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Key Performance Indicators of Private Finance Initiative (PFI) Projects During Pre-Construction Phase

Suhaiza Ismail[1*], Rosnani Mohamad[2], Julia Mohd Said[3]

[1,3]Department of Accounting, Kulliyyah of Economics and Management Sciences, International Islamic University Malaysia, Gombak, Selangor, Malaysia.
[2]Jabatan Akauntan Negara Malaysia.

*Corresponding author: suhaiza@iium.edu.my

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ABSTRACT

There are two objectives of this paper. The first objective is to investigate the important performance indicators of private finance initiative (PFI) or also known as public private partnership (PPP) projects before beginning of construction. The second objective is to investigate the difference in the perception of the importance of the performance indicators between the public and private sectors. A postal questionnaire survey was used. The questionnaire was distributed officers of government departments and private sector companies who may have been involved in PFI/PPP projects. A total of 237 completed questionnaires were received, representing a 51.52 percent response rate. In examining the importance of performance indicators, the descriptive statistical tests of mean, standard deviation and mean score ranking were used. Independent t-tests were conducted to investigate the differences in the perceptions of the importance of performance indicators between the two respondent groups. The findings indicate that all the performance indicators in relation to before the construction period were perceived as 'important' by all respondents. The top five performance indicators before construction begins were 'Project maintainability', 'Commitment and responsibility between public and private sectors', 'Government's knowledge of PFI/PPP', 'Project technical feasibility' and 'Appropriate risk allocation, risk sharing and risk transfer'. The performance indicator that was perceived as the least important was 'Stable and favourable political environment'. In terms of the differences in the opinion between the private sector and the public sector respondents, two indicators that are 'General public support' and 'Type of construction' were perceived by the public sector respondents as significantly more important than by the private sector respondents. This study offers empirical evidence on key performance indicators for PFI/PPP project that are important at the early yet crucial stage of a PFI/PPP contract, i.e. before construction begins, as perceived by two key parties in a PFI/PPP contract, i.e., the public and the private sectors.

Keywords: performance indicators, construction, private finance initiative, public private partnership, Malaysia

1.0 INTRODUCTION

The Private Finance Initiative (PFI) is a form of Public Private Partnership (PPP) which specifically refers to a long-term contractual relationship between government and private sector concessionaire whereby the significant responsibilities which include designing, constructing, financing and operating public facilities and services are on the concessionaire. In return, once the facilities are in operation, the government will make annual repayment to the concessionaire to cover the construction and operating or maintenance costs of the facilities. The contract which is normally between 15 to 30 years comprises of three phases: before construction, construction and after construction. Before construction is the negotiation phase between government representatives and the awarded concession company. The construction phase is the period when the facilities are built and usually takes a few years. After construction refers to the maintenance period, which takes up to 20 years until the end of the contractual concession period.

In Malaysia, the official announcement on the PFI establishment was made under the Ninth Malaysia Plan in 2006 (Ninth Malaysia Plan, 2006; PPP Guideline, 2009; Ismail and Abdul Razak, 2023). Although the successful implementation of privatisation policy, which was first introduced in 1983, several pertinent issues regarding the implementation of the Privatisation Policy has led to the unveiling of the PFI with the main objective of streamlining the privatisation policy (Ninth Malaysia Plan, 2006; Tenth Malaysia Plan, 2011; Ismail,2012, Ismail and Abdul Razak, 2023). As the PFI is a continuation of the privatisation policy, the ultimate justifications for adopting it are similar to the objectives of privatisation; to improve the performance of the public sector in delivering public facilities and services through the participation of the private sector and to reduce government expenditure on providing public services (Ninth Malaysia Plan, 2006; Takim, Ismail, Nawawi and Jaafar, 2009; Ahmad et al, 2024). In the tenth Malaysia Plan, the government has announced that the term Public Private Partnership (PPP) is to be used as the term if broader and could cover various modes of procurement that involve the partnership between government and private sector companies.

The long duration of the PFI/PPP contract and the complexity of the PFI/PPP structure (Shen et al., 2006; Wilson et al., 2010) indicate the strong need for proper monitoring and measuring of performance of a PFI/PPP contract. One of the commonly used performance measurement and monitoring mechanism is key performance indicators (KPIs). The KPIs measure the achievement of performance using relevant indicators. In relation to PFI/PPP contract, although measuring performance are important at all phases (i.e. pre-construction, construction and post-construction), pre-construction is the most crucial phase because all the terms of the contract, the design, the output specifications as well as the costs and financing aspects of the project are decided and agreed upon at this phase. Jones (2013) emphasized that inadequate procurement planning has been one of the key failings in the Malaysian public procurement system.

Furthermore, there have been issues related to the planning phase of PFI reported in the Auditor General Reports (Auditor General, 2012 – 2018). The particular issue raised was the lack of good project planning, which resulted in negative impacts on projects, such as project delay, low quality output and inefficient use of resources (Auditor General, 2012 and 2015). This highlights that, as PFI/PPP projects involve long-term contracts, the processes in the initial pre-construction phase largely determine the success of subsequent phases. Therefore, identification of the key indicators of measuring performance at the pre-construction stage is undoubtedly essential.

