VALUE FOR MONEY OPTIMISATION AND SUSTAINABILITY IN PFI PROJECTS

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Since 1992, the public sector in the UK has used Private Finance Initiative (PFI) to finance major infrastructure projects and to secure Value for Money. PFI is claimed to have successfully minimised construction risks and delivered projects with high certainty in the time, cost, quality, and client satisfaction. However, recent concerns on poor returns have increased pressure to demonstrate that expectations will be consistent 'vis-à-vis' their ability to give long term VFM. This paper is based on a research to explore the VFM uncertainty of PFI projects and establish causes hitherto. The research investigated variations in costs, time, and client requirements from the strategic business case stage through to the operational phase. Data collection methods include a documentary analysis of full business cases of five PFI projects and published reports, and a questionnaire survey of 44 PFI projects in the UK. Analysis shows in many PFI projects; VFM results are not always constant because costs, time and client requirements change continuously in the project's lifecycle. Early warnings on VFM variations are not systematically exploited due to lack of consistent frameworks. The current PFI implementation framework is prescriptive of procedures and assumes the appraisers have the right information to carryout VFM assessment at all recommended stages. The study subsequently proposed a model, which seeks to improve the delivery of PFI projects by optimising value for money and sustaining it throughout the project's lifecycle

Keywords: performance, private finance initiative, uncertainty, value for money.

INTRODUCTION

Since 1992, the public sector in the UK has used Private Finance Initiative (PFI) as a mechanism to involve the private sector in the funding of major capital projects. Through PFI, many public infrastructures, such as schools, hospitals and prisons, and roads have been built. The PFI package includes agreements to provide a fully serviced facility for a period typically of around 25 to 30 years. To the public sector, PFI has offered a solution to the problem of underinvestment by offering a long-term income stream. For its advocators, PFI is credited for superior performance in cost, time, and client satisfaction (HM-Treasury, 2008). PFI delivers better Value for Money (VFM) than traditional procurement methods because of its focus on appropriate risk allocation, faster project completion, reduced project cost overruns, incentives for innovation, and focus on whole life costs (Akintoye *et al.*, 2003).

Although PFI has been in use for nearly two decades, it still faces several challenges to provide conclusive proof of VFM. These challenges have persisted for so long because PFI is usually applied to complex and large-scale schemes, which involve long contractual durations (Cheung *et al.*, 2010). The complexity of PFI projects

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affects the specification of quality of service, pricing of the facility and services and defining performance measurements. For the same reason, many projects incur higher cost and take a long time to develop and procure. The actual achievement of VFM cannot be fully assessed until PFI projects become operational. Besides, optimising the potentials for VFM is critical during the development stage, because there are limited opportunities to improve VFM once the project is operational (NAO, 2011). Models and standardised procedures have become important tools to facilitate consistent implementation of PFI projects. However, only a few models and frameworks have been proposed that deal with other issues not specific to the whole life VFM optimisation. This paper presents a proposed model to improve VFM in the delivery of PFI projects. The model is developed based on the validated deficiencies of the existing PFI frameworks.

DEFICIENCIES OF THE EXISTING VFM ASSESSMENT FRAMEWORKS

Value for money (VFM) is defined as an optimum combination of cost and quality to meet the client's needs (HM-Treasury, 2008). It emphasises on cost effectiveness, quality of the outputs, efficient delivery of projects, effective operational performance, and long-term outcomes (Demirag and Khadaroo, 2010; Akintoye *et al.*, 2003). However, in practice, it is commonly assessed by comparing two or more options for potential or actual outcomes. Decision on the best value option depends on the combination of the above factors (Yuan *et al.*, 2009). The Treasury provides statutory frameworks for VFM assessment in all PFI projects. Further guidance and support are provided by the respective departments or advisory agencies such as the Partnership UK (PUK) and Local Partnership- formally the 4Ps. The National Audit Office issued a framework for the implementation of PFI projects that provides further requirements on lifecycle VFM assessment (NAO, 2006). It prescribes criteria for six project stages: strategic analysis, tendering, contract completion, pre-operational implementation, and early and mature operational. However, the framework is developed as an audit tool that comes to effect late when the project has passed the key milestones.

