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BOT 政府行使介入權最適時間與方式之研究(I)

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計畫主持人：荷世平

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Framework for the Government Step-in Decision in BOT Projects

Abstract

As economy slows down, the BOT/PFI projects become popular in many countries. BOT procurement is undertaken on a service-based output basis rather than an asset delivery basis. Major studies and efforts focused on financial arrangements or project construction management. No serious research on the public sector's step-in rights related issues nor were relevant significant cases been analyzed. To address the uncertainty nature of BOT projects within operation period, the public sector's action should follow Pareto rule, namely to develop a decision–making process which (1) maximize the efficiency of resource allocation and income distribution as well as (2) minimize the transaction cost. Satisfying these objectives is a challenging task that requires identifying tradeoffs among themselves. This paper presents a case study for examining one of the very first PFI agreements in 1993 and the renegotiation of the deal in 1999.The analysis provides some valuable lessons which could be learned from this particular deal for future BOT/PFI contracts design. Furthermore, the outcome of the study will be interdisciplinary works which provide a new approach to BOT/PFI regulators and contracting parties without discrimination.

Keywords: BOT, decision-making, benchmark approach, contract-designing, option theory

1 Introduction

The outset of the Private Finance Initiative (PFI) in 1992 provided concession-based deals which were generally produced on a limited recourse or project financial basis. For the private sector entity to undertake such a long term commitment, it must have sufficient funding to deliver the contracted-for service as well as to ensure that project may be build and then operated and maintained.

Inevitably, BOT/PFI procurements are for the delivery of what amount to indispensable service to the public. The absolute necessity to deliver these services has led to unusual contractual requirements within public-private concession contracts. Legal issues arise across a very broad area and need to be identified carefully. Early studies indicate that governments will seek step-in rights in a board range of circumstances, such provisions are not only made for the public sector to be able to intervene earlier in the event that the private sector is not delivering service to the performance standard but also alarm lenders and other investors - they will not recover the investment they have made in the project unless the private sector borrowers is delivering services and being paid for such services.

1.1 Scope of This Study

We shall introduce the study conducted by researchers on financial and economic law analysis first, and then we shall adopt modern research on real option models and benchmark approaches, to discuss how they can be related with our research objectives. As to contract design related monitor issues arise within the operation period for example, are whether the establishment of the project was consistent with the public sector's long-term business strategy; how the private sector’s problems arose; whether the terms of the original contract aided the resolution of crisis; what options considered to tackle the crisis; what the terms were of the revised agreement made to save the project. We tried to collect the evidence in support of our opinions under each of these issues from examination of the Royal Armouries case. According to the scenario case study, this article shows some strategies for improvement of the decision-making system in order to reduce the risk of BOT/PFI projects within operation period...

The paper is structured as follows:

part 1 contains overview of BOT/PFI and identifies performance risk within operation period;

part 2 considers step-in rights and provides methods to formulate the critical time issue;

part 3 reviews an empirical case and examines decision –making process;

part 4 discusses optimal contract design and monitoring strategies;

part 5 conclusions

1.2 Risk Management in Operation

Government is responsible for a wide and diverse range of activities including delivering services to the public such as social welfare benefits; procuring and managing major construction projects; regulating industry and collecting revenue. All of these activities involve some form of risks. The Treasury published *Management of Risk - A Strategic Overview* (2000) 【1】which defines risk as" *the uncertainty of outcome, within a range of potential exposures, arising from a combination of the impact and probability of potential events."* Risk management means the public sector has a corporate and systematic process for evaluating and addressing the impact of risks in a cost effective way and having staff with the appropriate skills to identify and assess the potential for risks to arise.

According to the result of survey by NAO in 2000, the main barriers for risk taking in the public sector side are: asymmetric information, risk averse, lack of expertise, lack of formal systems, processes and procedures, unclear responsibilities, the status and activities of public body's limits and time, funding constraints. Instate of tolerating those barriers, the incentives should be incorporated with concessions.

2 Step-in Rights

Step-in rights entitle the public sector to be able to intervene earlier in the event that the private sector is not delivering service to the agreed performance standard .To the extremely circumstance, such a right can be a trigger for the contract termination before contract duration.

