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TG72 - PUBLIC PRIVATE PARTNERSHIP

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TG72 - PUBLIC PRIVATE PARTNERSHIP

PAPERS AND POSTGRADUATE PAPERS FROM THE SPECIAL TRACK

Public-Private-Partnerships (PPP's) are joint ventures, in which business and government cooperate; each applying its strengths to develop a project more quickly, more efficiently or otherwise better than government could accomplish on its own. There are many ongoing studies concerning PPP's for infrastructure, facilities and services delivery in the construction environment that need to be coordinated to develop a body of knowledge across the world. This will allow various features of PPP (social, economic, political, cultural, etc.) to be captured and documented. Against this background the Task Group will address PPP on an international level by providing a forum to facilitate exchange and synthesis of research and by identifying emerging international practices concerning PPP in facilities and construction development. The Task Group's objective is to develop a thriving international research community within the field of public private partnership through involving practitioners and experts in the field to collaborate on distinct scholarly tasks.

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A Comparative Analysis of Critical Risk Factors for China's PPP Projects

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Abstract

Risk identification for Public-Private Partnerships (PPPs) projects is the first stage of the risk management process. It is of considerable importance since the processes of risk analysis and response management may only be performed on correct and comprehensive risk identification. Due to the differences in terms of work culture and project experience, different stakeholders may have different perceptions on the Critical Risk Factors (CRFs) of PPP projects. The aim of this paper is to identify and compare the different perspectives of CRFs derived from two major stakeholders, i.e. industrial practitioners and researchers in China. In order to identify the CRFs, an empirical questionnaire survey was conducted from October to December 2007 in China. In general, the responses from both industrial practitioners and academic respondents were consistent. However, the independent 2-sample t-test demonstrated that there were significant differences in the mean values between two groups for 8 risk factors, namely *'Operational revenue below par', 'Operation cost overrun', 'Influential economic events', 'Quality of workmanship', 'Force majeure', 'Design deficiency', 'Nationalization/expropriation', 'Availability of labour/materials'*. The findings provide better understanding of the CRFs and pave the way for further research related to Chinese PPP arrangements.

Keywords: China, public-private partnerships, critical risk factor

1. Introduction

Risk management mechanism influences PPP projects' performance, hence it should be established before executing the project (Akintoye et al. 2003). The success of a project depends very much on the extent to which the risks involved can be identified and measured (Tah et al., 2000). Risk identification is defined as 'the process of systematically and continuously identifying, categorizing, and assessing the initial significance of risks associated with a construction project' (Al-Bahar et al., 1990). The process of risk identification depends much on the historical data of projects and relative experience of practitioners. However, similar risks may not be duplicated in different projects, even in different phases of the same project.

PPP projects are subject to more risks owing mainly to its complexity and a wide range of stakeholders involved (Tiong, 1995). A comprehensive list of CRFs will provide PPP stakeholders with a useful tool in correctly measuring the potential sources of project risks and appropriately mitigating their potential consequences.

A few papers have focused on the risks associated with Chinese PPP projects (Wang et al., 1998; Wang et al., 2000; Smith et al., 2004). Yuan et al. (2007) assert that political, economic and regulation risks have more impact on China's PPP projects. However, fewstudies have a deeper and more comprehensive investigation on the CRFs of PPP in China. In order to enrich the existing knowledge base, the current paper describes a survey which explored the CRFs in the Chinese context. Furthermore, from a comparative analysis on CRFs between two major stakeholders, i.e. industrial practitioners and the researchers, it is envisaged that a better understanding of PPP risks will be gained in the Chinese context.

2. Research methodology

2.1 Risk identification

The first step in the data collection was a comprehensive literature review followed by a number of case studies to identify and classify all existing PPP risk factors in the Chinese context. A risk register comprising of 21 risk factors was identified from the literature review as shown in Table 1. The second step compared the identified risk register with those advocated by Li (2003), a well known PPP researcher who published extensively on PPP related topics in the early 2000. The mapping is presented in Figure 1. The results show that risks identified in the current study tally well with those identified by Li (2003). Although the authors could have developed their own research questionnaire, there were several advantages foreseeable to adopt Li's (2003) survey questionnaire rather than designing a new template. Firstly, the value of Li's (2003) questionnaire has already been recognized by the industry at large. His publications as a result of the research findings derived from the questionnaire indicate its worthiness. Secondly, there would be no added advantage to reinvent the work that has previously done by other researchers. And thirdly by administering Li's (2003) questionnaire again but in different administrative systems would be of interest for comparison purposes in the future. Therefore Li's (2003) questionnaire was adopted for the survey as presented in

this paper with prior permission obtained from the author Dr. Li Bing and his doctoral research supervisor, Prof. Akintola Akintoye who is currently the Head of the School of Built and Natural Environment, University of Central Lancashire, U.K.

Table 1: Risk factors for running PPP projects in China

Risk factor	*Roumboutsos et al. (2008)*	*Jin et al. (2008)*	*Li et al. (2005)*	*Sachs et al. (2007)*	*Ng et al. (2007)*	*Zeng et al. (2007)*	*Wang et al. (2000)*	*Zou et al. (2008)*	*Illustrative cases*
A. Political and Policy Risk									
1.Riots and revolutions		√							
2.Expropriation		√	√				√		
3.Government approval									*5*
4.Corruption									*12*
B. Legal Risk									
5.Changes in law risk				√		√			
6.Industry regulation			√						
C. Economic Risk									
7.Poor macroeconomic performance			√					√	
8.Financial repression							√		*5*
9.Lack of finance support									*6*
D. Natural Risk									
10.Forece majeure	√		√			√	√		*3,6*
E. Completion Risk									
11.Location unavailability	√								*13*
12.Design risk		√			√	√			
13.Construction risks									*7,8,11*
F. Coordination Risk									
14.Inefficient organization due to too heavy bureaucratic dealings			√	√					
15.Unclear distribution of authorities	√		√		√				
16.Unclear cooperation principles			√		√				
17.Not motivated key staff			√				√		
G. Operation Risk									
18.Avaliability and quality of input									*8,9,16*
19.Quality and efficiency of maintenance and							√	√	

operation									
20.Maintenance and upgrade requirements			√						*9*
21. Operating and maintenance cost overrun			√						*9*
PPP cases in China									
Case 1	*Shandong Zhonghua Power Project*								
Case 2	*Fuzhou Jinshan Sewage Treatment Plant*								
Case 3	*Jiangsu **** Sewage Treatment Plant*								
Case 4	*Changchun Huijin Sewage Treatment Plant*								
Case 3	*Shanghai Dachang Water Plant*								
Case 5	*Beijing No. 10 Water Plant*								
Case 6	*Hunan **** Power Plant*								
Case 7	*Qingdao Veolia Sewage Treatment Plant*								
Case 8	*Hangzhou Bay Bridge*								
Case 9	*Fujian Xinyuan Minjiang No. 4 Bridge*								
Case 10	*Shanghai Yan'an Road.(E) Tunnel*								
Case 11	*Beijing Jingtong Expressway*								
Case 12	*Shenyang No.9 Water Plant*								
Case 13	*Fuzhou Changle Sewage Treatment Plant*								

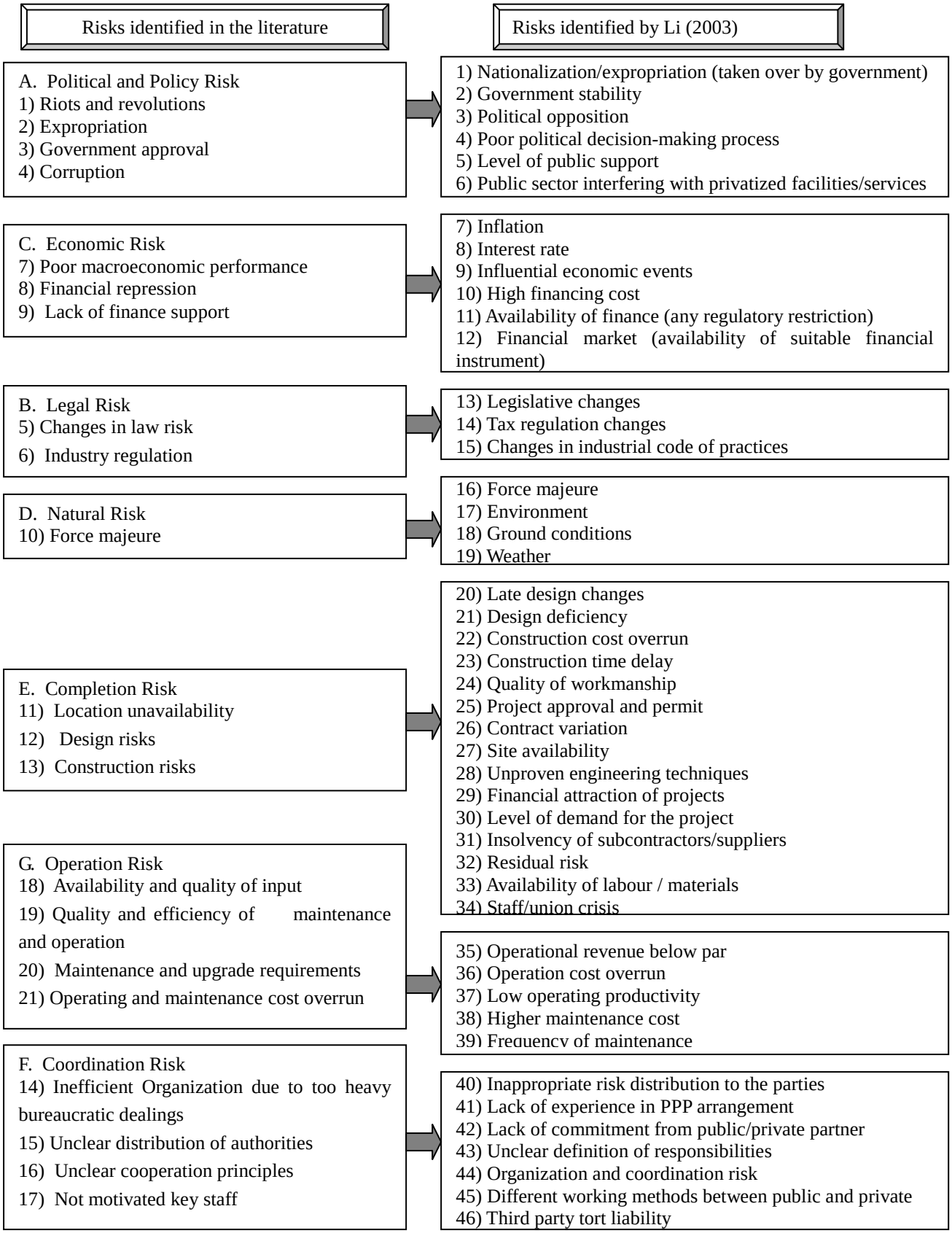

Figure 1: Summary of Risks of PPP as identified from literature and by Li (2003)

2.2 Survey description

A questionnaire survey was undertaken in China from October to December 2007, aiming to identify the CRFs in China's PPP projects. The target survey respondents of the questionnaire comprised industrial practitioners who have direct hands-on involvement with PPPs from the public, private and other sectors and the academia who have research experiences on PPP area. These respondents were requested to estimate the impact of each identified risk factor according to a five-point Likert scale (1 = Least Important and 5 = Most Important).

Survey questionnaires were sent to 102 target respondents in China. A total of 53 completed questionnaires (32 from industrial practitioner group and 21 from Academic respondent group) were returned representing a response rate of 52%, which may be regarded as a favorable result. The respondents' profile is given in Table 2.

Table 2: Survey respondents' profile

Respondent profiles	*Categorization*	*Percentages*
Types of the role	*Public Enterprises*	*13.2*
	Private Enterprises	*47.2*
	Academic Organizations	*39.6*
Year of work experience in construction area	*5 years or below*	*47.2*
	6-10 years	*13.2*
	11-15 years	*15.1*
	16-20 years	*13.2*
	21 years or above	*11.3*
Number of PPP projects participated	*None*	*54.7*
	1 project	*9.4*
	2 projects	*20.8*
	3 projects	*7.5*
	4 projects or above	*7.5*

2.3 Tools for data analysis

The data collected from the questionnaire survey was analyzed using the mean score technique, according to the primary roles of the respondents. The five-point Likert scale described previously was used to calculate the mean score for each risk factor, which was then used to determine the risk ranking. These results made it possible to compare the impact of the risks to the industrial respondents and the academia by using the independent 2-sample t-test.

The independent 2-sample t-test is used to test for any difference between two independent groups on the means of a continuous variable (SPSS 2002). Several assumptions are made: two independent random samples have been extracted from each population; the two populations are both normally distributed; and the two populations have a common (equal) variance (if the number of cases in each of the groups is similar, then the equality-of-variance assumption is not so important).

Kendall's concordance (W) analysis was conducted to measure the agreement of different respondents on their rankings of CRFs based on mean values within a particular group. If the Kendall's

coefficient of concordance (W) carries a pre-defined significance level of say 0.05, a reasonable degree of consensus amongst the respondents within the group on the rankings of CRFs was indicated. However, it should be noted that W is only suitable when the number of attributes is less than or equal to 7. If the number of attributes is greater than 7, chi-square is used as a near approximation instead. The critical value of chi-square is obtained by referring to the table of critical values of chi-square distribution (Siegel et al., 1988).

3. Discussion

3.1 Agreement of industrial practitioners and academia

Based on 45 degrees of freedom, the critical value of Chi-square was 61.656 at a significance level of 0.05. For both groups, the computed Chi-square values were all above the critical value of Chi-square (136.851 and 181.204 respectively). Therefore the respondents' assessment of CRFs within each group (i.e. practitioners vs researchers) is proved to be consistent. This finding ensures that the completed survey questionnaires are valid for analysis.

3.2 Risk ranking between industrial practitioners and researchers

Table 3 shows the mean rank of the industrial practitioners and researchers, and the results of Independent 2-sample t-test. Eight risk factors were found to be significantly different with a significance level below 0.05. Further finding is noted that industrial practitioners estimated each of the eight risk factors with higher magnitude than the researchers. These eight risk factors are:

- Operational revenue below par
- Operation cost overrun
- Influential economic events
- Quality of workmanship
- Force majeure
- Design deficiency
- Nationalization/expropriation
- Availability of labour/materials

The majority of these risk factors are project risks (with the exception of Influential economic events, force majeure and nationalization/expropriation), which are by and large project specific. This might reflect the fact that many industrial practitioners are closely involved in the specific project process, thus paying more attention to the risks at project level.

The uncertainty of operational revenue arises from a wide variety of ways, such as request or change in practice from the project company, industrial relations, change of the industrial standards of services or products, equipment's maintenance and renewal, as well as the government change of output specifications. Jong et al. (in press) concluded that efficiency in generating 'Value for Money' is the main target for implementing PPP for transport infrastructure projects.

Complex PPP projects may incur higher operational costs than those under the conventional public sector procurement. It involves the cost of providing designated services which are different from expectation because of fluctuations in the prices of equipment, labour, utilities, and other supplies (NHS, 1999). The potential overrun in operation cost may have a negative effect on the project objective of securing the best value. Therefore, PPP projects should be economically viable to cover the cost (Corbett et al., 2006; Zhang et al., 2006).

Industrial practitioners opined higher importance on the risk of 'quality of workmanship'. To guarantee quality of workmanship, the private sector usually selects contractors with rich experience and advanced management level, together with appointing technical consultants to supervise the project construction process.

Poor engineering design may not fully match the need of facility output specification, thus having a negative impact on the value for money of the project (Li, 2003). In order to alleviate the risk, private consortium usually select top technical experts to design the construction, simultaneously appoint individual technical consultant or engineer to estimate and supervise the project.

Macroeconomic instability and uncertainty can also greatly increase the risks in PPP projects. Due to the long-term contracts and large capital investment natures, continuation and stability of policy is an essential risk factor for the application of PPP projects in China (Adams et al., 2006). Influential economic events usually bring about economic risks to PPP projects, including local, national and global environments. Especially, under the trend of economic globalization, the international economic forces are more likely to influence the economy of a country. Yuan et al. (2008) assert that owing to its longer capital chain than traditional construction projects, PPP project is more sensitive to external economic environments. Furthermore, force majeure may have an enormous impact on the construction and operation phases of a project. Because of their uncontrollable nature, practitioners need to continually scan and forecast these risks (Yuan et al., 2008).

