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# Evaluation of Public-Private Partnerships: A Life-Cycle Performance Prism for Ensuring Value for Money

## Abstract

Public-Private Partnerships (PPPs) have become an integral strategy to deliver infrastructure projects in Australia. Yet, PPPs have been plagued with controversy due to recurrent time and cost overruns. The paucity of an approach to evaluate the performance of PPPs throughout their life-cycle has hindered the ability of governments to manage their effective and efficient delivery. This paper examines the practice of evaluation for a hospital and prison that were delivered using PPPs. The empirical evidence indicates that with PPPs: (1) performance is typically measured during the construction and operation phases using time, cost and quality and a restricted number of key performance indicators; and (2) a process-based and stakeholder-oriented measurement approach would be better suited to evaluate performance. Building upon the extant literature and the findings emerging from 'practice' (i.e., actual activity, events or work), a Performance Prism for ameliorating the evaluation of PPPs throughout their lifecycle is proposed. The research presented in this paper provides stakeholders of PPPs, especially governments, with a robust framework for governing and future proofing their assets to ensure value for money.

**Keywords:** Evaluation, PPPs, Performance Prism, Social infrastructure, Australia

26 **Introduction**

27 Public-Private Partnerships (PPPs) have been extensively used to deliver public assets,  
28 when governments' budgets for infrastructure development are limited. The PPP market in  
29 Australia is considered to be mature and sophisticated; it forms an integral part of State  
30 Governments' procurement strategies for delivering infrastructure (Hodge, 2004; Duffield  
31 and Clifton, 2008). Yet, the use of PPPs has been plagued with controversy, particularly in  
32 Australia and the United Kingdom (UK), where many projects have experienced  
33 substantial overruns and poor operational performance, for example, Southern Cross  
34 Station, Melbourne, Australia (cost overruns), Latrobe Regional Hospital, Victoria,  
35 Australia (poor service quality) and Dalmuir Wastewater Treatment Works, Scotland, UK  
36 (poor operational outputs) (Harris *et al.*, 2014; Regan, 2014).

37

38 A variety of factors can contribute to the unsatisfactory performance of PPPs (Liu *et al.*,  
39 2015b), including ineffective project evaluation which has been reported in the literature  
40 (e.g., Yuan *et al.*, 2012; Liu *et al.*, 2015a; Love *et al.*, 2015). Essentially, performance  
41 evaluation is critical to business success, particularly at the corporate and project levels  
42 (Love and Holt, 2000; Kagioglou *et al.*, 2001; Liu *et al.*, 2014; 2015c). Yuan *et al.* (2009)  
43 has suggested that the absence of an effective performance evaluation within PPPs acts as  
44 a trigger for producing below optimum quality of the public services. Despite this, most  
45 procured PPP projects have not undergone a comprehensive evaluation in terms of what  
46 has been delivered (Hodge, 2005; Regan *et al.*, 2011). Further, the accountability of the  
47 government involved with PPPs has shifted to enhancing the effectiveness of service  
48 quality and efficiency of public resources. This has resulted in increasing demand for a  
49 more robust evaluation as a governance tool for the projects (Wu *et al.*, 2016).

50

51 This paper examines the ‘practice’ (i.e., actual activity, events or work) of performance  
52 evaluation for two social infrastructure projects procured using a PPP: (1) hospital; and (2)  
53 prison. In conjunction with the extant literature, the findings are used to interpret PPP  
54 performance evaluation and then adapt and develop a life-cycle *Performance Prism*  
55 valuable for the public sector to improve the projects’ evaluations and ensure Value for  
56 Money (VfM) is delivered for an asset from ‘cradle’ to ‘grave’.

57

### 58 **Public-Private Partnerships and Performance Evaluation**

59 There is no universally accepted definition for PPPs. The European Investment Bank (EIB)  
60 (2004) defines PPPs as “the relationships formed between private sector and public bodies  
61 often with an aim of introducing private sector resources and/or expertise to provide and  
62 deliver public assets and services (p.2).” Notably, the European Commission (2003) states  
63 that governments embark on PPPs to:

64

- 65 • accelerate the provision of infrastructure by allowing the public sector to translate  
66 capital expenditure into a flow of on-going service payments;
- 67 • ensure timely project implementation by allocating responsibility for design and  
68 construction to be undertaken by the private sector;
- 69 • reduce whole life cost and provide incentives to the private sector to minimise costs  
70 and improve the management of a project’s life-cycle;
- 71 • reduce government risk exposure by transferring to the private sector;
- 72 • improve service quality and innovation via the use of private-sector expertise and  
73 performance incentives; and
- 74 • enhance prudent management of public expenditure and reduce corruption by  
75 increasing accountability and transparency.

76 There has been a tendency for PPP research to focus on the following areas: (1) the  
 77 development of critical success factors (CSF); (2) governments' roles/responsibilities; (3)  
 78 selection of concessionaire; (4) risk allocation/management; (5) effectiveness/efficiency of  
 79 project implementation; and (6) project finance (Liu *et al.*, 2015b). Table 1 summarises the  
 80 scope of PPP research over the past two decades. Noteworthy, there is a dearth of research  
 81 that has addressed PPP evaluation with empirical research being limited to Garvin *et al.*  
 82 (2011), Yuan *et al.* (2012) and Mladenovic *et al.* (2013).

84 Table 1: Scope of the research on PPPs

Research Themes	Authors
Critical Success Factors	Tiong (1996); Qiao <i>et al.</i> (2001); Jefferies <i>et al.</i> (2002); Li <i>et al.</i> (2005); Jefferies (2006); and Liu <i>et al.</i> (2015c).
Government's roles/responsibilities	Kumaraswamy and Zhang (2001); Pongsiri (2002); Koch and Buser (2006); da Cruz <i>et al.</i> (2013); Van den Hurk (2016); and Wu <i>et al.</i> (2016).
Concessionaire selection	Zhang and Kumaraswamy (2001); Zhang <i>et al.</i> (2002); Zhang (2004, 2005a); and Jang (2011).
Risk allocation/management	Wang <i>et al.</i> (2000); Grimsey and Lewis (2002); Thomas <i>et al.</i> (2003); Jin (2011); Chan <i>et al.</i> (2011); and Roberts and Siemiatycki (2015).
Effectiveness/efficiency of implementation of PPPs	Lemos <i>et al.</i> (2002); Edelenbos and Teisman (2008); Trumbull (2009); Beisheim and Campe (2012); Taylor and Harman (2015); Kort <i>et al.</i> (2015).
Project finance	Levy (1996); Ye and Tiong (2000); Zhang (2005b); Devapriya (2006); Regan <i>et al.</i> (2011); and Engel <i>et al.</i> (2013).