2.1 Optimal Time

How often do departments assess overall risks? NAO report (2000) showed thirty-eight per cent of departments do not routinely assess their overall risks. For the private sector entity to undertake such a long term commitment, a further consideration is that priorities change over time and areas of performance subject to assessment need to be reviewed periodically. It is therefore important to identify core areas whose indicators will be collected on consistent basis over time. Later, we shall introduce two financial methods (1) NPV-at-risk method and (2) option pricing theory to identify the critical time issue.

2.1.1 NPV-at-Risk Method

Ye and Tiong (2000)【2】 presented the NPV-at-risk method to analyze the impact of the risks on the value of a BOT project. The basic concept of this method is to simulate the primary variables underlying the net present value of a project, and obtain the distribution and confidence level of the NPV. Myers (1976) pointed out the major limitations of the NPV-at-risk method: '*If NPV is calculated using an appropriate risk adjusted discount, any further adjustment for risk is double-counting. If a risk-free rate of interest is used instead, then one obtains a distribution of what the project's value would be tomorrow if all uncertainty about the project's cash flows were resolved between today and tomorrow. But since uncertainty is not resolved in this way, the meaning of the distribution is unclear*.'

2.1.2 Option Pricing Theory

Traditional methods, such as NPV analysis, fall short in reflecting the characteristics of privatized infrastructure projects and the risks involved. Ho and Liu (2002) examined why the evaluation of BOT investments can be improved by applying real option framework and present an option pricing based model for evaluating the project financial viability【3】. So the critical time (bankruptcy condition) can be modeled as

$V_t - D_t(K_t)e^{-r_d(T-t)} < O$

Note：

- $D_t(K_t)$ is defined as the total outstanding debt at time T prices estimated at time t.
- $D_t(K_t)e^{-r_d(T-t)}$ is the total estimated debt at time t prices obtained by discounting $D_t(K_t)$ at the loan interest rate r_d for the period $T-t$.

In order to account appropriately for the asymmetric payoffs under the bankruptcy risk, Equation above suggests that if the project value estimated at t is less than the estimated required total debt at time t prices, the lending bank will force the bankruptcy of the BOT firm to prevent further loss. This quantitative model considers the project characteristics explicitly and evaluates the project from the perspectives of the private sector and of the public sector when the project is under bankruptcy risk. Therefore, the critical time would be pointed out. In that case, the public sector shall have a strong theoretical reason to trigger step-in rights by all means before bankruptcy. Interested readers may refer to Ho and Liu (2002) for details regarding the formulation the BOT-Option Value model.

2.2 Performance Measurement System

In order to trigger step-in rights without discrimination, BOT/PFI contract should contain a reasonable system to measure the private's performance against specified criteria. We introduce two different approaches to explore this issue.

2.2.1 Value for Money

Value for money (VFM) means to achieve the optimum combination of whole life cost and quality to meet customer requirements. Within a VFM framework, evaluation is commonly directed at the following:

- Economy – how much money is spent;
- Efficiency – the relationship between the inputs into activities and the direct outputs from those activities;
- Effectiveness – the relationship between efficiency and outcomes. Outcomes are the ultimate impact of activities and are intended to relate to aims and objectives.

To identify VFM, the illustration between conventional procurement and PFI is showed below (See Figure 1).