Table 3: Risk Ranking of PPP Projects in China between Industrial Practitioners and Academics using independent 2-sample t-test

Critical risk factors	*Mean*	*Ranking*	*Mean*	*Ranking*	*T.*	*Sign.*
1.Legislative changes	*4.03*	*1*	*4.00*	*1*	*-0.121*	*0.904*
2.Project approval and permit	*3.90*	*3*	*3.81*	*2*	*-0.407*	*0.686*
3.Inappropriate risk distribution to the parties	*3.90*	*4*	*3.71*	*8*	*-0.777*	*0.441*
4.Operational revenue below par	*4.00*	*2*	*3.57*	*13*	*-2.058*	*0.045*
5.Financial market (availability of suitable financial	*3.75*	*8*	*3.76*	*4*	*0.051*	*0.960*

instrument)						
6.Contract variation	*3.84*	*6*	*3.67*	*10*	*-0.709*	*0.482*
7.Lack of experience in PPP arrangement	*3.67*	*19*	*3.81*	*3*	*0.604*	*0.549*
8.Public sector interfering with privatized facilities / services	*3.71*	*12*	*3.71*	*9*	*0.024*	*0.981*
9.Tax regulation changes	*3.58*	*23*	*3.76*	*5*	*0.837*	*0.407*
10.Construction cost overrun	*3.58*	*24*	*3.67*	*11*	*0.379*	*0.706*
11.Operation cost overrun	*3.87*	*5*	*3.33*	*21*	*-2.123*	*0.039*
12.Site availability	*3.63*	*20*	*3.57*	*14*	*-0.298*	*0.767*
13.Availability of finance (any regulatory restriction)	*3.42*	*33*	*3.76*	*6*	*1.835*	*0.072*
14.Lack of commitment from public/private partner	*3.68*	*17*	*3.48*	*17*	*-0.685*	*0.496*
15.Construction time delay	*3.71*	*13*	*3.43*	*18*	*-1.392*	*0.170*
16.Unclear definition of responsibilities	*3.47*	*30*	*3.67*	*12*	*0.928*	*0.358*
17.Level of public support	*3.70*	*14*	*3.43*	*19*	*-0.825*	*0.413*
18.High financing cost	*3.61*	*21*	*3.52*	*15*	*-0.432*	*0.667*
19.Organization and coordination risk	*3.29*	*37*	*3.76*	*7*	*1.816*	*0.075*
20.Poor political decision-making process	*3.47*	*31*	*3.52*	*16*	*0.226*	*0.822*
21.Unproven engineering techniques	*3.77*	*7*	*3.19*	*28*	*-1.975*	*0.054*
22.Financial attraction of projects	*3.60*	*22*	*3.35*	*20*	*-0.952*	*0.346*
23.Late design changes	*3.55*	*27*	*3.33*	*22*	*-0.918*	*0.363*
24.Level of demand for the project	*3.58*	*25*	*3.29*	*24*	*-1.233*	*0.223*
25.Inflation	*3.52*	*28*	*3.33*	*23*	*-0.763*	*0.449*
26.Influential economic events	*3.74*	*9*	*3.10*	*29*	*-2.207*	*0.032*
27.Quality of workmanship	*3.74*	*10*	*3.05*	*32*	*-2.389*	*0.021*
28.Force majeure	*3.68*	*18*	*3.05*	*33*	*-2.281*	*0.027*
29.Political opposition	*3.72*	*11*	*3.00*	*34*	*-1.943*	*0.058*
30.Interest rate	*3.47*	*32*	*3.24*	*26*	*-1.040*	*0.303*
31.Design deficiency	*3.70*	*15*	*3.00*	*35*	*-2.941*	*0.005*
32.Nationalization/expropriation (taken over by government)	*3.69*	*16*	*2.95*	*36*	*-2.304*	*0.025*
33.Low operating productivity	*3.32*	*36*	*3.29*	*25*	*0.166*	*0.869*
34.Difference in working methods between the public and private sectors	*3.26*	*38*	*3.24*	*27*	*-0.086*	*0.932*
35.Higher maintenance cost	*3.39*	*34*	*3.10*	*30*	*-1.268*	*0.211*
36.Government stability	*3.58*	*26*	*2.90*	*40*	*-1.696*	*0.096*
37.Environment	*3.33*	*35*	*3.10*	*31*	*-1.098*	*0.278*
38.Insolvency of subcontractors/suppliers	*3.48*	*29*	*2.95*	*37*	*-1.674*	*0.100*
39.Ground conditions	*3.10*	*40*	*2.95*	*38*	*-0.605*	*0.548*
40.Third party tort liability	*3.16*	*39*	*2.81*	*42*	*-1.522*	*0.134*

41.Changes in industrial code of practices	*2.90*	*43*	*2.95*	*39*	*0.177*	*0.860*
42.Residual risk (remaining risk after taking all mitigation measures)	*2.87*	*44*	*2.90*	*41*	*0.158*	*0.875*
43.Weather	*3.07*	*41*	*2.57*	*43*	*-1.706*	*0.094*
44.Availability of labour / materials	*3.06*	*42*	*2.57*	*44*	*-2.028*	*0.048*
45.Frequency of maintenance	*2.87*	*45*	*2.57*	*45*	*-1.528*	*0.133*
46.Staff / union crisis	*2.86*	*46*	*2.38*	*46*	*-1.672*	*0.101*

4. Conclusions

The research work presented in this paper has compared the perceptions of respondents from the industry and researchers in China on their attitude towards 46 risk factors in PPP projects. The comparative analysis of 53 returned questionnaires found that in general the within group analysis from both industrial practitioners and academic respondents were consistent. However, the independent 2-sample t-test demonstrated that there were significant differences in the mean values between two groups for 8 risk factors, namely *'Operational revenue below par', 'Operation cost overrun', 'Influential economic events', 'Quality of workmanship', 'Force majeure', 'Design deficiency', 'Nationalization/expropriation', 'Availability of labour/materials'*. The findings also showed that industrial practitioners assessed these risks as more important than the researchers. It is envisaged that the research findings presented in the current paper could provide stakeholders with a better understanding of PPP risks in China, and hence resulting in better performance.

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Public Private Partnership (PPP) as part of Infrastructure Management solutions – a structural approach of delimiting PPP from other Private Sector participation Models

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Abstract

PPP is used worldwide to implement public tasks. However, the term is very unspecific and stands for a multitude of complex approaches. This often leads to confusion between the stakeholders making it difficult to jointly develop, evaluate and/or monitor PPP projects. This paper presents a structured instrument for a clear comparison of PPPs. It has been developed based on several years of lasting international research on PPP models.

Keywords: privatisation, public sector participation, PPP models, infrastructure management

1. Background and importance of the theme

Public Private Partnerships, or its commonly used abbreviation "PPP" has become an important way of implementing public tasks and providing public services around the globe. In many countries it has been established as an alternative to conventional procurement methods. In some countries it has already, or according to political priorities, will have in the near future a portion of up to 15% (Germany) or even 20% (UK) of all public procurement. However, it is still a very heterogeneous and unspecific term in practice, as well as in scientific literature it stands for a multitude of different approaches with mostly very complex and sometimes intransparent structures, which is based on the cooperation between public and private actors/players. Consequently, there is often great confusion in international discussions between the different stakeholders like politicians, project executing agencies, private investors, auditing authorities etc. simply because they all may use the term PPP, although they have a very different understanding of it. One essential reason for this, is that if they are compared internationally the historical development of PPP, the understanding of what PPP actually is and what its goals and fields of application are, show very different patterns.

1.1 Historical development and fields of application of PPP

The term "PPP" was first used in the USA in the 1960s to refer to typical ***urban development*** projects involving private investors. From here, the concept spread all over the world and is still applied in many countries today. Larger cities in particular seek to ensure the involvement and assistance of private investors in order to develop brownfield and fallow sites for use that adequately reflects the aims of urban planning while offering a commercial interest for the investors. The city generally provides the land on which the private partner uses its capital to develop, construct and market the real estate and the corresponding infrastructure, taking into account the relevant urban planning standards and other public requirements but applying its own ideas and at its own risk. The partnership is formed with the goal of a joint concept of urban development and once the goal is reached usually the public partner withdraws and leaves the business to the private partner.

PPPs then became known globally as a method of procurement for the public sector, for example in the area of ***social and economic infrastructure management***. Initially developed into a standardised form as a result of the Private Finance Initiative (PFI) in the United Kingdom in the 1990s, it was taken up throughout the world in various forms and is becoming increasingly popular both as an alternative procurement option for the public sector and a good investment opportunity for private investors. The key characteristic of this kind of PPP is the transfer to private bidders for a limited period of time of integrated services relating for example to the planning, construction, financing, maintenance and operation in a lifecycle approach of public infrastructure, this was previously performed by the public sector. PPPs of this kind also exist in other areas of procurement such as E-Government and/or IT, procurement of equipment, service vehicles, aeroplanes/helicopters etc.

Besides urban development and public infrastructure management, the term PPP is being used more and more in many varying fields, for example ***research cooperation, sponsoring*** (in the areas of sports, education and training), the ***collaboration of Governments and NGOs*** and even in ***charity***.

In Germany for example, PPP has been applied for a long time in nearly all of the fields mentioned above. However, there is hardly a harmonised understanding, the goals, the approaches, the concepts, as well as the standards and instruments vary significantly. The only common ground seems to be the collaboration between partners related to the public on the one hand and to the private on the other hand and - after more thorough observation – some inherent structural elements.

Since the research work of the author mainly refers to PPP in infrastructure management this present paper also concentrates on that particular field of application.

1.2 Goals and characteristics of PPP in infrastructure management

In industrialised countries the main objective of PPP is in the field of infrastructure management, that is the design, construction, finance, maintenance and operation of it. It is usually to generate efficiency gains for the public sector in the provision of related services. These are generally evaluated in, so-called "value for money tests" and checked by the responsible audit authorities. However, another stated aim – with varying priority – is to bridge liquidity bottlenecks on the part of the public partner when performing urgent construction or modernisation tasks involving infrastructure that is needed by members of the public and other users. In summary, the main characteristics of a PPP that are considered to lead to efficiency gains in comparison to so-called "conventional" procurement are (i) the lifecycle approach, (ii) the risk transfer with a balanced risk allocation, (iii) the creation of incentive structures and leveraging of innovation potential through results-oriented performance description and remuneration, (iv) the use of private expertise and capital, (v) the long-term relationships on a partnership basis and, in particular, governed by contractual provisions.

The generation of efficiency gains as the core argument for the application of PPP as a method of procurement in Germany and nearly all over Europe seems to be of much less importance in the emerging countries of Asia and Latin America, compared to the pure financing and liquidity aspect. This applies in particular to user-financed PPPs such as toll roads, water supply projects and disposal projects. Often the clear priority is to obtain private capital for the implementation of infrastructure measures - in some cases, whatever the cost. High-growth countries such as China and India, which are currently experiencing a boom that is comparable to the economic boom in Western Europe in the 1960s and 1970s, can and must be able to afford this approach in order to meet the huge need for infrastructural development. The resulting debt can be presented as an investment in future generations to a greater extent than would be possible in countries with low long-term growth rates.

To compare the individual goals and characteristics of PPP in every case; standardisation and standards are helpful and needed. In Germany for example, even the PPPs applied in the different infrastructure sectors and subsectors differ significantly as far as the aforementioned characteristics and the rules that govern the relationship are concerned. It is notable, that a systematic PPP standardisation process based on a common understanding of PPP as well as PPP competence centres (a so called Federal PPP Task Force has recently been replaced by the ÖPP AG (Partnerships Germany) similar to the UK model) be responsible for setting out appropriate standard instruments

and regulations for the development and implementation of PPP procurement have only been established in the sectors of social infrastructure and road infrastructure. According to "PPP im öffentlichen Hochbau" (PPP in the public real estate sector, meaning more or less the same as social infrastructure), an expert opinion commissioned by the German Federal Government in 2003 defined PPP as "a long-term, contractual cooperation between the public and private sectors for the economic execution of public tasks under which the necessary resources (e.g. expertise, equipment and facilities, capital, staff) are bundled in a joint organisational relationship and any project risks are allocated appropriately to reflect the risk management expertise of the project partners."

In other sectors, such as energy supply, water supply, disposal and waste disposal, PPPs and the corresponding strategies, understanding and even terminology have historically developed in different ways.

1.3 Research problem, objective and methodology

The described situation does not only exist in Germany but is typical for many other countries in Europe (e.g. France, Italy, the Netherlands, Spain and others) and around the globe. That may be the reason why the Green paper on public-private partnerships and community law on public contracts and concessions established by the Commission of the European Communities (2004) - similar to papers on national level - remains very general and vague in its definition of PPP:

"The term public-private partnership ("PPP") is not defined at Community level. In general, the term refers to forms of cooperation between public authorities and the world of business which aim to ensure the funding, construction, renovation, management or maintenance of an infrastructure or the provision of a service".

However, the differences in national, sector and project specific understanding of procedures for PPP make it difficult for interested researchers and knowledgeable managers to discuss and compare corresponding issues as well as for the relevant stakeholders of individual PPP projects (i.e. politicians, project executing agencies, private investors, auditing authorities etc.) to jointly develop, evaluate and/or monitor PPP projects. Besides the fundamental discussion concerning the general applicability, the main targets and the best way to achieve them, a lot of structural questions arise when discussing and comparing the various PPP models, for example:

- Is it a model that transfers ownership or ownership equivalent rights from the public to the private side regarding the premises, buildings, infrastructure assets etc. (including the land) that have to be built, restored and/or maintained/operated?

- Is a PPP always a contractual relationship with limited duration or does a permanent "institutional partnership" like a joint venture, or a project company jointly founded by a public and a private partner also constitute as a PPP?

According to the Green paper on public-private partnerships and community law on public contracts and concessions (2004) “institutionalised PPPs involve the establishment of an entity held jointly by the public partner and the private partner. The joint entity thus has the task of ensuring the delivery of a work or service for the benefit of the public. In the Member States, public authorities sometimes have recourse to such structures, in particular for administer public services at local level (for example, for water supply services or waste collection services)”. In a footnote it is added that “The Member States use different terminology and schemes in this context (for example, the Kooperationsmodell, joint PPPs, Joint Ventures)”.

- Does a PPP model necessarily have to comprise all lifecycle elements of real estate or infrastructure management or is it still considered a PPP if it does not contain for example the “finance” or the “operation”? In Germany such models are called “PPP light”, “incomplete PPP” or something similar.

- Does the transfer of what kind of risks and which degree of risk transfer constitute a PPP and distinguish it from a conventional procurement method?

- What types of incentive schemes characterise a PPP?

- Is the question of whether a project is user or (public) budget financed relevant for the denomination as a PPP?

- What kind of finance (e.g. project finance) is typical for PPP and is an equity exposure from the private partner necessary?

1.4 Research objective

The whole discussion shows that the term PPP still means different things around the world in different countries and sometimes even within one country, when comparing different national infrastructure sectors. It is not surprising that there exist nearly as many definitions and meanings of PPP as corresponding publications or practical contexts in which the term is used. It seems that PPP is a “brand”, that stands for innovative, efficient and liquidity problem solving, rather than a precise or even scientific designation of a particular procurement method.

The only way to find some common ground in terms of the basic understanding of PPPs as a concept under these circumstances obviously seems to be (and that is how it is practiced by international institutions) to refer to each and every form of cooperation between the public and private sectors as a PPP, irrespective of whether it involved functional or material privatisation, was commissioned or initiated independently, governed by contractual provisions or a loose association, with or without the involvement of private investment, with or without transfer of ownership to the private partner, etc. However, in order to seriously analyse and evaluate international best practice in PPP in a scientific

context and in practical/professional project implementation, it is essential to refer to more transparent, traceable and in particular comparable criteria.

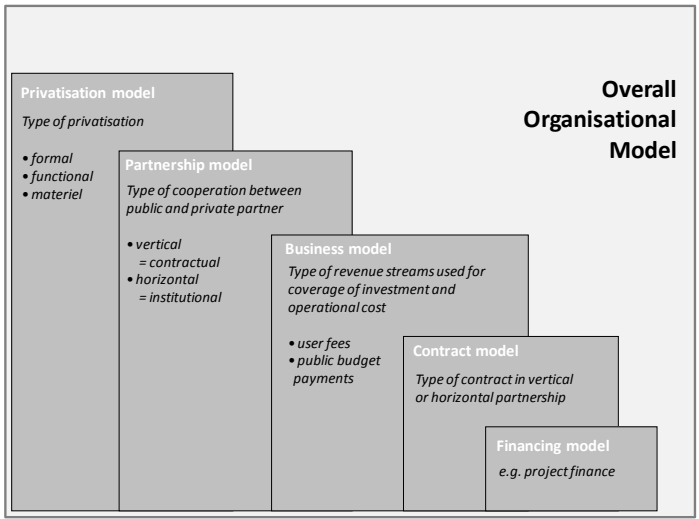
The solution cannot be to add another definition to the multitude of already existing definitions and thus to contribute to a never-ending scientific discussion. Therefore, the objective of this paper is to present a structured approach that has been developed over the last number of years by the author and his research team. It allows for clearly describing and distinguishing between relevant structural elements of PPP and other procurement methods, particularly in social and economic infrastructure management, thus simplifying all kinds of professional discussions even on an international level and allowing for precise comparisons.

