

Criteria for Selecting the Private-Sector Partner in Public–Private Partnerships

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Abstract: A critical issue in public–private partnerships (PPPs) in international infrastructure development is the selection of the right private-sector partner. This necessitates a best value source selection methodology in which the establishment of a set of appropriate selection criteria is a prerequisite. Various important selection criteria have been identified through a literature review of previous studies on critical success factors; experience drawing and lessons learning from international PPP practices; examination of selection criteria used in worldwide PPP projects; and interviews/correspondence with international PPP experts and practitioners. These identified criteria are classified into four evaluation packages for PPP projects in general: (1) financial, (2) technical, (3) safety, health, and environmental, and (4) managerial. The relative importance of these evaluation packages and the relative significance of the criteria within each package have been statistically analyzed based on a structured questionnaire survey of worldwide PPP expert opinions. These statistical analyses include validity and reliability analysis, Mann Whitney U tests, direct comparisons of mean criterion significance indexes and criterion rankings between respondents across public, private, and academic sectors, and a general rank agreement analysis across sectors for each evaluation package. These research outputs would facilitate the formulation of a multicriteria best value source selection methodology for PPP projects in general and the development of both objective and subjective evaluation criteria to select the right private-sector partner for a particular PPP project.

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Introduction

Different types of public–private partnerships (PPPs) have been practiced in worldwide infrastructure development (Davis 1996; Blackwell 2000; National 2003). PPPs cover a full range of infrastructure projects and services involving the resources of the private sector in the delivery of services and/or facilities for public use. These include everything from outsourcing of services to full privatization of government activities (National 2002). Many fundamental issues significantly distinguish PPPs from traditional design-bid-build contracts. These include: (1) a broad range of uncertainties and risks associated with the long-term PPP contract; (2) radical realignment of risks, responsibilities, and rewards among multiple project participants; (3) the private-sector partner undertakes far more responsibilities and assumes much more and deeper risks than a mere contractor; (4) nonrecourse or limited recourse and off-balance transactions; and (5) complicated contractual arrangements between project participants (Merna and

Dubey 1998; International 1999; Delmon 2000; Akintoye et al. 2003a).

Substantial amounts (if not most) of the broad range of risks associated with long-term PPPs are assumed by the private-sector partners. Therefore, the private-sector partner must have the necessary skills, experience, and resources to manage these risks and provide quality and cost effective facilities and services. Zhang (2004) maintains that the selection of the right private-sector partner is a critical success factor (CSF) for PPPs.

There are a variety of contract tendering and award procedures for public infrastructure projects which can be grouped into three main categories: (1) competitive tendering, (2) competitive negotiations, and (3) direct negotiations. It is claimed that the best way of finding a suitable private-sector partner is to keep some degree of competition among prospective partners. This is particularly important when private companies are tendering for a monopoly right to provide services through a long-term PPP contract (The World Bank 1997). A key issue in the competitive tendering process is how to evaluate the submitted tenders such that the most suitable private-sector partner is selected. This requires the identification of a set of major criteria and the establishment of their relative importance for the evaluation of private-sector partners for PPPs. The writer has thus conducted a research in this regard.

This paper is organized as follows. The next section discusses the approaches to the development of a four-package criterion set for the selection of the private-sector partner for PPPs. The third section describes the relative significance of the criteria within each evaluation package and the relative importance of the four evaluation packages. The fourth section introduces the structured questionnaire survey of worldwide PPP expert opinions on the

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relative importance of the four evaluation packages and the relative significance of the criteria within each of them. The next section analyzes the responses from the survey, including validity and reliability analysis of the survey, determination of the weights of the four evaluation packages and the significance of the criteria within each package, and an analysis of the similarities and differences in significance rating across the public, private, and academic sectors. The sixth section discusses how the outputs from this research can be used to develop a multicriterion best value source selection (BVSS) methodology for PPP projects in general. Finally, the paper closes with conclusions.

Development of a Four-Package Criterion Set

Important criteria for the selection of the private-sector partner are identified through a systematic research approach that includes (1) literature review of previous studies on CSFs for PPPs and other types of contracts, (2) experience drawing and lessons learning from worldwide PPP practices, (3) examination of evaluation criteria used in worldwide PPP projects, and (4) interviews/correspondence with international PPP experts and experienced practitioners.

Previous Studies on Critical Success Factors

Chua et al. (1999) maintain that success of a construction project is determined by four aspects: (1) project characteristics, (2) contractual arrangements, (3) project participants, and (4) interactive processes. Cheng et al. (2000) have studied the CSFs for construction partnering. Berry (1991) and Morledge and Owen (1997) have studied the CSFs in privatized infrastructure projects. Sanvido et al. (1992) list CSFs for construction projects. Parfitt and Sanvido (1993) provide a checklist that can be used as a guideline in predicting the success of a project. Barnhart (1987) presents common CSFs for integrating mergers and acquisitions. Tiong et al. (1992) and Tiong (1996) have identified six CSFs in winning build-operate-transfer (BOT) contracts. Tiong and Alum (1997) have further identified distinctive elements of winning proposals in competitive BOT tendering. Gupta and Narasimham (1998) provide additional CSFs for promoters to win BOT contracts.

Experience and Lessons from International Public-Private Partnership Practices

Experience has been drawn from international PPP practices. These include private finance initiative (PFI) projects in the United Kingdom (Blackwell 2000), BOT-type toll roads in the United States (Levy 1996), BOT tunnel projects in Hong Kong (Zhang et al. 2002) and BOT-type projects in Mainland China (Zhang and Kumaraswamy 2001), and project finance in many other countries (Davis 1996; International 1999; Scott and Martens 2000). These PPP projects include roads, bridges, ports, airports, and railways in the transportation sector; power, telecommunication, water supply, and waste disposal systems in the utilities sector; schools, hotels, hospitals, military facilities, and prisons. In addition, lessons have been learned from some failed PPP projects, such as the two BOT transportation projects in Thailand (Ogunlana 1997) and the failure of Malaysia's privatized national sewerage project (Abdul-Aziz 2001). The failure of this sewerage project was due to a number of reasons: (1) the lack of competition and transparency in the selection of the conces-

sionaire, (2) low equity-debt ratio, (3) over-generous "safety nets" extended to the concessionaire by the government, (4) inefficiencies and management blunders of the concessionaire, (5) frequent change of ownership of the concession company in a short period, and (6) strong public opposition.

The World Bank has provided reasons why many partnered infrastructure projects have been held-up: (1) wide gaps between public and private sector expectations, (2) lack of clear government objectives and commitment, (3) complex decision making, (4) poorly defined sector policies, (5) inadequate legal/regulatory frameworks, (6) poor risk management, (7) low credibility of government policies, (8) inadequate domestic capital markets, (9) lack of mechanisms to attract long-term finance from private sources at affordable rates, (10) poor transparency, and (11) lack of competition (Asian Business 1996).