In addition, the government and private sector providers are the two main parties in a PFI/PPP project. Each party has different roles at each phase including the pre-construction stage a PFI/PPP project. Hence, this present study aims to focus on two objectives. First, to examine the important key performance indicators at the pre-construction period. Second, to investigate the differences in the perception between the government and the private sector in relation to the importance of the key performance indicators at the pre-construction period.

This paper is structured as follows. The next section offers literature review on the performance measurement and monitoring of PFI/PPP projects. Then, the research methodology section is provided. The last two sections are on the findings and discussion and on the implications, limitations and suggestions for future study, respectively.

2.0 LITERATURE REVIEW

Various aspects of PFI/PPP have been studied by researchers. These include studies on PFI/PPP concepts (Ismail and Pendlebury, 2006; Rusmaini, 2010; Siddiquee, 2011; Hampton et al., 2012; Winch et al., 2012; Ismail and Harris, 2014); financing of PFI/PPP (Shaoul, 2009; Ismail and Assuhaimi, 2013), reporting, auditing and accountability aspects of PFI/PPP (Grimsey and Lewis, 2002a; Demiraj and Khadaroo, 2008; Asenova and Beck, 2010; Sheihu et al., 2018); as well as on achievement and performance of PFI/PPP projects (Akintoye et al., 2003; Henjewele et al., 2008; Jaconson and Choi, 2008; Hodge and Greve, 2008; Robinson and Scott, 2009). Although the scope of studies on performance of PFI/PPP is variety which include VFM and efficiency of PFI/PPP projects (Zhang, 2006a and 2006b; Nisar, 2007, Zhang, 2009; Ismail et al., 2011; Ishawu et al., 2020; Aitkaliyeva et al., 2022; Ahmad et al., 2024), critical success factors (CSFs) of PFI/PPP (Jacobson and Choi, 2008; Akintoye et al., 2003, Li et al., 2005; Abdul Aziz, 2010; Ismail, 2013a; Rohman, 2022); and various performance measures of PFI/PPP (Chan et al., 2004; Yuan et al., 2008; Yuan et al., 2009; Garvin et al., 2011; Yuan et al., 2012), the remaining part of this literature review focuses on prior studies related to PFI/PPP performance indicators.

Yuan et al. (2008) and Yuan et al. (2009) are among the earlier studies of PFI/PPP key performance indicators. In their two earliest studies, Yuan et al. (2008) and Yuan et al. (2009) identified and validated a KPI framework for assessing PPP project performance and categorised the KPIs into five categories: 1) physical characteristics of projects; 2) financing and marketing indicators; 3) innovation and learning indicators; 4) stakeholder indicators; and 5) process life cycle indicators. The first component, which consists of 15 KPIs, is considered as the input of the projects and influences the performance of the projects in the initialisation. This is basically the KPIs at the pre-construction stage of PFI/PPP project. The second, third, fourth and fifth components consist of nine, six, four and 14 KPIs, respectively.

For the KPIs at the pre-construction stage Yuan et al. (2008) and Yuan et al. (2009) reported that the respondents perceive 'commitment and responsibility between public and private sector' as the most important indicator, while 'appropriate risk allocation, risk sharing and risk transfer', 'concessionaire's knowledge of PPPs', 'government's knowledge of PPPs' and 'project technical feasibility, constructability and maintainability' are ranked second, third, fourth and fifth, respectively. The 'type of construction' indicator is ranked last by the respondents. In 2012, Yuan et al. conducted a questionnaire survey to explore the perception of PPP stakeholders in China on the KPIs identified by Yuan et al. (2009). The results show that all the 48 performance indicators are perceived as important by the respondents.

Agunsanmi et al. (2013) investigated the KPIs for PFI/PPP projects in Nigeria based on the perception of the key parties in PFI/PPP. Similar to Yuan el al. (2012), the study also reported five dimensions of KPIs which one of the components is also for preconstruction phase. In relation to the KPIs at the initial stage of PFI/PPP, the indicators that are highly ranked are 'design complexity', 'construction complexity', 'commitment of public sector', 'project technical feasibility and 'technology advancement'. The study also reported agreement among parties on the important of all the indicators. In another study, Mladenovic et al. (2013) explored the key performance indicators specifically for PFI/PPP projects in transportation in Germany. The KPIs were grouped into three that are economic KPIs, technical KPIs and operation and maintenance KPIs. The economic KPIs include 'value for money', 'cost reduction based on total life cycle cost', 'pricing of a certain risk' and 'cost efficiency'. The KPIs under the category of technical are those technical indicators that are directly related to the transportation projects and are determined at the pre-construction stage of the project. For the operation and maintenance, the KPIs covers safety related indicators, efficiency of projects and traffic volume (Mladenovic et al., 2013). More recently, acknowledging the challenge in monitoring the performance of PFI/PPP project, Lima et al. (2019) in their conceptual paper proposed a KPI framework for PFI/PPP projects. Their proposed framework covers five dimensions that are operational, financial, relational, environmental and social indicators.