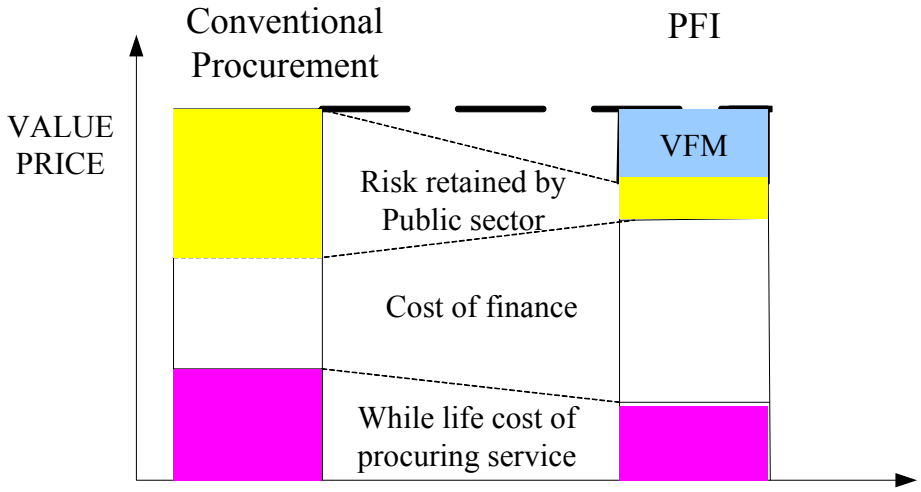

Figure 1. VFM

However achieving cost reductions (or containing costs) does not always represent *good management* – for example if there is a disproportionate, detrimental impact on outputs and outcomes. The transaction cost shall be appraised by including searching cost, bargaining cost and enforcement cost. That is why it is also necessary to evaluate efficiency and effectiveness. Performance Indicators (PIs), for instance, can be used effectively as management tools within an organization to improve the quality, efficiency and effectiveness of museum activities.

2.2.2 Benchmark Approach

Appeals Court Judge Richard Posner, the modern economic law pioneer, pointed out

that decisions (judgments) require a benchmark for comparison which implies wealth maximization. Without question PFI's objective shall match the end - wealth maximization. UK experience provided the Public Sector Comparator (PSC) as a benchmark now and it means a benchmark against which VFM is assessed (see Figure 1). The PSC is typically a cost estimate based on the assumption that assets are acquired through conventional funding and that the procurer retains significant managerial responsibility and exposure to risk. The PSC had an inherently high level of uncertainty attached to it, as a result of the difficulty of forecasting not only the demands over 20 years or more, but also the associated running costs and potential income realizable from the project. Risks were modeled in the comparator by using Monte-Carlo simulation and the final output of the final PSC was expressed as a range. The risks modeled in the PSC covered uncertainties in predicting future income in areas such as tickets sand sales and uncertainties in future costs such as ongoing maintenance payments.

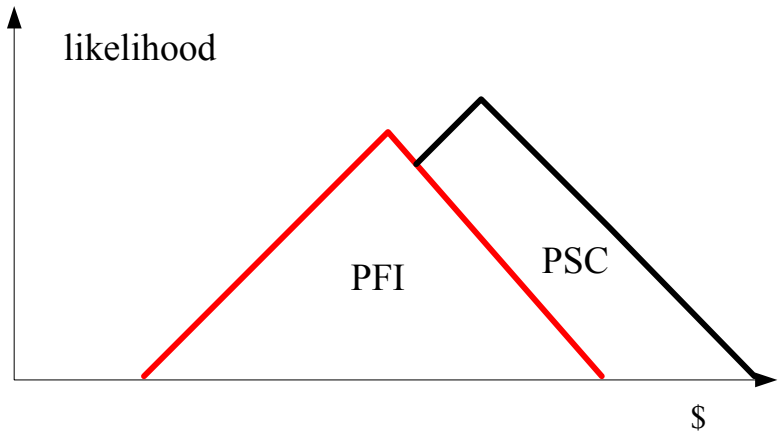

Figure 2 *The Public Sector Comparator (PSC)*

In order to evaluate success, it is necessary to have in mind benchmarks of measuring quality. A key element in this is the perception of value by users. The survey of expenditure may be useful for the private sector to carry out preliminary benchmarking on the relative proportion of expenditure they incur on different types of activity. This may in turn facilitate the gathering and interpretation of benchmarking information.

3 Case Study

The Royal Armouries originally entered into a PFI contract with Royal Armouries (International) plc ("RAI") in December 1993(see Figure 3). Under this contract RAI were to build a new museum which would allow the Royal Armouries to display a greater proportion of its collection. The Royal Armouries agreed to contribute £20

million to the £43 million cost of construction, with RAI meeting over £14 million and Leeds City Council and Leeds Development Corporation £8.5 million.