Evaluation Criteria Used in Worldwide Public-Private Partnership Projects

Levy (1996) presents evaluation criteria used in some BOT toll roads in California and South Carolina. Blackwell (2000) lists the evaluation criteria used in PFI projects in the United Kingdom: (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, which 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. Hong Kong Government (1992) provides criteria for evaluating BOT tunnel projects.

Interviews/Correspondence with Public-Private Partnerships Experts and Experienced Practitioners

In the process of the literature review and case studies, interviews and correspondence with experts/experienced practitioners in many public, private, and academic organizations have been carried out. Both specific questions regarding a particular topic or PPP project and general questions regarding the general research and practices of infrastructure PPPs have been discussed in the interviews and correspondence. For example, in face-to-face and telephone interviews, to ensure fruitful results, lists of questions and discussion issues stressing different aspects of PPPs according to the types of subjects interviewed were sent ahead of the targeted dates of interview such that they had time to prepare and collect relevant information. In addition, postal, fax, and e-mail correspondences with a number of public clients, consultants, concessionaires, contractors, financiers, lawyers, and academic experts in many countries have been conducted. This interview/correspondence process has yielded a wealth of experiential information of and valuable expert opinions on PPPs.

Generation of a Four-Package Criterion Set

The CSFs identified in previous studies, evaluation criteria used in worldwide PPP projects, and experience and lessons from international PPP practices mentioned above are further analyzed, distilled, and coded, and criteria measuring the private-sector partner's capability in a particular area are packaged together. This enables the generalization of a four-package criterion set for private-sector partner selection in PPPs, supplemented by

interviews/correspondence with PPP experts and experienced practitioners. The four packages are (1) financial, including 35 criteria, (2) technical, including 26 criteria, (3) safety, health, and environmental, including 15 criteria, and (4) managerial, including 16 criteria. Please see Table 1 for details.

Significance of Evaluation Criteria

Criterion Significance within an Evaluation Package

The relative significance of different criteria within each evaluation package may be measured on a scale of 0–5, with 0=not applicable, 1=not significant, 2=fairly significant, 3=significant, 4=very significant, and 5=extremely significant.

Relative Importance of Evaluation Packages

There is also a need to compare the relative significance of criteria in different evaluation packages. This requires determining the relative importance of the four evaluation packages. One way to measure the relative importance of the four evaluation packages is to decide their weights, the summation of which is equal to 100%.

Questionnaire Survey

The writer had conducted a questionnaire survey from December 2000 to May 2001 of worldwide expert opinions on the suitable weights for the four evaluation packages and the significance of the criteria under each of them.

Discrete points of 0, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, and 80% are listed in the questionnaire for each of the four packages. A test of the questionnaire survey through interviews and correspondence with some PPP experts concluded that the weight of a single package should not be more than 80%. Respondents were requested to choose a suitable point according to their own opinion. The weights selected for the four packages by each respondent should add up to 100%. Respondents were also requested to rate the relative significance of the criteria within each package on a scale of 0–5 as mentioned previously.

Forty-six respondents returned complete questionnaires. They were from 42 different organizations/institutions in a number of countries and regions, including Australia, Hong Kong Special Administrative Region of China, India, Japan, Peru, the Philippines, Mainland China, Malaysia, Singapore, South Africa, Thailand, the United Kingdom and the United States. Twelve respondents are from public clients, 17 from private companies, and 17 from the academia. All respondents are of rich practical experience and/or have conducted meaningful research in PPP projects. Many of the respondents are from organizations that have rich PPP experience, knowledge, and expertise, for example, Essex County Council (United Kingdom), Dept. for International Development (United Kingdom), Partnerships United Kingdom, Manchester City Council (United Kingdom), Public/Private Partnership Unit of the Ministry of Defense (United Kingdom), Schools Private Finance Team of the Dept. for Education and Employment (United Kingdom), Gammon Construction Ltd. (Hong Kong), Nishimatsu Construction Co. Ltd., Hong Kong Branch, Southern Energy Asia-Pacific Ltd. (Hong Kong), Hong Kong Highways Dept., Hong Kong Transportation Dept., the Philippine BOT Center, International Finance Corporation, the

Asian Development Bank and the World Bank. In addition, many respondents provided constructive comments on PPPs although they did not return completed questionnaires.

Analysis of Survey Responses

Validity and Reliability of the Questionnaire Survey

The quality of the questionnaire is examined by conducting a validity and reliability analysis. The validity analysis examines whether what is expected to be measured is measured. This means that if all selection criteria within an evaluation package collectively explain the private-sector partner's capability in that area they should be significantly correlated with one another. For example, all criteria within the financial package should be significantly correlated to each other if they all measure the private-sector partner's financial capability. Pearson correlations are used to examine whether relationships between all criteria in a specific evaluation package exist to ensure validity. The results show that most of the criteria in an evaluation package are significantly correlated to each other. Therefore, the validity is ensured to a satisfactory degree. Table 2 shows the correlations between some of the criteria in the financial package. The correlations of other criteria in the financial package and those of the criteria in other packages are not shown here due to limitation of space.

To ensure that at a certain level the scale (0–5) for measuring the evaluation criteria yields the same result over time, the *internal consistency* method is used. This method aims at finding the reliability coefficient based on the average correlation amongst criteria and on the number of criteria. Cronbach alpha is performed to test the *internal consistency* reliability of the scale. As a reliability coefficient, the alpha varies from 0 to 1; the higher the alpha, the greater the internal consistency reliability. The alpha value is inflated by a large number of variables; so there is no set interpretation as to what is an acceptable alpha value. A rule of thumb that applies to most situations is (George and Mallery 2000):

$$\text{Alpha} > \begin{cases} 0.9 & \text{Excellent} \\ 0.8 & \text{Good} \\ 0.7 & \text{Acceptable} \\ 0.6 & \text{Questionable} \\ 0.5 & \text{Poor} \end{cases}$$

Alpha < 0.5 Unacceptable

The values of Cronbach alpha for criteria in different packages and for all criteria are listed in Table 3. That all alpha values are greater than 0.8917 indicates a good or excellent internal consistency.