In the context of Malaysia, there are a few studies that attempted to contribute on the performance measurement of PFI/PPP projects. Ismail (2009) conducted a study to formulate the KPIs to assess PFI project performance. The study identified a number of KPIs which were categorised into professional, functional and operational categories. The operational KPIs were further sub-categorised into Pre-construction, Construction and Post-construction. Of the three phases, the pre-construction phase was ranked second most important after the construction phase. Lop et al. (2017) proposed a performance measurement model for a PFI/PPP projects in Malaysia that is named as Amalgamated Model of PFI performance measure. The model also emphasises

KPIs. In 2018, Mohamad et al. (2018a) conducted a study on performance indicators of PPP projects in Malaysia but mainly focuses on financing and innovation aspects of PPP projects. Lop et al. (2018) has examined the important KPIs at the operational stage of PFI/PPP projects. More recently, Ismail et al. (2021) investigated the important performance indicators for lifecycle process of PPP projects in Malaysia.

From the above review, despite a number of existing studies on performance measurement and performance indicators, most of the studies have not focused mainly on the pre-construction stage of PFI/PPP which is evidenced at one the critical phase in ensuring the successful of the remaining projects. Moreover, the need for more studies on performance measurement of PFI/PPP has always and still been highlighted by experts and researcher (Lop et al., 2018; and Palcic et al., 2019). Palcic et al. (2019) strongly stated that performance measurement of PFI/PPP projects are still missing despite that PFI/PPP has been implemented world-widely for a long time. Lop et al. (2018) claimed that the current KPIs for PPP in Malaysia are insufficient to measure the performance of the projects and hence, call for more efforts to improve the KPIs for Malaysian PFI/PPP projects. Thus, the present study aims are to fill this gap in the literature with a focus on the pre-construction stage.

3.0 RESEARCH METHODOLOGY

The current study used a questionnaire survey method to gather the perception of the public and private sectors concerning the performance indicators for the pre-construction phase of PFI projects in Malaysia. The study adopted the questionnaire developed by Yuan et al. (2010), with modifications to better suit the context of the PFI/PPPs in Malaysia. The rationale for adopting prior study's instrument is that the indicators identified are recognized by the industry and academia and a number of papers that used the questionnaire have been published in reputable refereed journals. As claimed by Ismail (2013c), there is no strong justification to reinvent work that has previously been discovered by other researchers. Moreover, using the same instrument by researchers from different countries will allow future studies to make a comparison between various countries on the importance of the performance indicators (Ismail, 2013c). The questionnaire consists of two parts: Part A seeks information on the background of the respondents, including details of the nature of their organisation (either public or private sector), their involvement with a PFI/PPP project, as well as their familiarity with and experience of the PFI/PPP scheme; while Part B consists of performance indicators of PFI/PPP projects, particularly on the pre-construction phase. In this part, respondents are given five levels of importance to choose from based on the following scale intervals:1: unimportant; 2: marginally important; 3: moderately important; 4: important; and 5: extremely important. The list of the performance indicators is as presented in Table 1.

The questionnaire was distributed to the respondents via postal mail to officers of government departments and private sector companies who may have been involved in PFI/PPP projects and familiar with the PFI scheme. The sample size was determined based on the targeted stakeholders actively involved in PFI/PPP projects. Based on the information obtained from UKAS, 21 out of 24 ministries in Malaysia have implemented projects using the PFI/PPP scheme. A total of 10 questionnaires were sent to each of the 21 ministries. In addition, 10 questionnaires were sent to each of the 14 state governments, specifically to the Economic Planning Unit (EPU) of each state. As for the private sector companies, five questionnaires were sent to each of the 22 public listed construction companies that had indicated their interest in participating in the study. The data collection took about two months with two rounds of follow up.

3.1 Data Analysis

The data was analysed using the Statistical Package for the Social Sciences (SPSS) software version 21. For this study, the central tendency (mean) score and standard deviation for each objective and performance indicator was computed based on the five-point Likert scale. Then, based on the mean scores, the factors were ranked according to their importance as perceived by all the respondents, as well as separately by the public sector respondents and private sector respondents. Furthermore, an independent samples t-test was conducted to compare the mean scores of the two different groups of people or two samples. The aim of using this test was to try to determine whether or not there is a statistically significant difference in the mean scores of the two groups. In this study, this test was conducted to investigate the differences in the perceptions of the public and private sectors regarding the importance of each PFI/PPP pre-construction phase performance indicator at the 10% significance value.

Table 1. List of Performance Indicators for Pre-Construction Phase.

No.	Performance Indicators
1.	Project maintainability
2.	Commitment and responsibility between public and private sectors
3.	Government's knowledge of PFI/PPP
4.	Project technical feasibility
5.	Appropriate risk allocation, risk sharing and risk transfer
6.	Concessionaire's knowledge of PFI/PPP
7.	Competitive tender procedure
8.	Level of technological advancement
9.	Type of construction
10.	Level of design complexity
11.	Standard PFI/PPP contract
12.	Level of construction complexity
13.	Stable and favourable legal environment
14.	Different outputs of different type of construction
15.	Flexibility in the contracts (e.g. necessary if the user needs change, exit position for private sector)
16.	Stable and favourable macro-economic condition
17.	General public support
18.	Stable and favourable political environment

4.0 RESULTS AND DISCUSSION

Response rate and demographic profile of the respondents. Table 2 provides a summary of the number of questionnaires distributed and the number of completed questionnaires received.