85  
 86 While the aforementioned studies have made a valuable contribution to raising the  
 87 significance of performance evaluation within PPPs, they have stopped short of tackling  
 88 how to comprehensively evaluate them throughout their life-cycle (Liu *et al.*, 2015b; Love  
 89 *et al.*, 2015). Thus, empirical research aiming to address this significant theoretical issue is  
 90 required (Koontz and Thomas; 2012; Liu *et al.*, 2016). Haponava and Al-Jibouri (2012)  
 91 further this view as they have suggested that there is a need to identify a new approach for

92 evaluating construction projects (especially infrastructure projects) to enable life-cycle  
93 project success. In fact, the traditional approach for performance evaluation is based on the  
94 triumvirate of time, cost and quality (TCQ). It has been widely criticised for not being able  
95 to accommodate the dynamic and changing nature of projects throughout their life-cycle.  
96 Baccarini (1999) suggests project success needs to encapsulate both product and process  
97 views. Product success is concerned with the long-term impacts of the built asset on local  
98 community/region. Conversely, process success relates to effectiveness and efficiency of  
99 the managerial actions or activities that are performed (Baccarini, 1999).

100

## 101 **Research Approach**

102 The debate about PPPs has moved beyond ideological arguments about their advantages  
103 and disadvantages to focusing on ‘how’ to structure and/or manage the projects throughout  
104 their life cycles to achieve the predetermined policy objectives and goals (Yong, 2010). In  
105 line with this focus, a case study is used to determine and explore ‘how’ performance  
106 measurement in PPP projects can be improved. According to Flyvbjerg (2006), a case  
107 study is suitable for all stages of a research, and particularly useful for generalizing and/or  
108 examining new knowledge. Moreover, performance measurement research tends to marry  
109 with the ontology and epistemology of interpretivism. Therefore, practitioners’ experiences  
110 and insights should not be ignored when deriving a new performance measurement system  
111 (PMS) for the organisation (Neely *et al.*, 2000). Similarly, Love *et al.* (2002) identify that  
112 research of this nature should not rely on a positivist approach, as it may neglect the  
113 impact of human behaviour and subsequent decision-making processes that can be  
114 enacted.

115

116 The cases selected for this research were the only social infrastructure PPPs being

117 delivered by a State Government at the time of the research. The State Government and  
118 participants of each of the *Special Purpose Vehicles* (SPV) demonstrated a willingness to  
119 participate in the research. A cross-sectional case study was adopted to provide an in-depth  
120 understanding of the nature of performance measurement. The cross-sectional approach  
121 was intended to minimize disruption to participants who agreed to partake in the research.  
122 Since the completion of the research other social infrastructure PPPs have commenced.

123

### 124 **Data Collection**

125 Triangulation formed the basis of the data collection process as it can be used to overcome  
126 problems associated with bias and validity (Yin, 1984; Stake, 1995; Love *et al.*, 2002). A  
127 series of informal discussions, semi-structured interviews and documentary sources (e.g.,  
128 contractual documents) formed the cornerstones of the data collection process.

129

130 Interviews were conducted at the interviewees' offices and were digitally recorded, and  
131 then transcribed *verbatim*, to allow for any finer nuances to be detected. Interviews were  
132 purposely kept relaxed using phrases such as 'tell me about it' or 'can you give me an  
133 example'. The indicative questions that were used for the interviews included:

134

- 135 • What approach is being used to evaluate the performance of the PPP project you are  
136 involved with?
- 137 • What do you consider to be the shortcomings of the performance evaluation process in  
138 the project?
- 139 • How do you think performance evaluation can be improved in the project?

140

141 The open nature of the questions stimulated avenues of interest to be pursued as they arose

142 without introducing bias in the response. Additional notes were taken during interviews to  
 143 support the digital transcription process and to maintain validity and safeguard against the  
 144 digital recorder’s failure. Notably, focused sampling was used for selecting interviewees as  
 145 it is particularly effective for a case study that aims to explore new lines of inquiry.

146

147 A total of 22 interviews were conducted with each varying in length from 90 minutes to  
 148 two hours. A conscious effort was made to break down any barriers that may have existed  
 149 between the interviewer and interviewee. Interviews were transcribed and then sent to the  
 150 interviewee for checking and approval. Table 1 provides a summary of interviewees. To  
 151 ensure confidentiality, each case is referred to as Project-A and Project-B with the data  
 152 collection process occurring over a period of a year.

153

154 Table 2: Interview respondents of Projects A and B

<b>Projects and Interviewees</b>	<b>Serial Codes</b>	<b>Organisations</b>
<i>Project-A</i>		
Procurement Director (PD)	PD-A&B	State Government
Project Manager	PM-A	State Government
Service Director	O/FM-A	Clinical & Healthcare Provider
Construction Manager	CM-A	Construction Company
Architect	D/A-A	Design Firm
Contract Advisor/Manager	CM/PA-A	State Government
<i>Project-B</i>		
Project Manager (PM)	PM-B	Construction Company
Design Manager (DM)	DM-B	Design Firm
Contract Manager (CM)	CM-B	Construction Company
Engineering Manager (CEM)	CEM-B	Construction Company
Facility/Asset Manager (F/AM)	F/AM-B	FM Group

155

156 The Procurement Director was responsible for overseeing the progress of both case  
 157 projects (A/B) as well as the senior management in charge of the essential parts of the



158 delivery of the assets (e.g., design, construction, operation and/or facility maintenance –  
159 FM). All practitioners that were interviewed had minimum of 10-years’ experience  
160 delivering social infrastructure PPPs in Australia and/or Europe.

161

## 162 **Data Analysis**

163 The narratives that were compiled were analysed using *NVivo 10* software, which  
164 combines the efficient management of non-numerical, unstructured data with powerful  
165 processes of indexing and theorizing. *NVivo 10* enabled additional data sources and journal  
166 notes to be incorporated into the analysis as well as identifying emergent new themes. The  
167 development and re-assessment of themes, as the analysis progressed, accords with calls to  
168 avoid confining data to pre-determined sets of categories. This process complied with the  
169 approach developed by Silverman (2006) for interpreting qualitative data. Kvale (1996)  
170 suggests that *ad hoc* methods for generating meaning enables the researcher to access “a  
171 variety of common-sense approaches to interview text using an interplay of techniques  
172 such as noting patterns, seeing plausibility, making comparisons etc. (p.204).”