Treasury's VFM guidance focuses on investment decisions covering the early stages of PFI projects from inception to the end of procurement. The Guidance requires investment decisions to base on both qualitative aspects such as project viability, desirability and achievability and quantitative aspects such as whole life cost (HM-Treasury, 2006). The assessment is carried out at three levels: programme level, project level and procurement level. The programme level assessment is carried out during the Strategic Outline Case (SOC) stage when the investment is being considers. The project level assessment is carried at the Outline Business Case (OBC) stage before advertising the project on the OJEU (Official Journal of the European Union). Key aspects of VFM assessment at programme and project level are the clearly defined project objectives and identification of long-term business needs (Pitt *et al.*, 2006). PFI does not specify the means to deliver projects; rather it specifies outputs and the required performance standards (Robinson and Scott, 2009). Therefore, understanding both business objectives and stakeholders' value is vital (Li *et al.* 2005). VFM assessment at the procurement level begins immediately after the OBC and continues through to financial close and the approval of the Full Business Case (FBC) (HM-Treasury, 2006). Qualitative assessment focuses on the strength of competition, procurement efficiency, and appropriate transfer of risks. On the hand, quantitative assessment compares costs between the Public Sector Comparator (PSC), representing traditional procurement methods, and the PFI option. Securing good VFM at the

procurement level depends on the identification, assessment and allocation of project risks to the project partner with the best ability to manage them (Li *et al.*, 2005; Akintoye *et al.*, 2003). However, these processes generate significant risks to both parties, which require proper frameworks to allocate the identified risks, respond to unknown uncertainty and monitor the outcomes (Jin and Doloi, 2008). In the end, VFM achieved during the programme level, project level and procurement level assessment needs be demonstrated through project outputs and outcomes (Demirag and Khadaroo, 2010). Outputs are demonstrated by quality and innovative nature of the facilities and services delivered by the winning private sector consortium. Outcomes are demonstrated by the impact of the contracted facilities and services on the users and organisation's performance. The majority of the operational projects are still at the early operational phase and only a handful of evaluations have been reported. Evaluations including those by PUK (2005) and Ipsos MORI (2008) revealed that PFI projects have high level of satisfaction with operational performance. However, there are concerns that these projects face VFM uncertainties due to frequent changes in facilities and services (NAO, 2008); value testing exercise (NAO, 2007); poor project handover (PUK, 2005); and difficult performance monitoring (Yuan *et al.*, 2009; Robinson and Scott, 2008). Addressing these issues require more integration of PFI lifecycle processes.

There are also concerns that PFI guidance and frameworks are overly prescriptive of approval requirements and standardised procedures, which encourage compliance and subjectivity (Froud and Shaoul, 2001). Moreover, a survey of 200 accountants working in the public sector showed that 58% of the respondents did not believe that PFI schemes are objectively tested for VFM (ACCA, 2002). Another concern is that VFM assessment exercise is complex and lacks vigorous testing for robustness (Cheung *et al.*, 2010). The complexity is also a reason why PFI projects extensively rely on the expertise of external consultancies (Ball and King, 2006). During the operational phase PFI projects lack systematic ongoing VFM evaluation projects; therefore, they completely lose track when changes to the facility or services are implemented (NAO, 2011 and 2008).

Variations and the uncertainty of VFM are typical characteristics of process complexity and skill deficiencies in PFI (Carrillo *et al.*, 2006). Existing studies show that PFI projects experienced continuous variations in cost through all stages from inception through to the operational phase (Pollock *et al.*, 2007; NAO, 2008). Contrary to the claim that PFI offers certainty in cost, time and quality; continuous and disproportionate cost overruns affects long-term optimality of VFM. This underlies the present research, which aims at addressing the problem of VFM uncertainty in PFI projects. It is based on the hypothesis that the current VFM frameworks produce inconsistent results, which limit the optimality of VFM and its sustainability. The research particularly addressed two objectives:

1. To substantiate uncertainty about the planned parameters used in the assessment of VFM including clients requirements, time and cost.
2. To propose an improved model for optimum VFM and its sustainability through the entire project's life

VALIDATING VFM UNCERTAINTIES

To ascertain VFM uncertainty, a two-stage research was undertaken. Stage 1 is a documentary analysis involving Full Business Cases (FBC) from five PFI projects. Stage 2 is a questionnaire survey of healthcare and transport PFI projects. The two-

stage research is justifiable by the fact that both the depth and sample representativeness are vital to substantiate uncertainty. Documentary analysis is limited to certain projects and covers a few project stages whilst a survey alone would be limited in depth. Therefore, outcomes from the documentary analysis were validated using wider project samples during the questionnaire survey. The documentary analysis investigated how the planned parameters varied as the project moved from one milestone to the other. The PFI projects chosen for the documentary analysis were: (1) Brent Emergency Care and Diagnostic Centre (BECaD); (2) Queen Alexandra Hospital (QAH); (3) City General and Haywood Hospital (CGHH); (4) Birmingham New Hospitals Project (BNHP); and (5) New Hospitals Programme for Bart's and the London NHS Trust (BLH).