1.5 Research methodology

This paper is based on the author's own vast international scientific and practical experience as well as a long lasting systematic research on PPP in general and specific subjects regarding PPP in particular. The research activities executed by the author and his research team at the Chair of Construction Economics at the Bauhaus-Universität Weimar and together with the KnowledgeCentre@Weimar between 2000 and 2009 required a permanent observation of the PPP procurement scene at an international level, and all kinds of privatisation processes in the infrastructure industry. The KnowledgeCentre@Weimar is a research network of first rate international Universities concerning PPP, which has been hosted by the Chair of Construction Economics since it was founded in 2001. The network provided valuable insights in the relevant international markets and a great number of case studies that are, among other things, also relevant for the purpose of this paper, for example see Alfen et al. (2009). Some of the findings were published earlier in diverse publications of this paper's author (see e.g. Weber et Alfen 2006 and 2009).

2. The overall organisational model

The approach developed in Weimar consists of a "tool box" called the "overall organisational model" that not only allows for clearly describing and comparing, but also for developing complex solutions for infrastructure management. It is based on the fact that each and every procurement model – and consequently also the different PPP models - consists of different structural elements representing the "compartments" and "sub-compartments" of the tool box. The tool box may support public and private partners in developing and implementing their projects by using the compartments/structural elements in order to compose the overall organisational models (conventional and PPPs) that perfectly suite individual cases and environments. Secondly, it may help strategic and financial investors as well as public audit authorities to better analyse and describe



individual PPP projects, during their due diligence and evaluation processes/exercises.

Figure 1: Elements of the overall organisational model (own source based on Alfen, Weber (2010)).

It finally allows the sorting of different PPP approaches and individual PPP models as they are understood in a specific environment in their universally valid and traceable structural elements and ranging them in the corresponding compartments and sub-compartments of the tool box, independent from individually applied terminology.

As can be seen in Figure 1 the main compartments of the tool box are the (i) privatisation-, (ii) partnership-, (iii) business-, (iv) contract- and (v) financing models.

2.1 The privatisation model

Privatisation often has negative connotations. This can be seen from the use of phrases such as "selling the family silver" when discussing the sale of state assets or "privatisation of profits and nationalisation of losses" in reference to the privatisation of production processes or services that were previously performed by the public sector. In its essence, however, the term "privatisation" describes nothing more than the complex procedures for the transfer of companies, individual assets and/or services from the public sector to the private sector. Whether this brings with it positive or negative consequences for society as a whole cannot be generalised but should be investigated on a case-by-case basis. In the following a distinction is made between three privatisation models: (i) formal privatisation, (ii) functional privatisation and (iii) material privatisation. The key characteristics used to distinguish between these forms of privatisation are:

- the nature, extent and degree of integration of the functions transferred to the private partner;
- the allocation of the "provision function" (this essentially relates to the question of which of the partners is responsible for determining demand, i.e. where and when capacity should be established and maintained and what its dimensions, price and quality should be);
- the ownership interests (which of the partners own the asset before, during and after the partnership);
- the duration of privatisation (limited to a defined period of time or unlimited).

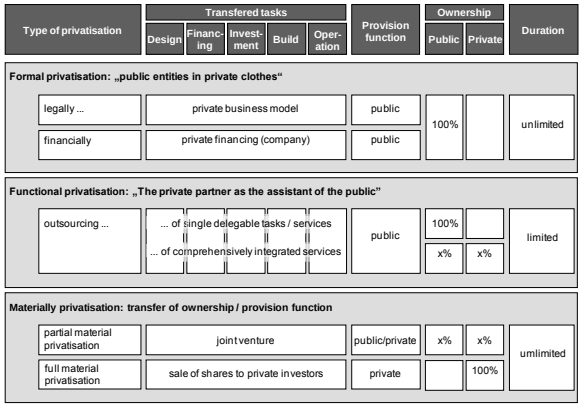


Figure 2 provides an overview of the various forms of privatisation in terms of the characteristics described above.

Figure 2: Main characteristics of different privatisation models (own source based on Alfen, Weber (2009)).

2.2 Formal privatisation

Formal privatisation describes the transformation of an administrative entity into a private law company, typically in the form of a corporation. The public sector remains the sole shareholder. As such, this procedure involves a purely legal privatisation. The objective of this probably most widespread form of privatisation in all sectors of the infrastructure industry is usually to outsource the departments responsible for a specific infrastructural task from the public authority in order to form a legally and economically independent entity. Legal privatisation is often preceded by bundling in the form of public law institutions (e.g. special public agencies) or other strictly public law company structures without any partner from the private sector. However, formal privatisation often also serves as the precursor to a more extensive material privatisation, whether in part or in full, by way of an IPO and/or the sale of shares to strategic or financial investors. A typical example is Deutsche Bahn (the German national rail company) or public real estate agencies/companies on the governmental or the municipal level. The primary motivation for this kind of outsourcing is to escape the restrictions involved in public revenue, collective bargaining, administrative provisions etc. in order to offer services more efficiently than could be achieved in a purely public-sector administrative structure.

2.3 Functional privatisation

Functional privatisation describes the transfer of functions that were previously performed by the public sector in its own right to a private company e.g. planning, construction or infrastructure, asset management services such as cleaning and servicing when functions relating to buildings and physical structures are transferred.

Functional privatisation includes PPP models whose services are “comprehensively integrated”/ bundled and awarded by way of a PPP contract concluded for a long, individually defined term (lifecycle approach), i.e. corresponding to the understanding of PPP in many countries (and in particular used in Germany’s social and road infrastructure sectors). Accordingly, a limited form of functional privatisation always occurs when the “provision function” and, typically, ownership of the physical structure remains within the public sector. One exception is the BOOT (Build Operate Own Transfer) model, under which ownership is transferred to the private operator during the limited contractual term, mostly for tax reasons.

2.4 Material privatisation

The key characteristic of material privatisation is that, in addition to comprehensive functional transfer, ownership of the assets necessary to perform those functions is also transferred on a

permanent basis. This constitutes a de facto divestment on the part of the government. Accordingly, the provision function is generally also transferred from the public to the private sector, i.e. the capacity and prices of infrastructure provided are subsequently determined primarily on the basis of the interaction between supply and demand. In this scenario, the government withdraws to all practical extents from an entire infrastructural function that it previously performed. This means that, by contrast to functional privatisation, material privatisation always involves the formation of a new private company (as is the case in formal privatisation as well), if only to clearly demarcate the privatised operations.

A distinction is made between full and partial privatisation based on the extent to which a public partner retains an interest in the company after privatisation. Partial privatisation can be further broken down into majority and minority interests depending on the interest held by the public sector in the jointly owned private company. Full privatisation means that there are no longer any public partners. However, only as long as a market does not show market distortions or even market failure in an economic sense, it is safe to assume that a function can be transferred to the market in full. Among other things, this means that the competitive environment determines the appropriate prices for use, thereby ensuring optimal provision for the users of the respective infrastructure.

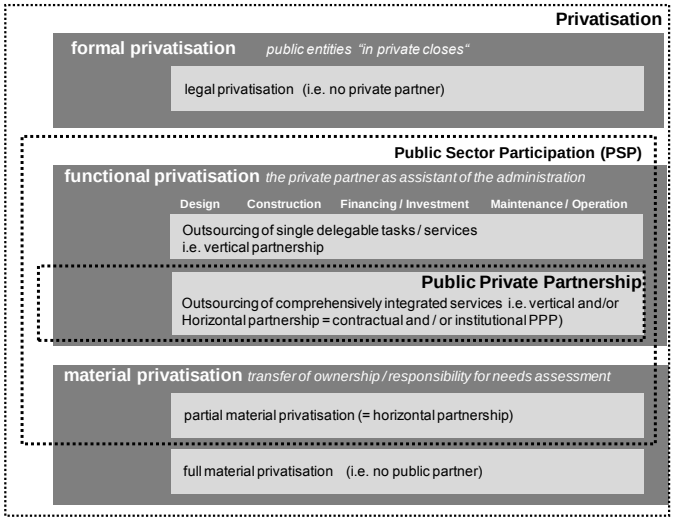
As evidence of market failure often exists for infrastructure – a reason for the state having to remain involved in some way – genuine cases of full material privatisation – i.e. 100% privatisation on a permanent basis – rarely occur in the public infrastructure sector. The most extensive privatisations around the world in both respects can generally be found in the telecommunications (e.g. Deutsche Telecom) and energy sectors. Even in these cases the public sector generally attempts to retain some influence over the company by way of a golden share. In the event of full material privatisation, the government can and must exercise an influence in the form of legislation, regulation or similar measures whenever public interests, such as those of users, are threatened.

Excluding the telecommunication and energy sectors, other examples include the privatisation of the British Airports Authority (BAA) or, to a lesser extent, Dusseldorf Airport in Germany as well as "Autobahn TankRast GmbH", Germany's leading service provider on service areas along the Autobahn. The majority of full or partial privatisations in the transportation sector involve airports. This can be explained, to a certain extent, by the fact that there is significantly greater competition between airports than between other transport carriers. Full material privatisations practically do not exist at all in the road sector.

2.5 The partnership model

When distinguishing between the various privatisation models, it becomes evident that not all forms of privatisation necessarily include a legal involvement on the part of the private sector. Figure 3 shows for example, that there is no private partner as shareholder - and consequently no Private Sector Participation (PSP) in the case of formal privatisation and - at the other extreme - no public partner in the case of full material privatisation, under which the private sector acts alone on the market. Consequently, PSP or partnerships between the public and the private sector only exist in

functional privatisations in the form of outsourcing and partial material privatisation as highlighted in Figure 3.



A distinction is made between horizontal and vertical partnerships in structural terms. Hence, in the case of functional privatisation, reference is also made to contractual and institutional PPPs. Accordingly, Figure 4 illustrates the structural differences between these two functional partnership models and the horizontal partnership arising from partial material privatisation.

Figure 3: Privatisation with or without Public Sector Participation (own source).

It should be noted that the latter is sometimes called "Institutional PPP" or "Institutionalised PPP", for example in the EU Green paper on public-private partnerships and community law on public contracts and concessions (2004). Nevertheless, in order to clearly distinguish between partnership models without, or only with temporally limited transfer of ownership, (functional privatisation) and those with permanent transfer of ownership (material privatisation) from the public to private sector, the Figure 3 models of partial material privatisation are still called "horizontal partnerships" and not PPPs.

In both cases of PPPs, i.e. contractual (vertical) and institutional (vertical/horizontal), a principal/agent relationship is entered into with a special purpose company (SPC), which is formed specifically for the respective (project) purpose under the terms of the PPP contract, which functions as a contract for work and labour or a service agreement. A highly varied range of contract models may be used (see chapter 1.8 and Figure 5). In contrast to (purely) contractual PPPs where the agent is a (purely) private project company, the public sector retains an interest in the project company in the case of institutional PPPs, whether in the form of the public-sector principal itself, or another public-sector institution.

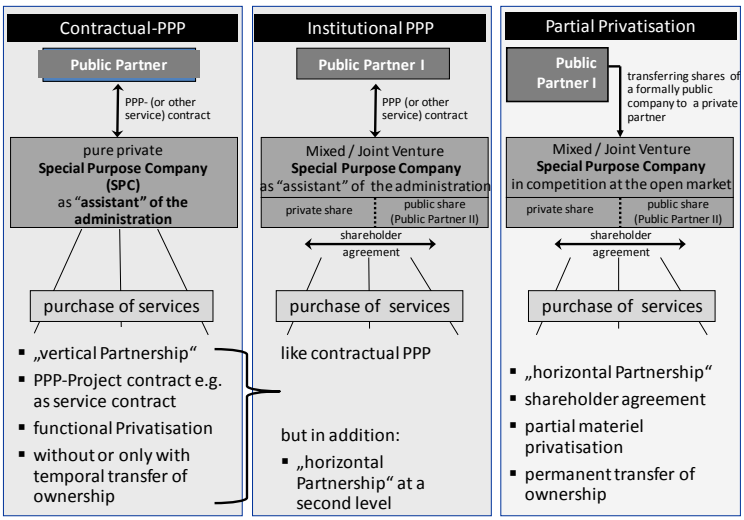


Figure 4: Partnership models and their structure (own source based on Alfen, Weber (2009)).

The horizontal partnership shown on the right-hand side of the diagram as a partial material privatisation describes the participation of public-sector and private-sector partners as co-shareholders of an infrastructure project company that design, build, finance, maintain and/or operate an infrastructure asset. Broadly speaking, there are two ways in which this type of partnership may come about. In the first case, an infrastructure project is put out to tender as a BOO contract (see chapter 1.8 and Figure 5). The tender conditions specify that the public sector intends to participate in the project company to be formed jointly by the partners after awarding and contract signing.

In the second case, an already existing project company, which is fully owned by the public sector is seeking a private investor as a shareholder. Shares are then sold either to a private strategic partner by way of tender, auction, or widespread by way of IPO. There may be various reasons for taking this approach; however, the most common scenario is that capital is required for the expansion or renovation of an infrastructural facility. A further objective may be a desire to integrate the expertise of a private operator into the existing organisational structure and transfer some of the risks to the private partner.

For example, following the Airport Terminal fire in 1996, Dusseldorf Airport looked for a buyer to take 50% of the shares, perform and finance the renovation and conversion work and operate the airport permanently in cooperation with the public-sector partner. In terms of financing, partial privatisation models use common financial techniques such as mergers and acquisitions as well as initial public offerings (IPOs) at the stock exchange.

In all cases of horizontal partnerships, be it PPPs or partial material privatisations, the public sector can generally control the degree of its influence over the provision function in the wider sense and the transfer of functions on the basis of its shareholding as set out in the partnership agreement. However, the business risk also remains with the public sector to the same extent. If the aim of obtaining private investment is to achieve a clear separation of risks and risk spheres between the public and private partner, this can generally be achieved more effectively by entering into a vertical partnership i.e. with one of the PPP contract models described in chapter 1.8, rather than a horizontal partnership agreement. The influence that the public project execution agency wishes to exercise can generally be, and is sometimes even better set out in the underlying (PPP) contract.

2.6 The business model

The two key aspects to be taken into account when evaluating a business model are the income side, i.e. the available sources of income, the amount of income as well as the corresponding remuneration mechanisms, and the cost side. The following highly simplified discussion focuses solely on the income side. In contrast to the cost side, which largely depends on the infrastructure services to be provided, there are two alternatively applicable structures for the income side of an infrastructure investment that are fundamentally different, but may be used equally for the same infrastructure services. Although the private partner can generally only determine the source of its income and the

concrete configuration of the remuneration structure to a limited extent, if at all, these factors are highly relevant when it comes to the risk and potential yield of a project. As a basic rule, the business models of infrastructure companies can be broken down into “budget-financed” and “user-financed” models.

2.7 Budget-financed remuneration

In the case of budget-financed models, the private partner receives fixed remuneration that is generally payable by the principal at regular intervals. A distinction can be made between:

- performance-based payments corresponding to the services set out in the specifications or list of services;
- availability-based payments corresponding to the availability of premises, areas, facilities, equipment, etc.;
- volume-based payments corresponding to the consumption of water, electricity, gas, etc.;
- results-based payments corresponding to contractually agreed optimisation targets;
- usage-based payments, which can be further broken down into (i) frequency of use, such as the shadow toll for roads or fees that reflect the number of users of a swimming pool, a sports hall or another public facility and (ii) intensity of use, such as in the case of shadow tolls with diverging rates based on axle loads or emissions.

It should be noted that volume- and usage-based payments both include user and market risks for the private partner even though they are budget financed remuneration systems. However, in comparison with user-financed remuneration they are softened due to the fact that users’ consumption behavior is not influenced by price, and change of it. This is the case because users are not charged directly upon usage but the public contract partner pays the bill “in the background”.

2.8 User-financed remuneration

In the case of user-financed models, the revenue flows required to cover the investment and current operating costs are obtained from user fees such as tolls, charges, entrance fees or rents. The characteristic feature of user-financed models is that the market risk is determined by the level of demand. Demand and the market risk vary in accordance with the willingness of the users to pay the respective fees. This depends to a large extent on the respective usage situation, with a distinction made between:

- compulsory usage, e.g. compulsory connection to the water network, where users have no choice but to obtain their water supply from the local provider;

- (quasi-)compulsory usage, e.g. when there are no alternatives to using the services offered or the available alternatives are unattractive; typical examples include bridges over or tunnels under rivers that cannot be crossed in another manner within an acceptable distance;

- free choice of usage in a competitive environment, e.g. when the user can choose between several telephone providers or a shorter toll road compared with one or more longer non-toll roads within an acceptable distance.