173

## 174 **Case Background**

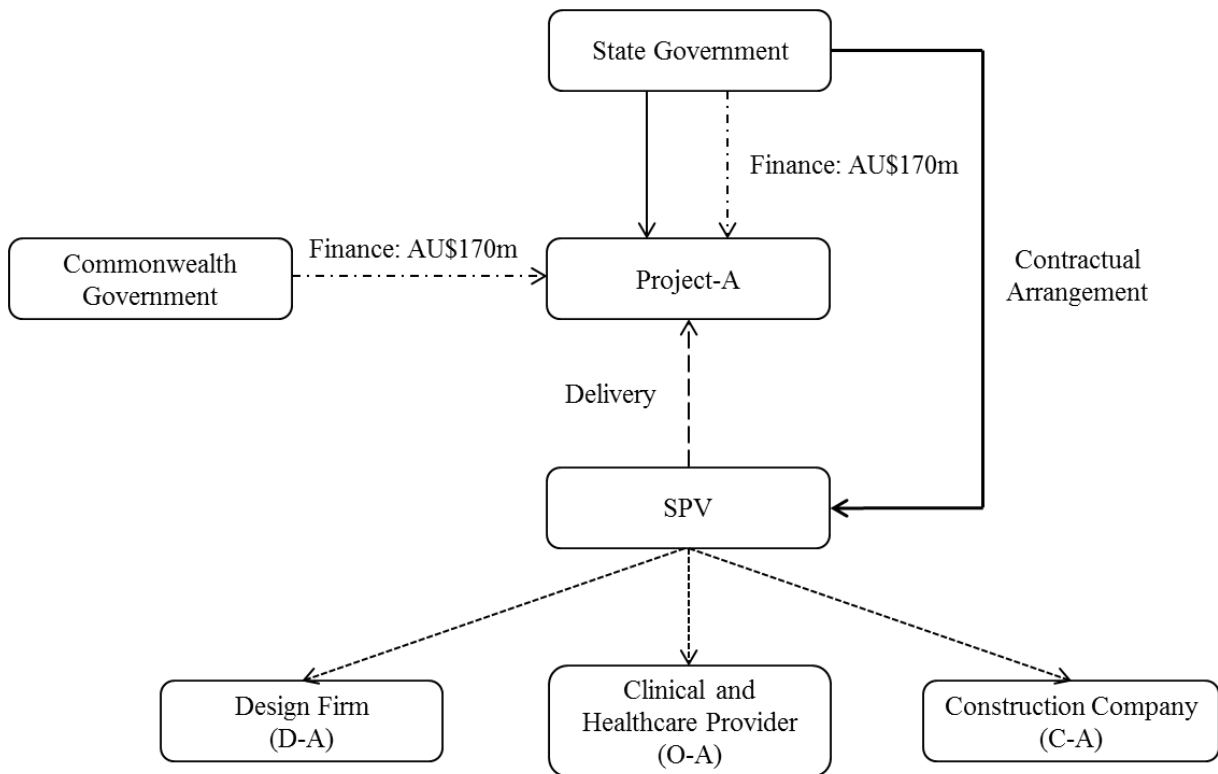
175 Project-A is a public hospital, encompassing more than 300 beds and housing more than  
176 1,000 staff. State-of-the-art facilities are embedded into the hospital. For example,  
177 Magnetic Resonance Imaging scanners, which ensure that a comprehensive range of  
178 clinical and healthcare services (e.g., pathology, general medical and medical specialities,  
179 general surgery and surgical specialities, maternity, intensive care, and adult rehabilitation)  
180 are offered to the local communities. The hospital had a contract value of AU\$340 million  
181 in 2008, was procured using a Design Build Operate and Maintain (DBOM) and became  
182 operational in 2016. Contrastingly, Project-B was a regional prison, which aimed to deliver

183 more than 1,600 additional beds across the State's prison system. This project replaced the  
 184 existing facility, which initially was built in the 1980s and incorporated only 100 beds.  
 185 Project-B had a contract value of AU\$200 million in 2009 and was procured employing a  
 186 Design Build Finance Maintain (DBFM) and was completed in 2016.

187

188 Both DBOM and DBFM are forms of PPP. In the case of Project-A, the private-sector SPV  
 189 handled the asset's design, build, operation and maintenance, while the SPV of Project-B  
 190 was responsible for designing, building, financing and maintaining the facility. Unlike  
 191 Project-B, which was fully funded by the private-sector SPV by introducing equity  
 192 investors and debt providers, Project-A was co-funded by the Australian Commonwealth  
 193 and State Governments (i.e., AU\$170 million from each). Figures 1 and 2 illustrate the  
 194 structures of the case projects.

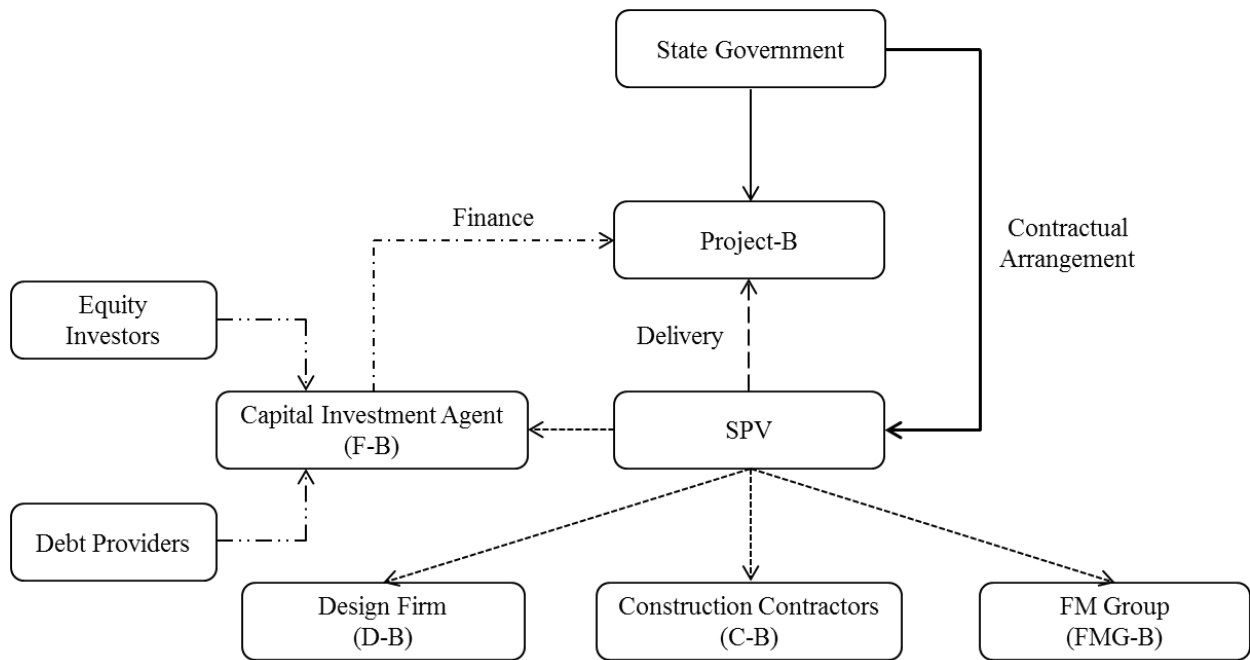
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196

197

Figure 1: Structure of Project-A



198

199

Figure 2: Structure of Project-B

200

201 Both projects have a similar delivery process, involving: (1) *Initiation & Planning* (e.g.,  
 202 business case study, invitation for the Expression of Interest and evaluation of submitted  
 203 proposals), *Procurement* (e.g., request for proposal, tendering/bidding and financial close)  
 204 and *Partnership* (e.g., design, construction and/or operation and maintenance).