Package Weights

The following formula is used to determine the mean weight of each evaluation package:

$$W_j = \frac{\sum_i w_i N_{ij}}{\sum_i N_{ij}} \quad \text{for } j = 1, 2, 3, 4$$

where W_j =mean weight for package j based on the responses; w_i =particular weight i ; $w_i \in (0, 5\%, 10\%, 15\%, 20\%, 25\%, 30\%,$

Table 1. Evaluation Packages for Public-Private Partnerships Projects in General

Financial	Technical	Health, safety, and environmental	Managerial
1. Sound financial analysis	1. Qualifications and experiences of key design and construction personnel	1. Qualifications/experience of safety, health and environmental personnel	1. Location of home office registration/main place of business
2. Total investment schedule	2. Competencies of designer/subdesigners, contractor/subcontractors	2. Management safety accountability	2. Constitution of the management, their qualification and experience
3. Payment and drawdown schedules	3. Quantities, conditions and ownership of plants and equipment	3. Past health and safety performance	3. Leadership and allocation of responsibilities in the consortium
4. Equity/debt ratio	4. Design standard	4. Past environmental performance	4. Organizational culture and structure
5. Sources and structure of main loans	5. Design life	5. Safety and health record/accident rate	5. Contractual relationships among participants
6. Sources and structure of standby financing facilities	6. Conforming to design requirements	6. Safety and health policy and management system	6. Working relationships among participants
7. Attractiveness of main loan agreement	7. Conforming to client's requirements	7. Noise mitigation and handling of dangerous/emergency situations	7. Coordination system within the consortium
8. Attractiveness of standby loan agreement	8. Additional facilities/services beyond client's requirements	8. Safety planning for handling hazardous materials	8. Dispute resolution system within the consortium
9. Attractiveness of shareholder agreement	9. Structural aspects	9. Environmental policy and management plan	9. Ability to address counterparty risk (default by other parties)
10. Low financial charges	10. Geotechnical and foundation aspects	10. ISO 14000 Certification	10. Communication and documentation systems
11. Fixed and low interest rate financing	11. Electrical and mechanical systems	11. Conformance to laws and regulations	11. Partnering and negotiation skills
12. Long-term loan financing and minimizing refinancing risk	12. Architectural/aesthetics aspects	12. Protection of flora and fauna	12. Trade union record
13. Abilities to deal with fluctuations in interest/exchange rate	13. Quality management and assurance systems	13. Protection of items of cultural/archeological values	13. Project management skills
14. Creative financial packages	14. Design and construction quality control schemes	14. Construction/demolition waste disposal	14. Staff training regime
15. Local financing	15. Construction technologies and methods	15. Control of air and water pollution	15. Risk management system
16. Concessionaire's ability to get supplementary external finance	16. Constructability		16. Procedures for transferring the project to the client
17. Currencies of loans and equity finance	17. Maintainability		
18. Currency of revenues and payments	18. Value engineering potential		
19. Financiers' abilities (especially the leading bank's)	19. Construction programs and abilities to meet them		
20. Minimal financial risks to the client	20. Material schedule		
21. Internal rate of return	21. Use of local equipment and materials		
22. Net present value	22. Construction cost schedule		
23. Tariff/toll setting up and adjustment mechanism	23. Insurance package for construction and operation		
24. Low toll/tariff levels	24. Tariff/toll collection technology		
25. Government's control on tolls/tariffs	25. Operation and maintenance policy		
26. Schedule of revenues	26. Operation and maintenance cost schedule		

Table 1. (Continued.)

Financial	Technical	Health, safety, and environmental	Managerial
27. Financial strength of the participants in the project company			
28. Strong financial commitments from shareholders			
29. Construction period			
30. Concession period			
31. Financial institution guarantees			
32. Insurance cover			
33. Sharing of profits with the client			
34. Less financial guarantee required from the client			
35. Ability to address commercial risk (e.g., supply and demand risk)			

Table 2. Pearson Correlations for Some Financial Criteria

Financial criterion	Sound financial analysis	Total investment schedule	Payment and drawdown schedule	Equity/debt ratio	Sources and structure		Attractiveness		
					Main loans	Financing facilities	Main loan agreement	Standby loan agreement	Shareholder agreement
Sound financial analysis	1.000	0.336	0.334	0.524	0.634	0.582	0.446	0.428	0.550
Total investment schedule	0.336*	1.000	0.493	0.339	0.168	0.460	0.435	0.466	0.404
Payment and drawdown schedule	0.334*	0.493**	1.000	0.120	0.222	0.373	0.431	0.532	0.497
Equity/debt ratio	0.524**	0.339*	0.120	1.000	0.420	0.400	0.463	0.194	0.531
Sources and structure of main loans	0.634**	0.168	0.222	0.420**	1.000	0.741	0.601	0.478	0.602
Sources and structure of standby financing facilities	0.582**	0.460**	0.373**	0.400*	0.741**	1.000	0.607	0.746	0.715
Attractiveness of main loan agreement	0.446**	0.435**	0.431**	0.463**	0.601**	0.607**	1.000	0.729	0.695
Attractiveness of standby loan agreement	0.428**	0.466**	0.532**	0.194	0.478**	0.746**	0.729**	1.000	0.633
Attractiveness of shareholder agreement	0.550**	0.404**	0.497**	0.531**	0.602**	0.715**	0.695**	0.633**	1.000

Note: * = correlation is significant at the 0.05 level (2-tailed); and ** = correlation is significant at the 0.01 level (2-tailed).

Table 3. Reliability Analysis

Criteria	Cronbach alpha
Financial	0.9482
Technical	0.9422
Safety, health, and environmental	0.9477
Managerial	0.8917
All criteria	0.9728

35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%); and N_{ij} = number of responses that assign w_i to package j .

The minimum and maximum weights assigned to each evaluation package and the mean weights by all respondents, and by respondents from the public, private, and academic sectors, respectively, are shown in Table 4. Overall, the weights for the financial, technical, safety, health, and environmental, and managerial packages are 39.64, 26.43, 21.07, and 14.88%, respectively. The three sectors assign package weights in a quite similar pat-

tern. The financial package is assigned a weight that is much higher than those of the other three packages, whereas the weight of the managerial package is much lower than those of the other three. The percentage differences of the mean weights by different sectors from the corresponding overall mean values based on all responses range from 2.89 to 16%. The public, private, and academic sectors rank the four packages in exactly the same

order. For practical use, it may be generalized that the four packages constitute 40, 25, 20, and 15% of the total weights (100%), respectively.

Criterion Significance Indexes and Ranks

The significance indexes of the criteria under each evaluation package are determined according to

$$S_i = \frac{(N_{i0} \times 0) + (N_{i1} \times 1) + (N_{i2} \times 2) + (N_{i3} \times 3) + (N_{i4} \times 4) + (N_{i5} \times 5)}{N_{i0} + N_{i1} + N_{i2} + N_{i3} + N_{i4} + N_{i5}} = \frac{N_{i1} + 2N_{i2} + 3N_{i3} + 4N_{i4} + 5N_{i5}}{N_{i0} + N_{i1} + N_{i2} + N_{i3} + N_{i4} + N_{i5}}$$

where S_i =mean significance index for the i th criterion under a package; N_{i0} =number of responses as 0 for the i th criterion under a package; N_{i1} =number of responses as 1 for the i th criterion under a package; N_{i2} =number of responses as 2 for the i th criterion under a package; N_{i3} =number of responses as 3 for the i th criterion under a package; N_{i4} =number of responses as 4 for the i th criterion under a package; and N_{i5} =number of responses as 5 for the i th criterion under a package.