Table 2. Questionnaire Distribution and Response Rate

Group of Respondents	No. of Questionnaires Distributed	No. of Questionnaires Returned	Usable Questionnaires
Public Sector:			
Federal Government	210	152 (72.38%)	152 (72.38%)
State Government	140	36 (25.71%)	20 (14.29%)
Private Sector	110	65 (44.83%)	65 (59.09%)
TOTAL	460	253 (55.0%)	237 (51.52%)

As shown in Table 3, there are more respondents from the public sector than the private sector. The main reason for the imbalance in the number of respondents between the two groups is because fewer private sector companies are involved in PFI/PPP projects at present. This is primarily due to the strict requirements set by the government on private company participation in PFI/PPP projects. As stated in the PPP Guideline (2009), for a private sector company to be involved in a PFI/PPP project, it must be financially strong with paid-up capital of the SPV of at least 10% of the project value. In addition, the projects must be completed by using the latest technologies. On the other hand, there are more respondents from the public sector because almost all the ministries have implemented PFI/PPP projects.

Table 3. Distribution of Respondents

Sector	Role of Respondents	Frequency	Percentage	Total	
				Frequency	Percentage
Public Sector	Federal	152	64.1	172	72.6
	State	10	4.2		
Private Sector	Contractor	23	9.7	65	27.4
	Facilities Management	22	9.7		
	Operator	6	2.5		
	Consultant	6	2.5		
	Financier	2	0.8		
	Others	6	2.5		
	TOTAL	237	100	237	100

4.1 Results based on Overall Respondents

Table 4 provides the mean scores and mean score ranking for the relative importance of the performance indicators used in assessing PFI/PPP performance before the construction begins as perceived by all respondents and by the respondents in each sector. As shown in Table 3, the mean scores range from 3.77 to 4.31, which indicates that all the performance indicators were perceived as 'important' by all respondents. Based on mean score ranking, the top five performance indicators at pre-construction phase were 'Project maintainability', 'Commitment and responsibility between public and private sectors', 'Government's knowledge of PFI/PPP', 'Project technical feasibility, constructability' and 'Appropriate risk allocation, risk sharing and risk transfer'. The performance indicator that was perceived as the least important was 'Stable and favourable political environment'.

'Project maintainability' was ranked first as the most important performance indicator in evaluating the performance of PFI/PPP projects at pre-construction phase. The result is in line with the fundamental concept of PFI, whereby the private sector is responsible for maintaining the facilities throughout the contract period which runs for about 20–25 years. The existence of project maintainability component as part of a PFI contract differentiate it from the traditional mode of procurement. Therefore, it is an important performance indicator to be agreed upon the pre-construction period. This result is consistent with that of Yuan et al. (2012), who also found that project maintainability is an important performance indicator in assessing the performance of PFI/PPP projects in the US and China.

'Commitment and responsibility between public and private sectors' is the second most important indicator as perceived by all respondents. In a PFI/PPP, the private sector is responsible for delivering the pre-determined facilities and services on time. As for the public sector, it is responsible for making a payment if the private sector meets the standards and performance laid out in the agreement (PPP Guideline, 2009). As PFI is a long term contract, it is essential that at the pre-construction phase, the full commitment and clear responsibility of each party is obtained. Hence, it is an important performance indicator of this pre-construction stage. This result is consistent with Yuan et al. (2012) for China and the US and also supports that of Ismail (2013a), who found that the commitment and responsibility of both sectors is a critical factor in the success of PFI/PPP projects in Malaysia.

The third most important performance indicator for PFI/PPP projects before construction begins was 'Government's knowledge of PFI/PPP'. The government as a procurer of the project should have proper knowledge and understanding of the unique concept of PFI implementation in Malaysia and its differences compared to the conventional method of procurement. This is important to ensure maximum VFM can be achieved from a PFI/PPP project (Jayaseelan and Tan, 2006). Moreover, inadequate knowledge may lead to a loss of time in resolving issues such as communication problems due to a lack of understanding of the technical terms used in the project (Akintoye et al., 2003). The finding is consistent with Yuan et al. (2012), who found that this performance indicator is perceived as important by all respondents.

'Project technical feasibility' was ranked fourth, as shown in Table 4. PFI projects normally involve huge capital and require a high level of technical expertise both in terms of construction and operation, as evidenced

in many PFI projects including the Mass Rapid Transit (MRT) System and the IIUM Teaching Hospital projects. Therefore, this performance indicator on the project feasibility is very important to be evaluated at the pre-construction stage in order to ensure the project is completed and delivered successfully. This result is in line with the evaluation criteria used in selecting the best bidder for a PFI/PPP project. The result is also consistent that of Yuan et al. (2012), who found that this indicator is the second most important performance indicator in China and the US. Moreover, Ismail (2013a) revealed that project technical feasibility is among the important CSFs for PFI/PPP implementation in Malaysia.

