

# Improving Concessionaire Selection Protocols in Public/Private Partnered Infrastructure Projects

Xueqing Zhang, M.ASCE<sup>1</sup>

**Abstract:** A critical contributor to the success of a public/private partnered (PPP) infrastructure project is the selection of the right private-sector partner, the concessionaire, who would provide the best overall deal throughout the build-operate-transfer (BOT) development process. This paper proposes a core concessionaire selection protocol that incorporates public procurement principles, best-value selection approach, competitive selection process, and multicriteria tender evaluation. Key pointers for an improved concessionaire selection protocol are discussed and analyzed by drawing experience and learning lessons from worldwide PPP practices. These include improved project brief and tender documents, formulation of a best-value selection methodology, determination of suitable criteria and methods for prequalification and tender evaluation, capital structure (equity-to-debt ratio), financial models, and potential improvements in different stages of the concessionaire selection process. Relevant results of a questionnaire survey of international PPP expert opinions on an enhanced concessionaire selection protocol are also presented.

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## Introduction

Innovative procurement approaches have been practiced recently in worldwide infrastructure development through public/private partnerships (PPPs) where limited-time privatization based on the concept of concession or build-operate-transfer (BOT) is popular in many countries. Different PPP scenarios are promoted to address an ever-increasing gap between available public funding and the great need for infrastructure projects and to overcome both market failure and government failure for improved efficiencies (Mustafa 1999). This paper argues that neither a purely public nor a private approach to infrastructure provision has proven sustainable in either the developed or the developing world. Properly formulated PPPs can achieve more efficient outcomes than those that can be provided by either the public or private sector alone (Miller 1999; Miller et al. 2000).

Infrastructure privatization involves social, political, economic, legal, and environmental dimensions and consequently is much more complicated than traditional public procurement. Many countries and regions still lack PPP experience and expertise, and various PPP procurement protocols are still being tried and tested. Even the limited evolving knowledge of PPPs is widely dispersed and inadequately documented, quite apart from the lack of systematic studies and analyses of relevant issues. Furthermore, various problems have been encountered in interna-

tional PPPs (Whitfield 2001). For example, many infrastructure projects that had been planned to develop through BOT-type schemes have never materialized (Birgonul and Ozdogan 1998), and some even have failed (Abdul-Aziz 2001) due to lack of an appropriate environment for PPPs.

The current worldwide trend toward infrastructure PPPs and the lack of knowledge and expertise in this domain make it all the more significant to extract, benchmark, codify, and consolidate that experience, expertise, and knowledge and draw lessons from evolving international PPP practices in order to develop a body of PPP knowledge. This knowledge would help in the establishment of relevant laws, regulations, and guidelines and in the development of efficient procurement frameworks for best PPP practices.

The writer has adopted a systematic research approach (including literature review, case studies, interviews/correspondence with international experts, and questionnaire survey) with which to develop a core concessionaire selection methodology that incorporates public procurement principles, best-value selection approach, competitive selection process, and multicriteria tender evaluation. Key pointers for an improved concessionaire-selection protocol are discussed and analyzed by drawing experience and learning lessons from worldwide PPP practices. These include improved project brief and tender documents, formulation of a best-value selection methodology, determination of suitable criteria and methods for prequalification and tender evaluation, capital structure (equity-to-debt ratio), financial models, and potential improvements at different stages of the concessionaire selection process. Relevant results of a questionnaire survey of international PPP expert opinions on enhanced concessionaire-selection protocols are also presented.

## Research Methodology

A literature review of concessionaire-selection priorities in PPP infrastructure projects was supported by case studies, question-

<sup>1</sup>Professional Engineer, Yellow River Conservancy Committee, 11 Jinshui Road, Zhengzhou 450003, China

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naire survey, and interviews and correspondence with worldwide experts/experienced practitioners in diverse public client organizations. This was also supplemented by a review of recent trends in contractor selection in traditional projects. Lack of experience in PPP projects, coupled with extensive experience in traditional contractor selection, has mainly prompted this supplemental study. The objective was to extract useful elements from contractor selection to improve concessionaire selection.

Case studies include private finance initiative (PFI) projects in the U.K., BOT-type toll roads under the Intermodal Surface Transportation Efficiency Act in the United States, BOT tunnel projects in Hong Kong, and BOT power and transportation projects in China, India, Malaysia, the Philippines, and Thailand.

The writer conducted a structured questionnaire survey from December 2000 through May 2001 of international expert opinions on various issues related to the procurement of BOT-type PPP projects. The 46 respondents who returned completed questionnaires are from 42 different organizations/institutions in a number of countries and regions, including Australia, the Hong Kong Special Administrative Region of China, India, Japan, Peru, the Philippines, Mainland China, Malaysia, Singapore, South Africa, Thailand, the U.K., and the United States. Twenty-nine respondents are from industry, 17 are from academia, and many are from organizations that have rich experience with PPP projects. Zhang (2004a) provides the background information for these respondents, including a breakdown of respondents by country, working background (academia or industry), and type of organization (public, quasi governmental, or private).

