



Criteria in Selecting Key Performance Indicators for Public Private Partnership (PPP) Projects

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Abstract: Public Private Partnership (PPP) is conceptualised as a performance-based procurement in which concessionaires are contracted to provide efficient facilities and services to the government. The quality of the facilities and services provided by the concessionaires will be assessed using key performance indicators (KPIs). This is for determining the level of performance against the agreed level of standards as expected by the government. However, most of the PPP projects are currently facing the difficulties in meeting the expectation. It is due to several issues such as lack of methods for measuring the KPIs, the lack of understanding of the KPI implementation, project performance not reflecting the actual performance (physical) on site, the absence of a weightage system on KPIs, and inconsistent of works performance. These shortcomings have led to the difficulty in determining the performance level of the PPP projects. Therefore, this research aims to identify the important criteria for selecting KPIs for PPP project and to determine the implications on the absence of important criteria in selecting PPP project KPIs. Empirical research using case studies via semi-structured interviews technique were conducted within PPP stakeholders. The important criteria were determined from the data obtained from thirty-two (32) semi-structured interviews conducted across six (6) case studies. The results indicate 11 important criteria to be considered when establishing the KPIs for PPP projects. The findings of this research may benefit practitioners in setting the criteria in selecting appropriate KPIs for the implementation of PPP project during operational and maintenance phase.

Keywords: Criteria, key performance indicators, project performance and public private partnership, performance

1. Introduction

Public Private Partnership (PPP) refers to the contractual arrangement between the public and private sectors to enhance their participation in the economic development of a country. PPP involves the transfer of the responsibility to finance and manage a package of capital investment and services including the construction, management, maintenance of the building and facilities, refurbishment, and replacement of public-sector assets within the concession period to the private sector or so-called concessionaire. In the meantime, the public sector continues to focus on monitoring and measuring performance for the delivery of services and facilities provided by the concessionaires.

The PPP procurement approach has been adopted extensively in construction projects globally with the main aims to achieve value for money (VFM). As mentioned by Almarri and Boussabaine (2017), the main driver behind the paradigm of PPP procurement is achieving VFM by providing all the necessary service provisions at an optimal cost and to the output specified standards. Furthermore, VFM in the PPP context is also often used to express satisfaction

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on the cost of good quality service by achieving good performance (Ismail, 2009). Although the importance of achieving good performance is often emphasised in the implementation of this procurement approach, there are still numerous PPP projects that demonstrate poor performance levels especially in social infrastructure projects (Liu et al., 2016). Beside this, Hashim et al. (2017) also reported that most PPP projects are currently facing difficulties in meeting client expectations. Accordingly, these issues have raised questions concerning the rationale of adopting the PPP approach in Malaysia where VFM is a part of the goal to achieve success (UKAS, 2009).

Currently, the implementation of PPP's, especially for PPP/PFI schemes in Malaysia, has entered into the nine years of the operational and maintenance (O&M) phase and many researchers had argued on the issues and challenges that will be faced by the stakeholders in this phase (Hashim et al., 2017; Khaderi & Aziz, 2010). Among the issues argued by the researchers include insufficient of PPP implementation guidelines, difficulties in managing KPIs, maintenance approach, service delivery failure, asset risk, and life cycle issues (Hashim et al., 2017). These issues would indirectly contribute to project implementation failure. Hashim et al. (2018) in his study revealed that, defects occurring in PPP projects had significantly affect the project performance and disrupted project operations during O&M phase.

Lop et al. (2020) in their study revealed that the issues faced during the O&M of PPP projects will significantly affect project performance. There are four (4) crucial issues identified in the research findings such as lack of skills and knowledge on PPP, insufficient procedures and its implementation, challenges in PPP project management, and conflicts on documentation. As such, the achievement of good project performance is vital as the key concept of the PPP approach, mainly referring to performance-based payment. To determine the level of achievement, performance assessment needs to be conducted to assist in accurate decision-making. However, in Malaysia, the assessment of an operational project cannot be accurately performed at this stage, given there are no effective mechanisms or tools that have been developed to determine the level of project performance. This is mainly due to unclear measurement parameters and the lack of detailed justification for KPIs as stated in the concession agreement (Lop et al., 2018). Therefore, Liu et al. (2014a); Javed et al. (2013); Ismail (2012); Khaderi & Aziz (2010); and Yuan et al. (2009) emphasised the importance and significance of KPIs in determining the level of PPP project performance. It is essential to develop effective KPIs to ensure the success of the PPP procurement approach throughout the life cycle of projects, and at the same time to attain VFM. Given the various issues that have been mentioned above, the contention of this research is determined the important criteria in selecting KPIs for PPP projects in Malaysia.