Consolidated summaries of the mean significance indexes of the criteria in different evaluation packages and their ranks by overall rating or by different sectors appear in Tables 5–8. The values of skewness and kurtosis of the significance indexes of different criteria according to overall ratings are also provided in these tables.

Similarities and Differences in Significance Rating across Sectors

Mann Whitney U Test

The Mann Whitney U test (George and Mallery 2000) is a non-parametric test used to compare two independent groups of sampled data. The statistic of this test is U, which is compared to a table of critical values based on the sample size of each group. Here, the Mann Whitney U test is conducted to determine whether the mean significance of each criterion is equal across the public, private, and academic sectors. If the U value exceeds its critical value at some significance level (usually 0.05) it means that there is evidence to accept the hypothesis that the mean significance of each criterion is equal between two sectors.

The results of the test show that the mean significances of most of the criteria are not statistically different among the three sectors. For example, as shown in Table 9, only four out of the 35 financial criteria (11%) are indicated as statistically different,

namely, local financing, ability of the concessionaire to get supplementary external financing, minimal financial risks to the client, and schedule of revenues. Two of them are between public and private sectors and three between private and academic sectors. No financial criterion is statistically different between public and academic sectors. Therefore, it can be concluded that the public, private, and academic sectors consider evaluation criteria very similarly (for example, 89% for financial criteria) in the selection of the private sector partner.

Comparison of Ranking Order and Mean Significance Indexes across Sectors

As shown in Table 5, for the thirty-five criteria in the financial package, overall, all are rated as being greater than 3 (significant) except for the three criteria attractiveness of shareholder agreement, attractiveness of standby loan agreement, and local financing, which are rated at a level close to the significant rating (greater than 2.8). In addition to these three criteria, the private sector also rates the ability of the concessionaire to get supplementary external financing and the sources and structure of standby financing facilities at a level close to the significant rating. However, the private sector rates local financing at a level only slightly higher than the fairly significant rating (2.08). The public sector rates all criteria at a level greater than 3 (significant) except for the criteria sources and structure of standby financing facilities and attractiveness of standby loan agreement, which are rated at 2.87 and 2.75, respectively. Overall, the top ten most significant criteria are sound financial analysis, net present value, tariff/toll setting up and adjustment mechanism, ability to address commercial risk, minimal financial risks to the client, internal rate of return, financial strength of the participants in the project company, total investment schedule, concession period, and strong financial commitments from shareholders. Overall, these ten cri-

Table 4. Package Weights and their Ranks

Evaluation package	Minimum (%)	Maximum (%)	Mean weight (%)					Difference from overall mean value (%)		
			Overall	Public	Private	Academic	Rank	Public	Private	Academic
Financial	20.00	70.00	39.64	37.92	43.93	37.19	1	4.34	10.82	6.18
Technical	5.00	50.00	26.43	29.58	25.36	25.00	2	11.92	4.05	5.41
Safety, health, and environmental	10.00	40.00	21.07	19.58	20.71	22.50	3	7.07	1.71	6.79
Managerial	0.00	50.00	14.88	12.50	16.43	15.31	4	16	10.42	2.89

Table 5. Significances and Ranks of Financial Criteria across Sectors

Criterion	Overall				Public		Private		Academic	
	Skewness	Kurtosis	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Sound financial analysis	−1.271	0.528	4.44	1	4.55	1	4.21	3	4.56	1
Net present value	−1.247	1.554	4.19	2	4.27	2	4.33	1	4	7
Tariff/toll setting up and adjustment mechanism	−1.155	0.982	4.14	3	4.18	4	4	5	4.25	2
Ability to address commercial risk (e.g., supply and demand risks)	−0.614	−0.585	3.98	4	3.64	12	4.07	4	4.13	4
Minimal financial risks to the client	−0.381	0.366	3.95	5	3.55	17	4.29	2	3.94	8
Internal rate of return	−0.456	−0.765	3.95	6	3.73	10	4	6	4.06	5
Financial strength of the participants in the project company	−1.384	3.458	3.85	7	4	6	3.36	15	4.19	3
Total investment schedule	−0.873	0.601	3.81	8	4.27	3	3.33	17	3.94	9
Concession period	−0.109	−0.749	3.81	9	3.82	8	3.81	8	3.81	14
Strong financial commitments from shareholders	−0.236	−0.605	3.78	10	4.09	5	3.5	13	3.81	15
Financiers' abilities (especially the leading bank's)	−0.057	−0.62	3.76	11	3.64	13	4	7	3.63	20
Low toll/tariff levels	−0.798	0.078	3.67	12	3.36	23	3.8	9	3.75	17
Government's control on tolls/tariffs	−0.781	0.926	3.64	13	3.45	20	3.53	12	3.88	12
Less financial guarantee required from the client	−0.367	−0.752	3.6	14	3.18	27	3.8	10	3.69	18
Equity/debt ratio	−0.242	−1.219	3.59	15	3.82	9	3.08	22	3.87	13
Insurance cover	0.103	−0.69	3.57	16	4	7	3.33	18	3.5	25
Low financial charges	−0.082	−0.65	3.56	17	3.3	25	3.47	14	3.81	16
Abilities to deal with fluctuations in interest/exchange rates	−1.321	2.031	3.56	18	3.64	14	3.07	24	3.94	10
Sources and structure of main loans	−0.515	−0.258	3.54	19	3.45	21	3.57	11	3.56	24
Financial institution guarantees	−1.092	2.303	3.53	20	3.73	11	3.31	19	3.63	22
Long-term loan financing and minimizing refinancing risk	−1.429	4.06	3.51	21	3.55	18	3.36	16	3.63	21
Schedule of revenues	−0.807	1.082	3.46	22	3.64	15	2.64	32	4.06	6
Fixed and low interest rate financing	−1.378	3.839	3.44	23	3.55	19	3.31	20	3.5	26
Construction period	−1.034	1.788	3.44	24	3.27	26	3	26	3.94	11
Payment and drawdown schedule	0.198	−1.074	3.4	25	3.64	16	3.13	21	3.5	27
Creative financial packages	−1.092	1.105	3.35	26	3.45	22	3	25	3.6	23
Ability of the concessionaire to get supplementary external financing	0.232	−1.062	3.29	27	3.18	28	2.93	30	3.69	19
Sharing of profits with the client	−0.041	−0.068	3.22	28	3.18	29	3	27	3.44	28
Currency of revenues and payments	−0.658	0.358	3.18	29	3	34	3.08	23	3.38	29
Attractiveness of main loan agreement	−0.66	−0.065	3.07	30	3.18	30	3	28	3.06	33
Currencies of loans and equity finance	−0.331	0.165	3.07	31	2.82	35	3	29	3.31	30
Sources and structure of standby financing facilities	−0.201	−0.424	3	32	3.36	24	2.86	31	2.87	34
Attractiveness of shareholder agreement	0.396	−0.154	2.95	33	3.09	32	2.64	33	3.13	32
Attractiveness of standby loan agreement	−0.074	−0.855	2.8	34	3.18	31	2.57	34	2.75	35
Local financing	−0.563	−0.545	2.8	35	3.09	33	2.08	35	3.19	31

teria are rated at a significance level greater than 3.78, meaning that they are very significant. The public, private, and academic sectors rate these ten criteria at a level greater than 3.55, 3.33, and 3.81, respectively. As shown in Table 10, the public and academic sectors agree with the overall ratings by listing eight of these ten criteria among the top ten, whereas the private sector ranks seven of them among the top ten. Therefore, it may be concluded that all sectors consider these ten criteria very significant.