205

### 206 Performance Evaluations of Case Projects

207 The performance evaluation systems of Projects A and B contain two separate parts that  
 208 were handled by the public authorities and the private-sector SPVs, respectively. The  
 209 evaluations undertaken by the government focused on the assessment for VfM as well as  
 210 business case development and the effectiveness of the tendering decision. Conversely, the  
 211 measurements initiated by the private-sector entities concentrated adhering to the  
 212 predetermined deliverables of schedule, budget and service (i.e., asset quality and/or  
 213 operational outputs). For example, the Procurement Director stated:

214 “There are two parts of performance evaluation in the projects. For the  
215 government, we used the concept of ‘Gateway Review’ to control the  
216 performance of the project. So, during the inception stage, strategic evaluation  
217 for feasibility, such as value for money assessment under the Public Sector  
218 Comparator and a number of qualitative issues (for Project-A), and then an  
219 evaluative review for business case development were conducted, followed by  
220 assessments for confirming the defined outputs and checking the tender decision.  
221 For the private consortia, they checked if the projects were delivered on time and  
222 on budget or assessed if the operation can meet our devised key performance  
223 indicators (KPIs) (Project-A) ...”

224

225 The objective information obtained from documentary sources provided an understanding  
226 of the practice of evaluation being implemented in the case projects. According to the  
227 ‘Project Summary’ of each case project, Project-B used only the Public Sector Comparator  
228 (PSC) for assessing VfM. In the case of Project-A VfM assessment depended upon the  
229 PSC and several non-quantitative measures (e.g., quality of services, range of services and  
230 additional services) (Tables 3 and 4). The ‘Service Agreement’ of Project-A also indicated  
231 that a total of 159 KPIs determined by the relevant public authority of the State  
232 Government were being used to monitor the service quality of the built facility.

233

234

235

236

237

238

239

Table 3: VfM assessment of Project-A

<b>Methods</b>	<b>Main Contents</b>
Quantitative comparison	PSC: (,000): AU\$6,268,756
	Private-Sector Delivery (,000): AU\$4,960,040
	Saving (,000): AU\$1,308,715
	Saving (%): 20.9%
Qualitative consideration	Quality of Services, Range of Services and Additional Services

240

241

Table 4: VfM assessment of Project-B

<b>State's Risk Adjusted PSC (AU\$,000)</b>	<b>SPV's Risk Adjusted Proposal (AU\$,000)</b>	<b>Savings (AU\$,000)</b>	<b>Saving Percentage</b>
\$452,590	\$372,312	\$80,278	17.7%

242

243 The interviewees from the private SPVs of both PPPs further explained the evaluation  
 244 systems of the projects. For instance, the Service Director, who oversaw the subcontractors  
 245 and the operation and maintenance of Project-A, made the following comment:

246

247 “We are evaluating each component in the design and construction by examining  
 248 financial and time performance, and we employed external engineering  
 249 specialists to inspect the quality regularly, to ensure the quality of the asset. We  
 250 have key performance indicators (KPIs) determined by the government to control  
 251 operational outputs. If we cannot meet those KPIs, we will get abatement.”

252

253 Like Project-A, the performance evaluation that was undertaken by the SPV of Project-B  
 254 focused on traditional measures of TCQ. The Project Manager (PM-B), for example,  
 255 introduced that:

256

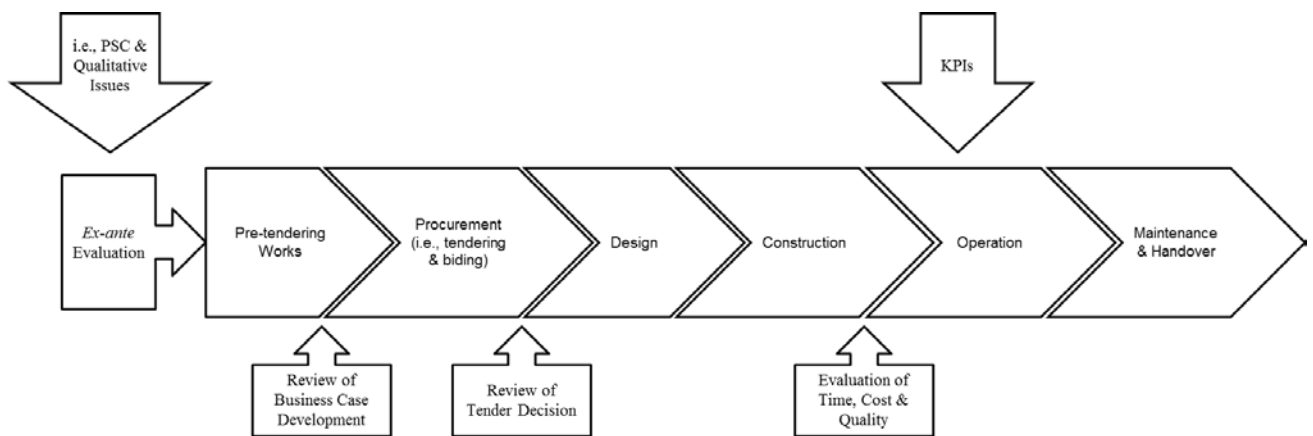
257 “As a private contractor, we talk about time, cost and quality in the evaluation.

258 They are the only performance measures we have for this project. Time is now  
259 our premium, and in terms of costs, we are running within the budget. Quality –  
260 this measure is about once we start building – the quality of the product that we  
261 put forward.”

262

263 The performance evaluation systems for Projects A and B are illustrated in Figures 3 and 4,  
264 with attention being placed on a quantitative VfM assessment, reviews of business case  
265 development and tendering decisions, examinations of TCQ or operational measurement  
266 that relied on KPIs. All interviewees (Projects A and B) maintained that the approaches  
267 that were applied to evaluate PPPs needed to be improved owing to a series of  
268 shortcomings, which are presented and discussed below.