The fifth ranked performance indicator as perceived by all respondents was 'Appropriate risk allocation, risk sharing and risk transfer'. Similar to other earlier ranked indicators, risk allocation, sharing and transfer is also an important indicator because the optimal risk allocation between the government and the private sector consortium should maximise the VFM achieved by a PFI/PPP project (Akintoye et al., 2003). The allocation of risk is usually based on knowing which party is best able to manage it (PPP Guideline, 2009; Ismail, 2012). This result is consistent with that of Li et al. (2005) and Yuan et.al, (2012), who found that this indicator is perceived as the second important performance indicator that has a strong impact on PPP performance during the early contractual stage.

Of the 18 performance indicators for the early stage of the PPP contract, 'Stable and favourable political environment' was perceived by all respondents as the least important performance indicator. This is possibly due to the current stable political situation in Malaysia, which may have caused the respondents to believe that it should not among the most important PPP performance indicators for PPP projects in the country (Ismail, 2013a). Even though this finding contradicts Yuan et al. (2012), who found that 'The type of construction' is the least important performance indicator among their total sample of respondents, the result is consistent with Ismail (2014), who found that regardless of the political outlook, the public always welcomes PFI/PPP projects for their ability to provide public facilities and services.

4.2 Differences in the perceptions of the public and private sectors

Based on the mean score results, which range from 3.79 and 4.38 for the public sector and from 3.58 to 4.13 for the private sector, both groups of respondents perceived all the performance indicators as 'important' for evaluating the pre-construction phase performance. Moreover, the public sector respondents perceived all the performance indicators except one as more important than did the private sector respondents. This is evidenced by the higher mean scores for each indicator in the public sector group. In terms of mean score ranking, the ranking of the first nine indicators for the public sector group mirror the results for all respondents except for 'Government's knowledge of PFI/PPP' and 'Commitment and responsibility between public and private sectors' indicators.

There are differences in the rankings of the performance indicators made by the public and private sectors, and particularly for three factors: 'Level of construction complexity', 'Stable and favourable legal environment' and 'Flexibility in the contracts'. The public sector group perceived that 'Level of construction complexity' is a more important indicator than did the private sector. This is possibly due to the government not having expertise and skills especially in respect of high technology projects that can be achieved through collaboration with the private sector (PPP Guideline, 2009; Ismail, 2013a). On the other hand, the private sector respondents ranked 'Stable and favourable legal environment' and 'Flexibility in the contracts' as the seventh and eighth in importance while the public sector respondents ranked these two indicators lower. A possible reason for the results is that having a stable legal environment and flexibility in the contract makes it is easier for the private sector to make changes to the contract term if needed and also gives an option for the private sector to end the partnership without facing a heavy penalty.

To statistically examine the differences in the results for both sectors, an independent t-test was conducted, the results of which are presented in Table 5. Based on the results as tabulated in Table 4, there is no significant difference in the perceptions of both sectors relating to all performance indicators before project construction begins at the 10% significance level except for two indicators with marginally significant: 'General public support' and 'Type of construction'.

The 'General public support' and 'Type of construction' indicators were perceived by the public sector respondents as significantly more important than by the private sector respondents. The public sector respondents' greater emphasis on 'General public support' can be attributed to the nature of their responsibilities. Public sector organizations are mandated to safeguard the public's welfare and interests,

making public approval a critical metric for project success. However, personal experience and the organizational culture within public bodies likely reinforce this focus. Individuals in the public sector are often more attuned to the socio-political implications of infrastructure projects, as they face scrutiny from both the government and the general population. The importance they place on public support may also stem from a risk-averse culture prevalent in public organizations, where public opinion is seen as a measure of legitimacy and alignment with policy goals.

By contrast, private sector organizations are driven primarily by profit motives and operational efficiency, which could explain why 'General public support' is less of a concern for them. Their focus tends to be more on the financial viability of a project rather than on broader public perceptions. This distinction reflects not only the differing priorities of the sectors but also how personal roles, past experiences, and organizational missions shape perceptions of what constitutes project success. While public sector respondents view public support as crucial for maintaining accountability and justifying the use of public funds, private sector respondents may be more concerned with meeting contractual obligations and delivering on time and within budget.

The indicator 'Type of construction' is also more important to the government because construction for different types of sector, the size of the project and the time at which the project was procured and developed will lead to differences in cost, time and risk performance (Henjewele et al., 2014). These differences may have a knock-on effect on other project characteristics such as the complexity of the project, risk management, total cost of the project, and completion period (Akintoye et al., 2003). Therefore, the public sector or government as the procurer perceived this indicator as important because it affects the technology and costing offered and adopted by the private sector in implementing the PFI/PPP project (Ismail and Abdul Rashid, 2007; PPP Guideline, 2009).

The higher importance placed on 'Type of construction' by the public sector also reflects how organizational culture and external factors impact perceptions. In public organizations, where projects are often subject to extensive regulation and public scrutiny, the type and scale of construction are seen as key factors influencing a project's risk profile. This focus on managing risks—whether financial, political, or operational—may lead public sector respondents to prioritize construction type more heavily, as it directly impacts project cost, timeline, and complexity. Public sector employees are typically more conservative and risk-averse, given the longer-term implications of projects, which can affect national infrastructure and public services.