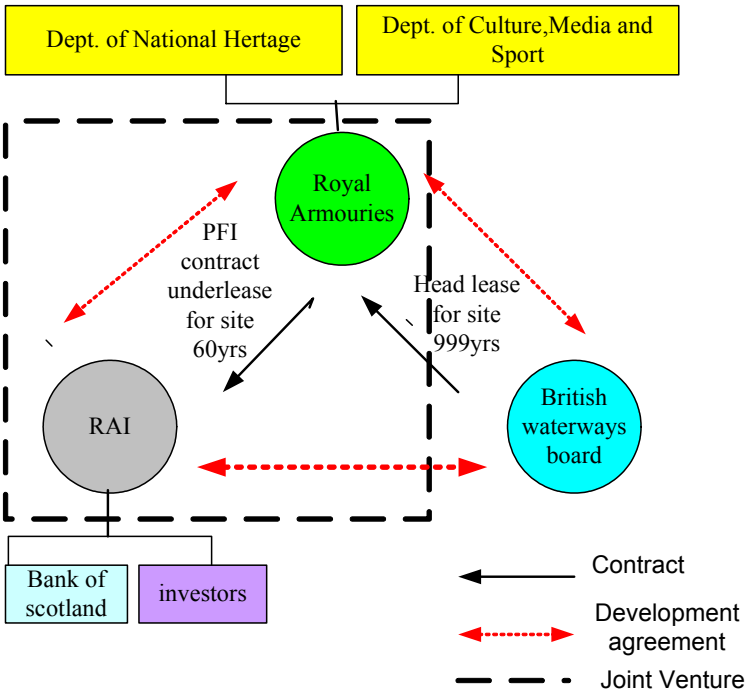

Figure 3 Original PFI Relationship Frameworks in 1993

Once construction was complete, RAI was to operate the new museum for 60 years. (see Figure 4) In return RAI would retain all the income the museum generated from visits by the public. The new museum opened in March 1996; however, visitor numbers were so low that it never made enough money to meet its operating costs and the costs of servicing RAI's debts.

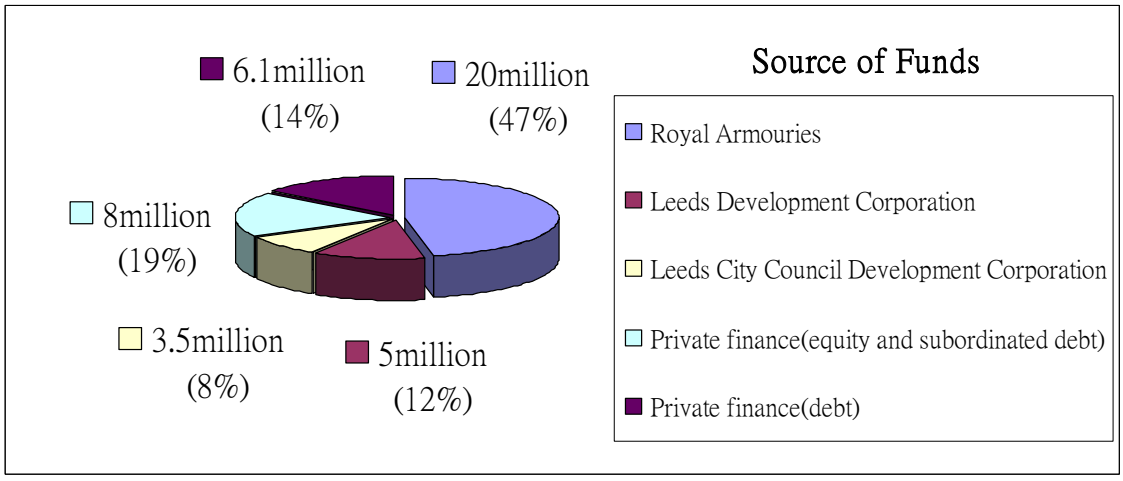

Figure 4 Source of Funds

Consequently, by early 1999 RAI's cumulative losses were estimated at £10 million, despite two refinancing by RAI. As part of the second refinancing in 1998 RAI's bankers, the Bank of Scotland, advised that it would not be able to make additional funding available to RAI after July 1999 if the financial problems persisted. Withdrawal of the Bank's support after that date would have resulted in RAI becoming insolvent. In response, therefore, in July 1999 the Royal Armouries negotiated a revised deal with RAI which ensured that the museum remained open. Under the re-negotiated deal the Royal Armouries took over responsibility for running the museum, while RAI retained responsibility for the provision of catering, car parking and corporate hospitality services at the museum (see Figure 5).