269



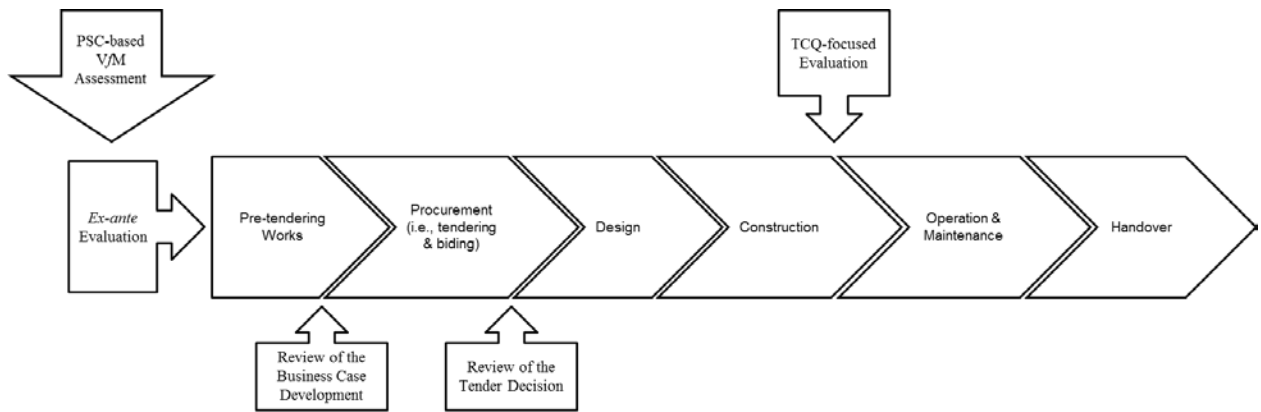
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271

Figure 3: Performance Evaluation System of Project-A

272

273



274

275

Figure 4: Performance Evaluation System of Project-B

276

### 277 Shortcomings of Existing Performance Evaluations

278 There was consensus amongst interviewees from the public sector (i.e., PD-A&B and  
 279 CM/PA-B in Table 1) that there was a need to improve the existing performance  
 280 evaluations as they were not robust enough to accommodate the deliverables to ensure the  
 281 long-term success of their projects. These included, for example, a mechanism to engender  
 282 and enact continuous improvement, efficiency and competitiveness of the  
 283 tendering/bidding procedures and non-financial benefits in V/M assessment. The  
 284 Procurement Director stated that:

285

286 “The track record of our approach used for performance evaluation is good, but  
 287 we will have to refine it. In particular, there is a need to ensure that lessons  
 288 learned are properly captured. But this internal process with the projects was not  
 289 robust enough and we are constantly improving it. And, PPP approval process  
 290 within the government in the Procurement phase sometimes has been protracted.  
 291 Although we can get through that quickly, focusing more on the approval  
 292 procedure in evaluation can increase its efficiency. Moreover, competition of  
 293 tendering/bidding is important but this was missed when we measured our

294 projects, and, the PSC for assessing VfM is not perfect though it has worked well  
295 with us. VfM is a holistic consideration of project benefits, not just delivering the  
296 required scope at the cheapest cost. It is related to a wide range of benefits to the  
297 public, such as economic and social.”

298

299 In addition to these issues, the Contract Manager of Project-A identified the deficiency of  
300 the KPIs that were designed and implemented with an aim of controlling the operational  
301 outputs of the private-sector SPVs. This experienced PPP practitioner stated:

302

303 “KPIs for the operation of the facility will be used for next a couple of years, but  
304 we are in an intensively changing business environment and there is no doubt the  
305 indicators designed today will not be suitable for the whole contractual period.”

306

307 The information derived from the interviews with the key managerial practitioners of the  
308 private SPVs of Projects A and B (e.g., Corporate Service Director, Project Manager and  
309 Design Manager) indicated that the project measurements conducted by the private-sector  
310 entities were confronted with challenges. As mentioned above, the approaches adopted by  
311 the SPVs to the performance measurement of the case projects are referred to as *ex-post*  
312 evaluation, which were concerned with TCQ. The use of TCQ in an evaluation of PPPs has  
313 been criticised by both academia and practitioners as it cannot capture such issues as  
314 design innovation, asset sustainability and stakeholders’ satisfaction, all of which are  
315 expected by the governments from SPVs. This was re-stated by the Procurement Director  
316 (PD-A&B) for the two case projects as the following comment:

317

318 “We expected an introduction of private consortia would be an opportunity to



319 drive innovation in design through the whole of life perspective and enhance the  
320 sustainability of the facilities and end-users' satisfaction.”

321

322 The current performance evaluation of the projects, however, failed to indicate whether the  
323 public client's expectations had been met. For instance, the Construction Manager of  
324 Project-A identified that traditional TCQ assessment is too simplistic to capture inherent  
325 complexities and uncertainties of PPPs and stated:

326

327 “An effective measurement should reflect not only tangible but also intangible  
328 issues. But the TCQ-focused assessment failed in doing so because it is not a  
329 complete measurement. For example, the state government would like to expand  
330 the hospital in the future. Under the long-term planning by 2020, they will  
331 expand the hospital by another 100 beds. So, what we did was we came up with a  
332 design which allowed, effectively, half of the ward to be replicated and then built  
333 with minimal interruption to the existing facility, and then all the services which  
334 are involved for the hospital are able to be added on - hooked into - to  
335 supplement the additional hundred beds. In the existing evaluation, how are these  
336 innovative works being reflected?”

337

338 The Project Manager and Design Manager of Project-B possessed a similar view as they  
339 considered that more intangible performance measures should have been implemented to  
340 evaluate the design and construction of the PPP project, with emphasis being placed on  
341 innovation and asset sustainability. Such intangibles are critical to the satisfaction levels of  
342 the owner and end-users of an asset. The Service Director of Project-A supported this view  
343 as well, not only of the TCQ measures adopted for design and construction, but also the

344 KPIs devised for asset operation and facility maintenance. The Service Director stated:

345

346 “If I were the director of the State government responsible for setting up this  
347 contract, I would devise far more engineering KPIs. I would like to make sure the  
348 hospital is well maintained and there was proper asset planning or condition  
349 reporting etc. The government now is focusing too much on clinical care and has  
350 got their clinical care covered, but they don’t have the building measurement  
351 covered and the performance indicators for FM have not been documented well.  
352 This is not good for ensuring VfM.”

353

354 This was confirmed by the Asset Manager of Project-B, who suggested that as the project  
355 had been delivered using a DBFM, the State government and SPV should have made  
356 explicit the measures for controlling the quality of the FM work. After all, operational  
357 expenditure far outweighs capital costs when the life of an asset is taken into consideration.  
358 Stressing the importance of measuring the performance of operations and maintenance the  
359 Director stated:

360

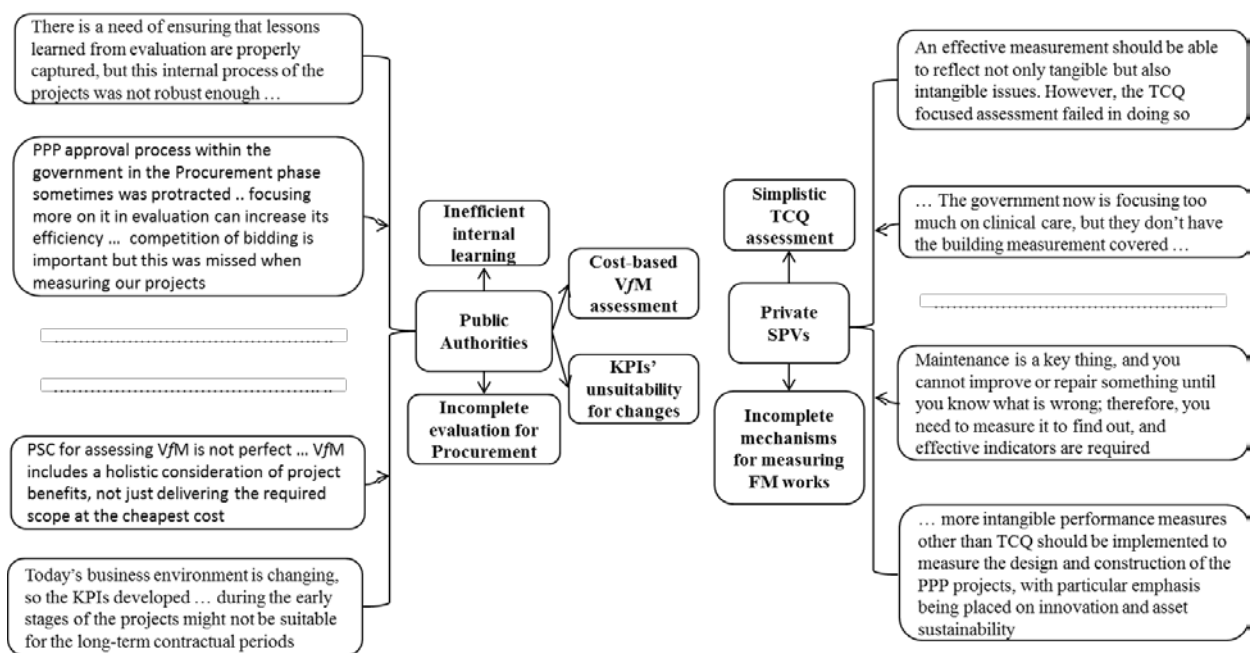
361 “Maintenance is a key thing. You cannot improve or repair something until you  
362 know what is wrong. You need to measure it to find out, so effective indicators  
363 are required.”

364

365 The key emergent themes and issues arising from the second part of the interviews  
366 regarding the shortcomings of traditional performance measurement in PPPs are presented  
367 in Figure 5. There were a series of deficiencies in the performance evaluation systems of  
368 Projects A and B, which included: (1) a cost-based VfM assessment rather than a complete

369 evaluation for both financial and non-financial benefits; (2) an ineffective and inefficient  
 370 internal process for absorbing the lessons learned from project evaluation; (3) neglect of  
 371 critical issues relating to the procurement of the projects (i.e., tendering/bidding); (4) a  
 372 simplistic TCQ assessment for design and construction; (5) the lack of performance  
 373 measures for the outputs of FM works; and (6) the weak ability of operational KPIs in  
 374 accommodating business environment changes.

375



376

377

Figure 5: Key emergent themes from the case studies

378

### 379 Recommendations for Improvements

380 The case studies undertaken have identified shortcomings with the performance evaluation  
 381 that was used to measure PPPs. Based on these findings, a process-based and  
 382 stakeholder-oriented perspective should be addressed in the performance evaluation of  
 383 PPPs. If, for example, KPIs focus on process and key stakeholders' expectations, they can  
 384 reflect the distinct feature of PPPs related to a unique delivery process and sophisticated

385 stakeholder networks. In fact, most of the interviewees considered that a  
386 life-cycle/process-based measurement approach is ideal for PPPs and can supersede  
387 traditional *ex-post* evaluation due to its robustness in being able to capture all the  
388 deliverables of PPPs (i.e., tangible and intangible) that cascade from the initiation and  
389 planning to operation and maintenance phases. For example, the Contract Manager of  
390 Project-A from the public authority explicitly proffered that:

391

392 “As a consultant, I care about delivery process and key stakeholders, especially  
393 in a social infrastructure project, like a hospital. This is because PPPs are unique  
394 for their life-cycle with a long-term contractual arrangement between public and  
395 private sectors and a sophisticated stakeholder network ... So, addressing process  
396 and stakeholders’ needs can reveal all important deliverables and then improve  
397 the effectiveness of the performance evaluation system of the project.”

398

399 The Project Manager and Design Manager of Project-B supported the view expressed  
400 above. They also argued that future PMSs devised for PPPs must be ‘life-cycle’ oriented  
401 and designed for reflecting whether or not the key project stakeholders’ expectations have  
402 been satisfied, rather than just simply indicating if the projects were delivered on ‘time’  
403 and/or on budget. Furthermore, some of the interviewees suggested that a  
404 life-cycle/process-based and stakeholder-oriented measurement could be achieved by  
405 deriving and using a sequence of project-phase-based KPIs (e.g., indicators of PPP  
406 initiation, procurement, construction, operation and facility maintenance as well as those  
407 indicators in respect of client’s and/or end-users’ satisfaction). Additionally, it was  
408 identified during the case studies that KPIs for assets’ operations are not capable of  
409 accommodating intensive changes throughout a long-term contractual period. Thus, as

410 proposed by the Contract Manager of Project-A, a review mechanism needs to be launched  
411 into PPP projects to update the operational KPIs:

412

413 “The contractual arrangement of our PPP project is up to 25 years. So, a review  
414 mechanism is useful for the operational KPIs in order to ensure they will be able  
415 to accommodate future social and economic changes. But the state government  
416 obviously does not have such a robust mechanism to update them.”

417

418 A review mechanism for KPIs, theoretically, can underpin the implementation of a  
419 process-based PMS. This is because the performance measures of the process-based PMSs  
420 are required to reflect the long-term business environment in which the organisation  
421 operates (Neely, 1999). With this principle, a review mechanism of life-cycle PMSs (in  
422 PPPs) will help to ensure VfM and success of the projects.

423

424 Assessment for VfM, as discussed above, is a pivotal component of the performance  
425 evaluation system of PPPs. The Office of Government Commerce in the UK (2002)  
426 defines VfM as “the optimum combination of whole life cost and quality to meet the user’s  
427 requirement.” It is a concept relating to overall outcomes achieved, covering a wide range  
428 of issues involving life-cycle costs, physical and service quality, maintainability, social  
429 benefits and sustainability (Department of Treasury and Finance Victoria, 2007).  
430 Nonetheless, the PSC, which is widely applied to PPPs, is a purely cost-based assessment,  
431 and thus it largely ignores non-quantitative issues. For instance, in the case projects, net  
432 present values (NPVs) of the projects were adopted as the key criteria by decision makers  
433 in state government to determine whether a PPP would be a feasible way for procuring the  
434 public assets, though limited non-financial benefits of services (quality and range) had

435 been considered in Project-B. A broad life-cycle VfM assessment with consideration of  
436 both qualitative and quantitative issues should be proposed and developed for PPPs. Such  
437 issues include whole-life cost, physical quality, service quality and range, asset's  
438 conditions (e.g., maintainability and sustainability) and social or economic impacts on  
439 local community and the public. This view was confirmed by the two interviewees who  
440 claimed that it is necessary to shift VfM assessment of PPPs from a cost-based evaluation  
441 to a whole-life measurement conducted within both quantitative and qualitative contexts.