On the other hand, private sector respondents might view the 'Type of construction' as more of a technical challenge rather than a factor of strategic importance. Their experience and organizational focus on efficiency and innovation may make them more flexible in handling different construction types, seeing it as a manageable variable rather than a risk-laden decision. The private sector's ability to leverage technology and advanced construction methods might also explain why they view this indicator as less critical to project success, compared to the public sector's more traditional approach.

Moreover, external factors such as regulatory frameworks, political environments, and economic conditions may also influence these perceptions. For example, public sector respondents may be more sensitive to fluctuations in public opinion or changes in government policy, which could heighten their focus on public support and construction type. Private sector respondents, in contrast, might be more influenced by market conditions, competition, and the availability of resources, leading to a different prioritization of performance indicators. In sum, the divergent perceptions between the public and private sectors on indicators like 'General public support' and 'Type of construction' highlight the impact of personal experiences, organizational culture, and external influences on how individuals evaluate project performance. Understanding these underlying factors is critical for fostering better collaboration and alignment between the sectors in PFI/PPP projects.

Table 4. Perception of Survey Respondents Concerning the Relative Importance of Performance Indicators in Relation to Pre-Construction Phase.

No.	Performance Indicator	Overall			Public Sector			Private Sector		
		Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank
1.	Project maintainability	4.31	.820	1	4.38	.787	1	4.13	.882	1
2.	Commitment and responsibility between public and private sectors	4.24	.848	2	4.31	.811	3	4.06	.924	3
3.	Government's knowledge of PFI/PPP	4.23	.874	3	4.32	.847	2	4.00	.909	5
4.	Project technical feasibility	4.22	.837	4	4.27	.813	4	4.11	.893	2
5.	Appropriate risk allocation, risk sharing and risk transfer	4.16	.857	5	4.24	.833	5	3.94	.889	6
6.	Concessionaire's knowledge of PFI/PPP	4.12	.822	6	4.17	.800	6	4.00	.873	4
7.	Competitive tender procedure	4.08	.908	7	4.15	.876	7	3.88	.968	10
8.	Level of technological advancement	4.05	.832	8	4.12	.799	8	3.88	.900	9
9.	Type of construction	4.03	.878	9	4.12	.841	9	3.81	.941	12
10.	Level of design complexity	4.01	.878	10	4.08	.866	12	3.81	.889	11
11.	Standard PFI/PPP contract	4.01	.902	11	4.09	.920	11	3.80	.820	13
12.	Level of construction complexity	3.99	.878	12	4.11	.859	10	3.67	.856	17
13.	Stable and favourable legal environment	3.95	.814	13	3.98	.817	14	3.88	.807	8
14.	Different outputs of different type of construction	3.95	.829	14	4.04	.817	13	3.69	.814	16
15.	Flexibility in the contracts (e.g. necessary if the user needs change, exit position for private sector)	3.89	.930	15	3.87	.956	16	3.92	.860	7
16.	Stable and favourable macro-economic condition	3.81	.826	16	3.84	.879	17	3.70	.659	15
17.	General public support	3.81	.830	17	3.90	.807	15	3.58	.851	18
18.	Stable and favourable political environment	3.77	.898	18	3.79	.937	18	3.72	.786	14

4.3 Differences in the perceptions of the public and private sectors

Based on the mean score results, which range from 3.79 and 4.38 for the public sector and from 3.58 to 4.13 for the private sector, both groups of respondents perceived all the performance indicators as 'important' for evaluating the pre-construction phase performance. Moreover, the public sector respondents perceived all the performance indicators except one as more important than did the private sector respondents. This is evidenced by the higher mean scores for each indicator in the public sector group. In terms of mean score ranking, the ranking of the first nine indicators for the public sector group mirror the results for all respondents except for 'Government's knowledge of PFI/PPP' and 'Commitment and responsibility between public and private sectors' indicators.

There are differences in the rankings of the performance indicators made by the public and private sectors, and particularly for three factors: 'Level of construction complexity', 'Stable and favourable legal environment' and 'Flexibility in the contracts'. The public sector group perceived that 'Level of construction complexity' is a more important indicator than did the private sector. This is possibly due to the government

not having expertise and skills especially in respect of high technology projects that can be achieved through collaboration with the private sector (PPP Guideline, 2009; Ismail, 2013a). On the other hand, the private sector respondents ranked 'Stable and favourable legal environment' and 'Flexibility in the contracts' as the seventh and eighth in importance while the public sector respondents ranked these two indicators lower. A possible reason for the results is that having a stable legal environment and flexibility in the contract makes it is easier for the private sector to make changes to the contract term if needed and also gives an option for the private sector to end the partnership without facing a heavy penalty.

To statistically examine the differences in the results for both sectors, an independent t-test was conducted, the results of which are presented in Table 5. Based on the results as tabulated in Table 4, there is no significant difference in the perceptions of both sectors relating to all performance indicators before project construction begins at the 10% significance level except for two indicators with marginally significant: 'General public support' and 'Type of construction'.

