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## Article

# Factors Affecting the Readiness of User-Pay Public–Private Partnership Procurement for Infrastructure Projects: A Comparison between Developed and Emerging Economies

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**Abstract:** The successful implementation of infrastructure projects through public–private partnerships (PPPs) significantly relies on a well-designed procurement scheme; however, there is currently no established systematic decision-making model to identify the most optimal one. This paper explores the factors affecting the selection of public–private partnership schemes in infrastructure projects, with a particular focus on the differences between developed and emerging economies. The study opted for a comprehensive literature review and open-ended interviews to validate 25 critical factors affecting the optimum selection of PPP procurement for infrastructure projects. Then, a questionnaire survey was adopted to evaluate the selected factors and empirically examine the differences and commonalities between developed and emerging economies. The results highlighted the “financial attraction of projects to investors” and “financial viability based on the net present value and risk-adjusted present value” as the two most important factors. While the importance of most selection factors was agreed upon, nine selection factors were ranked unanimously higher for developed economies than for emerging economies. The findings of this study will aid in comprehending the factors that impact the choice of PPP schemes and provide insights for policymakers and project managers in both developed and emerging economies. These factors serve as inputs in developing a decision-making framework that aids both public and private stakeholders in selecting the most appropriate PPP procurement schemes for infrastructure projects.

**Keywords:** public–private partnership; procurement; infrastructure management; scheme selection; developed economies; emerging economies



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## 1. Introduction

Public–private partnerships (PPP) are a popular procurement method for infrastructure projects across the globe that optimizes benefits for all the stakeholders involved [1]. PPP projects come in many procurement schemes, such as operation and maintenance (O&M), private finance initiative (PFI), design–build–finance–operate (DBFO), and build–own–operate–transfer (BOOT), with loose-to-strict contract-based partnerships, and are continuously being developed to suit project characteristics. Each PPP scheme type entails a unique combination of private and public involvement and varying degrees of responsibility and risk borne by both sectors pertaining to aspects such as design, construction, operation, management, and capital investment. New alternative PPP procurement schemes have been proposed to tackle present matters, namely, the project’s intricacy and demand increases for faster delivery with improved quality. Hence, clear and commonly accepted designations of PPP procurement schemes are integral to securing the successful execution of PPP projects [2].

Much research has investigated the development of the decision-making process related to project delivery methods; still, most of these are focused on traditional procure-

ments and construction management with minimal to no incorporation of PPPs, as reported in El-Sayegh [3] and Mahdi and Alreshaid [4]. In reality, identifying the most appropriate PPP procurement scheme is challenging, as limited research specifically concentrates on identifying the best procurement model for a PPP project.

Regardless of efforts from various governments across the globe to facilitate the effective implementation of PPPs, notable failures have been recorded worldwide, attributed to the selection of inappropriate procurement schemes. Types of failures that have been recorded are concession canceled, private sector withdrawal, contracts abandoned at an early stage, and project nationalization [5]. Several examples have been observed in emerging economies, such as the Hong Kong–Zhuhai–Macau Bridge (HZMB), the Kai Tak Cruise Terminal, and Phu My Bridge, where PPP contracts were terminated, and the projects were reverted to the government (the HZMB [6]; the Phu My project; La Trobe Valley Regional Hospital [7]; the M1/M15 Toll Road, Hungary; 91 Express Lanes, US; London Underground [8]), or the financing model was changed from BOT to DB and O&M (the Kai Tak project) [6]. In other cases, some projects initially adopted the BOT scheme but eventually reverted to conventional models for different reasons, including political risks and a lack of financial guarantees [9]. These case studies show that, because of the complex nature and uncertainties of projects, determining the best-fit PPP procurement scheme at the initial stage is vital and necessitates identifying a set of factors and their influences over selecting the optimum procurement scheme.

Different economies, based on different maturity levels and experiences, adopt various PPP procurement schemes to suit the objectives of projects. Because PPPs in developed economies are well established and successfully implemented [10], their practices have often been the points of reference for late adopters with less PPP experience [11]. Moreover, economies with less PPP maturity often make PPP procurement system selections based on decisions made over other economies with mature PPP experience without analyzing the local factors. This often leads to project failures and delays. As a result, rather than irrationally adopting successful procurement systems for PPPs, emerging economies with less PPP experience need to carefully investigate the factors, analyze the priorities in detail, and learn from the successful implementation of developed economies, adopting more flexible, creative PPP procurement models. Using statistical analysis, this study aims to categorize the important factors to be considered in selecting the best procurement scheme for a PPP infrastructure project.