## **BOT and Concessionaire**

The BOT concept represents a significant paradigm shift in infrastructure development that changes the philosophy of project procurement by moving from a reactive contractor in a traditional design-bid-build project to a proactive concessionaire in a BOT project. The BOT approach provides a special-purpose vehicle where diverse functions (finance, design, construction, operation, and service provision) are integrated and a cooperative relationship formed, while in a traditional project these functions are fragmented and the relationships among multiple participants are often confrontational.

The selection of the most suitable concessionaire is critical to the success of a PPP project. The concessionaire (which usually has no track record) is often a consortium formed for a particular PPP project and has far more commitments and assumes much broader and deeper risks than a mere contractor. These risks can be broadly classified into (1) elemental risks, comprising physical, design, construction, operation and maintenance, technology, finance, and revenue-generation risks, and (2) global risks, comprising political, legal, commercial, and environmental risks (Merna and Smith 1996). In developing the project, the concessionaire enters into contracts with a number of other participants, including the public client, investors/shareholders, lenders, main contractor(s), main designer(s), insurers, material/equipment suppliers, operator/maintainer, and intermediate and end product/service purchasers. Zhang and Kumaraswamy (2002) have discussed the contractual arrangements of a BOT-type PPP project.

## **Considerations in Concessionaire Selection**

### **Public Procurement Principles**

Public clients should adhere to the following principles in the procurement of public works and services: public accountability,

value for money, transparency, and open and fair competition. The use of public funds should be justified by multiple criteria (financial, technical, managerial, environmental, etc.). All necessary information related to the procurement should be provided in the project brief and relevant tender documents. The tender evaluation process, evaluation criteria and methods, and time schedule should be clearly outlined and made transparent to facilitate better understanding among interested parties. Transparency in concessionaire selection procedures can enhance the ultimate value to the public client and benefit the private sector participants by providing a level field on which to play. All interested parties should be treated equally, and concessionaire prequalification, preliminary tender examination, tender clarification, and detailed evaluation should be kept in confidentiality during the selection process.

### **Best Value Selection Approach**

The characteristics of BOT-type PPP projects and the great commitments and broad risks assumed by the concessionaire require a best-value approach in the selection of an appropriate concessionaire. For example, this approach has been adopted in the U.K. in the development of PFI projects, where a concessionaire that provides the best and final offer (BAFO) is selected against multiple evaluation criteria. In addition, some researchers [e.g., Gransberg and Ellicott (1997)] have explored best-value source selection approaches, which aim to achieve a balance between most economically advantageous perspectives and the best-value prospects.

In adopting the best-value approach, the client should clearly define the objectives it wishes to achieve, the relative importance of each value item, and the contributors to each value item, and then develop both objective and subjective indicators to evaluate these contributors. The client's objectives should be translated into an appropriate tender evaluation package that contains a set of criteria and their corresponding value functions. Note that conflicts may exist among various objectives in the best-value selection scenario, and hence there should be a tradeoff according to the relative importance of these objectives. In addition, although this scenario has the potential to yield increased benefits in the long run, the client may opt for a desired instead of a best value due to certain constraints (e.g., budget limitations). Furthermore, public clients, governed by the public accountability principle, cannot easily pay higher prices for better value if this is difficult to justify (Palaneeswaran 2000).

### **Competitive Selection Process**

Five tendering methods commonly have been used: (1) open competitive tendering, (2) invited tendering, (3) registered lists, (4) project-specific prequalification/shortlisting, and (5) negotiated tendering. In the questionnaire, survey respondents are asked to indicate which of these tendering methods their organizations have used or the respondents have experienced, and which they would like to recommend for use. Zhang (2004a) provides a summary of the responses, which shows that the open competitive tendering is most commonly used and is also the most recommended by the respondents.

Open competitive tendering has been adopted in the U.K. in its PFI projects, for example, the design-build-finance-operate (DBFO) roads; in toll roads in the United States under its Intermodal Surface Transportation Efficiency Act; in BOT tunnel projects in Hong Kong; and in power and transportation projects

in many developing countries, such as China, India, Malaysia, the Philippines, and Thailand. The open competitive tendering process normally consists of the following stages: (1) request for prequalification, (2) prequalification, (3) invitation to tender, (4) tender evaluation and shortlisting, (5) negotiations with short-listed tenderers, and (6) selection of the best tender and award of concession (Zhang et al. 2002). In the tendering process, all interested parties should be treated on an equal footing without discrimination. Otherwise, some tenderers may drop out of the competition or submit noncompliant tender proposals.