The lower the level of competition, the greater the need for regulation, which may serve to increase or reduce the market risk depending on the circumstances.

In both cases, budget-financed and user-financed business models, the user fees charged are often supplemented by performance-based or availability-based elements, e.g. in the form of contractual penalties, which could also be regarded as project-specific regulation measures. For example, this may serve to offset the lack of quality incentives that arises in monopoly situations in particular. On the other hand, low user fees (e.g. for kindergartens) that are insufficient to cover the actual cost of a service may be supplemented by government grants in the form of start-up funding or continuous subsidies due to social considerations.

2.9 The contract model

This paper can only provide an overview of the various contractual models for the management of public infrastructure that are common throughout the world. This overview focuses on PPP contract models as defined in Figure 3 that embody as extensive a lifecycle approach as possible. Even when the respective contractual characteristics are globally largely uniform in terms of the need for regulation and the content thereof, the names used for such complex contractual models are extremely heterogeneous. However, in international usage, the models are often designated using letters that reflect the services transferred under the scope of the respective contract, while this systematisation is already more consistent, the abbreviations used in accordance with it are not always correct.

PPP = functional privatisation, comprehensively integrated services	
(D)B(F)OT	*(Design) Build (Finance) Operate Transfer Concession*
(D)B(F)OOT	(Design) Build (Finance) Operator Own Transfer
DBFO(T)	Design Build Finance Operator (Transfer)
	Availability Payments Model
	PPP-Ownership Model
(D)B(F)OOT	(Design) Build (Finance) Operate Own Transfer
	PPP-Purchaser Model
DBLOT	Design Build Lease Operate Transfer
	PPP-Lease Model
DB(F)ROT	Design Build (Finance) Rent Operate Transfer Contracting
	PPP-Rent Model

(Partial) Material Privatisation	
(D)B*(F)*OO	(Design) Build (Finance) Operate Own Funding of Special Purpose Company
BDB*(F)*OO	Buy Design Build (Finance) Operate Own Shareholder of Special Purpose Company (Purchase of Shares) with the obligation to invest
DB*(F)*ROO	Design Build (Finance) Rent Operate Own Renting incl. Facility Management

Application typically in the area of (selection and designation in accordance with the German application):
- Social infrastructure
- *Economic infrastructure (in particular roads but also other transport subsectors or supply- / waste management)*
- Social and economic infrastructure

Figure 5: Contract models of functional privatisation with comprehensively integrated services of material privatisation (own source based on Alfen, Weber (2010)).

The individual letters stand for the following services: “D” – Design, “B” – Build, “O” – Operate or Own (which obviously is quite misleading), “T” – Transfer, “L” – Lease, “R” – Rent and “F” – Finance.

This fundamental concept also forms the basis for the overview contained in Figure 5 which shows the contract models (as well as their special designation) used in the social infrastructure and road traffic infrastructure sectors in Germany. However, international experience has shown that these basic models can essentially be transferred to all sectors with sector-specific characteristics primarily being reflected in the specific contractual provisions of the individual projects. Due to lack of space, the contract models cannot be described and discussed further in this paper.

2.10 The financing model

After establishing the PPP model (the ownership interests, the remuneration structure, etc.), one of the key determining factors in the organisational model is the financing of the respective infrastructure company/facility and its detailed structuring. Project finance is the most common financing model internationally. In some countries, such as France and Germany, so called “forfaiting models” are also used, with the investment being based on the creditworthiness of the public-sector principal rather than that of the project and its cash flow, at least after the construction of the infrastructural facility. Traditional corporate finance may also be used but more in conjunction with partial privatisation – or, indeed, precisely because the partial privatisation model is being used.

2.11 Possibilities regarding the development of privatisation-, partnership- and contract-models

The information presented above shows that there are essentially two different development trends with regard to privatisation (referred to here as "privatisation paths"). One is based on forms of functional privatisation and is characterised by increasing private sector involvement in the various functions and steps in the value chain within the lifecycle of a physical infrastructural facility. As such, this can be seen as a growing "privatisation of functions". The other path is initiated by a public-sector institution that performs specific functions relating to a physical infrastructural facility and is seeking to involve private partners as shareholders and providers of capital. Figure 6 illustrates these two development paths:

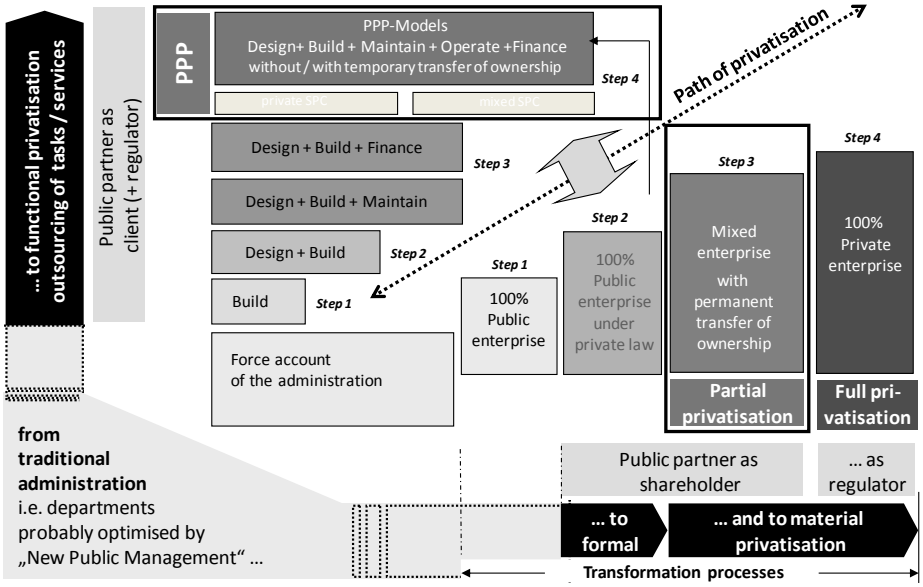


Figure 6: The privatisation development path (own source based on Alfen, Weber (2010)).

- functional privatisation, from the outsourcing of simple functions to the complex, cross-lifecycle PPP model with the contractual variations described above;

- partial or full material privatisation, generally via the aforementioned bundling of functions within a public law institution and subsequent formal privatisation.

These trends towards growing privatisation are also accompanied by trends in the opposite direction. In addition, interim forms spanning these two fundamentally different directions do exist. One example is the formally privatised ASFINAG in Austria that – as principal - awarded a concession for a highway project to a strategic investor in 2006.

3. Conclusion

This paper has shown that PPPs as a particular form of cooperation between public and private sector partners vary regarding their goals and fields of application around the globe. It also disclosed that the understanding of what a PPP model actually constitutes and what distinguishes it from other usual forms or better to say "organisational models" of collaboration between public and private partners may be country, sector and even project specific. Finally this paper has made clear that the term PPP often is a brand rather than a clear and distinctive designation of a procurement method traceable for everyone.

Based on comprehensive international research work a "tool box" has been developed and presented in this paper that contains all structural elements to clearly describe, analyse and evaluate the existing forms of public, public-private and private organisational procurement models, thus making it possible for investors and audit authorities (e.g. as basis for their due diligence) to compare PPPs as they are understood in a particular environment or for public and private project partners to develop, implement and supervise/monitor their PPP project based on a common understanding.

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Inconsistencies in Project Delivery Systems for Prisons: A Comparison between Public and Private Methods

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Abstract

Social, political, economical and technological factors have exerted increasing pressure on prison populations in Australia. The use of Public Private Partnerships (PPPs) has emerged as a viable approach to procure additional prisons. However, current PPP models are not a perfect solution. Within the Commonwealth of Australia, and indeed the various State jurisdictions, there are a variety of PPP systems, each with conflicting approaches, particularly in the crucial area of risk allocation. While prisons are still funded using public sector finance, the predominant delivery system currently used to procure prisons in Australia is the Build-Own-Operate (BOO) approach. Subsequently, inconsistencies emerge between the private, public and PPP delivery systems. Using a thematic approach to data analysis this paper focuses on the operational efficiencies (operational and construction costs) of public and private prisons. The findings of this paper are part of a broader research project that also investigates the efficiency of management and staff and inmate satisfaction. The results indicate that these themes are inter-related and inconsistencies in one, affects others regardless of procurement approach. Due to reductions in public sector expenditure the implementation of increased private sector ownership is recommended not only to meet demand for this type of infrastructure but also as a means of delivering greater efficiency. Combined with a relevant mix of private and public sector operation this would minimise some of the current inconsistencies and concerns facing governments and communities in the procurement of Australian prisons.

Keywords: Australia, prisons, procurement, public versus private, public-private partnerships (PPPs)

1. Introduction

Correctional facilities in Australia have traditionally been procured by the public sector where the funding traditionally comes from State government budgets funded by taxpayers (Arndt, 2000). However, provision and maintenance of these facilities has become extremely expensive and due to short falls in funding governments have become reluctant to bear the costs of procuring this type of infrastructure alone. This has resulted in governments sourcing alternate funding methods to procure public infrastructure as is already evident in the US, UK, Canada, South Africa, and Australia (Kaduce, Parker & Thomas, 1999). In most of these countries, the governments have experienced funding shortfalls concurrent with an increasing demand for infrastructure maintenance and renewal requirements. By using alternate methods of procurement, the impact on government budgetary constraints are minimised (Jefferies, Gameson & Rowlinson, 2002). The emergence of PPPs has presented governments with an alternate method of procurement which allows governments to obtain value for money by aiming to eliminate the waste and inefficiencies inherent with the public sector (Love, Wood, Picken & Confoy, 2000) and by transferring risk to the party that is best able to manage it.

Recently, significant pressure has been exerted on prison capacity due to factors such as increasing crime rates, longer terms of imprisonment, changes in arrest and prosecution practices and revised sentencing polices. This has resulted in the prison population experiencing substantial growth (Greenfield, Beck & Gilliard, 1996). In Australia, states such as New South Wales (NSW) have seen crime rates escalate due to an increase in the number of persons being charged in Local and Higher courts. In 2005, there was a 12% increase in the number of people charged compared to 2000 (Greenfield et al., 1996). As a result there has been extensive debate amongst scholars and academics about the optimal method of prison procurement. On one hand, there are claims made by Kaduce et al. (1999) that privatisation achieves economies without compromising the calibre of services provided by prisons and claims made by Dutney (1997) suggest correctional systems should be fully privatised as the required outcomes are only achievable through the private sector. However, according to Perrone & Pratt (2003), the empirical evidence regarding whether private prisons are more cost effective and/or provides higher quality of confinement to inmates is inconclusive.

This paper investigates public versus private procured correctional facilities in the context of their operational efficiencies and construction costs. The objectives of this paper are to analyse the inconsistencies between publicly and privately procured prisons; investigate the various procurement methods used for the delivery of prisons; and make some initial recommendations on an appropriate procurement model to minimise the inconsistencies with the operation and delivery of prisons. The research findings reported in this paper are part of a broader research project that also investigates the efficiency of the management process and the satisfaction of both prison staff and inmates in the delivery of public and private prisons.

2. Public private partnerships

The private sector is playing an increasingly important role in the procurement process of public works and infrastructure. The growing demand for public infrastructure has become a major challenge for governments, due to shortfalls in funding and an unwillingness by taxpayers to bear costs (Arndt, 2000). The emergence of PPPs has been a response to the increasing demands for development of infrastructure to meet the communities needs whilst not directly impacting the government's budgetary constraints (Jefferies et al., 2002). Grimsey & Lewis (1999) define PPPs as *"agreements where pubic sector bodies enter into long term contractual agreements with private sector entities for the construction or management of public sector infrastructure facilities by the private sector entity"*.

PPPs are partnerships formed between the public and private sector for the purpose of designing, planning, financing, constructing and/or operating projects which would be regarded traditionally as falling within the remit of the public sector. This generally involves a private partner investing in public infrastructure and providing related non-core services to the government or community on the government's behalf by working together under long term contractual arrangements (Webb & Pulle, 2003). The use of PPPs enables the government to deliver more cost effective services, at a higher quality, and at an earlier time. The private sector is able to apply its resources and specialist skills to the provision of modern buildings allowing the public sector to concentrate on related services that will continue to be managed by the government, which allows the government to implement change without losing sight of the true business of government (Akintoye, Beck & Hardcastle, 2003).

3. Using PPPs to procure prisons

Since the early 1990's, Australian State and Federal Governments have actively encouraged the private sector to take interest in the funding of public infrastructure with a shift towards the use of PPPs. Prison procurement is an effective application of PPP projects as they are able to offer significant value for monetary gains (Genders, 2003). The privatisation of prisons in Australia is neither a unique nor a modern development as the privatisation of correctional centres dates back to colonial periods (Kaduce et al., 1999). In 1994 the number of privately procured prisons in the US, UK and Australia increased from 21% to 88%, the rated capacity of these facilities rose by 51% or a potential inmate population of 49,154 (Logan, 1996). Typically, the Build-Own-Operate (BOO) approach has been used for Australian PPP prison projects, where the service provider retains ownership of the asset in perpetuity and the government agrees to purchase the services produced for a fixed length of time (Arndt, 2000). Junee Correctional Centre in NSW, was the first prison in Australia procured using the BOO method in 1993 and has a capacity of 750 inmates. It was designed, financed and operated by GEO Group Australia (DCS, 2007).

The need to procure additional prisons has been largely influenced by the increase in crime rates, sentencing lengths, changes in law and legislation, arrest and prosecution practices, and stricter probation and parole conditions (Greenfield et al., 1996). The prison population in Australia increased 12% or 23,444 to 26,273 from 2004 to 2007 respectively. On 12th August 2007, The

Sydney Morning Herald reported that 9467 of the 9945 male prison beds were occupied (Barker, 2007). The growth in NSW prisons is also evident with a recorded 8,484 inmates in corrective services custody in 2000, increasing to 10,167 in 2006.

Since 1992, the Australian government has sought to implement the emerging overseas strategy whereby its focus should be on the policy, objectives and outcomes, leaving the service delivery to contracted competitive providers from the private sector to achieve cost efficiencies and improved levels of service delivery (Daly, 1997). Through privatisation the government aims to achieve the following long term objectives: reduce state debt; minimise cost to the tax payer whilst delivering higher quality of services; establish competitive industries; improve state infrastructure; and retain strong control of policy direction and performance accountability but where appropriate, transfer service delivery activity to the private sector.

4. Public versus private

Prisons in NSW are virtually all publicly delivered, the only current privately procured prison is the Junee Correctional Centre. Traditionally, prisons are designed, built, operated and financed by State governments with the use of public funds. The requirement for additional prisons first needs to be identified by the Minister, approval of public funding is then required through the State government to procure a proposed facility. Once approval is granted a tender is called by the Department of Commerce for expressions of interest to build the facility. Upon acceptance of the tender the procurement stage begins (Roth, 2004). Generally, the design of prisons in rural NSW are often reused, as evident with the construction of Goulburn and Bathurst prisons (DCS, 2007) and the recent Kempsey and Wellington prisons, where the designs of the prisons are identical with the exception of a few amendments to suit site conditions. In contrast, procurement of privately owned and operated prisons involves the government contracting out the operation of a prison to a private enterprise. Once the government decides to privatise a prison, a contract is put out to tender and in some cases the private enterprise may compete against the public sector for the contract (Roth, 2004).

The operation of prisons involves State governments, correctional officers, inmate development committee (drug & alcohol, welfare and psychologist), classification and placement, as well as inmate public health and education departments. Publicly procured prisons are operated by state governments. The training of officers in publicly acquired facilities is conducted at the Department of Corrective Services Academy for a period of 3 months, which consists of theory, conflict resolution, physical training, Occupational Health and Safety procedures, legalities and security protocol. On successful completion of theory, officers act as interims in various correctional facilities for a period of 9 months (DCS, 2007).

The operation in private prisons is similar to publicly acquired prisons. However, the State government retains a virtual power of veto over the ‘prison managers’ whereby authorisation may be revoked (Harding, 1992). The hiring and training of staff is conducted by a service provider, such as Group 4 Corrections Service or Corrections Corporation Australia. Prison security guards undertake training internally with service providers being required to meet strong accountability requirements

and performance standards (Daly, 1997), as agreed in the terms and conditions of the contract. Training for newly accepted prison security guards in the Victorian State prison system consists of a residential program for a total of 12 weeks in a training facility operated by the Office of Corrections (Kirby, Roche & Greaves, 2000).