As shown in Table 6, for the twenty-six criteria in the technical package, overall, all are rated as being at or greater than significant except for five criteria, two of which, electrical and mechanical systems (significance index 2.95) and insurance package for construction and operation (significance index 2.93), are very close to significant, and three of which, use of local equipment and materials, material schedule, and additional facilities/services beyond client's requirements, are close to significant (all greater

Table 6. Significances and Ranks of Technical Criteria across Sectors

Criterion	Overall				Public		Private		Academic	
	Skewness	Kurtosis	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Qualifications and experiences of key design and construction personnel	−0.232	−1.113	4.14	1	4.25	1	3.93	3	4.25	1
Conforming to client's requirements	−1.196	1.761	4.02	2	4	4	4	2	4.06	3
Competencies of designer/subdesigners, contractor/subcontractors	−0.327	−0.139	3.98	3	4.08	3	3.71	4	4.13	2
Conforming to design requirements	−0.302	−0.193	3.83	4	4.17	2	3.43	8	3.94	5
Construction programs and abilities to meet them	−0.421	−0.025	3.75	5	3.42	10	4.08	1	3.75	9
Design and construction quality control schemes	−0.357	−0.958	3.72	6	3.75	6	3.53	6	3.88	6
Maintainability	−1.698	3.954	3.71	7	3.42	11	3.62	5	4	4
Design life	−0.193	−0.571	3.6	8	3.75	7	3.5	7	3.56	17
Design standard	−0.254	−0.625	3.58	9	4	5	3.2	11	3.62	15
Quality management and assurance systems	−0.31	−0.845	3.55	10	3.58	8	3.27	9	3.8	8
Operation and maintenance policy	−1.394	3.224	3.43	11	3.42	12	3.21	10	3.63	13
Constructability	−0.29	0.195	3.34	12	3.17	18	3	12	3.75	10
Value engineering potential	0.093	−1.028	3.23	13	3.42	13	2.75	13	3.44	20
Geotechnical and foundation aspects	−0.757	0.796	3.2	14	3.25	16	2.54	16	3.73	11
Construction technologies and methods	−0.13	−0.008	3.15	15	3.08	19	2.62	15	3.63	14
Tariff/toll collection technology	−0.422	0.131	3.15	16	3.58	9	2.38	22	3.44	21
Quantities, conditions and ownership of plants and equipment	0.283	−0.513	3.14	17	2.83	25	2.67	14	3.81	7
Operation and maintenance cost schedule	−0.757	0.878	3.14	18	3.33	14	2.5	18	3.56	18
Structural aspects	−1.007	1.624	3.13	19	3.33	15	2.33	23	3.6	16
Construction cost schedule	−0.962	1.83	3.13	20	3.08	20	2.42	20	3.69	12
Architectural/aesthetics aspects	0.203	−1.056	3.03	21	3.25	17	2.54	17	3.27	23
Electrical and mechanical systems	−1.187	1.493	2.95	22	3.08	21	2.25	24	3.4	22
Insurance package for construction and operation	−0.344	−0.837	2.93	23	3	22	2.46	19	3.25	24
Use of local equipment and materials	−0.761	0.525	2.83	24	2.83	26	1.92	26	3.5	19
Material schedule	−0.308	−0.311	2.75	25	2.92	23	2.42	21	2.88	25
Additional facilities/services beyond client's requirements	−0.528	0.51	2.6	26	2.92	24	2	25	2.81	26

than 2.6). The public sector rates three of the five criteria and the academic two of them at a level close or very close to significant (all greater than 2.81). The public sector also rates quantities, conditions, and ownership of plants and equipment at a level close to significant (2.83). It is also noticed that the private-sector rates thirteen of the technical criteria at a level between fairly significant and significant, and one criterion, use of local equipment and materials, at a level slightly lower than the fairly significant level (1.92). Overall, the top ten most significant criteria are qualifications and experiences of key design & 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 of the project, design standard, and quality management and assurance systems. Overall, these ten criteria are rated at a significance level greater than 3.55, meaning that they are very significant. The public, private, and academic sectors rate these ten criteria at a level greater than 3.42, 3.2, and 3.56, respectively. As shown in Table 10, the public and private sectors

agree with the overall ratings by listing nine of these ten criteria among the top ten, whereas the academic sector ranks eight of them among the top ten. Therefore, it may be concluded that all sectors consider these ten criteria very significant.

As shown in Table 7, for the fifteen criteria in the safety, health, and environmental package, overall, all are rated greater than 3.29 (higher than significant) except for one criterion, ISO 14000 certification (significance index 2.75), which is close to significant. The public sector rates all of the fifteen criteria greater than the significant level. The private sector rates twelve of them greater than the significant level, one very close to the significant level, and two between fairly significant and significant. The academic sector rates fourteen of the fifteen criteria greater than the significant level, and one close to significant. All sectors rate ISO 14000 certification between fairly significant and significant. Overall, the top five most significant criteria are conformance to laws and regulations, control of air and water pollution, past environmental performance, protection of items of cultural/archeological values, and management safety accountability. Overall, these five criteria are rated at a significance level greater

Table 7. Significances and Ranks of Safety, Health and Environmental Criteria across Sectors