### **Multicriteria Tender Evaluation**

PPPs offer a proactive scenario in place of the traditional reactive *modus operandi*. Many fundamental issues may significantly distinguish PPPs from traditional public procurement routes, for example, (1) the concessionaire undertakes far more responsibilities and assumes much more and deeper risks; (2) the financial issues (particularly if off the balance sheet) are much more complex; and (3) risks and rewards among various project participants are radically realigned. Political, legal, financial, technical, operational, managerial, and environmental issues have to be taken into consideration through the whole concession period. These issues make the selection of the right concessionaire critical to the success of a PPP project and necessitate a best-value selection approach, that in turn necessitates a multicriteria tender evaluation methodology.

### **Invitation to Tender**

#### **Project Advertisement**

Parties can be invited to express interest by publishing a notice in newspapers or journals/magazines. For example, subject to EU rules, PFI projects above a specified threshold project value must be advertised in the *Official Journal of the European Community* and apply prespecified objective selection criteria. In Hong Kong, invitations to tender for public works require the publishing of a notice in the Hong Kong government gazette. The project advertisement should be drafted carefully and in broad output terms to achieve maximum flexibility in determining the nature of possible tenderers and to exploit strategic opportunities. A too-specific statement of requirements may deter some potential tenderers and restrict the opportunity to consider innovative solutions during the competitive concessionaire selection process (HEFCE 1998). However, core elements should be fully identified and clearly stated, or the client may have to advertise the project again if major changes to the core requirements are made in the future.

### **Tender Documents**

Tender documents may include the (1) project brief, (2) instructions to tenderers, (3) draft concession agreement, (4) financial analysis model, and (5) outline of tender evaluation methodology.

#### **Project Brief**

The project brief summarizes the client's objectives and relevant information about the project under consideration. These objectives should be expressed in terms of desired outcomes, performance standards, and basic control requirements rather than detailed project specifications. The following information should be included in the brief: (1) background of the project; (2) the client,

project market, and nature of the opportunity; (3) client's requirements in terms of outputs; (4) details of any existing facilities and an indication of whether and how they might be used to meet future requirements; (5) the PPP principles as they apply to this opportunity; (6) an indication of any work done on a traditionally procured alternative and whether this work will be made available to tenderers; (7) an indication of the funding sources that the client will use to pay for the project; and (8) the qualifying requirements for interested commercial organizations in terms of their financial, technical, and commercial standing (HEFCE 1998).

### **Instructions to Tenderers**

In PPP projects, tender preparation and evaluation are intrinsically complex. Clear guidelines should be formulated to assist interested parties in preparing tender proposals and clients in evaluating tenders. The instructions to tenderers should indicate (1) a timetable of the tender evaluation process, (2) a brief description of the work proposed, (3) arrangement of site visits, (4) language of tender, (5) tender validity and guarantees, (6) format for submission, and (7) signing of tenders and documentation to accompany the tender (Merna and Smith 1996; CIC 1998). The timetable includes project advertisement, preproposal meeting, deadline for submission of written questions, deadline for the client to respond to these questions, submittal of proposals, presentation of proposals, notification of rankings, and beginning of negotiations for concession agreement.

### **Draft Concession Agreement**

The draft concession agreement should address key issues such as the concession period, performance standards, payment mechanisms, compensation on termination, default trigger events and step-in rights, risk allocation, liabilities of parties to the agreement, and dispute resolution procedures. Merna and Smith (1996) have proposed a structured concession agreement (SCA), which consists of two distinct sections: (1) a legal agreement comprising general, specific, and common legal terms and obligations of both the public client and the private concessionaire, and (2) the project conditions, including construction, operation/maintenance, finance, and revenue-generation packages. The SCA identifies all risks, rewards, and responsibilities of the contractual parties and accommodates all those provisions relating to the terms of the concession together with specific project conditions. The SCA is the basis for tender preparation, tender evaluation, and risk analysis.

### **Models for Financial Analysis**

In a multicriteria tender evaluation, financial aspects are usually assigned a much higher weight than other packages. For example, in the Laibin B power station in China, financial aspects were given an 84% weight (60% for the electricity tariff plus 24% for the financial proposal). Therefore more diligence study should be conducted on financial aspects using financial analysis tools such as sensitivity analysis and the net present value (NPV) method. The public client may prepare some financial analysis models to assist tenderers to enter financial data (e.g., design costs, construction costs, operation and maintenance costs, outputs, tolls/tariffs, interest rates, currency exchange rates, and possible change ranges of these variables). This also makes it simple and straightforward for the client to compare the strengths and weaknesses of the financial packages of different tenders.