Private enterprise is paid operational costs and fees by the government. The terms and conditions of the contract outlines the performance levels that to be met. The management cost will generally include a performance linked fee, where the fee for performance levels is withheld from the monthly operational payment for the service provided (Kirby et al., 2000). Examples of performance measures implemented in the Acacia Prison cited in Department of Corrective Services Western Australia (2006) are as follows: assaults on prisoners; assaults on staff/visitors; percentage of positive urinal analysis results; number of complaints to the ombudsman; number of self harm or suicides; percentage of inmates employed or in programs; percentage of required vocational/educational training hours and offending behaviour programs; and number of failures of contract responsiveness.

Roth (2004) makes a simplistic attempt at comparing public and private prisons by arguing for and against the private model. Some of Roth's argument in support of the private approach include: The private sector is more efficient and innovative and will operate cheaper and better prisons; privatisation will strengthen accountability; there is nothing wrong in principle with contracting out prison management; the private sectors profit motive does not make it less trustworthy as prison manager; the profit motive will not conflict with doing justice and can actually coincide with it; private prison operators will not cut costs at the expense of standards; and private prison operators will not make decisions that increase the length of the inmates stay. (Roth, 2004).

5. The privatised approach

Privatisation of prisons emerged from the US in the mid 1980's and the NSW government started to use it in the early 1990's (Roth, 2004). Prison privatisation in Australia is seen mainly in the State of Victoria, where, by the end of 1997, 45% of the prisoners were detained in private prisons (Daly, 1997), operated by the public Correctional Enterprise, Corrections Corporation of Australia (CCA), and GEO Correctional Management or Group 4 Corrections Services.

The BOO concept has been used to procure prisons in Victoria, where it has been deemed by Love et al. (2000) to be more cost efficient. In NSW, through the use of the BOO method, the government was able to procure the 600 bed medium security prison at Junee for $57 million, which was approximately half the cost that the State government itself would have incurred. Operational costs in the Queensland correctional system were reported to be 9.3% more economical in the private system compared to the public system (Love et al., 2000). Moreover, a private prison in Florida US and a public prison in the US of the same classification and capacity were compared. The prison in Florida was constructed at a cost of US$69.9 million whilst, the publicly procured prison cost US$85.7 million. This highlights that the privately built facility was 23% more cost efficient (Tabarrok, 2003) compared to the publicly built.

It is argued that the prime objective of private companies, that of financial interest, may jeopardise the quality of confinement for inmates or the social welfare for staff (Hart, 2003). However, in South Australia, the State government identifies the key aims of new facilities as being able to 'reduce operating costs and be better equipped to manage future expansion' (Ferguson, 2007), without mention of the rehabilitation, social welfare of prisoners, staff or society.

The level of consistency amongst privately procured prisons is questionable as there are numerous reports of failures. The Port Phillip maximum security remand and reception centre in Victoria was issued with a default notice in October 2003 over reported security breaches where a small loaded handgun, mobile telephones, digital cameras and a significant quantity of drugs were discovered (Roth, 2004). In October 2000, the contract between CCA and Deer Park women's prison was terminated due to inadequate staffing levels and lack of proper security systems (Duffield, 2005). It appears that CCA failed to meet the performance standards, hence adversely affecting prisoner's wellbeing and rehabilitation, along with the operations of the prison system. CCA however retorts that, *"All prisons, both public and private face challenges in the areas of authority, legitimacy, procedural justice, accountability, liability, cost, security, safety and corruptibility, however, they face these challenges because of the nature of their mission, not because of their incorporation as public or private entities"* (Dutney, 1997).

The result of Dutney's (1997) research, suggest there are no differences between publicly or privately procured prisons. However, studies conducted by Logan (1992), have a different view on the quality of confinement. Federal, State and privately operated prisons were compared with the findings suggesting that staff preferred privately operated prisons, whereas, inmates preferred publicly operated prisons. Hence, the level of consistency between publicly and privately operated prisons may be challenged. With prisoners possessing no political power and being socially constructed as deviant or violent by most of the population (Schneider, 1999), they have little if any influence or input on the procurement of prisons.

6. Research method

Figure 1 provides a diagrammatic conceptualisation of the research. It displays a set of hypothetical findings on the public and private sectors, and outlines the possible inconsistencies that may be present. The shaded areas are domains which are inconsistent and they may be minimised by either bringing the public sector into conformity with the private sector or vice versa. It is proposed that by refining the PPP approach then inconsistencies may be minimised.

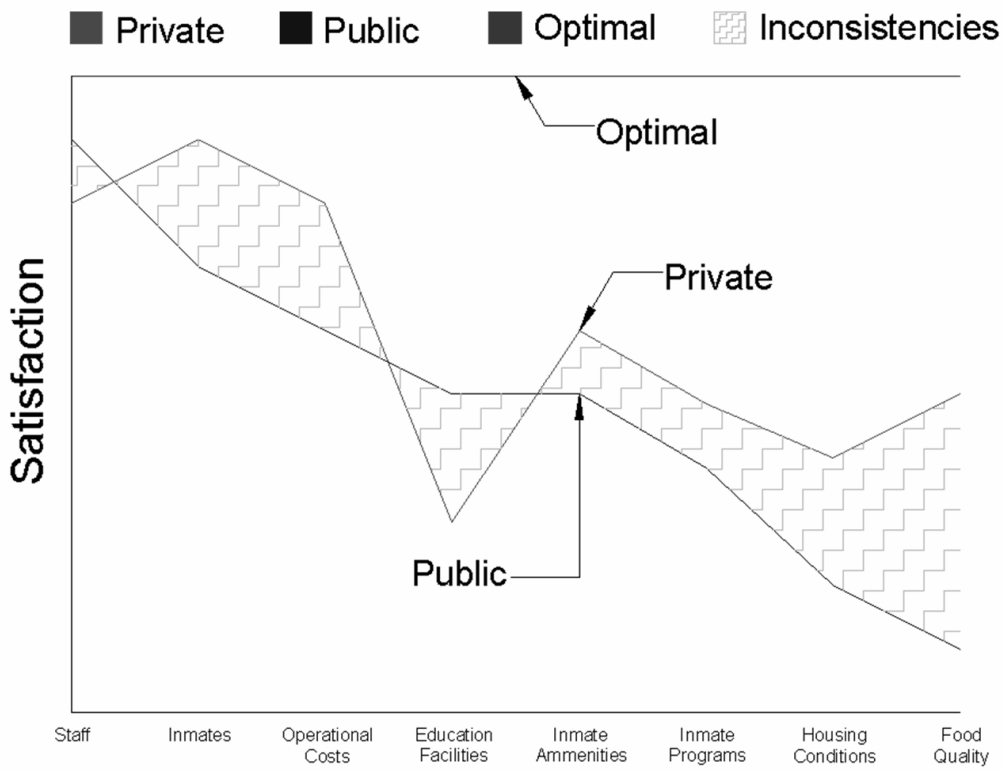

Figure 1: Hypothetical model to demonstrate inconsistencies

The research focused on investigating the inconsistencies between publicly and privately procured prisons. The research was conducted with an open minded approach that aimed to end up with an hypothesis. Salient issues were identified and guided the subsequent gathering of data to develop hypotheses. Document analysis was used to analyse data in this study. Document analysis is defined as *'The collection, review, interrogation and analysis of various forms of text as primary sources of research data'* (O'Leary, 2004). A hypothesis has not been tested, but rather a thematic analysis was used to identify the salient issues that guide the subsequent gathering of information and development of hypothesis. By definition a thematic analysis is identified by Ezzy (2002) as concepts, categories and themes that are developed while the research is being conducted. A thematic analysis was conducted to further investigate the underlying factors that may have contributed to operational inconsistencies in prisons.

7. Results

7.1 Operational efficiencies

7.1.1 Operational costs

Table 1 displays findings for the operational costs between private and public operated prisons where costs are represented per inmate per day and appear in either US or Australian dollars.

Table 1: Operational costs – public v private prisons

Source	*Private*	*Public*	*Comment*
(Archambeault & Deis, 1997)	US $22.93	US $26.90	Allen Correctional Centre (Public) versus Avoyelles Correctional Centre (Private)
	US $23.49	US $26.90	Winn Correctional Centre (Public) versus Avoyelles Correctional Centre (Private)
(Bowman et al., 1993)	US $49.00	US $77.00	Compares the minimum security Marion Adjustment Centre (Private) in Kentucky to minimum security Blackburn Correctional Complex (Public).
(Fabelo, 2001)	US $28.64	US $32.08	Compared the costs of offenders housed in State jail division facilities operated by the state in the year 2000, to an average contract rate of offenders in privately operated jails.
(GAO-Report, 1996)	US $36.76	US $42.70	Compared costs of four privately managed pre release 500 bed minimum security prisons for males in Texas to a hypothetical public model.
	US $69.75	US$80.00	Comparisons of costs between one state and private prison in New Mexico.
	US $42.68	US$40.85	Compared three for profit community correctional facilities for males, one private medium facility and two publicly operated prisons (one low-medium and one high security) in California.
	US $35.39	US $34.90-$35.45	Three multi classification prisons in Tennessee were compared, one privately operated and two publicly operated in Tennessee, excluding medical and mental health costs.
	US $33.61	US $35.28	Tennessee prison with the capacity of 1336 was compared with a Louisiana prison with a capacity of 1474.
(Harding, 1992)	A$82.90	A$129.78	Borallon (Private) versus QLD (Public)
(Logan, 1992)	US $69.75	US $80.00	Compared three women's prison, one federal, one state and one private in New Mexico.
(Logan & McGriff, 1989)	US $73.50	US $77.50	A study of the privately owned and operated 350 bed Hamilton County prison in Chattanooga was compared to a hypothetical model.
(Love et al., 2000)	A$107.50	A$117.45	Average costs of public and privately operated prisons in Australia
	A$140.00	A$180.00	QLD (Private) versus NSW (Public)
	A$130.00	A$140.00	QLD (Private)versus NSW (Public)
(NSW-Parliament, 2005)	A$82.59	A$87.76	Junee(Private) versus Mid North Coast (Kempsey)
(Pratt & Maahs, 1999)	US $52.41	US $47.56	Minimum Security prison cost comparisons
	US $41.25	US $49.22	Multi-security prison cost comparisons
	US $55.54	US $50.46	Medium Security cost comparisons
	US $88.87	US $103.21	Maximum Security cost comparisons
(Sechrest & Shichor, 1993)	US $54.49	US $50.08	The publicly operated San Joaquin Valley was compared to the privately operated Management and Training Corporation and the privately operated Public Civil facility located in the Mojave Desert. Average costs were taken between public and private.
(Segal, 2002)	US $35.90	US $43.08	Compared the costs and performance of a 444 bed private prison in Arizona to fifteen government operated prisons.
(Segal & Moore, 2002)	US $46.96 - $47.05	US $52.40	Florida Corrections comparison
	US $41.73	US $45.64	Study conducted on a larger prison in Florida
	A$121.00	A$136.66	Borallon (Private) versus Lotus Glen Correctional Centre

	US $31.07	US $34.26	Kentucky Department of Corrections
	US $31.30	US $34.26	Kentucky Department of Corrections
	US $31.08	US $35.22	Kentucky Department of Corrections
	US $32.32	US $36.32	Palm Beach County (Private) versus State facility
(Sellers, 1989)	US $91.00	US $134.00	Weaversville (Private) versus North Central
(Segal & Moore, 2002)	US $35.96	US $43.08	A 444-bed private prison in Arizona was compared to 15 government-run prisons in Arizona.

The private sector operates prisons at lower costs compared to the public. From the 31 findings 4 favoured the public approach, 26 findings favoured the private sector and only 1 had similar costs, therefore indicating inconsistency between the two models of delivery. The inconsistency is further emphasised by the disparity in cost savings, where, the public sector reported average costs savings of 7.6% versus an average costs savings of 16.54% by the private.

Inconsistencies are highlighted in the study performed by Harding (1992) which reports on the bidding of the operational contract for the Walcol Remand and Reception Centre in Brisbane. The private sector placed a bid of A$11.5 million per annum in contrast with the public sectors bid of A$18 million (Harding, 1992). Yet, it is inconclusive whether the private prisons are more cost efficient in operation as Sellers (1989) reveals that the publicly operated Salem County prison in New Jersey cost US$25.11 per inmate per day to operate, in comparison to the privately operated Butler County prison, similar in size and classification, that costs US$28.52 to operate (Sellers, 1989). The private sector is more efficient operationally from a costs perspective, and this would include services such as food, medical provisions, inmate programs and staff development and promotion. This may lead to reduce inmate escape and suicide attempts and improve staff morale. Costs for the likes of medical services may be reduced as a study conducted by NSW Parliament (2005) found that the average costs for medical services by the private and public sector was $9 and $20 per inmate per day respectively. Therefore, non-custodial services such as food and medical services could be contracted out to the private sector, hence, cost efficiencies are achieved and inconsistencies minimised.

7.1.2 Construction costs

Table 3 displays direct comparisons of the construction costs between privately and publicly operated prisons.

Table 3: Construction costs – public v private prisons

Source	***Private***	***Public***	***Comment***
(Joel, 1993)	US $4.9m	US $9.1m	Privately constructed Houston Detention Centre compared to a comparable public facility operated by the Immigration and Naturalisation Service.
(Love et al., 2000)	A$57m	A$57m	Private 600 bed facility versus Public 300 bed facility in Australia
(NSW-Parliament, 2005)	A$75.7m (adjusted for inflation)	A$125.6m	Junee (Private) versus Wellington (Public)
(Segal & Moore, 2002)	US $56 m	US $93m	Delaware County, Pennsylvania
(Tabarrok, 2003)	US $69.9 m	US $85.7m	The Legislative Budget Committee examined the construction costs of a government constructed prison compared with the construction costs for an identical private prison located in Florida.

Comparisons conducted on prisons with similar classification and size, revealed 5 of the 5 findings favoured the private sector for constructional costs. An example of inconsistent constructional costs is seen in Tabarrok's (2003) study which compared a privately constructed Florida prison to a similar publicly constructed prison and found that construction costs were US$69.9 million and US$85.7 million respectively (Tabarrok, 2003). Furthermore, the private Junee Correctional Centre costs A$75.7 million (adjusted for average annual inflation up to 2005) to construct in 1992. This figure was compared to the publicly constructed Wellington Correctional Centre that was reported to have costs A$126.5 million to construct (NSW-Parliament, 2005).

Evidently, there are high levels of inconsistencies in the operation and construction of public and privately procured prisons. The private sector clearly outperforms the public sector, however, there is much debate as to why this is so. It has been questioned whether costs savings are nothing more than a outcome of reduced quality of confinement (Harding, 1998). Further, Kaduce et al. (1999) queries whether privatisation is achieving costs savings at the expense of the quality of services being provided, such as reducing staff numbers, minimising inmates requirements of programs and daily needs (Kaduce et al., 1999). Therefore, studies on management efficiencies, the satisfaction of staff and inmates need to be evaluated in order to determine whether inconsistencies are related to the broader operational efficiencies of prisons.

8. Conclusion

An obvious solution to resolve the inconsistencies in the delivery of prisons between the public and private sectors would be to either fully privatise or fully publicly deliver the entire prison system. However, there are numerous reports of failures with management by the private sector, as seen in the examples of Deer Park Women's prison (Duffield, 2005) and the Port Phillip Remand Centre (Roth, 2004). Likewise, an all public system will also not address the issues of increasing prison population, crime rates, sentence lengths and most importantly the lack of government funding. Hence, the need to use alternate procurement methods is apparent. The BOO delivery system is one method currently used to procure prisons both internationally and in Australia, particularly in the State of Victoria. The design and construction stage of prisons is delivered more efficiently by the private sector with ample evidence indicating that the private sector can construct prisons far more economically than the public sector. Further inconsistencies between the likes of BOO and public sector delivery are also highlighted most specifically in terms of cost during the operational phase, where the private sector is more efficient.

As evident in the findings, the operational component is a significant factor in terms of inconsistencies. As the operation of prisons directly impacts on other areas of management efficiencies and indeed both staff and inmate satisfaction, then further research is required in these areas. Dividing the operational component between the public and private sectors may bring advantages. The cost savings by the private sector may be used to procure or finance other social infrastructure projects or to further improve the prison system. Moreover, staff satisfaction levels may improve if this aspect of delivery is retained in the public sector where State governments have a long and experienced history of offering custodial services. A Build-Own-Operate-Maintain (BOOM)

approach may overcome inconsistencies with the operational component classified as semi-privatisation. As one sector is responsible for each component and with all prisons following the same procurement model, inconsistencies may be minimised. The next stage of the research will explore this further and investigate management efficiencies and the satisfaction of both staff and inmates assessing any correlation between these issues and the operation stage of public and private prisons.