442

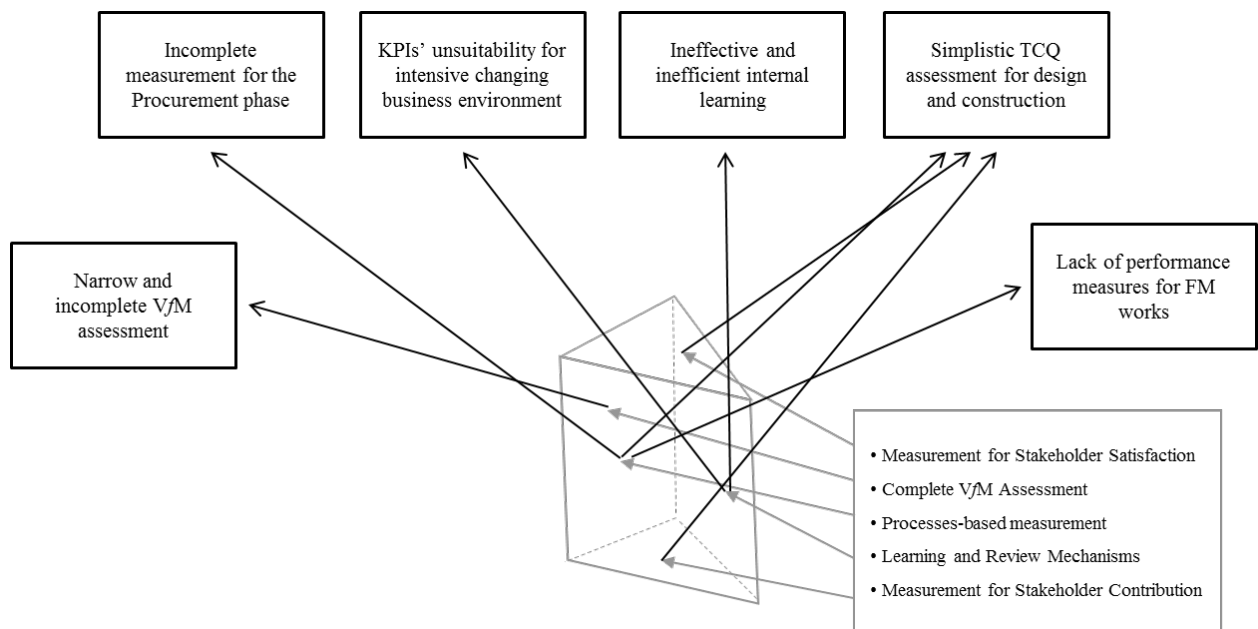
443 It is also noted from the empirical findings that ineffective and inefficient internal learning  
444 is a weakness of the performance evaluation systems of the case projects. Theoretically,  
445 organisational learning is an enabler for business growth and success and maintains a vital  
446 role in the process-based performance measurement of the organisation (Love *et al.*, 2004).  
447 Kululunga *et al.* (2001) also claim that organisational learning provides a vehicle” for  
448 delivering continuous improvement and incremental innovation. This implies that the  
449 “mechanisms” that stimulate effective and efficient learning must be integrated into the  
450 entire business process of the organisation to enhance their ability to capture and absorb  
451 “lessons” learned. As stated by the Procurement Director (PD-A&B), the public authority  
452 that oversaw the delivery progress of Projects A and B had already initiated actions to  
453 improve and accelerate its internal learning process of PPPs. The State Government is  
454 currently implementing a new system to absorb the information that was derived from the  
455 projects. Therefore, a learning mechanism should be incorporated into the PPP life-cycle to  
456 serve as a key function of their future performance evaluation.

457

### 458 **Life-Cycle Performance Prism**

459 Emerging from the case studies is the recommendation for a process-based and

460 stakeholder-oriented measurement to be developed with consideration of V/M assessment  
 461 and continuous improvement that engenders learning. Neely *et al.* (2001) have suggested  
 462 that the measurement for what stakeholders' need and how they contribute to the  
 463 organisation should be conducted simultaneously in a PMS. At this juncture, a new  
 464 *Performance Prism*, which is different from that one originally proposed by Neely *et al.*  
 465 (2001), can be developed as a 'stepping stone' for ameliorating performance evaluation of  
 466 future PPPs (Figure 6).  
 467



468  
 469 Figure 6: Life-cycle Performance Prism for PPP Evaluation (Adapted from Neely *et al.*  
 470 2001)  
 471

472 Figure 6 illustrates how the proposed framework can deal with the prevailing issues  
 473 confronting PPP performance evaluation. Specifically, the process-based and  
 474 stakeholder-oriented measurements, as demonstrated above, focus on evaluating the  
 475 deliverables of each project phase of a PPP (e.g., the suitability of business case  
 476 development, completeness of macro-environmental study, competitiveness of tendering

477 procedure and innovation in design). Consequently, the problematic issues in the existing  
478 performance evaluation system of a PPP, for example, incomplete and ineffective  
479 measurements for the project's procurement, design and construction, operations and  
480 maintenance, would be resolved by applying the Performance Prism framework.

481

482 Benefiting from a KPI review mechanism, the performance measures developed with the  
483 process and stakeholder-oriented measurement will be equipped with a robust capability in  
484 accommodating demographic and environmental changes (i.e., political, economic, social  
485 and legal). In addition, the proposed life-cycle Performance Prism possesses can improve  
486 the derived paucities, such as the myopia of VfM assessment and weak internal learning.  
487 This is because it emphasises: (1) a comprehensive evaluation for VfM that considers  
488 financial benefits as well as macro-impacts on local communities and the public (e.g.,  
489 social benefits and economic development); and (2) effective and efficient organisational  
490 learning to absorb the "lessons" emerging from the projects.