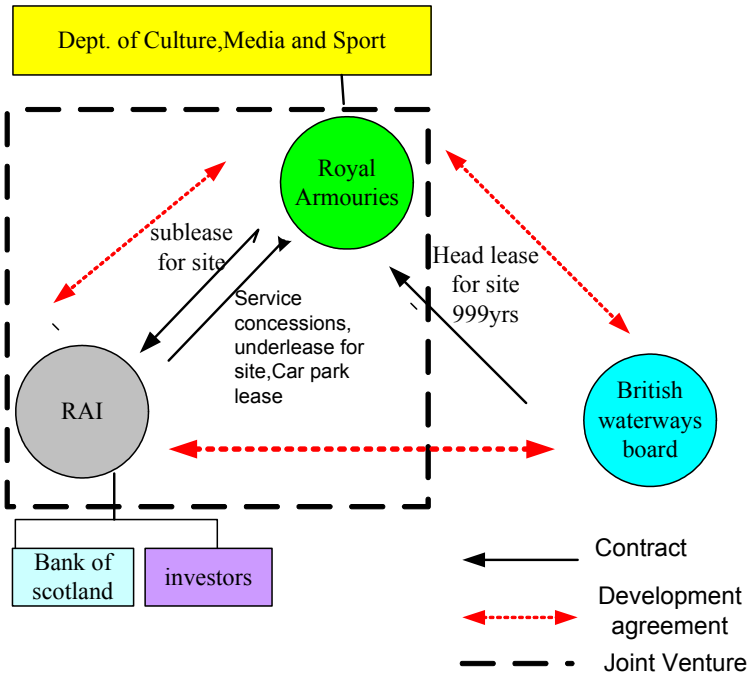

Figure 5 Renegotiation PFI relationship framework in 1999

On the basis of a report by the Comptroller and Auditor General (2000)【4】, we explore the public sector's decision-making process by focusing on the forecasts for visitor numbers, the re-negotiation in 1999 and on the extent of risk remaining with the private sector under the terms of the revised deal.

3.1 The Forecasts of Visitor Numbers

The actual number of visitors to the new museum was much less than Royal Armouries and RAI had forecast. However those forecasts were based on a certain pricing assumption and the consultants warned that the actual number of visitors would vary, depending on the admission price charged. The public sector should assess the

reasonableness of these projections by comparing them with the performance of comparable existing attractions. In addition, if the project involves a high degree of commercial risk, the project needs to be financed with a high level of risk capital relative to bank debt. If it is necessary to proceed with a project in the absence of adequate levels of risk capital, the government should plan for the contingency that extra funding will be required. The warnings on pricing appear to have been ignored by RAI. RAI had placed over reliance on their own consultancy advice and had charged a high entrance fee of £6.95. One of the first things that the Royal Armouries had done, on taking the museum over in 1999, was to reduce this entrance fee to £4.90.

In addition to the pricing policy, there were a number of other factors which contributed to visitor numbers being less than forecast. Such as delay in the development of the Clarence Dock area surrounding the museum.

3.2 Re-Negotiation an Existing Agreement

Whether the original strategic objectives for the museum had still been met after adopting step-in action？The National Heritage Act 1983 lays down a number of statutory duties with which the Armouries must comply, so the Armouries' objective was to avoid the museum's closure. Obviously, the Royal Armouries did not meet their strategic business objective of becoming more self-sufficient. In contrast, he has taken over the loss making aspects of the museum and will be dependent on extra funding from the government and the income from the lower-than-expected visitor numbers.

In negotiating the deal to save the museum the Royal Armouries did not seek appropriate commercial advice from an insolvency practitioner, although they were faced with a threatened insolvency. Faced with similar situations, the public sector should be clear both about their legal rights and the strength of their commercial position, and be prepared to use those rights and powers aggressively in negotiations. Under the terms of the revised deal RAI had to pay twenty per cent of their turnover to the Royal Armouries once their debt had been paid off. However, there were limits on the capacity of the museum to handle increased visitor numbers. The public sector should ensure that he has the right to share in the benefits of any future windfall gain resulting from any re-negotiated deal.

3.3 Ensuring Risk Remains with The Private Sector

Before signing the contract, the Royal Armouries had taken over comfort from assurances from their financial advisers, Schroders, that the deal was the best available from the market at the time, given the deal's parameters. In considering future deals, the public sector should get impartial advice on the merits of a proposed deal before it is signed. Under the current guidance the public sector would have had to consider at the

very start of the project what would happen at the contract's end. On this deal the Royal Armouries' ability to terminate the contract and take possession of the museum due to RAI's insolvency was limited for two years. The public sector needs to consider in advance how they will eventually exit from deals.