The survey used a structured questionnaire administered to PFI client teams from healthcare and transport infrastructure projects. Since the target projects were at different stages; the questionnaire was divided into four sections for convenience and ease of response. Section 1 asked all projects to provide general information about the respondent and the project. Section 2 asked details about changes made at the development phase (from SOC to FBC). Section 3 targeted operational projects seeking information about changes made in the operational phase and the reasons why. Section 4 all respondents to rank the effectiveness of various methods to address uncertainty. Operational projects were expected to complete most of the sections, while those in earlier stages were to complete sections relevant to their status. The questionnaire was sent to 80 projects. 44 respondents returned completed questionnaires representing a rate of 55%. Respondents for the development phase were mainly project directors and for the operational phase were contract managers. The received responses were from projects of different nature and sizes including 10 highways; 2 traffic junctions; 1 railway; 13 street lighting; and 18 buildings, of which 16 were hospitals and two office buildings.

Results from the documentary analysis

The five Full Business Cases covered three milestones: Strategic Business Case (SOC), Outline Business Case (OBC) and Full Business Case (FBC) stages. All projects complied with the current PFI framework. In particular, client's needs were identified at the SOC stage based on a review of the current service level and drivers for change. At the OBC stage, the needs were reviewed, and activities were remodelled. Various project options were presented and compared for costs and benefits. The PSC was developed based on the modelled 'activity assumptions' stipulating client's requirements and costs. During the FBC stage, the PSC was reviewed to reflect the negotiated project solutions. The analysis of VFM uncertainty focused on variations in number of beds and capital cost, which were consistently reported in all documents. The reporting of other client requirements including project scope, equipment, and facilities management (FM) services and timescale varied therefore could not be analysed. The analysis results are summarised in the following:

- The number of beds and capital cost continuously changed. At the OBC stage, 3 out of the 5 projects increased their client requirements and 2 reduced them. During the FBC stage, 3 projects reduced their requirements and the remaining 2 did not change. Meanwhile, costs constantly increased in all projects. From the SOC stage to OBC, the largest increase was 412% of the original planned cost. The highest cost increase from the OBC to FBC was 109%.

- There was a wide variation in the treatment of risks. Transferred risks, as a percentage of total PSC costs, varied from 0.89% for BNHP project to 14.4% for QAH project. The analysis shows that the BECaD project transferred 65% of total risks to switch VFM from 1.06% poorer to 1.23% better under PFI than the PSC. Similarly, the QAH project transferred 72% of total risks to switch VFM from 10.7% poorer to 3.10% better under PFI than the PSC. Another strategy was to inflate unit costs in the PSC. For example, the BLT project had the PSC unit rates higher than the preferred bidder's prices; therefore, it was able to realise a 1.33% VFM before transferring risks. These results indicate that the appraisers were under pressure to demonstrate VFM.
- Sensitivity analysis to demonstrate the robustness of the appraised VFM varied across projects. There was no consistency in identifying the most sensitive factors, and the judgement for the robustness was subjectively done. For example, the increase in service costs by 0.33% would switch VFM for BNHP project, but this was regarded a 'less likely' possibility. Similarly, in all projects, VFM was sensitive to the decrease in the PSC initial capital cost, but the decrease was regarded 'very unlikely'.

Questionnaire survey results

The questionnaire asked variations in three categories of parameters in the surveyed PFI projects: client requirements, including project scope, delivery units, equipment, and FM services; costs items, including capital cost, unitary charges, consultancy fees, revenue cost, and operating cost; and timescale. The analysis looked at variations at three milestones: from Strategic Outline Case (SOC) to Outline Business Case (OBC); then from OBC to Full Business Case (FBC); and finally, during the Operational Phase. Results for total variations and mean scores (MS) as shown in table 2. Scores show three trends: MS=2- no change; MS<2 - a decrease; and MS>2 – an increase. Results show that variations affected all parameters and at all stages.