The current paper is part of a broader project that focuses on developing the PPP scheme selection framework, drawing on international experiences. The factors of this study will help develop a decision-making framework that assists both public and private stakeholders in selecting the most suitable PPP procurement scheme for an infrastructure project. Therefore, evaluating and comparing the selection factors for a successful PPP procurement program across developed and emerging nations with varying degrees of maturity is essential. The current study aims to explore a comprehensive set of factors affecting the readiness of user-pay public–private partnership procurement for infrastructure projects in developed and emerging economies and then conduct a comparative analysis between the factors.

## 2. Background

A PPP can be defined as a collaborative effort between the public and private sectors to execute a project efficiently and effectively. PPPs foster collaboration in development and risk sharing between the partners, which are often overlooked by traditional procurement processes [12]. Private-sector companies investing in PPP projects aim to generate returns on investment by utilizing future cash flows to cover initial capital costs and financial charges, while also reinvesting profits in future projects or distributing them as shareholder dividends. Meanwhile, the public sector's objective in a PPP project is to ensure that the community receives a higher quality of service that is delivered in a timely and cost-



them, reducing the likelihood of project failures and disputes during the operational stage [19]. Different PPP schemes/models may be subject to different legal and regulatory frameworks; hence, an appropriate PPP will help avoid legal challenges and delays that could negatively impact the project's implementation and outcomes. The prudent selection of an appropriate PPP scheme and the extent of private sector participation can significantly reduce the risk of project failure during the operational phase, enhance the probability of achieving project objectives, and enhance risk management, as emphasized by the Australian Government [20]. Selecting a suitable PPP scheme, as a key task, can overcome obstacles in implementing infrastructure development projects in the future. It is vital to ensure that the project attains financial benefits and yields positive results during its life cycle. And according to Verweij and van Meerkerk [21], the type of contract does have an impact on cost performance; therefore, this necessitates the requirement of the careful consideration of multiple funding options and detailed analysis considering all the key factors to ensure that the project can be delivered with high efficiency and affordability.

Private capital markets offer a valuable alternative funding source when governments struggle to meet the investment requirements of new or rebuilt infrastructure [22]. In contrast to publicly financed models like DBO, DBM, and DBOM, where the investment responsibility lies largely or fully with the public sector and the government retains asset ownership from the outset, privately financed PPP schemes such as DBFOM, DBFO, and BOO involve the private sector taking on the responsibility for project financing. With privately financed schemes, projects are believed to be delivered faster [23], with better life-cycle costs and more cost-effective delivery [24], reducing financial pressures and operating responsibilities on the host government, project cost and time overruns, and inappropriate technology applications [25]. In addition, these types of PPP schemes attract direct foreign investment to emerging economies and, in turn, alleviate the tensions in governments regarding financing infrastructure projects and recurrent expenses.

In developed economies such as the UK, the US, Australia, Ireland, and Canada, PPPs have long been applied, with rich PPP programs compared with countries with emerging economies [26]. Thus, it is believed that PPP markets in developed economies are mature, and private investors have confidence in their markets. In contrast, emerging economies have recently started using PPPs as an innovative procurement tactic to speed up economic growth. However, emerging nations are facing several risks and uncertainties and thus find it more challenging to attract private-sector investment [27]. Established regulatory frameworks, legal structures, and transparent processes in developed nations demonstrate the successful implementation of PPPs in infrastructure development. Appropriately, emerging economies can avoid mistakes by learning from developed economies to achieve successful projects [28]. Hence, a comparative analysis between developed and emerging economies to solicit the differences in their viewpoints is essential. This comparison can reveal how practitioners and experts with valuable insights into the technical, financial, and legal aspects of PPP projects in developed economies successfully choose and implement their PPP projects.

### 3. Factors Affecting PPP Scheme Readiness

Selecting the most suitable procurement method is crucial for clients and project participants and is becoming an important and contemporary issue [29]. In selecting a suitable delivery method for a project, various factors affecting effective project delivery should be considered. The important factors for the selection of a PPP scheme can be identified through the following systematic approaches: (1) a literature review of current literature on critical success factors for different types of PPP schemes and (2) interviews with international PPP experts and experienced practitioners.

The instability of political and governmental systems, along with the precariousness of macroeconomics, seems to be a major hindrance to utilizing PPP schemes when considering the long-term nature and comprehensiveness of PPP projects [30,31], especially in emerging economies where systems are likely to suffer from frequent changes, which can cause and

escalate the risks to private parties. Economic recessions and market volatility can lead to delays in project delivery, increased costs, and financial hardship for the private partner.

A supportive political climate for PPP projects supports the development of PPP projects and, further, is a precondition for a successful PPP project [32]. By providing essential legal and regulatory frameworks and a favorable political environment, assurance of the participation of the private sector in PPP infrastructure services will increase and be measured by the degree of political support. The level of political support can also have a significant influence on multinational investors in the process of analyzing investment opportunities in other countries [33].