The 'General public support' and 'Type of construction' indicators were perceived by the public sector respondents as significantly more important than by the private sector respondents. The public sector respondents' greater emphasis on 'General public support' can be attributed to the nature of their responsibilities. Public sector organizations are mandated to safeguard the public's welfare and interests, making public approval a critical metric for project success. However, personal experience and the organizational culture within public bodies likely reinforce this focus. Individuals in the public sector are often more attuned to the socio-political implications of infrastructure projects, as they face scrutiny from both the government and the general population. The importance they place on public support may also stem from a risk-averse culture prevalent in public organizations, where public opinion is seen as a measure of legitimacy and alignment with policy goals.

By contrast, private sector organizations are driven primarily by profit motives and operational efficiency, which could explain why 'General public support' is less of a concern for them. Their focus tends to be more on the financial viability of a project rather than on broader public perceptions. This distinction reflects not only the differing priorities of the sectors but also how personal roles, past experiences, and organizational missions shape perceptions of what constitutes project success. While public sector respondents view public support as crucial for maintaining accountability and justifying the use of public funds, private sector respondents may be more concerned with meeting contractual obligations and delivering on time and within budget.

The indicator 'Type of construction' is also more important to the government because construction for different types of sector, the size of the project and the time at which the project was procured and developed will lead to differences in cost, time and risk performance (Henjewele et al., 2014). These differences may have a knock-on effect on other project characteristics such as the complexity of the project, risk management, total cost of the project, and completion period (Akintoye et al., 2003). Therefore, the public sector or government as the procurer perceived this indicator as important because it affects the technology and costing offered and adopted by the private sector in implementing the PFI/PPP project (Ismail and Abdul Rashid, 2007; PPP Guideline, 2009).

The higher importance placed on 'Type of construction' by the public sector also reflects how organizational culture and external factors impact perceptions. In public organizations, where projects are often subject to extensive regulation and public scrutiny, the type and scale of construction are seen as key factors influencing a project's risk profile. This focus on managing risks—whether financial, political, or operational—may lead public sector respondents to prioritize construction type more heavily, as it directly impacts project cost, timeline, and complexity. Public sector employees are typically more conservative and risk-averse, given the longer-term implications of projects, which can affect national infrastructure and public services.

On the other hand, private sector respondents might view the 'Type of construction' as more of a technical challenge rather than a factor of strategic importance. Their experience and organizational focus on efficiency and innovation may make them more flexible in handling different construction types, seeing it as a manageable variable rather than a risk-laden decision. The private sector's ability to leverage technology and advanced construction methods might also explain why they view this indicator as less critical to project success, compared to the public sector's more traditional approach.

Moreover, external factors such as regulatory frameworks, political environments, and economic conditions may also influence these perceptions. For example, public sector respondents may be more sensitive to fluctuations in public opinion or changes in government policy, which could heighten their focus on public support and construction type. Private sector respondents, in contrast, might be more influenced by market conditions, competition, and the availability of resources, leading to a different prioritization of performance indicators. In sum, the divergent perceptions between the public and private sectors on indicators like 'General public support' and 'Type of construction' highlight the impact of personal experiences, organizational culture, and external influences on how individuals evaluate project performance. Understanding these underlying factors is critical for fostering better collaboration and alignment between the sectors in PFI/PPP projects.

Table 5. Summary of Independent T-test Results for Performance Indicators in Relation to Pre-Construction Phase.

No.	Performance Indicator	F-value	t-value	Significant
1	General public support	2.901	2.588	.090*
2	Type of construction	2.836	2.264	.093*
3	Stable and favourable political environment	2.182	.555	.141
4	Stable and favourable macro-economic condition	2.031	1.328	.155
5	Different outputs of different type of construction	1.706	2.961	.193
6	Level of technological advancement	1.389	1.883	.240
7	Competitive tender procedure	1.110	1.993	.293
8	Level of construction complexity	.921	3.495	.338
9	Level of design complexity	.833	2.079	.362
10	Flexibility in the contracts	.676	-.378	.412
11	Government's knowledge of PFI/PPP	.179	2.435	.672
12	Appropriate risk allocation, risk sharing and risk transfer	.077	2.342	.782
13	Project technical feasibility, constructability	.065	1.227	.799
14	Project maintainability	.040	2.106	.841
15	Concessionaire's knowledge of PFI/PPP	.030	1.397	.862
16	Commitment and responsibility between public and private sectors	.011	2.025	.917
17	Standard PFI/PPP contract	.011	2.214	.918
18	Stable and favourable legal environment	.006	.909	.936

*significant at 10%

5.0 IMPLICATIONS, LIMITATIONS, SUGGESTIONS FOR FUTURE STUDY AND CONCLUSION

This study investigated the important key performance indicators at the pre-construction phase of a PFI project using a questionnaire survey on public and private sector respondents who have involved with PFI projects. The top five performance indicators before construction begins were 'Project maintainability', 'Commitment and responsibility between public and private sectors', 'Government's knowledge of PFI/PPP', 'Project technical feasibility' and 'Appropriate risk allocation, risk sharing and risk transfer'. The performance indicator that was perceived as the least important was 'Stable and favourable political environment'. In terms of the differences in the opinion between the private sector and the public sector respondents, two indicators that are 'General public support' and 'Type of construction' were perceived by the public sector respondents as significantly more important than by the private sector respondents.