- Client requirements increased (MS>2) from the SOC to OBC, but most of them were then decreased (MS<2) from OBC stage to FBC. It is interesting to note that delivery units, equipment and FM services increased at the OBC stage and decreased at the FBC stage, while project scope continually increased at both stages. This demonstrates that clients will remain unsure of what they will achieve until the end of procurement.
- Cost variations had MS>2.0 through all three review stages - demonstrating that these items continuously increased. At the OBC stage, capital cost was the most serious problem, while consultancy fee was least problematic. There were slight improvements in costs at the FBC stage; but consultancy fee worsened. More escalations happened in during the operational phase. Around two-thirds of the operational projects surveyed overran the operating cost and unitary charges and 10 % overran capital cost. The increase in capital cost indicates that major works were undertaken which also involved capital reinvestment. Meanwhile, the overrun in operating cost and unitary could be due to both minor and major changes.
- There were significant time delays (MS>2.0) at both the OBC and FBC stages. Over half of the projects delayed the completion of the OBC. Delays worsened during the tendering stage. Two-thirds of the projects delayed the FBC.

Table 1: performance of the planned parameters

Parameters		SOC to OBC		OBC to FBC		Operational	
Categories	Description	Total variation (%)	Mean score	Total variation (%)	Mean score	Total variation (%)	Mean score
Client requirements	Project scope	34.50	2.35	33.30	2.19	-	-
	Delivery units	31.00	2.10	51.80	1.78	-	-
	Equipment	17.20	2.17	25.90	1.89	-	-
	FM services	7.10	2.07	11.50	1.96	-	-
Costs	Capital costs	61.30	2.55	53.30	2.33	10.30	2.10
	Unitary charges	53.80	2.46	51.80	2.22	58.60	2.59
	Consultancy fees	37.90	2.38	57.10	2.57	-	-
	Revenue cost	48.20	2.41	44.40	2.22	-	-
	Operating cost	-	-	-	-	65.50	2.66
Timescale	Planned timescale	57.14	2.50	65.40	2.65	-	-

Note: SOC- Strategic Outline Case; OBC- Outline Business Case; FBC- Full Business Case

VFM OPTIMISATION AND SUSTAINABILITY MODEL

Following the analysis of VFM uncertainties in PFI projects and evaluation of the existing VFM frameworks, this study developed a new VFM optimisation and sustainability model. The model stems from the VALiD (Value in Design) concept of lifecycle value analysis (Saxon, 2005). It provides a logical structure to help project teams understand the issues that must be discussed among stakeholders to create an agreed understanding of VFM drivers specific to the project. It can be viewed as an evolving model that varies with project stages to assist the stakeholders and project teams to define VFM objectives and translate them into implementable processes while allowing for feedbacks. The model is incremental to the current PFI framework (HM-Treasury, 2006). VFM is created through continuous processes aiming at reducing the amount of resources committed and increasing benefits. The optimisation starts right from the onset of the project and proceeds for the entire period of the useful life of the facility. VFM assessment principles remain unchanged. Instead, stakeholders have more ownership of the processes - leading to optimum VFM. Decisions on VFM are evidenced by a rigorous test for robustness to reduce subjectivity. Robustness analysis uses repeated simulation to validate that the best possible choice has been made; all the uncertainty within the available resources has been eliminated, and the choice is rationalised with objective knowledge. The structure of the proposed model is presented in figure 1. It comprises of five VFM processes: Understand; Develop, Assess, Test, and Sustain.

The ‘Understand’ phase is carried out at the Strategic Outline Case stage. Stakeholders define and agree on the project context and criteria for VFM. This creates an agreed understanding of the needs for the project and stakeholders’ expectations. The phase involves two processes: defining VFM in relation with the context of the project and identifying driving factors that shape the processes.

At the ‘Develop’ phase; project teams will define and prioritise processes, develop project implementation plans and implement the planned activities. The phase repeats with different activities at every project stage according to the implementation plan. A separate Process Map is developed to help experts convert the stakeholders’ defined drivers into fewer relevant operational processes. To complete this stage, there are 5 steps: analyse driver, define processes, assess and prioritise processes; develop an

implementation plan; and implement the plan to create VFM. The 'create VFM' process (shown in double box) is a standard process from the current frameworks. This refers to specific tasks carried at relevant milestones, such as defining optional appraisal at OBC stage and procurement at the FBC stage.