Criterion	Overall				Public		Private		Academic	
	Skewness	Kurtosis	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Conformance to laws and regulations	-0.983	0.028	4.21	1	4.33	1	3.87	1	4.44	1
Control of air and water pollution	-0.372	0.44	3.62	2	3.83	5	3.29	2	3.75	7
Past environmental performance	0.01	-0.385	3.59	3	3.75	7	3.15	5	3.81	4
Protection of items of cultural/archeological values	-0.306	-0.491	3.59	4	4	2	3.08	8	3.69	10
Management safety accountability	-0.082	-0.65	3.56	5	3.75	8	3.15	6	3.75	8
Safety and health policy and management system	-0.207	-0.305	3.56	6	3.67	10	3.08	9	3.88	3
Safety planning for handling hazardous materials	-0.385	-0.787	3.54	7	3.75	9	3	12	3.81	6
Qualifications/experience of safety, health and environmental personnel	-0.211	-0.736	3.51	8	3.42	13	3.2	4	3.88	2
Past health and safety performance	0.338	-0.346	3.49	9	3.5	11	3.23	3	3.69	9
Safety and health record/accident rate	0.039	-0.567	3.49	10	3.5	12	3.08	10	3.81	5
Environmental policy and management plan	-0.344	-0.63	3.45	11	3.83	6	3.14	7	3.44	12
Construction/demolition waste disposal	-0.299	-0.239	3.43	12	3.92	4	3	11	3.44	13
Noise mitigation and handling of dangerous/emergency situations	-0.222	-0.053	3.3	13	3.42	14	2.92	13	3.5	11
Protection of flora and fauna	-0.85	0.966	3.29	14	4	3	2.46	15	3.44	14
ISO 14000 certification	0.753	0.344	2.75	15	3	15	2.54	14	2.75	15

than 3.56, meaning that they are very significant. The public, private, and academic sectors rate these five criteria at a level greater than 3.75, 3.08, and 3.69, respectively. As shown in Table 10, the public and private sectors list three of the five criteria, and the academic sector two among the top five. Therefore, it may be concluded that the five criteria are very significant based on overall ratings and ratings according to the public and academic sectors.

As shown in Table 8, for the sixteen criteria in the managerial package, overall, all are rated greater than 3.12 (higher than significant) except for one criterion, location of home office registration/main place of business (significance index 2.4), which is between fairly significant and significant. The public and aca-

demical sectors rate this criterion close to significant (2.92 and 2.81, respectively) and the other fifteen criteria greater than 3.33 and 3.31, respectively. The private-sector rates ten of the sixteen managerial criteria greater than the significant level, three close to the significant level (all at 2.86), two between fairly significant and significant (2.29 and 2.64, respectively), and one, location of home office registration/main place of business, lower than the fairly significant level at 1.5. Overall, the top five most significant criteria are project management skills, constitution of the management, their qualification and experience, coordination system within the consortium, leadership and allocation of responsibilities in the consortium, and working relationships among participants. Overall, these five criteria are rated at a significance level

Table 8. Significances and Ranks of Managerial Criteria across Sectors

Criterion	Overall				Public		Private		Academic	
	Skewness	Kurtosis	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Project management skills	-0.772	0.94	4.05	1	4.08	2	3.93	1	4.13	2
Constitution of the management, their qualification and experience	-0.157	-0.768	3.93	2	3.75	7	3.64	6	4.31	1
Coordination system within the consortium	-0.313	-0.553	3.9	3	4	3	3.64	5	4.06	5
Leadership and allocation of responsibilities in the consortium	-0.166	-1.022	3.88	4	3.83	5	3.73	3	4.06	3
Working relationships among participants	0.14	-0.681	3.88	5	3.83	6	3.71	4	4.06	4
Contractual relationships among participants	0.241	-0.717	3.81	6	3.75	8	3.86	2	3.81	8
Dispute resolution system within the consortium	-0.412	-0.197	3.64	7	3.92	4	3.36	10	3.69	10
Communication and documentation systems	-0.534	0.388	3.64	8	3.33	14	3.5	7	4	6
Partnering and negotiation skills	-0.432	-0.238	3.62	9	3.33	15	3.5	8	3.94	7
Ability to address counterparty risk (default by other parties)	-0.24	-0.754	3.61	10	3.73	10	3.43	9	3.69	9
Procedures for transferring the project to the client by the end of the concession	-0.663	0.106	3.41	11	4.09	1	2.86	11	3.44	14
Risk management system	-0.407	0.033	3.4	12	3.67	11	2.86	12	3.69	11
Organizational culture and structure	-0.349	-0.25	3.33	13	3.75	9	2.64	14	3.63	12
Trade union record	0.048	-0.449	3.21	14	3.5	12	2.86	13	3.31	15
Staff training regime	-0.103	-0.556	3.12	15	3.5	13	2.29	15	3.56	13
Location of home office registration/main place of business	-0.122	-0.832	2.4	16	2.92	16	1.5	16	2.81	16

Table 9. Mann Whitney U test for Financial Criteria across Sectors

Financial criteria	Between public and private		Between public and academic		Between private and academic	
	Asymp. sig. (2-tailed)	Exact sig. [2(1-tailed Sig.)]	Asymp. sig. (2-tailed)	Exact sig. [2(1-tailed Sig.)]	Asymp. sig. (2-tailed)	Exact sig. [2(1-tailed Sig.)]
Sound financial analysis	0.262	0.344	0.854	0.904	0.255	0.334
Total investment schedule	0.052	0.061	0.315	0.368	0.172	0.202
Payment and drawdown schedule	0.280	0.305	0.797	0.827	0.265	0.299
Equity/debt ratio	0.112	0.134	0.956	0.959	0.060	0.072
Sources and structure of main loans	0.585	0.609	0.436	0.481	0.965	0.984
Sources and structure of standby financing facilities	0.146	0.183	0.177	0.212	0.879	0.886
Attractiveness of main loan agreement	0.793	0.809	0.847	0.865	0.947	0.951
Attractiveness of standby loan agreement	0.078	0.095	0.170	0.212	0.480	0.525
Attractiveness of shareholder agreement	0.163	0.202	0.872	0.904	0.172	0.193
Low financial charges	0.707	0.723	0.132	0.165	0.304	0.338
Fixed and low interest rate financing	0.937	0.942	0.978	0.981	0.904	0.926
Long-term loan financing and minimizing refinancing risk	0.816	0.851	0.679	0.716	0.982	0.984
Abilities to deal with fluctuations in interest/exchange rates	0.530	0.572	0.289	0.368	0.171	0.208
Creative financial packages	0.572	0.609	0.801	0.838	0.415	0.451
Local financing	0.060	0.072	0.979	0.981	0.025	0.028
Ability of the concessionaire to get supplementary external financing	0.285	0.317	0.103	0.134	0.047	0.058
Currencies of loans and equity finance	0.859	0.893	0.284	0.318	0.339	0.377
Currency of revenues and payments	0.547	0.566	0.379	0.422	0.943	0.945
Financiers' abilities (especially the leading bank's)	0.422	0.467	0.789	0.827	0.227	0.275
Minimal financial risks to the client	0.012	0.018	0.073	0.121	0.154	0.240
Internal rate of return	0.453	0.501	0.378	0.422	0.775	0.790
Net present value	0.712	0.760	0.654	0.680	0.418	0.470
Tariff/toll setting up and adjustment mechanism	0.714	0.753	0.609	0.645	0.351	0.402
Low toll/tariff levels	0.141	0.164	0.261	0.294	0.484	0.520
Government's control on tolls/tariffs	0.684	0.721	0.255	0.294	0.538	0.572
Schedule of revenues	0.047	0.066	0.164	0.195	0.002	0.002
Financial strength of the participants in the project company	0.255	0.291	0.569	0.610	0.059	0.085
Strong financial commitments from shareholders	0.103	0.134	0.430	0.481	0.371	0.400
Construction period	1.000	1.000	0.076	0.099	0.095	0.110
Concession period	0.937	0.942	0.834	0.865	0.921	0.926

Note: Bold text means statistically different.

greater than 3.88, meaning that they are very significant. The public, private, and academic sectors rate these five criteria at a level greater than 3.75, 3.64, and 4.06, respectively. Therefore, it may be concluded that the five criteria are very significant to all sectors. As shown in Table 10, the academic sector also list these five criteria as the top five, whereas the public and private sectors list three and four of them among the top five, respectively.