There had been a lack of market interest in the deal when it was put out to the market and only one bid had actually been received. The operating specification which was to detail those areas where such co-operation and joint working was required was not agreed subsequently. Even the Royal Armouries were not given access to RAI's financial records and there were disagreements between the two parties over issues which were of fundamental importance to the museum's future. The public sector should be aware of such warning signs that the deal being negotiated will not eventually be sustainable.

Surprisingly the Royal Armouries had no contingency plans in place, as they considered that the risk of the project's failure lay with RAI in the private sector. However, on this deal the business risks ultimately lay with the public sector as the Royal Armouries had been unwilling to countenance the closure of the museum and had therefore stepped in to rescue the project. In considering future PFI projects, therefore, the public sector should consider where the business risks ultimately lie and draw up their own contingency plans accordingly.

4 Contract-designing and Performance Standard

The new museum involved significant commercial risk, as it was a new attraction in a redevelopment area with no proven track record of visits by the public. What gets measured is what gets done. Performance measurement can be used not only to influence behaviour in a desired direction but also to serve as a benchmark. For example, the National Museums and Galleries developed a mechanism for raising standards of efficiency and quality in the sector and to identify examples of good practice. These objectives fit with Government initiatives seeking greater accountability and proof of "Best Value" from public services【5】. Those outputs are as follows

- a Business Model which analyses the activities;
- a long-list of Performance Indicators (PI's) for each activity;
- An agreed short-list of Performance Indicators to act as the foundation for a performance management regime.

OGC publish valuable reports, guidelines as well as PFI standard form contract 【6】 which reduce the transaction cost well. What the public sector measure must be meaningful and material to the fundamental mission of the organization and its operation. Strengthening economic legal infrastructure is about improving the quality and accessibility of the law and the capacity of individuals and institutions to implement,

apply and enforce those laws. The benefits are:

- improve transparency, predictability and fairness in the rules and regulations and administration of the public sectors; and
- engender business and investor confidence and enhance competition; and
- lead to economic efficiencies, innovation and reduced compliance costs for business

RAI should use the agreed PI's to collect information on outputs and outcomes. Through this they can demonstrate how the museum is contributing to the achievement of government objectives; and The Royal Armouries and the lender should use the agreed PI's to assist with their evaluation of the efficiency and effectiveness of the museum. This will provide an incentive for the private sector to consider where and how to reduce unit costs.

5 Conclusions

The study makes three main types of contribution under consideration:

- introduce an example of current practice;
- consider key issues and critical factors with regard to particular types of BOT/PFI;
- discuss basic standards with which all the private sector should be expected to comply.

In conjunction with investment and facilitation initiatives, strengthening economic legal infrastructure can help deliver significant returns in the form of social outcomes and sustained economic growth. Failure to provide an appropriate standard of decision-making could prove costly as a consequence of market uncertainty and loss of investor confidence. As the issues that need addressing are complex, and in some cases entrenched in legal system, culture and judiciary, measures will need to be undertaken with a long-term perspective, giving rise to incremental but substantive improvements. It is hoped that the work of the study will be continued in the form of an ongoing issues, such as the diversity of the activities, comparability and consistency as well as balancing long and short-term objectives, within performance period by dynamic approaches.

References

【1】National Audit Office (2000) *Management of Risk - A Strategic Overview,* The

Stationery Office. LONDON

【2】Ye, S. and Tiong, R. L. K. (2000) NPV-at-risk method in infrastructure project investment evaluation. *Journal of Construction Engineering and Management ASCE*, 126(3), 227–33

【3】S. Ping Ho and Liang Y. Liu (2002) An option pricing-based model for evaluating the financial viability of privatized infrastructure projects. *Construction Management and Economics* 20, 143-156

【4】 National Audit Office (2001) *The Re-negotiation of the PFI-type deal for the Royal Armouries Museum in Leeds*. The Stationery Office. LONDON

【5】Department for Culture, Media and Sport (1999) *Efficiency and Effectiveness of Government-sponsored Museums and Galleries – Measurement and Improvement – Private Finance Initiative Excellence Study.*

【6】OGC (2002) Standardisation of PFI Contracts-General Revised, The Stationery Office LONDON