2. Literature Review

2.1 Key Performance Indicator (KPI) for PPP Project

The key features of PPP are concerning allocation of risk, VFM, output specification, whole service approach, payment-based mechanism and KPIs (UKAS, 2009). The Ninth Malaysia Plan (9MP) spelt out certain issues regarding the implementation of PPPs, especially with regards to KPIs. More importantly, the development of KPIs for PPPs allow greater public participation in the formation of those KPIs. Moreover, it is anticipated that KPIs will assist in making PPPs more significant to public needs and requirements instead of benefiting mainly the profit-driven private concessionaires (Ismail, 2009).

KPIs in the context of PPPs and infrastructure delivery are defined by Ismail (2009) as organised and characterised KPIs through careful and systematic discussion, weighing and examination. The importance of KPIs in PPPs is the ability to assess the work performance against the standards as agreed by the public and private sectors. KPIs are also important to highlight organisational and project related weaknesses through performing a project assessment using KPIs. For instance, an organisation without an effective strategy, supported by KPI's to measure project performance, may experience significant defects or poor service delivery (Lop et al., 2017b). Inevitably, if these weaknesses or failures are not addressed, poor performance and low satisfaction level may result. Thus, KPIs are crucial to assist organisations and projects to continuously improve for the organisation and projects to be successful. Moreover, the implementation of KPIs will undoubtedly benefit multiple stakeholders. Importantly, as a useful tool to help improve performance, KPIs can help to monitor and evaluate performance, particularly in PPP projects. According to Liu et al. (2014b), monitoring and evaluating the performance of PPP projects are the core activities of contract and project management, which are considered important in most countries as part of their PPP policy regime. Therefore, KPIs are not only used in scoring the performance level but are also for monitoring the activities and outcomes in PPP projects (Yuan et al., 2009).

Even though several studies investigating KPIs have been conducted with the aim to improve performance, the use of KPIs is continuously debated (Ismail, 2012; Khaderi & Aziz, 2010). For instance, numerous challenges have been highlighted from a global perspective during the implementation of PPPs as reported by Lawther and Martin (2014); Javed et al. (2013); Toor and Ogunlana (2010). Most of the researchers' stated that KPIs lack clarity, difficult to understand, too complicated and some are too general and may lead to project failure and poor projects performance. Hence, this illustrates that there is a need to establish effective KPIs for measuring and monitoring the performance of PPP projects to achieve the project's goals and demonstrate VFM.

2.2 Criteria in Selecting of Key Performance Indicators

The selection of KPIs is an important stage in the process of defining operational KPIs in a project. Once an initial list of KPIs has been developed, the next step is to ensure that each indicator meets each set of predetermined criteria to ensure the quality and appropriateness of indicators for project operations. Many studies have suggested embedding several criteria is crucial in determining the most appropriate KPIs for assessing the performance. Table 1 displays the criteria for selecting KPIs for assessing PPP projects performance from previous studies.