**Table 1.** Summary of Responses on Prequalification Methods

Prequalification method	Used by respondents' units or experienced by respondents		Recommended	
	Number of responses	Percentage of total responses (%)	Number of responses	Percentage of total responses (%)
Binary method	13	34.21	14	30.43
Simple scoring method	11	28.95	9	19.57
Multiattribute analysis	8	21.06	17	36.96
Any of above methods plus outline tendering proposal	6	15.80	6	13.04
Total	38	100.00	46	100.00

### Outline of Evaluation Methodology

Tender evaluation of a PPP project is a complex process. Different packages (financial, technical, managerial and safety, health, and environmental) need to be evaluated. The client should provide an outline evaluation methodology, clearly stating the evaluation criteria, evaluation method, stages involved in the selection process and what measures to take at each stage, whether to use a preferred tenderer and a reserve tenderer, whether tender bonds are required, and whether the client will compensate the tendering costs of unsuccessful tenderers. Making both the evaluation criteria and evaluation process transparent can increase and ensure fair competition, which will benefit both the public and private sectors. The evaluation methodology should enable evaluators to derive the relative advantages, disadvantages, and risks involved in each alternative tender. In addition, the client should also keep the public informed about the development of the PPP project.

### Concessionaire Prequalification

Tender costs for BOT-type infrastructure projects are extremely high (in some cases between 5 and 10% of the total project costs) because resources involved in preparing a tender to finance, design, build, and operate a facility are much greater than those required for a design-bid-build contract (Merna and Smith 1996). Compared with the design-bid-build approach, a much longer

time horizon and more complicated contractual and financial arrangements need to be assessed in the BOT tender apart from additional commercial evaluations.

The prequalification process is aimed mainly at selecting to a short list (5 to 8) of qualified consortia (each consisting of reputable and experienced contractors, operators, and investors), among which a maximum number of 3 or 4 consortia will be invited to tender after further assessment and negotiation. This ensures that weaker consortia do not incur unnecessary tendering costs.

### Prequalification Methods

Four methods have been used in concessionaire prequalification: (1) the binary method (selecting consortia that meet all the preestablished "must" criteria while rejecting any consortium that fails to satisfy any of these criteria); (2) the simple scoring method; (3) multiattribute analysis; and (4) any of the first three methods plus an outline tender proposal. Zhang et al. (2002) explain methods (2) and (3). An outline proposal enables the client to understand the concessionaire's initial perception of a solution to meet the client's requirements.

In the questionnaire survey, respondents are asked to indicate which of these prequalification methods their organizations have used or they have experienced in prequalifying consortia, and which methods they would recommend for use in future PPP

**Table 2.** Contract Prequalification Ratings<sup>a</sup>

Prequalification rating	Definition	Remarks
Aggregate rating	Dollar limit of outstanding contract work that a contractor will be allowed to have at any given time, including dollar value of all work in progress	Used by New Jersey Department of Transportation (NJDOT)
Maximum rating	Dollar value established by subtracting the contractor's current dollar amount of outstanding work from its aggregate rating	Used by NJDOT
Project rating	Maximum dollar amount a contractor shall be allowed to bid on an individual project	Used by NJDOT
Current bid capacity	Lesser of a contractor's project rating or maximum rating	Used by NJDOT
Work class rating	Maximum value within the class of work used to determine a firm's eligibility to receive a bid document for a single project	Used by Washington State Department of Transportation
Maximum capacity rating	Total aggregate dollar value of uncompleted work an applicant may have under contract at any time as prime contractor and/or subcontractor, regardless of its location and with whom it has contracted	Used by Florida Department of Transportation
Ability factor	Determined from the total ability score derived by evaluating the applicant's organization, management, work experience, and letters of recommendation	Used by Florida Department of Transportation

<sup>a</sup>Based on Palaneeswaran and Kumaraswamy 1999

**Table 3.** Summary of Responses on Whether It Is Suitable to Prequalify Respondent Consortia to Remaining Maximum Number of Six

Answer	Academia		Industry		Overall	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	14	100	23	88.46	37	92.5
No	0	0	3	11.54	3	7.5
Total	14	100	26	100.00	40	100.00

projects. Table 1 provides a summary of responses on prequalification methods. The survey results show that the binary method and simple scoring method are the two most commonly used prequalification methods, but multiattribute analysis and the binary method are the most recommended. Furthermore, one respondent recommends a prequalification method that first uses the binary method to screen the consortia against basic ("must") criteria that must be satisfied, and then a simple scoring or weighted scoring system to further prequalify the consortia. Another respondent suggests prequalifying consortia based mainly on their reputation and experience in the chosen field.