Overall Ranking Agreement Analysis

In the previous sections, criterion significance indexes and their ranks have been derived according to overall responses, and responses from different sectors. It is useful to examine the agreement in the ranking of criterion significance indexes across sectors. Okpala and Aniekwu (1988) provide a quantitative method for agreement analysis of ranks by two groups. In this method, the rank agreement factor (RA) is used. The RA shows the average absolute difference in the ranking of the items between two groups. For any two groups, let the rank of the i th item in group 1 be R_{i1} and in group 2 be R_{i2} , N be the total number of items and $j=N-i+1$. Then,

The RA is defined as

$$RA = \frac{\sum_{i=1}^N |R_{i1} - R_{i2}|}{N} \quad (1)$$

The maximum rank agreement factor (RA_{\max}) is defined as

$$RA_{\max} = \frac{\sum_{i=1}^N |R_{i1} - R_{j2}|}{N} \quad (2)$$

The percentage disagreement (PD) is defined as

Table 10. Most Significant Criteria in Different Evaluation Packages

Overall	Public	Private	Academic
Top ten financial criteria			
Sound financial analysis	Sound financial analysis	Net present value	Sound financial analysis
Net present value	Net present value	Minimal financial risks to the client	Tariff/toll setting up and adjustment mechanism
Tariff/toll setting up and adjustment mechanism	Total investment schedule	Sound financial analysis	Financial strength of the participants in the project company
Ability to address commercial risk (e.g., supply and demand risks)	Tariff/toll setting up and adjustment mechanism	Ability to address commercial risk (e.g., supply and demand risks)	Ability to address commercial risk (e.g., supply and demand risks)
Minimal financial risks to the client	Strong financial commitments from shareholders	Tariff/toll setting up and adjustment mechanism	Internal rate of return
Internal rate of return	Financial strength of the participants in the project company	Internal rate of return	Schedule of revenues
Financial strength of the participants in the project company	Insurance cover	Financiers' abilities (especially the leading bank's)	Net present value
Total investment schedule	Concession period	Concession period	Minimal financial risks to the client
Concession period	Equity/debt ratio	Low toll/tariff levels	Total investments schedule
Strong financial commitments from shareholders	Internal rate of return	Less financial guarantee required from the client	Abilities to deal with fluctuations in interest/exchange rates
Top 10 technical criteria			
Qualifications and experiences of key design and construction personnel	Qualifications and experiences of key design and construction personnel	Construction programs and abilities to meet them	Qualifications and experiences of key design and construction personnel
Conforming to client's requirements	Conforming to design requirements	Conforming to client's requirements	Competencies of designer/subdesigners, contractors/subcontractors
Competencies of designer/subdesigners, contractor/subcontractors	Competencies of designer/subdesigners, contractor/subcontractors	Qualifications and experiences of key design and construction personnel	Conforming to client's requirements
Conforming to design requirements	Conforming to client's requirements	Competencies of designer/subdesigners, contractor/subcontractors	Maintainability
Construction programs and abilities to meet them	Design standard	Maintainability	Conforming to design requirements
Design and construction quality control schemes	Design and construction quality control schemes	Design and construction quality control schemes	Design and construction quality control schemes
Maintainability	Design life	Design life	Quantities, conditions, and ownership of plants and equipment
Design life	Quality management and assurance systems	Conforming to design requirements	Quality management and assurance systems
Design standard	Tariff/toll collection technology	Quality management and assurance systems	Construction programs and abilities to meet them
Quality management and assurance systems	Construction programs and abilities to meet them	Operation and maintenance policy	Constructability
Top 5 safety, health, and environmental criteria			
Conformance to laws and regulations	Conformance to laws and regulations	Conformance to laws and regulations	Conformance to laws and regulations
Control of air and water pollution	Protection of items of cultural/archeological values	Control of air and water pollution	Qualifications/experience of safety, health, and environment personnel
Past environmental performance	Protection of flora and fauna	Past health and safety performance	Safety and health policy and management system
Protection of items of cultural/archeological values	Protection of flora and fauna	Qualifications/experience of safety, health, and environmental personnel	Safety and health policy and management
Protection of items of cultural/archeological values	Construction/demolition waste disposal	Qualifications/experience of safety, health, and environmental personnel	Past environmental performance
Management safety accountability	Control of air and water pollution	Past environmental performance	Safety and health record/accident rate

Table 10. (Continued.)

Overall	Public	Private	Academic
Top 5 Managerial criteria			
Project management skills	Procedures for transferring the project to the client by the end of the concession	Project management skills	Constitution of management, their qualification and experience
Constitution of the management, their qualification and experience	Project management skill	Contractual relationships among participants	Project management skills
Coordination system within the consortium	Coordination system within the consortium	Leadership and allocation of responsibilities in the consortium	Leadership and allocation of responsibilities in the consortium
Leadership and allocation of responsibilities in the consortium	Dispute resolution system within the consortium	Working relationships among participants	Working relationships among participants
Working relationships among participants	Leadership and allocation of responsibilities in the consortium	Coordination system within the consortium	Coordination system within the consortium

$$PD = \frac{\sum_{i=1}^N |R_{i1} - R_{i2}|}{\sum_{i=1}^N |R_{i1} - R_{i2}|} \times 100 \quad (3)$$

The percentage agreement (PA) is defined as:

$$PA = 100 - PD \quad (4)$$

The higher the value RA is, the lower the agreement between the two groups. A RA of zero means perfect agreement. The RAs, RA_{\max} , and PAs for the criteria under different evaluation packages are shown in Table 11. The calculation details of these parameters for criteria in the technical package appear in Table 12. It is seen from Table 11 that there is quite a big disagreement in the ranking of the criteria in the safety, health, and environmental package between the public sector and the private or the academic sector, with PAs of only 48.21 and 35.71%, respectively. The PAs across sectors for criteria in the financial, technical and managerial packages range from 57.81 to 81.25%.