At any phase and from any party involved in the process, public/community opposition, such as politicians, environmentalists, users, or citizens in the project area of a PPP project, can be a source of delays and inconveniences, especially for the duration of the construction phase [34]; social and political problems [35]; or even project cancellations and nationalization. Numerous projects encounter disruptions, legal disputes, public controversies, and reputational damage to the project's stakeholders. Examples of project failures, where public opposition was the primary cause, have been observed in many countries such as the United States and Malaysia [36].

Projects can suffer from financial unviability and an unattractive investment environment because of an immature legal framework [37]. An immature legal framework includes a lack of guidelines, unclear responsibilities, a lack of roles in the public and private sectors, inadequate protection for investor rights, a lack of transparency, and ineffective dispute-resolution mechanisms. The type of PPP regulatory framework that a country adopts can be affected by its legal framework. In order to thrive, PPP projects rely on vigorous and thorough legal and institutional frameworks and processes to guarantee they are transparent and competitive and deliver value for money [33,38].

In addition, the government's experience in managing PPP partnerships—including experience in the operation and maintenance (O&M) stage and project management—facilitating conflicts, delivering essential services to the public, etc., is of great concern. Dedication, proficiency, capacity, and coordination in the public sector are vital for a government to carry out fruitful PPPs [30], thus ensuring that the private sector complies with a range of legal, regulatory, and contractual requirements. A lack of government experience can be the reason for insufficient risk transfer and allocation to the private sector. Continuous delays and cost overruns are common with postponed approvals for crucial land and environmental matters [39].

When assessing a PPP project, financial attractiveness to investors and financial viability are major concerns for the public and private sectors [30], as they are the main factors determining whether the project is viable. The higher the level of the investment, the more risks the project is likely to involve. The award of the contract, in certain types of PPP schemes, such as BOT, may depend more on commercial and financial terms rather than technical aspects [32]. In considering a PPP project's feasibility, the NPV and risk-adjusted present value typically carry more weight than the actual construction costs or physical design involved [40]. Since PPP projects often rely heavily on debt financing compared with equity, larger projects require more borrowing, which can have a significant impact on the project's success [39]. Because of the high cost of capital expenditures, PPPs may not be suitable for small investments [41].

Given the complexity and scale of a project, together with the concession period, there exists a vast array of potential risks that could obstruct the expected outcomes [13]. Numerous projects have been halted or canceled as a result of inadequate comprehension of risks and financial repercussions [42]. Technical risks, because of the adoption of immature technologies, catastrophic engineering, design disasters, and construction risks, can cause delays and cost overruns [13]. Operating risks cover higher operating and maintenance expenses that stem from production and operation processes, input availability and quality, project management effectiveness and efficiency, and maintenance and upgrade necessities [43]. In privately financed PPPs, the private party takes on the risks associated with

design, construction, operation, and/or maintenance, which can lead to better design and, therefore, reduces O&M costs [21].

One of the most substantial challenges that current PPP projects are facing is financial risks [41]. These risks can occur from various sources, including inaccurate forecasts, resource extraction failures, and price and demand volatility, which can lead to increased costs and reduced expected revenue. Furthermore, excess optimism regarding planned actions can result in lower revenue [44]. Politics also poses a substantial threat to PPP projects, especially for BOT projects; politics can be the most challenging risk element, for example, changes in law or delays in approval [45]. Consequently, time and cost overruns during the construction stage may result from political risks. Changes in government and political systems have also led to the termination of many projects [13].

Innovation undoubtedly plays a significant role in the success of securing a project [46]. Innovation encompasses not just technology [47] but can also be found in operations and management as well [48]. In developed economies with a strong focus on innovation, an innovative solution is a competitive advantage and can enhance the appeal of the technical proposal. New and creative applications of technology, operations, and management can elevate the quality and efficiency of infrastructure services and facilities, leading to significant improvements [49].

A guarantee from the government can lower this risk and raise investors' and lenders' confidence [33], help projects become financially viable, assure multi-benefit objectives and political support [50], assist in mitigating the risks linked to unfavorable elements, and aid in strengthening economies [51].

The degree of complexity in a project encompassing both the intricacy of its design and construction, as well as the level of complexity in its operation and management stage, involves a great number of functions and activities. As such, complexity should be a key consideration when selecting a procurement method [52]. The Australian Government [20] advises decision-makers to factor in complexity as a key determinant in choosing an appropriate PPP scheme.