Table 1 - Criteria for selecting KPIs for PPP Projects

Criteria	Description	Researchers	Frequency
Specific	KPIs need to be clear and precise as to what is being measured. There needs to be one widely accepted definition for KPIs to make sure different users interpret KPIs in the same way and, as a result, come to the same conclusions which they can act upon. Each KPI is precise, not vague.	Podgorski (2015); Mladenovic et al. (2013); Oyedele (2013); Yuan et al. (2008); Shahin & Mahbod (2007); Locke & Latham (2002).	6
Measurable	KPIs need to be measurable to define a standard. The measure may be quantitative or qualitative, but the measurement should be against a standard of performance and expectation.	Podgorski (2015); Mladenovic et al. (2013); Oyedele (2013); Ismail (2009); Yuan et al. (2008); Shahin & Mahbod (2007); Locke & Latham (2002).	7
Attainable	KPIs has to be measurable to define a standard value for it. It is important for the acceptance of KPI's to ensure that the developed KPIs are easily to be attainable.	Podgorski (2015); Oyedele (2013); Ismail (2009); Shahin & Mahbod (2007); Locke & Latham (2002)	5
Realistic	KPIs should be realistic. Being realistic in the choice of goals helps to examine the availability of resources and in the selection of KPIs.	Podgorski (2015); Oyedele (2013); Shahin & Mahbod (2007); Locke & Latham (2002).	4
Time limit	Expressing the value of KPIs in terms of time is important. Each KPI has a meaning relative to time if one knows the time dimension in which it is to be applied. The realisation and standardization of the KPI, therefore, has to be time phased.	Podgorski (2015); Oyedele (2013); Shahin & Mahbod (2007); Locke & Latham (2002).	4
Defined	Each KPI should have a clear and intelligible definition to ensure consistent collection of data and comparison. Vague descriptions can lead to misinterpretation and confusion. Too tightly defined or definitions which are too broad could create problems.	Mladenovic et al. (2013); Ismail (2009); Yuan et al. (2008).	3
Understandable	KPIs need to be interpretable and easy for users to comprehend. They need to be easily communicated and understood both internally and externally, or at least presented in an easily understandable and appealing way to both the target audience and users. Moreover, KPIs need to be concise and unsophisticated.	Carlucci (2010); Ismail (2009).	2
Relevance	Indicators should be relevant to the organisation. KPIs should be related to the strategic goals and objectives of the organisation. KPIs should ideally be relevant to the people providing the data and to the users of the KPIs. However, it may not be possible for a single indicator to be relevant to all users given different perspectives and interests.	Carlucci (2010).	1

Criteria	Description	Researchers	Frequency
Reliable	Refers to the quality of the KPIs which ensures that each KPI is free from error or bias and represents what it is intended to represent.	Carlucci (2010).	1

Comparable	Comparability refers to the quality of information related to the KPIs that enable users to identify similarities and differences between two sets of economic phenomena.	Carlucci (2010); Ismail (2009).	2
Consistency	Consistency is the conformity of an indicator from one period to the next period with unchanging policies and procedures.	Ismail (2009)	1
Linked with rewards and penalties	Developed KPIs should be presented along with incentives and penalties by the government, the so-called “a reward penalty system”. The purpose of linking KPIs with rewards is to motivate the private concessionaires to perform their responsibilities appropriately.	Yaacob & Aminuddin (2011); Ismail (2009).	2

Podgorski (2015) considers good indicators that are quantifiable, valid and representative, ensuring minimum variability of results for the measurement performed under the same conditions, sensitive to change, are cost-effective and understood by most users. Whereas, based on a review of the various sets of criteria as provided in the literature among various researchers included reliability (Carlucci, 2010; Locke & Latham, 2002); comparability (Carlucci, 2010; Ismail, 2009), and understandability (Carlucci, 2010). Consistency and long-term considerations were also among the criteria discussed by Ismail (2009).

Consequently, the constructed KPIs should be specific rather than general (Oyedele, 2013; Yuan et al., 2008; Shahin & Mahbod, 2007; Locke & Latham, 2002), measurable against objective criteria (Oyedele, 2013; Ismail, 2009; Shahin & Mahbod, 2007; Locke & Latham, 2002), capable of being achieved (i.e., with built-in tolerances rather than requiring the attainment of perfection) (Oyedele, 2013; Shahin & Mahbod, 2007; Locke & Latham, 2002), and relevant to the services provided (Carlucci, 2010). Further, it is important that the indicators own these criteria in providing more practical and effective KPIs.