There are several implications from the findings of the present study. The empirical evidence provided by this study contributes to the relatively limited body of literature on performance measurement for PFI/PPP projects in developing economies. While PFI is increasingly being used as a public procurement method, especially for large-scale infrastructure projects, there is a need for more context-specific research. By examining performance indicators during the pre-construction phase, this study opens avenues for future

research focused on different stages of PFI projects, providing a foundation for more comprehensive and comparative studies across diverse geographic and economic settings.

The significance of this contribution lies in the fact that effective performance measurement of PFI projects enhances public accountability. Since PFI projects typically involve public resources and long-term commitments, ensuring their successful execution directly impacts the government's accountability to society. In this sense, the study's findings can stimulate further research on how governments in developing economies can optimize their PFI/PPP frameworks to better serve public interests.

The results offer practical guidance to multiple stakeholders, including academicians, practitioners, and regulatory bodies, on the critical performance indicators that need to be considered during the pre-construction phase of PFI projects. These insights are especially useful for decision-makers within government bodies such as PPP Unit or Unit Kerjasama Aam Swasta (UKAS), which is responsible for overseeing PFI/PPP projects. The findings suggest that regulatory bodies like UKAS could benefit from revisiting and updating their current procedures and practices. Specifically, the study highlights the importance of establishing a systematic monitoring mechanism for PFI/PPP performance. Such a mechanism would enable continuous evaluation and ensure that performance objectives align with the standards set by the government. This could involve regular assessments of key indicators like project feasibility, maintainability, and risk management, ensuring that projects meet public expectations and are sustainable over the long term.

In terms of the result regarding the need for performance indicator on project maintainability, it provides a useful input on the significant role that facilities management companies play in the lifecycle of PFI/PPP projects. Since these companies are responsible for maintaining the facilities long after construction is completed, government authorities, particularly UKAS, should place greater emphasis on evaluating the credibility and capacity of these firms during the tendering process. This suggests that tenders should not only focus on the construction company but also on the ability of the facilities management company to uphold quality standards throughout the contract period.

The study’s findings also highlight the critical role of feasibility studies as a performance indicator. This implies that government agencies must ensure that comprehensive feasibility studies are conducted for all PFI projects. These studies should assess technical, financial, and operational viability to minimize risks and ensure the project's sustainability. If feasibility studies are already being conducted, there may be a need for a review or improvement of the existing mechanisms to enhance their effectiveness. Regular reviews and updates of feasibility study guidelines can help ensure that projects are better prepared and risks are mitigated early on.

The emphasis on risk management as a critical pre-construction performance indicator highlights the need for a well-prepared and reliable risk matrix. To successfully manage risks, a series of dialogues or workshops involving all contractual parties should be organized before or immediately after the contract signing. These discourses would help in identifying, allocating, sharing, and transferring risks in a way that is mutually beneficial to all parties. Establishing clear communication channels between public and private stakeholders can lead to a more collaborative approach to risk management, which is crucial for the long-term success of PFI projects.

The differences in the perception of performance indicators between public and private sector respondents point to the need for a better understanding of the roles and responsibilities of each party. Public sector stakeholders often prioritize public accountability and risk management, while private sector participants may focus more on financial returns and efficiency. A more profound understanding of these differing priorities can lead to more effective collaboration and decision-making. This can be achieved by fostering ongoing dialogue between both sectors to align their expectations, ensuring that both parties gain maximum benefits from PFI/PPP projects.

Nonetheless, this study has some limitations that should be noted. First, a common limitation of the postal questionnaire method is the issue of losing control over who completes the questionnaire. The respondents who answer the questionnaire may lack the time to do so due to job commitments, the possibility of questions being ambiguous and lead to misunderstand and the non-completion of some parts of the questionnaire. The respondents may also not truthfully answer the survey because fear of negative consequences as a result of reveal perception about the future effect. Second, this study only used the survey method to gather data on the perceptions of the two groups of respondents. The use of the questionnaire method to determine the perceptions of the public sector and private sector on key elements of PFI/PPP in Malaysia might not be able to fully

capture the overall understanding and perception of the respondents. Therefore, future research may opt to use focus groups, case studies or interviews as research methods. The advantage of using focus groups, case studies or interviews is that they enable direct interaction with the respondents. Thus, it is more convenient for them to express their opinions and share more informative insights regarding PFI/PPP performance objectives and performance indicators. Furthermore, future studies could also include and explore other indicators in more depth, as they might provide valuable insights in different contexts or phases of the project lifecycle. The third limitation of the present study is that it involves only two stakeholders of PFI/PPP projects – the public and private sectors. These sectors seem to be the most appropriate stakeholders to contribute to this study because both sectors are directly affected by and involved in PFI/PPP projects. However, other stakeholders such as the general public and academicians could be the respondents of future research. To conclude, despite its limitations this study has provided relevant information and has obtain empirical findings to stimulate more research and pave the way for future studies on the performance of PFI/PPP projects.

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