## **4. Research Methodology**

### *4.1. Pilot Study*

The comprehensive literature review helped identify 21 major factors affecting the critical procurement of PPP infrastructure projects. To confirm the validity and applicability of this set of factors, an interview was conducted with six academics and industry practitioners with profound experiences and expertise in PPP projects across different economies. All interviewees unanimously agreed that the proposed 21 factors were critical in choosing the optimum PPP procurement scheme, and the respondents offered valuable statements on the descriptions of the factor statements. According to four out of the six interviewees, the existence of alternative infrastructure solutions near the project site could have an effect on the demand for a PPP project. The other factors are the project's scale, the total investment amount, and types of assets: economic infrastructure or social infrastructure, which are crucial for selecting the optimum PPP procurement. These factors could be important, as public companies often seek a return on investments through economic benefits, which cannot be achieved if the demand decreases. Therefore, these factors are included in further expert opinions and validations. Based on the feedback received from the interviews, the list of 25 selection factors was revised into its final version and is presented in Table 1.

**Table 1.** PPP scheme selection factors.

Code	PPP Selection Factors	References
F01	Stable politics and government system	[30,31]
F02	Stable macroeconomics during the project life cycle (stable economic growth, low and stable inflation rate, low unemployment, etc.)	[30]
F03	Supportive political climate for PPP projects	[32,33]
F04	Community/public support to PPP projects	[34–36]
F05	Mature legal system required to support PPP procurements	[33,37,38]
F06	Government experience in operation and maintenance (O&M)	[30,39]
F07	Government experience in project management	
F08	The project scale and the amount of total investment	Interview
F09	Financial attraction of the project to investors	[30,32,39,40]
F10	Financial viability based on NPV and risk-adjusted PV	
F11	Technical risk due to engineering and design failures	
F12	Construction risk due to faulty construction techniques and cost escalation and delays in the construction stage	
F13	Operating risk due to higher operating costs and maintenance costs	[13,21,41–43,45]
F14	Financial risks arise due to inaccurate forecasts or failure to extract resources, the volatility in prices, and demand for products and services sold, which can lead to revenue deficiency	
F15	Financial risks arising from exchange rate volatility, transaction costs, and financing costs	
F16	Regulatory/political risks due to legal changes and unsupportive government policies	
F17	Innovation in technology	
F18	Innovation in management	[46–49]
F19	Innovation in operation	
F20	Government provides guarantees against financial risks, political/legal risks	[33,50,51]
F21	Project design and construction complexity	[20,52]
F22	The complexity of the operation and or maintenance stage	
F23	Alternative solutions that may affect the demand for the PPP project	Interview
F24	Type of asset: Economic infrastructure	
F25	Type of asset: Social infrastructure	Interview

#### 4.2. Questionnaire Survey

An online questionnaire survey was undertaken to examine the most critical factors in selecting an optimum PPP procurement scheme. The questionnaire consists of two sections. Section 1 examined the profiles of the respondents, including their experience in PPP projects. Section 2 aimed to collect respondents' expert thoughts on the importance of the selected 25 factors, with a request to evaluate the significance of the factors within each package based on a Likert scale of 1 to 5 (1 = unimportant, 5 = most important). Likert-style questions, using a five-point scale, have been adopted by many researchers in the PPP area, such as Chan; Lam [31]; Babatunde; Perera [53]; and Liu and Wang [54]. A pilot study was also conducted with a group of researchers and five industry practitioners with relevant PPP expertise. The participants confirmed the suitability and comprehensibility of the questionnaire.

A total of 250 responses were received, and the survey participants came from numerous different locations across the globe; the respondents represent major developed countries that have successfully implemented PPPs in economic infrastructure projects, such as the US, the UK, Ireland, Germany, Australia, and Canada. In total, 164 responses were obtained from emerging economies, including the Philippines, Nigeria, India, Brazil, China, and Vietnam. The demographic information of the respondents is shown in Table 2. The study assumes that the 164 samples collected significantly represent the emerging economies of the world. However, in future research, more respondents are required to improve the validity of the results. The respondents were categorized into developed and emerging economies, mainly because of PPP maturity and to help facilitate an effective comparison between the two regions of PPP development. Henceforth, developed



and emerging economies refer to economies with mature PPP and immature PPP project experiences, respectively.

**Table 2.** Profile of respondents.

Characteristic	Developed Economies		Emerging Economies		Total	
	Freq.	%	Freq.	%	Freq.	%
By sector						
Public sector	33	34.7%	47	27.3%	80	30.0%
Private sector	51	53.7%	101	58.7%	152	56.9%
Research, policy maker and others	11	11.6%	24	14.0%	35	13.1%
Total	95	35.6%	172	64.4%	267	100%
By number of years of experience in PPP						
0–5 years	24	27.9%	103	62.8%	127	50.8%
5–10 years	38	44.2%	39	23.8%	77	30.8%
10–20 years	20	23.3%	20	12.2%	40	16.0%
>20 years	4	4.6%	2	1.2%	6	2.4%
Total	86	34.4%	164	65.6%	250	100%

In emerging economies, 62.8% reported having less than 5 years of experience, whereas, in developed economies, respondents were more likely to have extensive experience, as the majority (72.1%) had more than 5 years of experience. This observation further justifies the decision related to the initial categorization of emerging and developed economies based on PPP maturity. Moreover, over the past decade, in emerging economies, there has been limited implementation of PPP projects, with a majority of the projects still at the preparatory stage [55]. The composition of the participants included 55% from the private sector, 30% from the public sector, and 15% from research communities. Furthermore, our research revealed that some respondents had worked in various positions in public agencies, private sector companies, and research organizations over their careers.