Furthermore, the assessment of standards and the scoring mechanism must be capable of being completed on time to calculate the monthly unitary payment (Oyedele, 2013; Yaacob & Aminuddin, 2011; Ismail, 2009; Shahin & Mahbod, 2007; Locke & Latham, 2002). According to Shahin and Mahbod (2007) the KPIs should be as specific as possible. Loose broad or vague KPIs are undesirable leading to difficulties in measuring performance. When KPIs are specific, it is much easier to measure the level of performance achievement.

Principally, KPIs as discussed by Yaacob and Aminuddin (2011) and Ismail (2009) should be linked with the reward system given that the main principle of the PPP states that payment to the concessionaire is based on performance, also known as ‘performance-based payment’ (UKAS, 2009). In addition, the KPIs should incorporate and align with incentives and penalties imposed by the government. The purpose of linking KPIs with rewards or incentives is to help motivate the private concessionaires to perform their responsibilities effectively and successfully (Ismail, 2009). In essence, KPIs can be described as a potential effectiveness attribute of a system. Therefore, it is important that indicators are clear and complex, consisting of many elementary performance attributes.

3. Methodology

A qualitative method via the exploratory approach of six (6) case studies was conducted using semi-structured interviews. This corresponds with the semi-structured face-to-face interviews with professionals and experts that were involved in PPP projects at the operational and maintenance (O&M) phase. The selection of case studies was based on the list of projects established by the Public-Private Partnership Unit (UKAS) of the Prime Minister’s Department of Malaysia. However, this research only focused on the educational sector. Six (6) university campuses under Phase 1 were chosen as the research case studies. It is due to the earliest PPP projects that have been implemented in Malaysia (PPP phase 1). Purposive sampling was adopted for the data collection. Thirty-two (32) participants among PPP stakeholders (i.e., public sector and private sector) involved in the case study projects were selected and participated.

The data obtained from these interviews were analysed using the thematic technique (Atlas.ti@8). The analysis of qualitative data has been conducted according to several stages, namely, transcription, organise, familiarisation, coding, identify themes, and report writing. These steps involved in analysing the data from the within-case studies and cross-sectional analysis. The analysis of within-case study was initially performed and followed by cross-case analysis (i.e., comparative analysis) to produce broad themes that emerge from the data and highlight similarities and differences that arise from the case study.

4. Results and Discussion

Section 4.1 until 4.3 presents findings of the cross-case analysis of the six case studies selected. The process of conducting the cross-case analysis was based on the results of each case study (within case analysis).

4.1 Background of Case Study

The contracts of these case studies were signed between three main parties, namely; the client, end users and concessionaire. The concession period of each contract is agreed at 20 years. These projects were among the earliest PPP projects implemented in Malaysia as mentioned by the Head of Department of Infrastructure and Infostructure (2016) and statistic by UKAS (2016). The total project values for the case studies ranges from RM266 to RM311 million designed to the maximum capacity of 5,000 students. Most of the campuses had been operating under the operational and maintenance (O&M) phase within 8-9 years. All participants involved in the interview process were from PPP practitioners from various stakeholders which involved directly in PPP projects during the O&M phase with an average of 8 years’ experience in managing PPP projects. Table 2 presents summary background of case studies and interview participants involved.

Table 2 - Summary background of case studies and participants involved

Case Study	Background Case Studies					Participants Involved	
	Built-up Area (acres)	Construction Period		Concession Period	Operational and Maintenance (years)	Stakeholders	Nos of Interviewees Participate
		Built	Completed				
Campus A	88	2010	2013	20 years	9	End Users,	5
Campus B	76	2011	2014	20 years	8	FM Contractors,	7
Campus C	49	2011	2014	20 years	8	Ministry of Higher	5
Campus D	76	2011	2014	20 years	8	Education (MOHE),	5
Campus E	80	2011	2014	20 years	8	Public Private	5
Campus F	45	2010	2014	20 years	8	Partnership Unit (UKAS)	5

4.2 Important Criteria for Selecting Key Performance Indicators

Table 3 presents the findings based on the interviews of the important criteria in selecting KPIs. A list of criteria was presented to participants during the interview process in which twelve criteria were identified by participants for consideration:

- 1) Specific
- 2) Measurable
- 3) Attainable
- 4) Realistic
- 5) Time limit
- 6) Defined
- 7) Understandable
- 8) Relevance
- 9) Reliable
- 10) Comparable
- 11) Consistency
- 12) Linked with rewards and penalties

Based on the results, the participants were asked to rate “Yes” if the criteria were important and relevant in selecting the KPIs, or “No” if the criteria were irrelevant. Based on the results, most participants agreed (100%) with the above criteria except for comparable, reliable, consistency and linked with rewards and penalties. About 95% of participants across all six cases rated “Yes” for the criteria; consistency and linked with rewards and penalties. While 93% rated “Yes” for reliable. However, they viewed reliable, consistency and link with a reward as important criteria in selecting KPIs for PPP projects.

Regarding “comparable” criteria, the results indicated that 38% rated “Yes”, and the remaining 62% rated this criterion as “No”. Investigating this finding further, revealed that this criterion is not relevant to be considered in selecting KPIs. Thus, it is not being reckoned as one of the important criteria in selecting the KPIs. Khalil et al. (2016) proposed that the results of rating important factors below 50% should not be considered as relevant to be part of the important factors. Hence, 11 out of 12 criteria were considered in the selection of KPIs in PPP projects. Nevertheless, only one criterion namely “comparable” was excluded from the list of important criteria which may be due to the specific nature of the project making it difficult to compare, especially in terms of quality information and data. Therefore, the findings indicate that KPIs play a significant role in delivering a better project performance. Moreover, the selection of KPIs according to the criteria listed above are important to ensure KPIs can be effectively applied to projects. This is supported by both statements of the Engineer (End Users) for Campus A and F stating that:

“...One example is indoor air quality. To perform this test, it will involve individual consultants in which the cost of performing this test is very high where UiTM asks for 50% of the total area of the campus to be tested. In

my opinion, the KPIs that have been set are unrealistic where they are quite difficult to be achieved by the concessionaire. Therefore, this KPI needs to be revisited and made clear so that it is more realistic and achievable by the concessionaire.” (A2-EU, Campus A)

“...How we want to know whether the concession achieves or not the KPIs that we set if the KPIs are difficult to measure. In my opinion, the KPIs that need to be developed should meet all of these criteria to make the KPI more effective and realistic.” (F2-EU, Campus F)

Both statements express the same views from the participants regarding the important criteria to consider in selecting KPIs to measure the performance of PPP projects. Podgorski (2015) cited that good indicator must meet some criteria to make them an effective tool for assessing and monitoring project performance. For instance, the indicators must be easily quantifiable, valid and representative, ensuring minimum variability of results for the measurement performed under the same conditions, sensitive to change, cost-effective, and easy to understand by most users. Similarly, Shahin and Mahbod (2007) and Locke and Latham (1990) suggested that KPIs (including associated performance standards, criteria, and weightings) should follow specific, measurable, achievable, relevant, time-sensitive (SMART) principles. Accordingly, with these KPIs, project performance can be measured more effectively. On the other hand, Carlucci (2010) suggested that the selection of KPIs should be characterised by the following features: relevance, reliability, comparability and consistency, understandability and representational quality.

Table 3 - Findings on the important criteria required in selecting key performance indicators from all case studies

No	Criteria	Agreement on the importance	Campus A %	Campus B %	Campus C %	Campus D %	Campus E %	Campus F %	Average Mean	Result
1.	Specific	Yes	100	100	100	100	100	100	100	Important
		No	0	0	0	0	0	0	0	
2.	Measurable	Yes	100	100	100	100	100	100	100	Important
		No	0	0	0	0	0	0	0	
3.	Attainable	Yes	100	100	100	100	100	100	100	Important
		No	0	0	0	0	0	0	0	
4.	Realistic	Yes	100	100	100	100	100	100	100	Important
		No	0	0	0	0	0	0	0	
5.	Time Limit	Yes	100	100	100	100	100	100	100	Important
		No	0	0	0	0	0	0	0	
6.	Defined	Yes	100	100	100	100	100	100	100	Important
		No	0	0	0	0	0	0	0	
7.	Understandable	Yes	100	100	100	100	100	100	100	Important
		No	0	0	0	0	0	0	0	
8.	Relevance	Yes	100	100	100	100	100	100	100	Important
		No	0	0	0	0	0	0	0	
9.	Reliable	Yes	86	100	100	86	100	86	93	Important
		No	14	0	0	14	0	14	7	
10.	Comparable	Yes	14	33	33	57	50	43	38	Not Important
		No	86	67	67	43	50	57	62	
11.	Consistency	Yes	100	100	83	86	100	100	95	Important
		No	0	0	17	14	0	0	5	
12.	Linked with rewards and penalties	Yes	100	100	83	86	100	100	95	Important
		No	0	0	17	14	0	0	5	