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Implications for Design and Construct Contractors Operating in a Public Private Partnership Environment: An Australian Perspective

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Abstract

The term Design and Construct (D&C) is a well-established description of a procurement method in which the roles and responsibilities of the various stakeholders are clearly defined. The advent of Public Private Partnerships (PPPs) brings a new opportunity for design and construct contractors with the concomitant challenge of operating as a member of a private sector consortium with numerous stakeholders. This research investigated the implications for design and construct contractors bidding for social (as opposed to economic) PPP projects. The conventional wisdom has been to assume that there is little difference between bidding for a traditional design and construct contract as compared to submitting a design and construct bid as part of a total PPP bid, however the results of the study indicated that there were subtle, and in some instances, significant differences. The first phase of the research dealt with the direct costs of bidding. This paper describes Phase One of the research project together with a proposed research methodology for Phase Two of the research which, will examine not only direct bidding costs but also the indirect costs to the design and construct contractor during the bidding and the operational phase of the construction project.

Keywords: bidding costs, design and build (D&B)/design and construct (D&C), direct and indirect costs, public private partnership (PPP), tendering/transaction costs

1. Introduction

This paper reflects on the initial stage of an ongoing research project that focuses on the costs of bidding in social infrastructure Public Private Partnerships (PPPs). The genesis for the research came from a ground swell of opinion amongst the private sector that the cost-to-bid ratio for social PPPs was higher than the cost-to-bid ratio of more standard procurement models and was also higher than the bidding costs for economic PPP projects (Curnow et al, 2005). Additionally there was evidence to support the view that a number of private sector players were either withdrawing from social PPP projects completely or being highly selective due to the unattractiveness of the projects on offer.

The body of opinion amongst private sector consortium bidders for social infrastructure PPP projects was that they are being hit by what might be described as a 'double edged sword' where the financial rewards of winning the bid were less and the contractual and other demands more complex than for economic PPP projects. Not-with-standing, the current situation in Australia is that the number of proposed social PPP projects is on the increase and there are a number of private sector players who are willing to bid in this environment (Jefferies and McGeorge, 2008).

Mark Binns, Chief Construction Executive of Fletcher Construction Company (New Zealand Herald, 2009) has recently discussed the problematic nature of operating as a Design and Construct (D&C)[1] contractor in a PPP environment making the following points in the context of the New Zealand economy:

- the PPP debate is in danger of being captured by vested interests such as right wing ideologues or lawyers and investment bankers (*the debate on ideological issues relating to PPPs has been ongoing for a number of years - see Jefferies et al 2006)*
- the questionable efficiency of the PPP model
- loss of control as part of a PPP consortium
- risks associated with other members of the consortium not performing
- upfront bid costs are higher (Binns describes the Australian bidding process as "horrendously expensive")
- a design and construct contractor can be held responsible for incidents occurring during the operation of the building through indemnity agreements. Binns cites the example of Melbourne's Laverton Prison where Fletcher Construction had responsibility for the design and construct phase but were deemed to be held liable for prisoner deaths due to the 'fit for purpose' terms in the contract which incorporated 'suicide free' cells.

[1] Throughout this paper the term 'Design and Construct (D&C)' has been used, as this is the common terminology in Australia. Other countries such as the UK and New Zealand use the term 'Design and Build' (D&B). The two terms are synonymous. For consistency where citations use the term D&B this has been converted to D&C to avoid the implication there is any difference between the two terms.

Binns' sentiments are to some extent echoed in this research where it was found 'that fundamentally the challenges to D&C/PPP contractors resulted from having to interact with a large number of players in a dynamic environment where the Special Project Vehicle (SPV)[2] and not the D&C contractor are in the dominant position. Certainly the consortium environment seems to mimic some of the characteristics described in complex systems theory such as 'non-linearity' where systems do unpredictable things and exhibit 'emergent properties' in which a logical result is achieved, although not necessarily a predictable one. There continues to be reservations amongst industry players about the efficacy of the PPP approach and some would perhaps prefer to operate in the much more controlled relationship which exists under a standard D&C procurement method. However not withstanding any reservations that may exist on PPPs, there is general acceptance that social PPPs are part of the procurement landscape in Australia and likely to remain so for the foreseeable future.

2. Relationships with social PPPs

As previously stated in a PPP, D&C/PPP contractors have to interact with a large number of players in a dynamic environment where the Special Project Vehicle (SPV) and not the D&C contractor are in the dominant position. Figure 1 illustrates a stylised example of a PPP network.

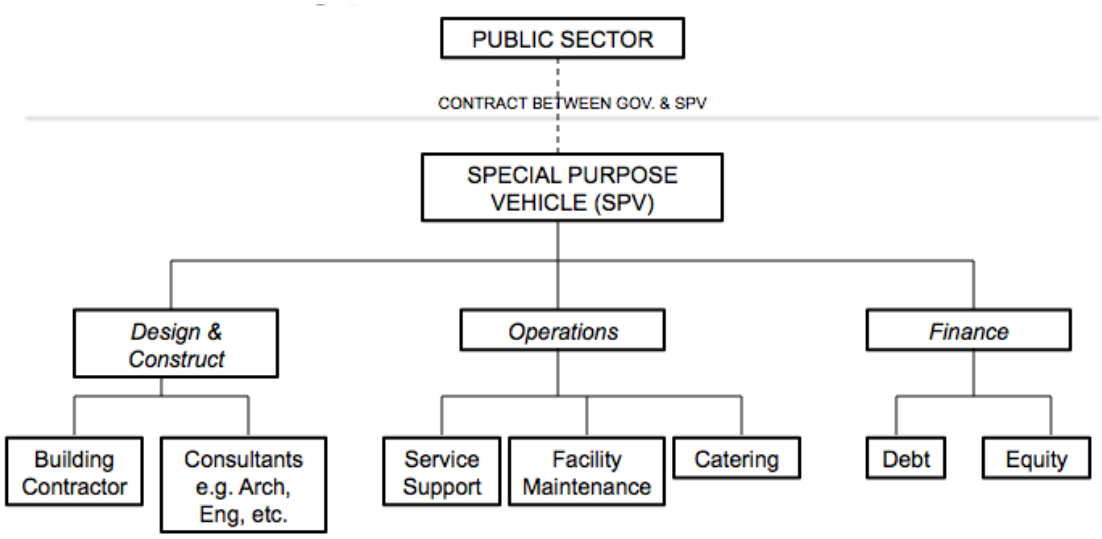

Figure 1: Generic example of a typical PPP contractual network

Figure 2 illustrates a contractual network for a small PPP project for 10 schools in New South Wales *(Source: New South Wales Office of Financial Management (2005) and* shows that the contractual

[2] A Special Purpose Vehicle (SPV) is a legal entity created solely for the purpose of representing the consortium stakeholders for the duration of the project.
The tender bid is submitted by the SPV on behalf of the consortium. This bid is contractually binding on the SPV.

environment for the D&C contractor in a social PPP is significantly more complex than for a conventional D&C contract.

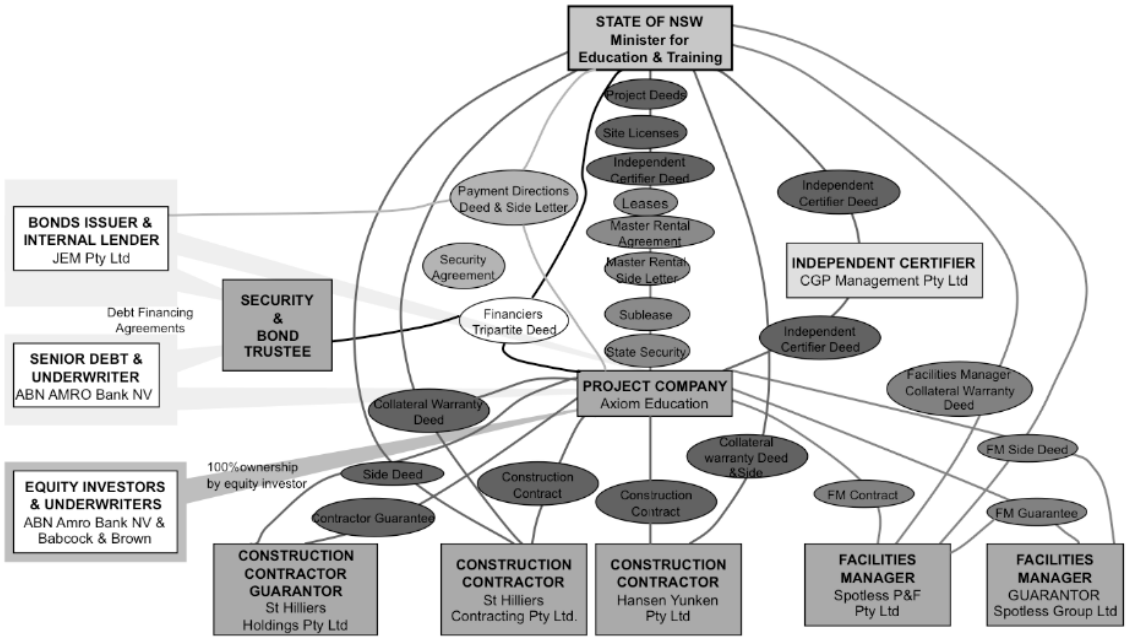

Figure 2: Contractual network for NSW Schools PPP (Source: NSW Office of Financial Management (2005)

2.1 The challenge

The conclusions from Phase One of this research project were that "..fundamentally the challenges to D&B/PPP contractors result from having to interact with a large number of players in a dynamic environment where the SPV and not the D&C contractor are in the dominant position. The term 'complex' is frequently used to describe the inter-relationship of players in a PPP consortium.

Following on from this observation it is proposed that Phase Two of this research adopts a systems approach to model and develop a transaction cost perspective. This will involve the identification and inclusion of a number of variables in a dynamic relationship. We believe that a comprehensive study of this nature will provide an indicator of the transaction costs to D&C contractors involved in social PPPs. The difficulty of this type of approach is not to be underestimated. Walker (2007) for example describes the transaction cost approach as a powerful tool which was used to analyse the contracting market in Hong Kong (Chau and Walker 1994) he however he does make the caveat that "The major problem of applying the transaction cost approach is the difficulty in measuring/ranking actual transaction costs".

Our intention is to apply a soft systems methodology underpinned by transaction costs theory. The application a soft systems methodology is, in our view, a viable approach which, whilst the outcome

will not result in absolute dollar values, is likely to provide a model which will bring clarity to a complex set of interactions. Checkland (1981) describes the basis of soft systems methodology is in accepting the fact that in a complex system addressing all perspectives as a whole is too complex an endeavour. Clarity is gained by addressing key perspectives separately, understanding their implications and then using these understandings when seeking to reintegrate of these perspectives into a set of evaluative conclusions and suggestions for future action. There is much ambiguity about what the systems approach actually is. Often a systems approach is taken to simply imply a holistic view. Checkland (1981) observes however that 'the systems paradigm is concerned with wholes and their properties, it is holistic, systems concepts are concerned with wholes and their hierarchical arrangement rather than *the* whole.

The interest for us in the adoption of a systems approach in Phase Two lies firstly in the basic systems methodology to attempt to identify and define the 'real life' situation then using the derived model as the basis for planning and future change. Our underlying hypothesis is that direct costs may not in fact be reliable indicators or descriptors of a D&C contractor's transaction costs as part of PPP procurement process. We believe that the data to test this hypothesis does exist, albeit in perhaps a form which may be difficult to extract. The key to extracting and manipulating this data will be the soft systems approach. The following Figure 3 illustrates a conceptual model of the types of variables and their relationships which, may emerge from the soft systems approach. Indirect costs include losses such as intellectual property and productivity and direct costs include the likes of planning, design, estimating etc.

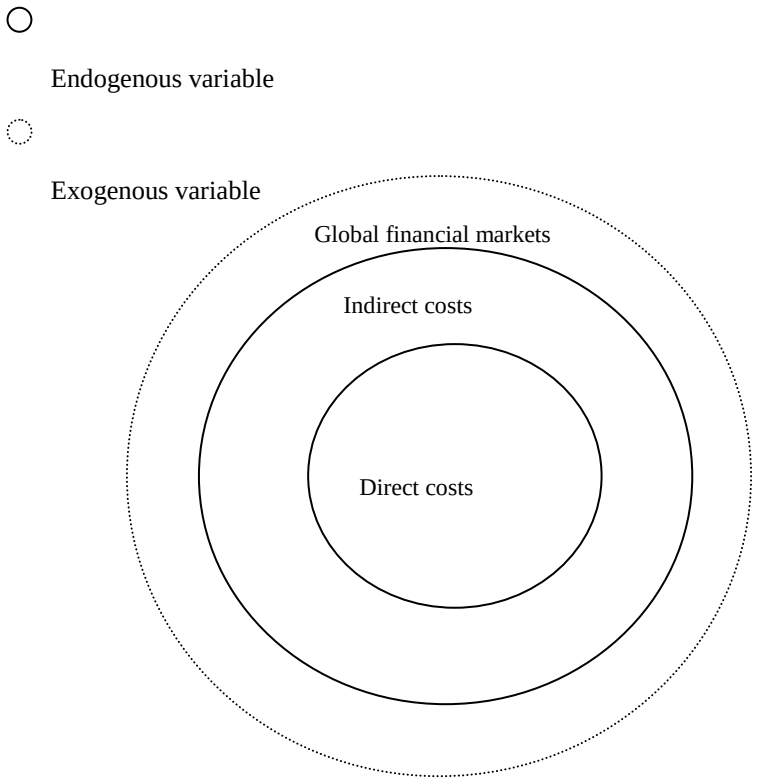

Figure 3: PPP project variables

3. Research approach for phase one

A comprehensive review of related literature and industry reports was used to generate a list of major challenges facing D&C/PPP contractors in the Australian construction industry. Three construction contractors each nominated two experts from senior management to participate in the interview process, i.e. six interviews in total. Currently, there are only four main consortia in Australia that have both the capability and expertise to bid for social infrastructure PPPs. Therefore, the three industry partner organisations involved in this research project represents a substantial sector of PPP contractors in Australia. A semi-structured interview process focused on key themes from a compilation of current major PPP infrastructure projects. Qualitative data was analysed using content analysis to group the findings. As part of the broader research project workshops were used to collect additional data and to focus on specific case study projects. This research only reports on a small aspect of the overall project and the data was obtained via the interview process. The results were presented to the Industry Partners on an ongoing basis via workshops as part of the original project proposal and in accordance with the University's Human Research Ethics approval process.

The basic premise underpinning Phase One of the research project was that there were underlying differences for D&C contractors bidding in a PPP environment as opposed to a standard D&C contractual relationship and that the most appropriate method of determining these differences was through interaction with senior industry experts whose views were taken as representing a distillation of the opinions of major players in the field. This expert opinion approach was justified both in terms research methodological grounds and also pragmatic grounds given the sensitive and confidential nature of the data. The focus in the first round of the research was on identifying the direct[3] costs of bidding. Whilst respondents touched on issues such as the risk of the potential loss of intellectual property, it was felt important that the thrust of the data collection in Phase One should be on direct costs rather than transaction costs as a whole.

The industry collaborators were (with one exception) D&C companies who, in turn, were part of larger holding companies. The interviewing process was in the main, with the D&C sector. The researchers found that it was at times difficult to differentiate between responses that related specifically to D&C issues and evidence that related to issues affecting the consortium as a whole. The network of relationships between the various consortium members during the bidding process is highly interactive. Although contractually the bid is submitted by the Special Purpose Vehicle (SPV) on behalf of the consortium, the relationship of the SPV to the other consortium members and funding of the SPV can vary quite markedly. Care needed to be taken in discussions with industry players to establish the role of a particular organisation in a PPP consortium since not only does this role vary from project to project, but also individuals within one organisation can have more than one role in preparing the project bid. The research was primarily concerned with PPPs as seen from a design and construct contractor's perspective. However, key personnel can have responsibilities in

[3] In the context of this paper 'direct costs' are defined as those costs that can be assigned a 'hard dollar' value such as consultants' fees. 'Indirect costs' are defined as those costs that are part of the D&C contractor's transaction costs that do not have a hard dollar value.

both design and construct and also facilities management (FM) and in some cases also be a member of the SPV team. During the interviewing process respondents often discussed both the consequences of winning a bid and undertaking the D&C contract under consortium conditions together with the consequences of loosing a bid and having to absorb the bid costs into the next round of bidding.