## 5. Results and Discussions

### 5.1. Reliability Test

Cronbach’s alpha ( $\alpha$ ) measures the internal consistency of the items on a scale, and  $\alpha$  is expected to be lower than 0.95 [56–58]. In this research, Cronbach’s alpha was recorded as 0.933, which is greater than 0.7 and less than 0.95, with a significance of 0.000, which means that there is very good internal consistency and reliability among the responses, and this validates the inclusion of all the factors for the analysis.

### 5.2. Kendall’s Coefficient of Concordance ( $W^a$ )

$W^a$  is employed to assess the degree of unanimity among the survey takers, as shown in Table 3. However, according to Siegel and Castellan (1988) [59], if the number of attributes is greater than seven, the Chi-square ( $\chi^2$ ) is used as a near approximation instead. Because the number of attributes is 25, the critical value of the  $\chi^2$  values is 36.415 (Fisher and Yates, 1943), which is lower than the computed  $\chi^2$  value of 843.908. Hence, the assessment by the respondents is proven to be consistent. This also reaffirms the validity of the survey responses for the analysis.

**Table 3.** Results of W<sup>a</sup> analysis for selection factors.

Characteristics	Developed Economies	Emerging Economies	All Respondents
Number of survey response	86	164	250
Kendall’s Coefficient of Concordance	0.186	0.128	0.141
Chi-square value	383.812	503.222	843.908
Critical value of Chi-square	36.415	36.415	36.415
Degree of freedom	24	24	24
Asymptotic significance	0.000	0.000	0.000

<sup>a</sup> Kendall’s coefficient of concordance and  $\alpha = 0.05$  (95% confidence interval).

### 5.3. Mean Score Ranking of 25 Factors for Selecting PPP Schemes

In order to determine the most suitable procurement scheme for a PPP infrastructure project, a ranking of the factors involved was conducted using mean values and standard deviations. Factors with higher mean values were assigned higher ranks. In cases where two or more factors had the same mean value, priority was given to the one with the lowest standard deviation. In this study, factors with a mean value greater than 3.40 were considered important, as this threshold is consistent with previous studies conducted by Chileshe and Kikwasi [60] and Yalegama and Chileshe [61].

The assumptions of the current study did not satisfy the use of parametric (including normal distribution and homogeneity of variance) techniques, and hence, non-parametric statistical techniques were used to validate the sample and the responses. To explore the difference in how participants from developed and emerging economies perceived the scores of PPP scheme selection factors, Mann–Whitney U-Tests were conducted. Given the imbalanced sample sizes between the two groups being compared and the absence of normality in the distribution of the data, the Mann–Whitney U-Test was deemed a suitable statistical tool to use [62]. The test results are summarized in Table 4. If the *p*-value is less than 0.05, there is a significant difference between the two medians of the groups.

By calculating the means for the overall sample, as well as for developed and emerging economies, a list of 25 factors for selecting PPP schemes was ranked in order to facilitate three analysis options: uncategorized (overall values), a mature PPP group (developed economies), and an immature PPP group (emerging economies). The mean importance values of the 25 factors ranged from 3.189 to 4.372 for the selection of privately financed procurement systems. “Government experience in O&M (FO6)” and “government experience in project management (F07)” have mean scores of 3.189 and 3.296, respectively, which are less than 3.400, and hence, are not considered important for further analysis. The mean scores of the rest of the 23 factors ranged from 3.442 to 4.628 (for developed economies) and from 3.421 to 4.238 (for emerging economies). The results, in general, signified that the participants in developed economies rated these factors with higher importance than their counterparts, mainly because of the greater experience of individuals and the level of maturity in PPP infrastructure projects in developed economies. Moreover, PPP projects in developed economies are often scrutinized with higher standards and requirements and more comprehensive legislation systems, while in emerging economies, there is an absence of competition and transparency. Hence, in emerging economies, the satisfaction of all the essential obligations and prerequisites is often underrated.