4.3 Implications on the Absence of Important Criteria in Selecting PPP Project KPIs

Table 4 shows the comparative analysis across all six cases on the implications of the absence of any important criteria in KPIs as identified in Sub-section 4.1 previously. The results show that there are many possible effects which will eventuate when the developed KPIs do not possess these criteria. Based on the findings, eight (8) factors (effects) have been identified which effect; 1) overall implementation of KPIs; 2) performance assessment; 3) understanding of KPIs; 4) KPI's measurement; 5) project performance; 6) payment process; 7) work delivery, and 8) project output.

Table 4 - Cross-case analysis of the effect on the absence of the important criteria of all case studies

No	Broad Themes	Sub-themes	Campuses					
			A	B	C	D	E	F
1.	Overall Implementation of KPIs	• Failed to draft good KPIs at the planning stage.	√	√	√	√	√	√
		• The standard is not clear and led to difficulties in monitoring and measuring performance.	√	√	√	√	√	√
		• Concessionaire failed to achieve KPIs.	√	√	√	√	√	√
2.	Performance Assessment	• Difficult to evaluate the overall performance of the concessionaire.	√	√	√	√	√	√
3.	Understanding of KPIs	• Difficult to define the job scope.	√	√	√			
		• Misunderstanding on the indicators.	√	√		√	√	
4.	KPI's Measurement	• Percentage of performance cannot be determined accurately.	√	√				
		• Indicators are difficult to be measured.	√	√	√			√
		• Difficult to achieve performance standard.						√
5.	Project Performance	• Performance achievement may not be	√	√				√
		• Does not reflect the payment received by the concessionaire.						√
6.	Payment Process	• Effect to the payment and deduction.	√	√	√	√	√	√
7.	Project Output	• The quality of work can be argued.		√		√	√	
8.	Work Delivery	• Difficult in delivering the work.	√	√				

The main effect which was highlighted by the majority of the participants was regarding the *overall implementation of KPIs*. Principally, KPIs for PPP refer to the performance-based delivery system. Moreover, it is also to ensure that the facilities and services for the infrastructure are delivered in line with the performance standards set by the government (UKAS, 2009). Also, good KPIs must possess all the criteria to ensure they will work effectively as a measuring tool. Therefore, it illustrates that the development of KPIs (by considering the important criteria) is vital, particularly during the early project stage to ensure that project operations can be implemented and operated successfully. This is in line with the statement made by one of the participants from the Public Private Partnership Unit of the Prime Minister’s Department of Malaysia (UKAS) stating that:

“...failing to draft good indicators at the planning stage will affect the operational and maintenance stages.”
(GA2, All cases)

Supporting this statement, Mladenovic et al. (2013) confirmed that performance objectives and KPIs need to be fulfilled by all PPP stakeholders from project planning to operations of the project. However, this will depend on the comprehensiveness of the KPIs being constructed given they can significantly and adversely affect the operation of projects.

The participants viewed *performance assessment* as the second factor affecting the implementation of PPP projects. Yuan et al. (2009) asserted that the absence of an effective PPP performance assessment would act as a trigger for producing of low service quality infrastructure. The findings revealed that the majority of participants are concerned about the difficulties in determining the concessionaire’s level of performance and achievement if the KPIs lacked this criterion. This was emphasised by one of the Senior Engineers (End Users), revealing that:

“...If this criterion is not considered during the selection of performance indicators, there will be many problems and therefore it will give an impact when measuring the concessionaire’s performance on the services and facilities provided. Consequently, the performance assessment will be inaccurate, and this performance does not reflect on the payment made.” (F2-EU, Campus F)

The statement above is aligned with the finding of Hashim et al. (2017a) confirming that incomplete and complex KPIs are among some of the challenges in managing and in assessing PPP project performance. Moreover, adding that it is crucial to focus on the development of KPIs at the planning stage to ensure that the KPIs are more effective and relevant in assessing operational project performance.