491

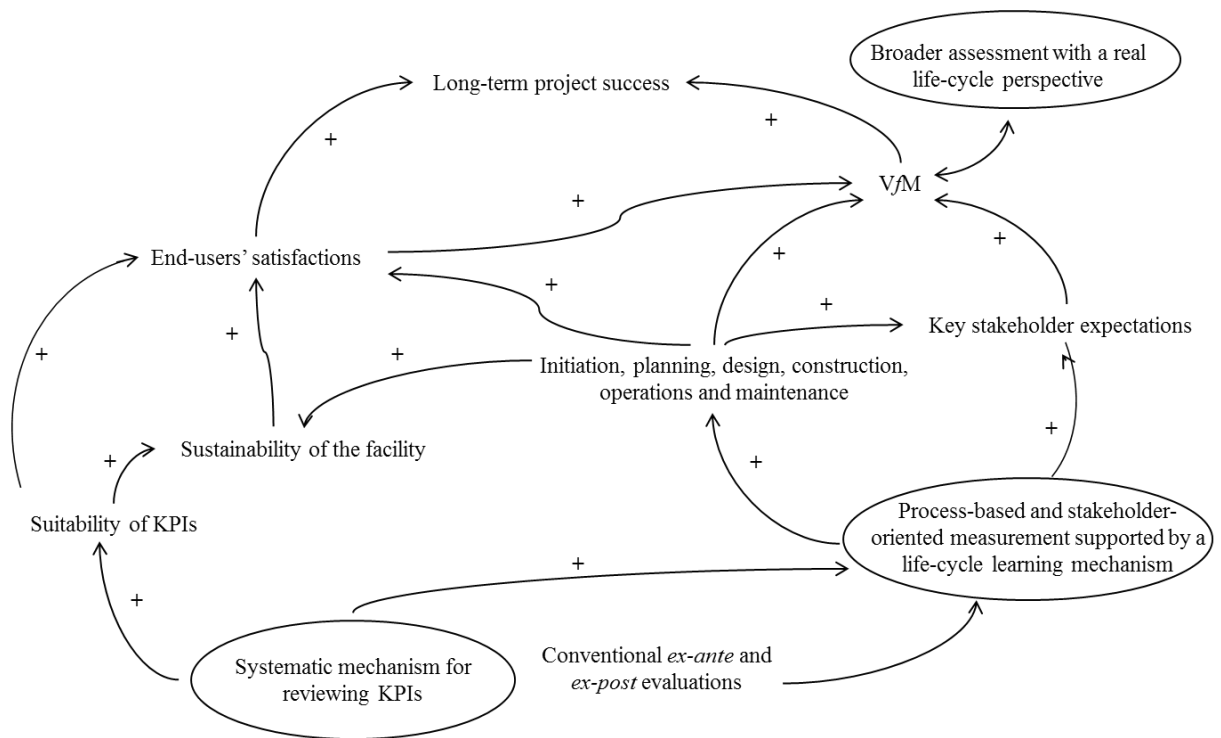
## 492 **Implications for Practice**

493 The proposed life-cycle Performance Prism provides stakeholders of a PPP (e.g., public  
494 governor, designer, builder, operator and facility maintainer) with an explicit and reliable  
495 direction of how to improve the systems or approaches applied to measure the performance  
496 of their projects. The application of the Performance Prism has the potential to provide the  
497 public and private-sector with the ability to: (1) evaluate their projects by concentrating on  
498 the process-based deliverables (e.g., business case, planning, decision on tendering or  
499 bidding, asset design, construction and operation and/or facility maintenance); (2)  
500 undertake an examination of VfM; and (3) examine the effectiveness/efficiency of learning  
501 mechanisms to be employed. These immediate benefits will provide the basis for ensuring



502 projects processes and product are delivered successfully. Figure 7 depicts how a shift  
 503 from conventional *ex-ante/ex-post* evaluations to a life-cycle measurement that addresses  
 504 the perspectives of the developed Performance Prism will be future-proofing PPPs, for  
 505 example, enabling an asset’s sustainability and ensuring a continuous value to meet key  
 506 stakeholders’ expectations.

507



508

509 Figure 7: Performance Prism framework in benefiting PPPs

510 Note: “+” denotes the positive effects generated by the framework on PPPs

511

512 As noted from Figure 7, changing a VfM assessment from a finance-focused evaluation to  
 513 a comprehensive life-cycle examination may significantly improve the veracity of the  
 514 business cases of PPPs. In turn, this may provide the government with a broader concept of  
 515 VfM and provide guidance to pursue a complete realization of project success. The  
 516 process- and stakeholder-oriented measurement, which is underpinned by a life-cycle  
 517 learning mechanism, is capable of effectively capturing the conditions of a PPP project’s

518 initiation and planning, procurement, construction, operation and facility management.

519

520 This type of measurement can benefit the government by improving their efficiency in  
521 decision making in terms of the options for infrastructure delivery. At the same time, it can  
522 assist the private-sector entity to effectively and efficiently monitor their deliverables and  
523 completely meet the key stakeholders' expectations over the project life-cycle. For instance,  
524 while the government can oversee the performance of its PPP project by screening the  
525 design KPIs or FM KPIs, the private SPV can also examine such KPIs to understand  
526 whether the public client/end-users are satisfied with the operational outputs.

527

528 As a consequence of embedding a learning mechanism into the KPIs, the quality (e.g.,  
529 physical quality and service quality) as well as the sustainability of the built asset will be  
530 enhanced. This leads to an increase in end user satisfaction and a decrease in risks that can  
531 result in the underachievement of V/fM and project long-term success. Moreover, the  
532 systematic mechanism for reviewing/updating the implemented KPIs can facilitate PPPs in  
533 accommodating changes to the internal and external environment, thereby enhancing the  
534 whole-of-life suitability of the asset. From this stance, increased end-user satisfaction may  
535 occur, which in turn will be significant to the realisation of V/fM and the project success. In  
536 summary, the Performance Prism framework can enable the continuous value of the asset  
537 throughout the life-cycle of a PPP.

538

## 539 **Conclusion**

540 PPPs have been widely used to deliver public infrastructure projects. Nevertheless, the  
541 question remains about how to comprehensively and effectively evaluate their performance.  
542 Previous research has identified that an understanding of the practice of performance

543 evaluation/measurement is a prerequisite for the successful design and implementation of a  
544 new PMS in the organisation. Therefore, case studies of the Australian social infrastructure  
545 PPPs, which relied on semi-structure interviews and documentary reviews, were conducted  
546 and have been presented in this paper.

547

548 The empirical examination of a prison and hospital projects delivered using a form of PPPs  
549 has provided the basis to identify that there are paucities and “gaps” existing in the projects’  
550 performance evaluations. These included a narrow assessment for VfM, an incomplete  
551 evaluation from procurement phase to post-implementation stages (e.g., design,  
552 construction, operation and maintenance) and ineffective and inefficient internal learning.  
553 Because of these findings, an innovative life-cycle Performance Prism was proposed and it  
554 was demonstrated how it can contribute to effectively address the current problematic  
555 issues in the performance evaluation of PPPs.

556

557 The outcome of this paper is theoretically significant, and a new approach for measuring  
558 PPPs throughout a project’s lifecycle has been proposed. It contributes to the body of  
559 knowledge of public project governance and evaluation within the context of PPPs.  
560 Additionally, this paper is practical, as the developed framework was empirically derived  
561 from an interpretation of ‘real-world’ projects. It can therefore ensure VfM is achieved as  
562 an effective and efficient evaluation and governance for PPP is established. However,  
563 future research is required to develop a balanced abatement mechanism, which can form  
564 the foundation for an application of the proposed Performance Prism framework. This will  
565 be useful for PPP performance measurement practice, which is particularly significant for  
566 the public authority to govern a project’s outputs and outcomes. In addressing this issue,  
567 emphasis needs to be placed on the development of incentives and guidance so that SPVs

568 can understand and accommodate an asset's performance risks. Therefore, an appropriate  
569 payment mechanism that is calibrated to monitor and measure PPPs needs to be designed  
570 to engender a contract capable of providing long-term value to key stakeholders.

571

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576

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