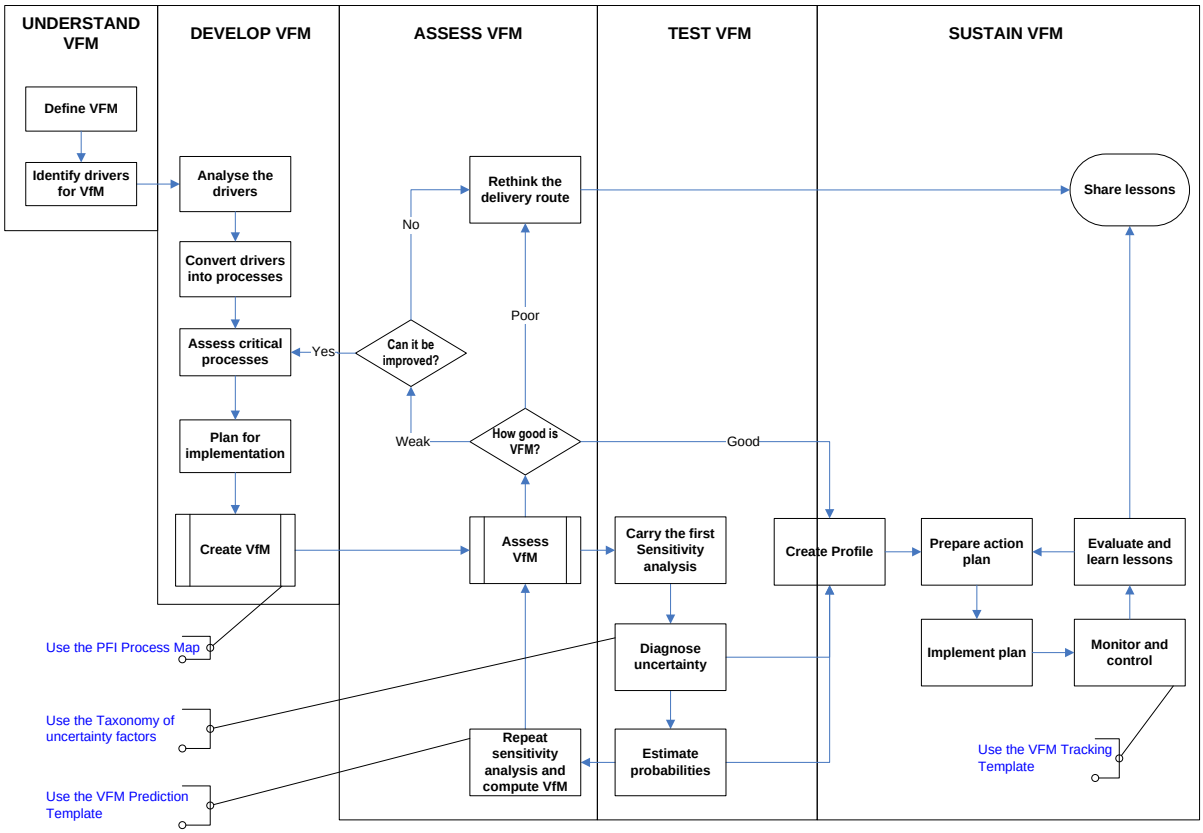

Figure 1: structure of the VFM Optimisation and Sustainability Model

At every implementation phase, VFM is 'Assessed' according to standard practices (HM-Treasury, 2006). In addition, results are 'Tested' for robustness. A traffic light system showing 'Poor', 'Weak' or 'Good' VFM is proposed together with appropriate measures to take. Sensitivity analysis is repeated but with few most sensitive variables to assess the potential impact on VFM could they materialise. The 'Assess' and 'Test' iteration comprises of five main tasks: initial assessment of VFM; first sensitivity analysis; diagnosis of potential uncertainty around the most sensitive factors; repeat sensitivity analysis, and reassessment of VFM. A separate 'VFM Prediction Template' has been developed to help the testing process. The template also includes a monitoring tool to analyse the implication of cost change on VFM during the operational phase. The project progresses to the next implementation stage only when it provides 'good VFM' under the preferred option.

The final step is to 'Sustain' the assessed VFM. The step considers both proactive and reactive measure to mitigate uncertainty and monitor VFM. The 'Sustain' process includes five sub activities: create uncertainty profile, develop an action plan to mitigate uncertainty, implement the plan; monitoring VFM; and evaluation and lesson learning. A comprehensive breakdown of uncertainties is summarised in a separate 'Taxonomy of uncertain factors'.

Supporting tools

To implement the model, there are three tools to assist the implementation of the model in practice: (1) Process map for VFM development phase; (2) prediction and tracking template for testing and monitoring of VFM; and (3) Taxonomy of uncertainty factors as a planning tool.