**Table 4.** Results of Mann–Whitney U-Tests between developed and emerging economies.

	Developed Economies			Emerging Economies			Total			Mann–Whitney U Test				
	Mean	Std.	Rank	Mean	Std.	Rank	Mean	Std.	Rank	Developed Economies Mean Rank	Emerging Economies Mean Rank	U Statistic	Z	p-Value
01—Stable politics and government system	4.349	0.930	4	4.159	1.074	4	4.224	1.029	3	133.06	121.53	6401.5	−1.313	0.189
02—Stable macro-economics during the project life cycle	4.233	0.836	6	4.110	0.907	6	4.152	0.883	6	131.28	122.47	6554.5	−0.983	0.326
03—Supportive political climate for PPP projects	4.337	0.889	5	4.140	1.002	5	4.208	0.968	4	134.08	121.00	6314.0	−1.475	0.140
04—Community/public support to PPP projects	4.035	0.999	10	3.970	1.024	7	3.992	1.014	9	128.40	123.98	6802.5	−0.484	0.628
05—Mature legal system required to support PPP procurements	4.186	1.000	9	4.195	0.978	3	4.192	0.983	5	125.63	125.43	7040.5	−0.023	0.982
06—Government experience in O&M	3.151	1.057	25	3.209	1.059	25	3.189	1.057	25	121.96	127.36	6747.5	−0.585	0.558
07—Government experience in project management	3.267	1.078	24	3.311	1.127	24	3.296	1.109	24	120.81	127.96	6649.0	−0.771	0.441
08—The project scale and the amount of total investment	4.198	0.931	8	3.768	0.976	10	3.916	0.980	10	147.15	114.15	5190.0	−3.604	0.000 *
09—Financial attraction of the project to investors	4.628	0.687	1	4.238	0.946	1	4.372	0.884	1	144.58	115.49	5411.0	−3.415	0.001 *
10—Financial viability based on NPV and risk-adjusted PV	4.419	0.711	2	4.232	0.904	2	4.296	0.846	2	133.08	121.52	6400.0	−1.314	0.189
11—Technical risk due to engineering and design failures	3.884	0.832	17	3.634	0.991	15	3.720	0.945	17	135.16	120.44	6221.5	−1.627	0.104
12—Construction risk due to faulty construction techniques and cost escalation and delays in construction	4.012	0.759	11	3.689	0.963	13	3.800	0.910	12	139.99	117.90	5806.0	−2.445	0.014 *
13—Operating risk due to higher operating costs and maintenance costs	3.988	0.833	12	3.610	0.982	16	3.740	0.949	15	143.55	116.03	5499.5	−3.035	0.002 *
14—Financial risks arising from inaccurate forecasts or failure to extract resources, the volatility of prices, and demand	4.221	0.860	7	3.933	0.934	9	4.032	0.918	8	140.08	117.85	5798.0	−2.463	0.014 *
15—Financial risks arising from exchange rate volatility, transaction costs, and financing costs	3.942	0.860	16	3.707	0.940	12	3.788	0.918	13	136.72	119.62	6087.5	−1.889	0.059

Table 4. Cont.

	Developed Economies			Emerging Economies			Total			Mann–Whitney U Test				
	Mean	Std.	Rank	Mean	Std.	Rank	Mean	Std.	Rank	Developed Economies Mean Rank	Emerging Economies Mean Rank	U Statistic	Z	p-Value
16—Regulatory/political risks due to legal changes and unsupportive government policies	4.349	0.891	3	3.951	1.056	8	4.088	1.018	7	143.84	115.88	5474.5	−3.097	0.002 *
17—Innovation in technology	3.570	0.875	21	3.598	0.989	18	3.588	0.950	18	123.81	126.38	6907.0	−0.282	0.778
18—Innovation in management	3.442	0.989	23	3.555	1.005	19	3.516	0.999	21	119.88	128.45	6568.5	−0.936	0.349
19—Innovation in operation	3.581	0.874	20	3.473	0.993	21	3.510	0.953	22	130.27	123.00	6642.0	−0.797	0.425
20—Government provides guarantees against financial, political/legal risks	3.953	1.084	15	3.732	1.130	11	3.808	1.117	11	134.70	120.67	6260.5	−1.518	0.129
21—Project design and construction complexity	3.767	0.877	18	3.421	0.984	23	3.540	0.961	20	141.30	117.21	5693.0	−2.638	0.008 *
22—The complexity of the operation and/or maintenance stage	3.686	0.871	19	3.482	0.937	20	3.552	0.918	19	135.45	120.28	6196.5	−1.671	0.095
23—Alternative solutions that may affect the demand for the PPP project	3.988	1.023	13	3.640	0.971	14	3.760	1.001	14	142.35	116.66	5603.0	−2.791	0.005 *
24—Type of asset: Economic infrastructure	3.962	1.153	14	3.610	1.077	17	3.731	1.114	16	141.64	117.04	5664.0	−2.658	0.008 *
25—Type of asset: Social infrastructure	3.506	1.013	22	3.448	1.058	22	3.468	1.041	23	127.15	124.63	6910.0	−0.272	0.785

Grouping variable: Developed economies vs. emerging economies. \* significance at 5%.