### Prequalification Criteria

A concessionaire is often a consortium formed for a particular PPP project that is usually complex and multidisciplinary. Concessionaire prequalification is specific to that project. The competence of the concessionaire is dependent on the overall resources and capabilities of the constituent companies, the concessionaire's ability to formulate competitive financial and technical packages, and its overall managerial skills and capabilities to deal with issues related to safety, health, and the environment. Tender prequalification may include the following aspects (Merna and Smith 1996; HEFC 1998):

1. General and financial report of all major constituting organizations of the proposed concessionaire consortium;
2. Details of any pending, threatened, or other legal proceeding;
3. Proposed sources of finance and debt/equity ratio;
4. Past work carried out by the major constituting organizations within or outside the field of the specific PPP project;
5. Existing workload of the main or subcontractors of the proposed consortium;
6. Experience of the consortium's legal and financial advisers in advising PPP projects;
7. Experience in managing PPP projects, facilities management, and assumption of other risks such as residual value, volume, or capacity;
8. Management structure of the proposed concessionaire;
9. Range of technical, operational, and financial capabilities necessary for the project, together with other resources and references;
10. Health and safety records, quality assurance systems and industrial relations; and

11. Meetings with and presentations from concessionaire consortia.

### Contractor Prequalification Ratings

The contractor is an important party to the concessionaire consortium. In-time completion of construction is a key success factor in project financing because infrastructure projects require huge amounts of investment in construction work, which results in large amounts of interest. Long-time delay in the completion of construction can ruin a PPP project because of accumulation of huge amounts of interest and the delay of generation of revenues. To ensure selection of a competent contractor, some evaluation ratings are used in the United States (Table 2).

### Clarifications and Presentations

The client may require further details from the consortium during the prequalification process and ask its clarifications on some issues. The client may also require the consortium to make presentations on important issues. For example, one critical issue is to assess the extent of integration of the participants in the consortium.

### Number of Consortia Invited to Tender

The following two questions are asked in the questionnaire survey:

Question 1: Do you think it is suitable to prequalify/shortlist respondent consortia to a remaining maximum number of six? Survey results appear in Table 3.

Question 2: Tendering costs for BOT-type projects are much higher than those for traditional projects. Do you think that a maximum of four is an appropriate number of prequalified consortia that should be allowed to submit tenders in order to minimize overall tendering costs in the industry? Survey results appear in Table 4.

Tables 3 and 4 show that most of the respondents think it suitable to prequalify and shortlist respondent consortia to a remaining maximum number of six and that a maximum of four is an appropriate number of prequalified consortia that should be allowed to submit tenders in order to minimize overall tendering costs in the industry. A number of respondents (particularly those

**Table 4.** Summary of Responses on Whether Maximum Of Four Is Appropriate Number Of Prequalified Consortia That Should Be Allowed to Submit Tenders In Order To Minimize Overall Tendering Costs in Industry

Answer	Academia		Industry		Overall	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	12	85.71	17	65.38	29	72.5
No	2	14.29	9	34.62	11	27.5
Total	14	100.00	26	100.00	40	100.0

**Table 5.** Summary of Responses on Whether Concessionaire Should Be Further Evaluated during Tender Evaluation Stage

Answer	Academia		Industry		Overall	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	9	69.23	14	66.67	23	67.65
No	4	30.77	7	33.33	11	32.35
Total	13	100.00	21	100.00	34	100.00

from the U.K.) maintain that the maximum number of consortia to be invited to tender should be three. However, note that although the number to be invited to tender should be kept as few as possible, viable competition must be ensured. In addition, the client may consider compensating unsuccessful tenders with a substantial percentage of their audited tendering costs in order to increase competition.

In the Edinburgh Campus redevelopment project in the U.K., the project advertisement stated that interested companies/consortia would be asked to complete a prequalification questionnaire, on the basis of which a maximum of five may be selected for interview, following which a maximum of three will be invited to tender and negotiate (CIC 1998).

### Further Evaluation of Prequalified Consortia

Table 5 provides a summary of responses on whether the respondent consortia should be further evaluated during the tender evaluation stage (i.e., after previous prequalification). A majority of respondents maintain that respondent consortia should be further evaluated.

### Tender Evaluation Methods

A number of tender evaluation methods are used currently. These include (1) the simple scoring method, (2) NPV method, (3) multiattribute analysis, (4) Kepner-Tregoe decision analysis technique, (5) two-envelope method, (6) NPV method plus scoring method, and (7) binary method plus NPV method. Zhang et al. (2002) and Zhang (2004a) provide some details of the description and application of these methods. In the questionnaire survey, respondents are asked to indicate which of the above tender evaluation methods their organizations have used or have experienced in a BOT-type tender evaluation, and to indicate which method they would recommend. A summary of responses appears in Zhang (2004a), showing that the NPV method and multiattribute analysis are the two most commonly used tender evaluation methods and they are also the most recommended.

The binary, simple scoring, and two-envelope methods may be appropriate for small and simple PPP projects, while for projects with a proven construction technology and no technical problems, the NPV method may be more appropriate. For complex projects, the multiattribute analysis and the Kepner-Tregoe decision analysis technique may be more suitable.