4. Results

In its first phase, this research addressed two distinct questions. The first question was whether the cost-to-bid ratio[i] was higher for social PPPs than economic PPPs and, if so, does this act as a deterrent to potential bidders? The second question addressed the issue of how bidders for social PPPs identify risks, opportunities and success factors and how these are built into the bid price? In the event, the first question was more successfully answered than the second. Hence the reason for the continuation of the research into Phase Two.

It important to distinguish between the two questions as problems can and do arise when the cost of bidding is confused with the bid price. There are difficult methodological issues associated with both questions.

4.1 The Cost of bidding or tendering

Hughes (2006) describing a study on the cost of procurement in the construction industry, makes the statement that there is a "desperate need for robust data" in respect to tendering costs. Whilst it may appear to be a relatively straightforward matter to identify the direct costs of bidding for a specific project, in reality this is not the case. To quote from Hughes, "the complexity of data collection places significant hurdles in the way of those who wish to undertake research in this area. This is probably why so few attempts have been made at assessing these costs. The quantification of the costs of tendering that have already been reported in the literature tend to focus on the cost of estimating and bidding, and take no account of the relationship between the distinct stages of a project. Moreover, they are based on impressionistic estimates, rather than analysis of data. However, the fact that they range from 1% to 15% indicates a strong feeling that there is a lot of expenditure in this area, and it is difficult to quantify. Also there is the further conclusion that the value added by this expenditure is not clear." In addition to the difficulties associated in accurately allocating costs to a specific tender bid (as discussed by Hughes) there is the added dimension of the commercially sensitive nature of the data surrounding PPP bidding and also the extended nature of the commercial relationships of a PPP consortium.

Not withstanding these challenges the research was able to obtain identify and quantify typical bidding costs from data provided by industry partners. Figure 4 demonstrates aggregated costs for the four principal components of the bid namely: D&C contractor; FM provider; Finance; and SPV. Figure 5 illustrates categories of stakeholder costs for a typical $250 million dollar social PPP project.

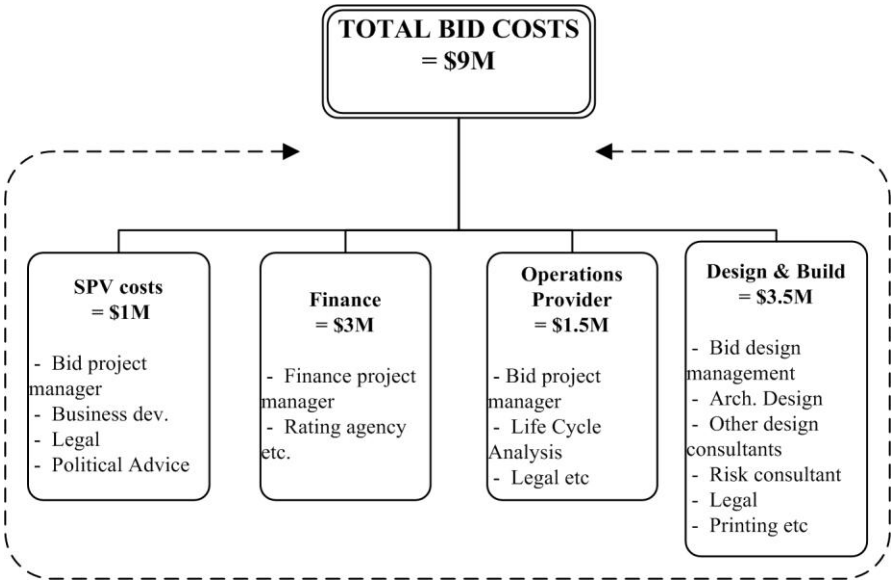

Figure 4: Typical Bid Costs for $250M PPP Social Infrastructure Project

5. Discussion

The researchers found that in some cases it was not even possible to separate issues that related specifically to D&C as an entity of a PPP consortium and issues which relate to the consortium as a whole. Not-with-standing, the respondents identified a number of issues, many of which were inter-related. These issues have provided the springboard for Phase two of the research.

One of the basic questions asked in Phase One was "are tendering costs likely to be higher for a D&C bid in a PPP as opposed to a standard D&C?"

Figure 5 illustrates likely (but not actual) bid costs for an Aus$250 million social PPP project, where the direct cost of preparing a D&C bid as part of an overall consortium bid cost exceeded one third of the total cost of bidding. Thus the D&C component is highly significant as far as bidding is concerned. Attempts were made to identify whether these bid costs would be the same for a standard D&C where the built component was of similar scale and complexity, however, direct comparisons between a 'standard' D&C and a D&C as part of a PPP are not as straight forward as might be assumed. There are a number of explanations as to why this might be the case.

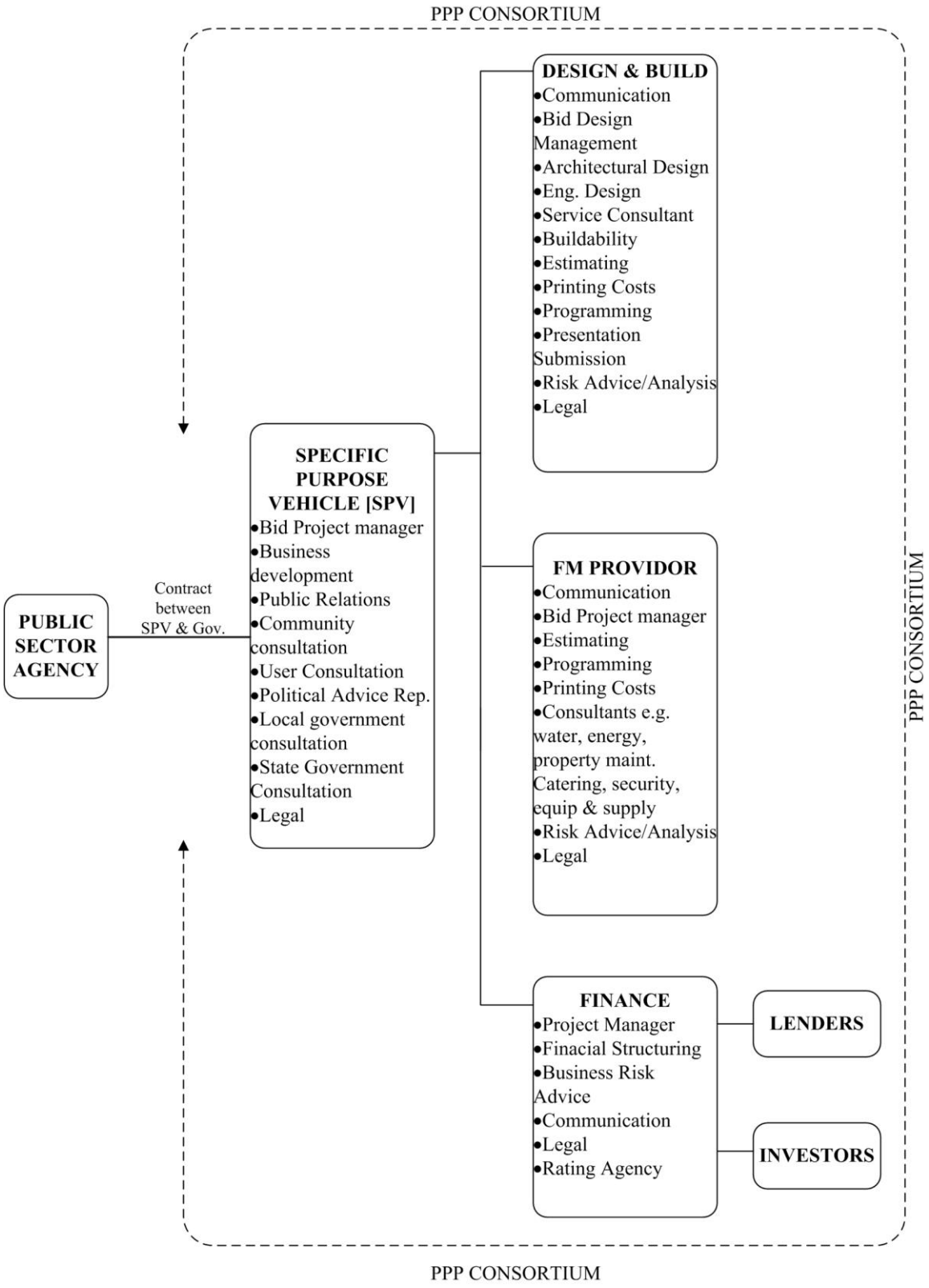

Figure 5: Categories of stakeholder costs for a typical $250 million dollar social PPP project

Firstly D&C companies may take the view that the utilisation of resources in collecting data on the cost of bidding outweighs the benefits. Secondly, whilst external costs (i.e. costs of consultants), are invoiced leaving an accurate paper trail of cost information, internal costs often become absorbed in overheads of the company. D&C companies do not normally operate with very clearly defined cost centres as for example, major accountancy or legal practices, thus the bidding costs of a D&C/PPP (contraction for D&C as part of a PPP) project may be partly absorbed into company overheads and distributed over other non-PPP projects. Further complexities arise in terms of internal relationships within the PPP. For example, D&C contractors may be owned by a larger holding company that may, in turn, be financing the SPV. In this set of circumstances it is likely that that D&C company will automatically be part of the PPP consortium, and will not have to compete to be chosen to be a consortium member. Whilst this would not necessarily affect actual bidding costs it may create cost allocation 'adjustments' that would not exist in a standard D&C. On other occasions the SPV may 'cherry pick' the D&C contractor from a number of competitors based on criteria determined by the SPV.

An emerging trend in Australia is for construction companies to move away from the provision of equity to the consortium and operate solely as a D&C contractor within the SPV, usually in an attempt to minimise their costs (and risks). However some financial institutions may insist that contractors provide some upfront equity as a sign of goodwill and a commitment for the duration of the project. Not withstanding this shift away from providing equity in the consortium, bidding costs for a D&C/PPP are seen as being high and a deterrent to bidding for projects. As a counterpoint there was also the view that bidding in the highly competitive PPP environment could potentially lead to a refinement and sharpening of the bidding process and thus lead to a reduction in the costs of bidding. However this is likely to be a costly way to gain experience particularly when bids are not successful. In Australia the PPP process has already reduced the pool of bidders. Already fewer competitors function in the market, leading to a reduction in competition, ironically one of the benefits often cited for PPPs. Indeed there would seem to be a general rule of thumb that major PPP players would not be prepared to enter the bidding process where more than 3 bidders were invited.

In summary it was found that the general view was that the bidding costs for D&C/PPP are higher than for a standard D&C. The basic rationale being that most contractors know what to expect with the standard D & B procurement process, and legal costs are kept to a minimum through the utilisation of standardised contract documents. Generally the standard D&C contract process is more predictable having greater clarity regarding roles and time frame (the bid period is usually shorter than for a PPP) thus minimising bid preparation costs. In essence in Australia standard D&C has widespread acceptance. It is an established system which, allows bid preparation costs to be kept to a minimum. By implication, the perceived higher costs of PPP bids are, in part, due to being a less well established system with non-standard contracts.

It was suggested that the additional costs could be up to 5-10% higher for a D&C/PPP as opposed to a standard D&C due, amongst other things, to the additional legal costs of a PPP bid. Another reason for additional bid preparation costs can occur in the design content where a commercial decision by the consortium to gain a competitive edge could result in higher design costs given that the more developed a design is the more likely it is to be short-listed. Thus, in some cases the design

component in a D&C/PPP bid may be more highly developed than for a standard D&C. The expectation for PPP bids is that the submission should have well developed design documentation. As a corollary to this, the cost of printing is also high with an example provided where the cost of printing contract documentation for a social PPP project valued at Aus$300,000,000 was in the region of Aus$100,000.

6. Conclusions and further research

Phase One of this project has, albeit with some reservations, regarding the accuracy of the primary data, been able to establish typical direct bid costs likely to be incurred by a D&C contractor bidding for a social PPP. However there would seem, as yet, to be little or no research conducted into the full transaction costs to the D&C contractor encompassing not only the direct and indirect costs of bid preparation and tender submission but also, as indicated by Binns, the long term risks associated with contractual obligations during the operational phase of the project. In addition to these direct and indirect costs there are what might be termed 'intangible' considerations such as the impact on the D&C organisation as a whole when senior staff are allocated to PPP bid preparation for an extended period of time. Further there is the impact on staff morale on the part of losing tenderers. Whilst it could perhaps be argued that winning and losing tenders is all part of being a player in a competitive market there are now instances of PPP bids being the subject of legal dispute resulting in financial losses to the D&C contractor combined with a hardening of attitudes not in the spirit of partnership.

As discussed D&C contractor transaction costs, particularly as they relate to PPP procurement have, as yet, to be comprehensively mapped. This paper proposes the adoption of a systems approach as a suitable methodology to advance research in this field. The PPP environment, particularly for social PPPs, is an intriguing field for construction management research. The PPP consortium is a temporary organisation with a complex network of players with competing goals and objectives, many of whom never get to see the complete picture. Inevitably the group operates under pressure, particularly the members of the SPV who are the drivers of the bidding process. The private sector view, which was continuously reinforced in Phase One of our research, is that social PPPs are more complex with relatively higher bid costs. Additionally there are difficulties in developing a true partnership between the public and the private sector resulting in frequently adversarial bidding environments. In an ideal situation 'success' would result in a win-win situation with a successful outcome for all the stakeholders, whereas all too often success is regarded as victory for the public sector over the private sector or vice versa. In the light of the previous comments it is our view that that modelling the transaction costs incurred by the D&C contractor in social PPPs will ultimately assist in reducing the non-value added components of the procurement and operational process.

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A Best Practice Framework of Output Specifications for PPP projects

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Abstract

Increasingly, the provision of infrastructure and municipal services is being undertaken by collaboration between the public and private sectors under the broad umbrella of PPP. When the public sector communicates its requirements to the private sector for the purposes of bid invitation, negotiation, payment administration and performance monitoring, output specifications are used instead of a set of prescriptive specifications. On one hand, output specifications need to provide room for innovations and flexibility for future changes. On the other hand, clarity and enforceability are important to fulfill their purposes. Based on previous research experience in developing a performance-based specification framework for specialist work contracting, a Best Practice Framework is proposed for specifying outputs of PPP projects. The proposed Framework embraces (1) Statements of client's requirements; (2) Physical Asset requirements; (3) Service requirements, (4) Links to payment mechanism and performance evaluation; (5) Rectification; as well as (6) Change mechanism. Drawing lessons from reported case studies, positive recommendations and caveats against pitfalls have been included in the Best Practice Framework.

Key words: PPP projects, framework, output specifications

1. Introduction

With the increasing adoption of public and private partnerships in the provision of built assets and services, much research has been carried out with respect to how the project requirements should be communicated and how performance should be measured and thus achieving the objectives.

Usually, construction projects have their specifications written in either prescriptive or performance-based format, or a combination of both (Lam, et al. 2003). There has been a trend of shifting the procurement approach from a traditional (prescriptive) input-based specification which stipulates material and workmanship requirements to an output-based specification containing performance orientated requirements (Lam, et al. 2007). In other words, construction works are specified by what they should achieve and contractors are paid according to the performance of the completed assets. According to the Private Finance Panel's practical guidance on PFI (Private Finance Initiative (a type of PPP projects prevailing in the UK), output specifications aim at defining services, not only requirements on the completed facilities (Private Finance Panel, 1996). This means, the focus is on what the facilities should serve in addition to the facilities and the construction work itself.

The benefits expected from the utilization of output specification are summarized in two areas below:

Flexibility and Innovation

The Private Finance Panel (1996) promoted the adoption of output specification because "outputs are only specifying what is required and give the service provider more freedom to decide how it is provided". An output specification, acting as an important component in PFI contracts, gives more rooms for innovation and flexibility in service provision. The output specifications allow tenderers to propose any innovative solutions to the client as long as the alternatives help to achieve the requirements.

Similar opinions have been drawn from Akintoye and Beck (2009), who suggested that output specifications provided more room for private sector consortia to innovate and carry out flexible operation which would fully utilize their professional experience to find the most cost-effective solution. As such, the economic and financial benefits of PPP projects can be realized to achieve better value for money for public users.

Risk transfer

Apart from stating the client's requirements on the facilities to be built and services to be provided, an output specification delineates responsibilities and sets out the framework for monitoring the quality of deliverables (Lam, et al. 2003). The risk of non-compliance, i.e., failure to meet the requirements, has been shifted to contractors. Contractors no longer have the excuse of only obeying what the client asks for. Instead, the end results are measured to assess the performance of the contractors and thus the payment due to them. Borun (2009) also pointed out that, under output specifications, contractors bear the responsibility and risk for deciding how they will provide the required services.