The top five important factors for the selection of a PPP scheme are “financial attraction of project to investors” (mean score, 4.372), “financial viability based on NPV and risk-adjusted PV” (mean score, 4.296), “stable politics and government system” (mean score, 4.224), “supportive political climate for PPP projects” (mean score, 4.208), and “mature legal system required to support PPP procurements” (mean score, 4.192). Participants from both advanced and emerging economies acknowledge the importance of the “financial attraction of project to investors” and “financial viability based on NPV and risk-adjusted present value” as the two most important factors for the optimum selection of a privately financed PPP procurement scheme. This is straightforward to comprehend; the primary driving factor for the adoption of these procurement schemes is to attract private financing for public infrastructure services, and it requires substantial upfront capital investment. The private sector’s involvement in PPP projects is mainly driven by profit motivations. Thus, these two factors can help attract the private sector to finance a project and, in turn, receive ample returns on investments.

#### *5.4. Significant Differences in the Rankings of PPP Selection Factors*

In contrast, the motivation of private investors and financiers to improve public infrastructure projects varies significantly in the conditions and environment in which these projects operate. “Mature legal system required to support PPP procurements” ranks third (mean score, 4.195) in emerging economies, while it ranks ninth (mean score, 4.186) for developed economies. This is simply because developed economies in general have more stable legal and regulatory frameworks, and governments are more supportive of PPPs. In contrast, “regulatory/political risks due to legal changes and unsupportive government policies” ranked third (mean score, 4.394) for developed economies but eighth (mean score, 3.951) for emerging economies. Changes in government policies or regulations and unclear and ambiguous legal frameworks increase the risks associated with PPP projects and may make it more difficult to secure financing or attract private sector partners. Political or policy alterations during concession can result in project termination or breach of contracts, leaving investors unable to recoup their investment. Experiences in some developed economies illustrate how political risks are easily identifiable and much easier to manage [63], while in emerging economies such as Thailand and China, these risks are more complex and need to be addressed with complex control methods [64]. PPP projects often require a large amount of private investment, and the profits gained by the private sector should be larger to surpass the investment. Thus, to guarantee the profitability of a project, it is crucial to consider the factors related to stable political and government systems, as they play a vital role in creating a favorable investment environment.

Table 4 presents the results of the significance test using the Mann–Whitney U-Test to compare the rankings between the two independent groups at a significance level of 0.05; the survey participants from developed and emerging economies reached a common consensus on the ranking in 16 out of 25 factors. The remaining nine factors with significant differences are rated consistently lower in emerging economies than in developed economies. For instance, the “financial attraction of project to investors” was ranked as the most important factor when deciding on a project to undertake in both developed and emerging economies. However, there is a difference in the mean value, in which the former is 4.628, compared with the latter mean value, which is 4.238. Also, respondents from developed economies ranked “the project scale and the amount of total investment” as more important than participants in emerging economies (8th with a mean value of 4.198 and 10th with a mean value of 3.978, respectively). These disagreements could arise because private sectors make PPP investments in developed economies. Hence, the financial attraction of the project is of utmost importance to the investors, and the scope of the service must be considered carefully to ensure the project’s success. In contrast, for most emerging economies, the main sources of PPP infrastructure project investments come from banks, government-owned companies and funds, and foreign aid rather than private investment [65].

Among the six risk-related factors, notable differences exist in four of the six between emerging economies and developed economies when choosing a project to be carried out under the privately financed family. These are “construction risk due to faulty construction techniques and cost escalation and delays in construction”; “operating risk due to higher operating costs and maintenance costs”; “financial risks arising from inaccurate forecasts or failure to extract resources, the volatility of prices, and demand”; and “regulatory/political risks due to legal changes and unsupportive government policies”. Respondents from advanced economies, with differences in risk perceptions, more experience with PPPs, and a higher level of sophistication in managing associated risks, ranked these factors as having greater significance than those from emerging economies. This is because, besides respondents from developed economies having a higher degree of risk awareness and a greater emphasis on risk management, in emerging economies, fewer projects have been implemented. Consequently, the full outcomes of risks have not been realized compared with developed economies. If these risks are posed, the project could end up with lots of obstacles, especially at the operational stages, and this finding is consistent with previous related studies by Osei-Kyei and Chan [62]. Moreover, developed countries may have more complex projects with advanced technologies, larger scale, and higher complexity in stakeholder engagement; thus, more comprehensive risk assessment and mitigation strategies are required. Also, developed economies possess stringent regulations and compliance requirements for construction and operations. Therefore, these risks are always considered significant in developed economies compared with emerging economies, where regulations and laws regarding risks are limited.