The third factor influenced by the absence of the criteria is the *understanding of KPIs* particularly in defining the scope of work. This may result from unclear KPIs, which will trigger varied understandings regarding the scope of work to be performed between the public and private sectors. This is experienced by a Senior Engineer (End Users) from one of the campuses:

“...there are certain KPIs that failed to be achieved by the concessionaire. Why does that happen?...all of this is due to the details or justifications on each indicator being unclear and not complete. It is difficult to interpret when it is unclear. So, with difficulty in interpreting... there will be different understandings and opinions between both parties. In the end, the KPIs cannot be achieved.” (A1-EU, Campus A)

The above statement indicates that the weakness of KPIs will possibly lead to misunderstanding and misinterpretation of the KPIs and even create conflict and eventually, the work not complying with the KPIs outlined in the contract. This is also in line with the research conducted by Lawther and Martin (2014); Javed et al. (2013); Toor and Ogunlana (2010), stating that KPIs lacking clarity, difficult to understand, too complicated and too general will lead to difficulty in assessing project performance.

The fourth factor affected is *KPI’s measurement*. As mentioned by the Senior Engineer (End Users) of Campus C:

“...when the project began operating, promptly we can see there are some deficiencies in measuring those indicators. Even though the KPI already existed in the document ...but it is not clearly stated in detail the parameter or method on how to measure the indicator. For example, the frequency of indicators is to be measured. This is not clearly stated in the document.” (C3-UD, Campus C)

The above statement suggests that poor development of KPIs will cause difficulties to measure the indicators and simultaneously creates a problem and other issues to determine the percentage of project performance. Furthermore, Neely et al. (2005) added that KPIs form the heart of performance measurement systems. Thus, it is crucial to ensure that developed KPIs can act as a good measuring tool.

Other factors disclosed by the interviewees were *project performance, payment process, project output, and work delivery*. In the PPP approach, the public sector places greater emphasis on the specified outputs or outcomes of the service(s) to be provided for the entire concession period whereby payment for the services will be based on performance. Principally, the performance of PPP projects relies on the achievement of KPI’s as stipulated in the concession agreement (CA). This is in line with research by Ismail and Yusof (2009b) regarding the main concept of PPP which is closely based around project performance. The concessionaire will receive payment(s) from end users based on the achievement of performance in meeting the agreed-upon standards (KPIs).

5. Conclusion

The purpose of this section was to achieve the research objective on the identifying the important criteria in selecting KPIs for PPP projects. The exploration began by identifying the required criteria in selecting KPIs through the literature review. Based on the previous research, it was found that various criteria were adopted in selecting KPIs. These identified criteria formed the basis for the PPP practitioners to respond to the identification of important criteria in selecting appropriate KPIs. The results also revealed that there were eleven (11) important criteria that KPIs should possess as part of the selection process. These criteria were to ensure that the developed KPIs were useful and effective. Another words, they needed to be specific, measurable, attainable, realistic, time limit, defined, understandable, relevant, consistent, linking with rewards and penalties, and reliable. Effective performance measurement starts with the right selection of KPIs based on the specified criteria, as mentioned in the previous section. Similarly, the absence of criteria will adversely affect the ability of KPIs to be used as an effective measurement tool. To demonstrate this aspect, eight (8) effects were identified resulting from the absence of said criteria on KPIs in assessing PPP project performance. These effects not only impact the overall implementation of KPIs but also regarding the performance

assessment of the project, the understanding of KPIs, KPI's measurement, project performance, payment process, work delivery, and output of the project. Accordingly, the identification of these important criteria will assist stakeholders in determining good and useful KPIs for PPP projects. This was an important element in developing the measurement tool in assessing the operational performance of PPP projects.

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