Financial aspects are the most important issue to consider in concessionaire selection, and therefore, in a multicriteria tender evaluation, the financial package is usually assigned a much higher weight than other evaluation packages. The NPV method is often used in conjunction with other evaluation methods, for example, the two-envelope method, NPV plus scoring method, binary method plus NPV method, and tender price plus multiattribute analysis. In addition, sensitivity analysis is often carried out to identify variables that contribute most to overall investment

riskiness and project returns because estimation errors of various variables may combine to have an overall effect on the project's financial feasibility. Sensitivity analysis can thus point the decision maker to where efforts should be directed to effectively control risks and maximize profits.

### Tender Evaluation Criteria

Tender evaluation criteria should reflect the client's objectives, the particular project, and the characteristics of the specific BOT-type approach.

### Recent Developments in Contractor Selection

Research on tender evaluation criteria for PPP projects in general is rare, while there is extensive experience with traditional contractor selection. It is therefore beneficial to extract good elements from new developments in contractor selection criteria, although a concessionaire is quite different from a traditional contractor.

The lowest bid price is usually the most important or even the sole criterion by which a contractor is selected. Other criteria, while also important, are often neglected (Hatush and Skitmore 1997). The simplicity and apparent cost savings are driving factors for using the lowest-price criterion. However, potential shortfalls exist in end quality and overall performance levels of the contractor. Contractors may seek other means to compensate for unrealistically low bids during the construction process. For example, some contractors are known to attempt to recover their costs or generate profits through claims after securing a contract on below-cost bids.

New approaches have been practiced to overcome the shortcomings of the sole lowest-bid-price criterion. One approach is the A+B bidding method used in highway projects in the United States. In A+B bidding, a tender proposal is required to incorporate two packages: bid price in dollars (part A) for all contracted works, and contract time, which is converted to a cost to the client (part B) based on opportunity costs to road users. Thus, a comparison can be made on a consolidated price criterion of A+B in dollars (Herbsman 1995). The A+B bidding method has been used by departments of transportation in Maryland, Missouri, and North Carolina.

Another approach is the average bid method, in which the highest and lowest bids are regarded as unreasonable and risky and are therefore rejected. Contracts are awarded to the contractor whose tender price is closest to the average of all the remaining bids. This method precludes the dangers of awarding a contract to a party that either mistakenly or deliberately submits an unrealistically low bid. This system may also be modified to reject tenders that fall outside a certain band, say, 15% on either side of a client's estimate (Kumaraswamy and Walker 1999). Average bid approaches have been used in Italy, Peru, Portugal, Taiwan, South Korea, and the United States.

Furthermore, Hatush and Skitmore (1997) have recommended

**Table 6.** Summary of Responses on Suitable Ratio of Equity to Debt for BOT-Type Infrastructure Projects

Suitable equity-to-debt ratio	Academia		Industry		Overall	
	Number	Percentage	Number	Percentage	Number	Percentage
5:95	1	5.56	0	0.00	1	2.44
10:90	1	5.56	5	21.74	6	14.63
15:85	2	11.11	1	4.35	3	7.32
20:80	5	27.78	1	4.35	6	14.63
25:75	2	11.11	1	4.35	3	7.32
30:70	4	22.22	7	30.43	11	26.83
35:65	0	0.00	4	17.39	4	9.76
>35:65	3	16.67	4	17.39	7	17.07
Total	18	100.00	23	100.00	41	100.00

multiple criteria in contractor selection. They classify various criteria into five packages: (1) general, (2) financial, (3) technical, (4) managerial, and (5) safety, health, and environment aspects.

### Critical Success Factors

It is also useful to identify factors that commonly lead to the success of PPP projects or to the selection of an appropriate concessionaire that is critical to the success of the corresponding PPP project. These factors can be tailored as tender evaluation criteria where appropriate. Research in and discussions about such critical success factors (CSFs) have been previously conducted, for example by Berry (1991), Tiong et al. (1992), and Morledge and Owen (1997).

Based on the public/private win-win principle, Zhang (2004b) identified five main CSFs, each including a number of success subfactors (SSFs). The five main CSFs are (1) favorable investment environment, (2) economic viability, (3) reliable concessionaire consortium with strong technical strength, (4) sound financial package and (5) appropriate risk allocation via reliable contractual arrangements. Zhang (2004b) also analyzes the relative significance of these CSFs and SSFs.

### Suitable Ratio of Equity to Debt

The ratio of equity to debt is an important financial criterion. Table 6 summarizes responses to the questionnaire survey on the suitable ratio of equity to debt for BOT-type projects. According to the overall responses, 59% of the respondents indicate that an equity to debt ratio of 20:80 to 35:65 is suitable, among which 46% respondents indicate that 30:70 is the suitable ratio. Based on this survey and further discussion with some PPP experts, it is concluded that 30:70 is the most suitable ratio from the perspectives of both the public and private sector. Some respondents have indicated that the ratio of equity to debt depends on the type of the project, that is, the level of risk perceived for the project. The ratio can be zero for low-risk projects (e.g., the Severn Bridge in the U.K.), while high-risk projects call for higher levels of equity (40 to 50%) to satisfy the lenders of a higher degree of certainty and assurance.