Development of Best Value Source Selection Methodology

Best Value Source Selection

BVSS has been increasingly used in the procurement of public works and services (Gransberg and Ellicott 1997; Akintoye et al. 2003b). BVSS is a process in which the public client evaluates and compares both cost and noncost factors in the selection of the most advantageous offer that will give the public client the best value for its money. BVSS requires that the chosen offer meet the client's needs in the most effective, economical, and timely manner (U.S. AMC, 1998). BVSS allows multiple criteria tradeoffs,

and, consequently, enables the public client to select a higher priced proposal provided that the additional cost is justified by the increased value it generated (Mickaliger 2001).

Problems Related to Best Value Source Selection

BVSS is open to wide criticism by contracting firms that are competing for federal contracts and by government contracting specialists who believe the process is used with broad discretion to award a government contract. It has even acquired the pejorative connotation of being subjective and many times less than fair. The skepticism associated with BVSS has led some companies to question whether they will receive fair evaluations during the selection process. It has also caused them to revisit bid decisions in the context of return-on-investment and risk (Mickaliger 2001).

Tradeoff between Cost and Technical Criteria

BVSS requires that technical criteria be evaluated directly against cost criteria. At present, there is no standard method for evaluating technical proposals. If the public client cannot justify the additional costs by the increased value, other tenderers will justifiably file protests. Inappropriate criteria or weights may substantially impair the value to the public. Therefore, actual project data should be collected and correlated to completed project value, and sensitivity analysis conducted to determine the appropriate value of technical weighting and the cost weighting in order to achieve the "real" best value through an equitable BVSS process (Molenaar and Johnson 2003).

Best Value Source Selection in Public-Private Partnerships

The courts have considered the challenges to BVSS and the legal decisions have upheld BVSS as long as the government docu-

Table 11. Agreement Analysis of the Ranking of Criteria under Different Evaluation Packages

Evaluation package	Maximum rank agreement	Rank agreement factor			Percentage agreement (%)		
		Public versus private	Public versus academic	Private versus academic	Public versus private	Public versus academic	Private versus academic
Financial	17.49	6.69	6.23	6.17	61.76	64.38	64.71
Technical	13	3.46	4.69	3.77	73.37	63.91	71.01
Safety, health, and environmental	7.47	3.87	4.8	3.07	48.21	35.71	58.93
Managerial	8	3.375	3.375	1.5	57.81	57.81	81.25

Table 12. Agreement Analysis of Ranking of Technical Criteria across Sectors

Evaluation criterion	Maximum absolute difference in rank			Actual absolute difference in rank					
	Ranks by sectors		Maximum absolute difference	Ranks by sectors			Public-Private	Public-Academic	Private-Academic
	1	2		Public	Private	Academic			
Qualifications and experiences of key design and construction personnel	1	26	25	1	3	1	2	0	2
Conforming to design requirements	2	25	23	2	8	5	6	3	3
Competencies of designer/subdesigners, contractor/subcontractors	3	24	21	3	4	2	1	1	2
Conforming to client's requirements	4	23	19	4	2	3	2	1	1
Design standard	5	22	17	5	11	15	6	10	4
Design and construction quality control schemes	6	21	15	6	6	6	0	0	0
Design life	7	20	13	7	7	17	0	10	10
Quality management and assurance systems	8	19	11	8	9	8	1	0	1
Tariff/toll collection technology	9	18	9	9	22	21	13	12	1
Construction programs and abilities to meet them	10	17	7	10	1	9	9	1	8
Maintainability	11	16	5	11	5	4	6	7	1
Operation and maintenance policy	12	15	3	12	10	13	2	1	3
Value engineering potential	13	14	1	13	13	20	0	7	7
Operation and maintenance cost schedule	14	13	1	14	18	18	4	4	0
Structural aspects	15	12	3	15	23	16	8	1	7
Geotechnical and foundation aspects	16	11	5	16	16	11	0	5	5
Architectural/aesthetics aspects	17	10	7	17	17	23	0	6	6
Constructability	18	9	9	18	12	10	6	8	2
Construction technologies and methods	19	8	11	19	15	14	4	5	1
Construction cost schedule	20	7	13	20	20	12	0	8	8
Electrical and mechanical systems	21	6	15	21	24	22	3	1	2
Insurance package for construction and operation	22	5	17	22	19	24	3	2	5
Material schedule	23	4	19	23	21	25	2	2	4
Additional facilities/services beyond client's requirements	24	3	21	24	25	26	1	2	1
Quantities, conditions, and ownership of plants and equipment	25	2	23	25	14	7	11	18	7
Use of local equipment and materials	26	1	25	26	26	19	0	7	7
Sum of absolute differences in rank			338				90	122	98
(Maximum) rank agreement factor			13				3.46	4.69	3.77
Percentage agreement (%)							73.37	63.91	71.01

ments its reasons for the tradeoff between cost and non-cost factors (Mickaliger 2001). Therefore, the public client should ensure that its best value award meet the requirements of the solicitation, standards of the legal decisions, and can withstand any protest proceeding after contract award. This necessitates the determination of appropriate criteria and their relative significance, against which proposals from the private sector are evaluated equitably, and consequently, a sound and defensible contract award decision made. The evaluation criteria for PPPs identified in this research through a systematic approach, the classification of them into four evaluation packages, and the determination of the relative significance of criteria within each package and the relative importance of the four packages based on international expert opinions would enable the development of an appropriate BVSS methodology for PPPs. This will undoubtedly promote international infrastructure development through PPPs.

Conclusions

Selecting the right private-sector partner is critical to the success of an infrastructure project developed through PPPs. This requires

the establishment of suitable evaluation criteria and the determination of their relative significance. A systematic research approach enables the writer to identify many important criteria that are classified into four evaluation packages. The relative significance of the criteria within each package and the relative importance of the four packages have been determined based on a structured questionnaire survey of international expert opinions.

Statistical analyses of the survey responses show that:

- (1) The quality of the questionnaire is ensured in terms of validity, reliability, and internal consistency;
- (2) The public, private, and academic sectors weight the four evaluation packages in a quite similar pattern and consider evaluation criteria very similarly;
- (3) The Mann Whitney U test indicates that the mean significances of most criteria in different evaluation packages are equal across sectors; and
- (4) Most of the criteria are significant according to overall responses, and responses from the public, private or the academic sector, indicating that these criteria should be considered to select the right private sector partner.

The above conclusions drawn from statistical analyses confirm

that an improved BVSS methodology for PPP infrastructure projects in general may be developed based on the criteria and their relative significance as is determined in this research. This will definitely promote international infrastructure development through PPPs. The writer is currently conducting a research in this regard.

This research also provides insights for future studies regarding the establishment of suitable evaluation criteria and their relative significance for a particular type of PPP projects. In tailoring the criteria identified in this research for a specific PPP project, appropriate adjustments should be made to reflect the uniqueness of the project, the risk allocations among project participants, and the composition of the private sector partner, the resources and capabilities of, and the role played by, each constituent company.

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