- Process map is developed to streamline PFI processes and maintain consistency in VFM delivery. It compiles lifecycle processes from the onset through to project implementation. It covers: the Strategic Outline Case, Outline Business Case, Full Business Case and contract management during the implementation phase. It focuses on VFM enhancing activities at the key milestones, their interconnections, and flow of information between them. The mapping integrates current PFI guidance, case studies and recommendations from published researches. It uses IDEF0 diagrams (Integrated Definition for Functional modelling), which are easy to follow by the multidisciplinary PFI team (Kamara and Anumba, 2000). The process map particularly helps the user to convert VFM drivers into linear processes, which can further be expanded into greater levels of details.
- The taxonomy compiles factors identified form a comprehensive review of the published literature. Priority factors causing VFM uncertainty were ranked in the course of study. It classifies uncertainty factors into 3 categories: Environmental, Technical, and Relational. These are further decomposed by type, group, category, and source to the fourth level. At the elementary level, uncertainty factors have few interdependencies, therefore, can be analysed individually. Project teams can utilise the taxonomy to identify uncertainty factors, to categorise and rank them, and create uncertainty profiles and develop a mitigation plan.
- The prediction and monitoring template simulates changes in VFM when the most sensitive factors vary. They take into account unforeseeable uncertainty, which is typically excluded from transferable risks. By considering few factors in the repeated sensitivity, various scenarios can be simulated to improve the accuracy of the predicted VFM. Inputs for prediction are established from the VFM appraisal and sensitivity analysis. Inputs for VFM monitoring are the cost change to the current date. Outputs are illustrated graphically to show the status of VFM and time at which it may likely to switch to the PSC.

DISCUSSION

Results from both the documentary analysis and questionnaire survey have validated uncertainty in the planned outcomes through all project stages. Frequent variations in client requirements, costs and time determine the uncertainty of value for money in PFI projects. Results show that current frameworks have not addressed the issue of robustness of the appraised VFM. The robustness is subjectively concluded, and the impact of the interaction between the most sensitive factors is not given adequate attention. The prescriptive nature of the current PFI frameworks provides little incentive for project teams to own the processes; instead, they comply to get the project approved. The study has developed a model to address some of the deficiencies in the current PFI framework. The model and its tools were reviewed by 15 experts: 9 were practitioners from PFI projects in the Healthcare and transport sector and six were academic researchers engaged in relevant areas. Three theoretical case studies were also used to test the template. Reviewer agreed that the model was

straight forward and covered key areas required to optimise VFM. It recognises the role of the drivers for VFM and reflects on the key milestones. The sequencing from Understanding, Developing, Assessing, to Testing ensures VFM is consistent whilst allowing for the utilisation of the lessons learned. The 'Assess and Test' circle provide robust approach to optimise VFM. It graphically illustrates variations in VFM and warns against any negative trend in the operational phase.

The model is useful as a checklist to optimise VFM especially due to its requirement to review the achieved VFM constantly. Contrary to the current practice, the model helps to detect possible areas of VFM loss, so that the initial assumptions can be reviewed. It can be used as a planning tool for new projects or monitoring tool for those in advanced stages of development. Since projects are not standard, the model gives flexibility to the user to customise value for money criteria and critical processes that suit the particulars of the project. However, the developed templates are based on the PSC approach; therefore its use is limited to similar cases. The template is also limited to assessing VFM based on cost variation when quality remains unchanged.

CONCLUSIONS

Value for money is the principal rational for the use of Private Finance Initiative in the UK. This study based on the hypothesis that current PFI implementation frameworks produced inconsistent results, which have limited potential to optimise and sustain VFM in projects lifecycle. The study focused on the client side investigating variations from the Strategic Business Case stage to Outline Business Case stage; from the Outline Business Case to Full Business Case; and during the Operational Phase. The study results have substantiated uncertainty in costs, time and client requirements through all stages of project's lifecycle. The results have also highlighted the need for an improved framework that focuses on well-evidenced decision on the robustness of the appraised VFM. This research has developed a model providing a systematic framework, procedures and tools for project teams to define, develop, assess, test and sustain VFM. The model offers a whole life approach to optimise value for money and to monitor progress at different implementation stages. The proposed model is not intended to replace the existing PFI guidance; instead, it addresses specific gaps to improve consistency of the VFM assessment results. The model has potentials to improve the delivery of VFM through optimisation of the benefits and costs during the project appraisal process, monitor VFM during the operating phase, and utilise lessons learnt for further improvements.

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