### Minimum Percentage of Design Completed

A certain percentage of design should be completed and attached to the tender to facilitate the evaluation of technical aspects. Table

**Table 7.** Summary of Responses on Minimum Percentage of Design That Should Be Completed When Submitting BOT-Type Tender

Minimum percentage of design	Academia		Industry		Overall	
	Number	Percentage	Number	Percentage	Number	Percentage
5	0	0.00	2	9.52	2	6.06
10	3	25.00	1	4.76	4	12.12
15	0	0.00	2	9.52	2	6.06
20	4	33.33	4	19.05	8	24.24
25	0	0.00	0	0.00	0	0.00
30	1	8.33	3	14.29	4	12.12
35	0	0.00	1	4.76	1	3.03
40	2	16.67	0	0.00	2	6.06
45	0	0.00	4	19.05	4	12.12
50	1	8.33	3	14.29	4	12.12
60	0	0.00	0	0.00	0	0.00
70	1	8.33	0	0.00	1	3.03
75	0	0.00	1	4.76	1	3.03
80	0	0.00	0	0.00	0	0.00
>80	0	0.00	0	0.00	0	0.00
Total	12	100.00	21	100.00	33	100.00



7 summarizes responses on the minimum percentage of design that should be completed by each concessionaire when submitting tender proposals for BOT-type projects: 76% of the respondents indicate that at least 20% of the design should be completed. Note that the appropriate percentage of design depends on the type of project under consideration, as indicated by some respondents.

### **Packaging Evaluation Criteria**

The aforementioned CSFs and criteria can be further evaluated and then classified into different evaluation packages. A parallel study conducted by the writer concludes that various criteria can be classified into four packages (Zhang 2004a): (1) financial; (2) technical; (3) managerial; and (4) safety, health, and environmental. In tailoring these criterion packages for a specific PPP project, appropriate adjustments should be made to reflect (1) the revised risk allocations in PPP projects in general, (2) the uniqueness of each specific concession, and (3) the composition of the concessionaire and the resources and capabilities of and the role played by each constituent company. Note that although the names of the criterion packages for concessionaire prequalification may be the same as those for tender evaluation, their contents and focuses are quite different. Prequalification criterion packages focus on the strength of the concessionaires while tender evaluation criterion packages focus on the advantages of the tenders submitted by prequalified concessionaires.

### **Negotiation for Best Value**

#### **Best and Final Offer**

After assessment of initial tender proposals, the client may conduct negotiations with the tenderers to achieve better value. Tenderers may be required to submit one or more revised proposals in accordance with the requirements raised by the client during the negotiations. Tender assessments are updated as the negotiation process proceeds and follows tenderers' submission of revised proposals. However, the client should avoid excessive clarification/negotiation and unplanned resubmission/revision of tenders. This practice of negotiation for best value has been conducted in Hong Kong and the U.K.

In PFI projects in the U.K., the public client arranges general discussions with shortlisted tenderers regarding their tenders after preliminary assessment. The client then requests tenderers to produce best and final offers (BAFOs), which are the tenderers' last and formal proposals and are clearly defined and further improved by including all points made during the course of general discussions. Following assessment and ranking of the BAFOs, the client will name and conduct negotiations with the preferred tenderer on particular issues of its tender. The negotiations will center on achieving a mutually acceptable contract that reflects the preferred tenderer's tolerance for risk and preferences for the reward structure. The public client ensures a better value than could have been achieved through a traditional public procurement route. In addition, the client may keep a reserve tenderer at the same time to increase competition. The client could invite the reserve tenderer for further negotiations toward a signed PFI contract should negotiations with the original preferred tenderer fail to reach final close.

### **Early Involvement of Financiers**

PPP projects are often delayed because financiers are brought into negotiations at too late a stage. Financiers often do not start their detailed consideration of a scheme until commercial terms have been agreed. At the preferred tenderer stage, the eventual provider may initially expect to fund the contract itself, but may subsequently bring in a financier, after which there could be a delay between the commercial agreement with the provider and the financial agreement with the financier. It would facilitate the contractual process if financiers were encouraged to participate at an earlier stage or even be required to do so as part of the initial project agreement.

### **International Practices in Concessionaire Selection**

#### **BOT Type Toll Roads in the United States**

A scoring system has been used (1) in four BOT-type toll roads in California—the Santa Ana Viaduct Expressway, Mid-State Tollway, San Miguel Mountain Parkway, and SR 91 Median Improvement—and (2) in three BOT-type toll roads in South Carolina—the Conway Bypass, Sea Islands Expressway, and Southern Connector. The South Carolina Department of Transportation (SCDOT) has initiated a multiattribute evaluation technique in which four charts represent tender evaluation results. A value chart displays each tender's scope of work, total project costs, right-of-way acquisition process, maintenance, law enforcement provisions, and toll collection policies. A second chart lists each tender's source of revenue, funding required from revenue bonds, toll collections, state obligation bonds, and investment earnings. A third chart compares cash outlays of each tender, and a fourth addresses financial risks by rating each tender's financial plan dependency in one of four categories: high, medium, medium-high, and very high. An overview tabulation would then be prepared, based on which the SCDOT finally determines and then begins negotiations with the preferred tenderer (Levy 1996).

