *Journal of Construction Engineering and Management*, 12/2 (March/April 2002): 110-116.
4. J.B. Miller, "Applying Multiple Project Procurement Methods to a Portfolio of Infrastructure Projects," in *Procurement Systems: A Guide to Best Practice in Construction* (London: E & FN Spon, 1999), pp. 109-227.
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