In contrast, although “financial risks arising from exchange rate volatility, transaction costs, and financing costs” was rated lower in emerging economies (mean score, 3.707) than in developed economies (mean score, 3.942), this factor was ranked higher in emerging economies (12th) compared with developed economies (16th). Given the volatile macroeconomic indicators in many emerging economies, namely, exchange and interest rate fluctuation, it is understandable that the overall project costs and user charges may increase [62]. On the other hand, some emerging economies heavily depend on financial assistance from international financial institutions or foreign investors when implementing PPP projects. Hence, the risk from the exchange rate, financing costs, and transaction costs, which are in foreign currencies, may affect the return of investors in emerging economies [66]. “Financial risks arising from inaccurate forecasts or failure to exact resources, the volatility of prices, and demand” ranked seventh (mean score, 4.221) for developed economies and ninth (mean score, 3.933) for emerging economies. Inaccurate demand forecasts due to inadequate or constrained data, along with excessively optimistic perspectives, were the primary reasons leading to the failure of numerous projects in emerging economies such as the Laos Republic, Mexico, and Hungary, as indicated in the study by Soomro and Zhang [44]. Accurate traffic demand forecasts play a critical role in determining the financial feasibility of projects. Decreases in traffic demand due to a decrease in customer trust in the performance of services are also a reason for less revenue generation. In many projects, efforts were made to solve the problem of community opposition, but in the end, the project was still in financial trouble; for instance, Bangkok’s Skytrain (BTS) and the Channel Tunnel Rail Link in the UK [44].

The construction stage poses the highest level of risk over the entire project life cycle [67]. “Regulatory/political risks due to legal changes and unsupportive government policies” ranked third (mean score, 4.349) in developed economies, whereas it ranked eighth (mean score, 3.951) in emerging economies. The ability to generate profits can be influenced by actions such as concession halted, changes in government, the imposition of taxes or regulations, and so on, severely reducing the value to investors, which, in turn, affecting the private sector entities [68].

Respondents from developed economies ranked the significance of “project design and construction complexity” and “alternative solutions that may affect the demand for the PPP project” higher than emerging economies. Underestimation of project designs

and construction complexity is an influencing factor that leads to project delays and cost overruns [69]. The higher the technical complexity, the more risks [70]. Developed economies have experienced some PPP projects that have not had sufficient users to make them financially viable, as users have a range of choices in avoiding high toll charges. Emerging economies have less experience in PPP execution, and hence, may underestimate the impact of project complexity.

## 6. Conclusions and Future Research

PPPs, with the use of private funding, can help governments deliver essential public services and infrastructure and boost economic development. Choosing the most appropriate PPP procurement scheme will help stakeholders achieve value for money with shorter delivery times and higher quality. However, different economies, based on their differences in PPP maturity, have various experiences and expertise. Knowledge of different contributing factors would provide key directions for stakeholders to make optimized decisions related to selecting the best procurement scheme for PPP infrastructure projects. Therefore, this study aimed to identify the factors that affect the selection of the best procurement system for privately financed PPP schemes by surveying PPP experts across the globe. The results were then analyzed based on PPP maturity by categorizing the responses into developed and emerging economies.

Cronbach's alpha shows that there is strong consistency and reliability in the survey for further data analysis. Kendall's coefficient of concordance shows a strong agreement among the respondents. The overall ranking of 25 selection factors, with standard deviation, indicates that, except for two factors related to government experience, the other 23 factors are important for choosing a project to implement under a privately financed PPP scheme in both developed and emerging economies.

Participants in developed economies ranked 'high importance' for the selection factors compared with their counterparts in emerging economies. This is largely because the implementation of PPPs in developed economies, in general, is scrutinized by higher standards and requirements and more comprehensive legislation systems, whereas the satisfaction of all the essential obligations and prerequisites is often underrated in emerging economies. Furthermore, respondents from both developed and emerging economies agreed that the "financial attraction of the project to investors" and "financial viability based on NPV and risk-adjusted PV" are the two most important factors for the selection of PPP schemes for privately financed projects, as the key motivation of these schemes is to bring private funding to public infrastructure services. Further analysis using the Mann–Whitney U-Test indicated that respondents from developed and emerging economies had statistically different opinions on the level of importance of nine selection factors. These nine factors are ranked unanimously higher in developed economies than in emerging economies. This might be because, in emerging economies, few projects have been completed; thus, many factors have not been assessed thoroughly compared with developed economies, where many PPP projects have been completed. Nonetheless, there could be instances where PPP projects adopt a government-pay mechanism as opposed to the user-pay mechanism discussed in this paper. However, this is beyond the current study scope, and future studies are encouraged to explore and compare this significance within PPP project schemes.

This research contributes to understanding the factors that impact the selection of PPP schemes in infrastructure projects and provides insights for policymakers and project managers in both developed and emerging economies. These factors serve as inputs in developing a decision-making framework that aids both public and private stakeholders in selecting the most appropriate PPP procurement scheme for infrastructure projects.

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