#### **Private Finance Initiatives in the United Kingdom**

The U.K. was a pioneer in the privatization of public works and services and the cohost of the Channel Tunnel, the world's most costly BOT project. The PFI was launched in 1992 as a policy framework to facilitate PPPs, with the aim of delivering high-quality and cost-effective public works and services by incorporating initiatives from the private sector without undue immediate effects on the government's borrowing requirements (CIC 1998). The Treasury Committee (1996) reported that an average of 17% cost savings could be achieved through the PFI over a typical contract term of 25 to 30 years, compared with a public sector alternative.

The U.K. government developed a 14-stage procurement process for PFI projects (HM Treasury 1997). The 14 stages are (1) establishing the business need, (2) appraising the options, (3) outlining the business case, (4) creating the project team, (5) notice publication in the *Official Journal of the European Community*, (6) deciding tactics, (7) prequalification, (8) shortlisting, (9) refining the original appraisal, (10) invitation to negotiate, (11) negotiation with tenderers, (12) selection of preferred tenderer and negotiation to financial close, (13) award of contract, and (14) contract management.

Tenders are evaluated against various criteria in different as-



assessment areas. Evaluation criteria may include (1) innovation, (2) compatibility with operational approach, (3) deliverability, (4) flexibility, and (5) risk transfer. The assessment areas depend on the nature of the project and may include (1) risk transfer, (2) planning/site considerations, (3) design, (4) redundant premises, (5) consequential risk, (6) occupancy risk, (7) development risk, (8) program, (9) accommodation requirements, (10) facilities management, (11) alternative revenue streams, (12) contract framework, and (13) consortium structure (Blackwell 2000).

## Hong Kong

Five large BOT tunnel projects have been successfully developed in Hong Kong since the late 1960s, of which the first, the Cross Harbor Tunnel, was transferred to the government in 1999 after a 30-year concession period (Zhang and Kumaraswamy 2001). Based on past BOT experience, the Hong Kong government has recently formulated a well-structured concessionaire selection framework that incorporates the Kepner-Tregoe decision analysis technique. This framework has been used in the selection of concessionaires for two recent BOT projects, the Western Harbor Crossing and the Route 3 Country Park Section. Zhang et al. (2002) have discussed the application of the Kepner-Tregoe technique in the selection of concessionaires in these two projects.

The Hong Kong government sets up a tender evaluation committee for BOT projects that is under the leadership of the secretary for transport and includes three panels: (1) financial and general, (2) land and engineering, and (3) operation and transportation. The evaluation covers both financial and technical aspects. Each panel is responsible for its own area of expertise and assesses whether the submitted tender proposals can meet the government's requirements. Major stages of the selection process are (1) rapid tender appraisal and shortlisting, (2) negotiations with shortlisted tenderers, (3) detailed tender assessment, and (4) negotiations with the preferred tenderer.

Note that prequalification was not required in the selection process because the huge commitments in developing such major tunnel projects and high tendering costs would deter incompetent parties from submitting tenders. In addition, the whole concessionaire selection process is monitored by the Independent Commission Against Corruption, which has played a major role in minimizing corruption levels in Hong Kong.

## Conclusions

Public clients use private funds and draw in managerial skills and operational efficiencies from the private sector in various types of PPP arrangements. Significant realignment of risks among multiple project participants is a striking feature of such a scheme, in which the concessionaire undertakes far more commitments and assumes much broader and deeper risks than a mere contractor. Selection of the most suitable concessionaire is critical to the success of a PPP project. Successful selection of the most suitable concessionaire depends on a number of issues, which include the quality of (1) the general arrangement of the selection process, (2) of the definition of project objectives and core requirements, (3) identifying and defining project-specific criteria, (4) the prequalification and tender evaluation methodology, (5) the understanding of what these tenders can achieve, and (6) the negotiation skills.

An appropriate selection protocol should be followed that may incorporate public procurement principles, a best-value-selection approach, a competitive process, and a multicriteria prequalifica-

tion and tender evaluation methodology. A number of methods have been in practice for prequalification and tender evaluation and can be modified and combined to suit a particular project. Tender costs for BOT-type projects are extremely high. Interested parties should be shortlisted before asking them to submit tenders in order to minimize overall tendering costs in the industry. Critical successful factors and other important criteria can be coded and classified into relevant criterion packages to facilitate evaluation.

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