A successful and useful output specification requires the synergy of all project participants through- out the stages of a PPP project, from the procurement and construction phase through the long term operation and even until the handover point has been reached.

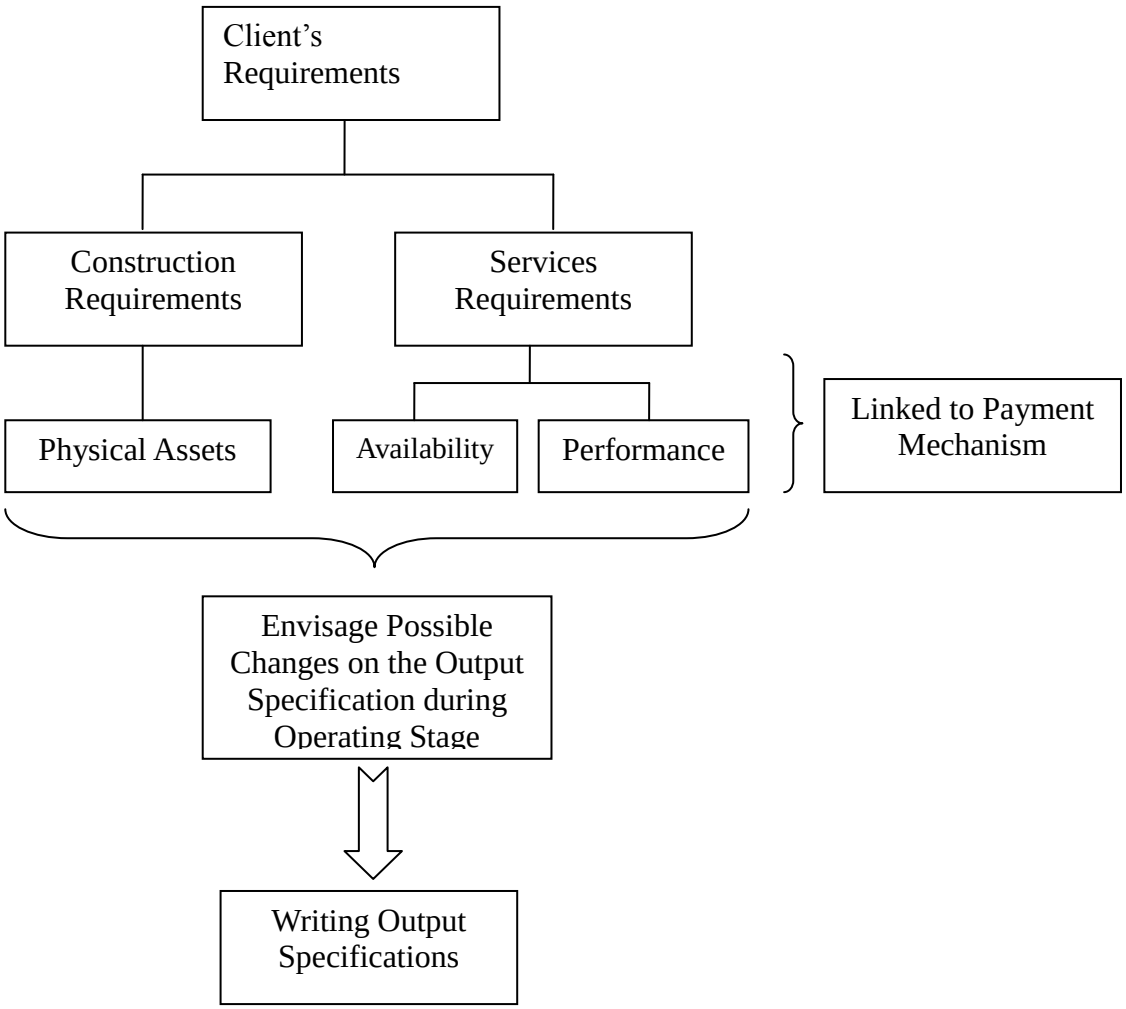

Figure 1: Workflow of Writing an Output Specification

2. Client's Requirements

Astron (2004) and Lam, et al. (2007) opined that an output specification is essentially needed to act as a design brief for PPP projects and should form a core section of the Invitation to Negotiate document. These studies also revealed that an explicit output specification clearly stating what the authority wants to achieve is a key factor in a successful PPP project. This is very critical especially when taking performance measurement and monitoring into consideration. A good specification clearly states the client's requirements and reduces the possibility of dispute in later operating stage (Akintoye and Beck, 2009). Meanwhile, a higher level of clarity increases certainty and reduces the risk of change following financial close (NAO, 2003).

Obviously, a good output specification is critical to a PFI project, but writing a clear and effective output specification is a very skillful and difficult job. The specification writer should have a detail mind presenting a comprehensive set of construction and service standards to the contractor. The writer should be equipped with a wide range of skills and knowledge in strategic policies and planning, project specific issues, design and build, facilities management and project finance (Astron, 2004). At the same time, the output specification should be general and not too prescriptive, leaving room for the contractors to provide innovative alternatives to accomplish the objectives and meet the client's requirements.

In addition, different types of PFI projects have their special features, not only regarding the technicalities but also the presentation approach. The elements of a laboratory output specification would be more demanding than any other output specifications. (Borun, 2006). Therefore, it is unrealistic to have a standardized output specification which is valid for all types of PFI projects. Nevertheless, a broad framework can be applied.

In the following sections, fifteen general principles on writing a good output specification have been summarized, using examples to illustrate the key points being mentioned.

(1) An output specification should aim at giving the contractor an opportunity to offer their own solutions. Authorities are encouraged to state that they would welcome innovative alternatives (Private Finance Panel, 1996).

Example 1: Building Maintenance

"……*Suppliers will be responsible for the maintenance*……***to a standard that permits service standards to be met***……"

(2) Note that in the above example, there is not any defined requirement for a maintenance programme for the bidder to follow (Private Finance Panel, 1996). Any maintenance services, as long as they satisfy the authority, are welcomed. A technique for defining appropriate performance standards is to use the concept of "***Equivalence***", if the requirement is very similar or identical to some projects which have already been specified. Apart from that, the output specification for the project can also be set to equivalent preset standards (Private Finance Panel, 1996). Some typical examples adopted can be seen in: (i)*"Waste Management Procurement Pack"*: Key landfill diversion performance standards (August 2008); (ii) School Standards such as *"The design development protocol for PFI scheme", "School Standard Form PFI Agreements (non-BSF)"* (August 2004), *"Building school for the future standard document" (March 2005)* (Ramsey, 2007).

(3) Output specification should be written by integration of the main PFI participants' inputs. The outputs should be based on a good understanding and broad consideration of construction and service requirements and then integrated with life cycle considerations. This relies on an effective and efficient communication network with which the contractors, end users and all other interest groups exchange their opinions and experience.

(4) Good output specification can help to avoid disputes over interpretation and subjectivity with reference to levels of service and standards (Akintoye and Beck, 2009). However, to provide a comprehensive output specification across different services without being too prescriptive is always easily said than done. A comprehensive output specification provides clear requirements to contractors for carrying out services that the client wanted. Meanwhile, it should not be too prescriptive, which makes writing good output specification a difficult job needing professional skills.

Example 2: Home care center – Furniture requirement in home care

"……*Of a high standard capable of withstanding* ***a high level of daily wear and tear***……"

Service provider may misinterpret the requirement and provides furniture which is not robust enough (Akintoye and Beck, 2009).

(5) As mentioned, the output specifications may refer to known standards and guidance. Care should be taken on enforceability of the standards; some of the standards are proven to be unenforceable as they were not specific enough. (CIPFA, 2007)

3. Payment Mechanism and Output specification

(6) To avoid an absolutely fixed payment regime in a PFI project

In PFI projects, payment should contain an element that links to the services availability and performance. An absolutely fixed payment regime regardless of the availability, timeliness or quality of service delivery is not encouraged (Borun, 2002).

PFI projects usually make payments based on (1) Availability, (2) Periodic Unitary Charge (e.g., Monthly Unitary Payment, MUP) with adjustment or deductions for unavailability and non-performance, (3) Sharing of third-party revenues, (4) Indexation and (5) other approaches such as indirect non-financial incentives, Ratchet Mechanisms, individual event payment (e.g. variable payment for Singapore National Stadium on event days)

(7) Clear indication of payment calculations in output specifications

An explicit formula demonstrating the payment mechanism will be helpful in reducing possible disputes between the authority and service provider.

Example 3: Singapore National Stadium (Lee, 2005)

"*Adjusted Monthly Unitary Payment (AMUP)*
= UP/12 + Variable Payment - Availability Deductions - Performance Deductions"

(8) In Service Failure Deductions, two aspects should be borne in mind, i.e., the magnitude of failure deduction and its relationship with service priority category (PartnershipUK, 2005). The amount to be deducted should always be stated according to their priority of importance, which is provided in the output specifications. Example 4 shows such a priority table with ascending level of monetary deductions per core session of use of a school building.

Example 4: UK School Project

Table 1: Service failure deduction table

Service Priority Category	*Service Failure Deduction (£) per*

	Core Session
Low	*£5*
Medium	*£10*
High	*£20*
Super	*£50*

Source: PartnershipUK, (2005)

(9) Sinking Fund Provision

Sometimes, a sinking fund provision might be required by the authority in restricting the usage of service providers' money. Under the provision, services providers have to set aside a portion of their income such that they are financially capable to meet their future liabilities, i.e. facilities maintenance and services enhancement.

(10) To avoid setting KPIs which diminish the incentive to improve performance. All requirements should be specific enough to preclude the possibility of a lower service standard being provided by the contractor.

Example 5: Home care center – Vehicle for the elderly

"……***Electronic tail gate*** *to enable access for passengers in wheelchairs*……"

In Example 5, a service provider may seek the loopholes or circumvent the requirements, only delivering the cheapest option available (Akintoye and Beck, 2009). The electronic tail gate as installed required a higher level of manual operation by the driver than anticipated. Although it seems that the contractor has provided the output, the quality of the services has not been met. Specification of the degree of automation would be necessary in this case.

(11) Avoid the vicious circle due to payment deduction

Akintoye and Beck (2009) stated that deduction payment would result in a vicious circle in that FM budget has been constrained, resulting in even poorer performance. In some projects, the KPIs will be deemed as a disincentive element by contractors (PartnershipUK, 2006). The concern is that a contractor will consider whether his action will result in under-performance as reflected by KPIs, thereby triggering performance deduction. Hence, they would prefer not to take the risk of improving performance either. Consequently, the conservative attitude leads to a vicious circle of deteriorating performance.

4. Performance Measurement

(12) The payment to contractor relies upon their service where availability is the basic criterion. Some services are not always needed to be available round the clock, thus an authority should state explicitly clear the periods over which availability is required (Sue and Swelt, 2006). In addition, an indiscriminate availability requirement is not necessary, since demand for various services should not be the same. The demand on emergency service, such as hospital emergency treatment, is always needed to be standing by, whilst a school is not necessary to be available throughout 24 hours.

Example 6 shows a clear time span of availability requirement:

"… *School will be required between the hours of 8a.m. and 6p.m.* …"

Source: Sue and Swelt, (2006)

(13) When dealing with payment matter related to unavailability, several conditions should be examined and included in the output specifications as the following scenarios show:-

Scenario 1: Service is unavailable: No payment should be made for the period or a pre-agreed deduction should be effected

Example 7: A PFI school project
Table 2: Availability Priority and Area Failure Deduction

Availability Priority	***Area Types***	****Area Failure Deduction***
1	*Kiln room, laundry, habitat areas, minor stores etc*	*£10*
2	*Infrastructure areas and offices, meeting room, car parking, medical room, some stores*	*£20*
3	*Less student orientated areas such as staff resource areas, reception plus changing areas, central stores, other sports areas; long jump pits, running track etc*	*£30*
4	*Generally non-teaching but important support areas such as learning resource spaces, library, careers, group rooms, dining and social, pupil resource areas.*	*£35*
5	*General teaching spaces such as maths, English, humanities - areas that are more easily interchangeable in an unavailability situation. Also pupil and disabled toilets, external pitches.*	*£45*
6	*Specialist spaces which are difficult to replace such as science, music, technology, hall, specialist sports areas, special needs suites and provision.*	*£55*

Source: PartnershipUK, (2005) ** (£ per Core Session)*

Scenario 2: Service is unavailable but Authority still uses that service: Deduction of payment up to a certain amount (e.g. 50%) will be effected.

Scenario 3: Service is unavailable but since this is due to incidents beyond the control of the contractor, the service is deemed to be available (despite unavailability strictly against the measured criteria)

Example 8 shows clear distinction in a PFI School Project:
"*IT equipment is to be provided by the LEA in a school PFI projec, Lack of equipment in computer rooms should not determine unavailability of the area as the equipment is not being provided by the contractor*" Source: Sue and Swelt (2006)

5. Performance Monitoring

(14) Monitoring Methods:

Robinson and Scott (2008) suggested that output specifications should state how and by which party monitoring will be conducted. Many researches conclude that at least one of the following monitoring methods should be adopted in output specifications for PFI projects: (1) Customer satisfaction survey, (2) Performance reporting (e.g. monthly audit from contractor himself or external adviser), (3) Fault reporting (e.g. number of monthly complaints from users) and (4) Other project-specific monitoring

regimes. Table 3 shows an example of monitoring methods and frequencies adopted for school projects in the UK.

Example 9: *PFI school projects*
*Table 3: School Project Monitoring Methods & Frequencies**

Monitoring Method	***Description/Source***
1	*School/the Contractor reports to Helpdesk, Helpdesk Records*
2	*Comparison with agreed Method Statements*
3	*Comparison against agreed benchmark*
4	*Contractor's self-monitoring (in accordance with the Performance Monitoring Program)*
5	*Analysis of information contained in the Contractor's duty rosters and other operational records*
6	*User satisfaction surveys*
7	*Review/reports by statutory bodies*
8	*School/LEA/DFES audit (analysis of complaints, random visits, validation checks of the Contractor data, deliberate testing etc)*

Source: PartnershipUK, (2005)
*Monitoring frequencies can be classified as daily, weekly, monthly, semi-annually and annually.

However, potential pitfalls of some monitoring methods have been noted as follows:-

1. Akintoye and Beck (2009) observed that user satisfaction survey was not linked to the payment mechanism in some of the PFIs. This undermines the enforceability of user satisfaction survey in their role of monitoring. Services providers may pay less attention or even ignore the survey which brings no harm to their payment.

2. Meanwhile, Borun (2002) as well as Akintoye and Beck (2009) pointed out that in many projects, contractors are doing self-monitoring, which was not rigorous enough, and hence eventually resulted in deteriorating service quality.

Example 10 shows such a finding from a court service contract:

"The contract also required Consul to produce self-monitoring reports … However, Consul had not regularly marked the services as required…"

Source: Borun (2002), *PFI: The Laganside Courts*, NAO

Akintoye and Beck (2009) suggested the use of external advisers for service monitoring, basically to examine whether the facilities management services being provided complied with the contractual requirements.

(15) Rectification Priority and Monitoring Frequencies

Rectification is the remedies after service failure and is closely related to the availability and the performance standard required to be achieved, hence affecting the level of payment contractor will eventually receive. The rectification category should be clearly identified and the period allowed for restoring the services has to be specified accordingly.

PartnershipUK (2005) provides a good example in output specifications on rectification. It classifies 3 levels of priority, in descending orders with respect to their urgency, including Emergency, Urgent and Routine.

The description should be clear and flexible, and leave room for the contractor to tackle problems

using their own solutions. The rectification period should be reasonable and explicit to minimize potential disputes on payment calculation.

Example 11: Table 4: Rectification Specification

Priority Category	***Description***	***Rectification Period***
Emergency	*Matters of an acute nature that impinge upon the health and safety of the users*	*Within 30 minutes*
Urgent	*Matters that impinge upon the operational function of the school including the operation of the Helpdesk service*	*Before commencement of the subsequent Core Session*
Routine	*Matters adversely affecting the user's enjoyment of the school or otherwise of an administrative or routine nature*	*Within 10 Core Sessions*[1]

Source: PartnershipUK (2005)

6. Changes

PFI projects usually last for a long operating life ranging from 20 to 30 years or even longer, and thus, changes are very likely to occur during operation. It is highly recommendable that considerations on expected change of the service requirements and other related issues be given in output specifications. The specifications also need to state that the contractor should continue to provide contracted service in case of change, except due to law change (Infrastructure Australia, 2008). Negotiations should then be invoked to achieve a fair deal.

Example 13: Street lighting project

"… Demographic projections may suggest that the Authority is quite likely to require new units to be brought into the scope of the Contract as housing increases in the area…"

Source: HM Treasury (2006)

A mechanism for adopting change is desirable. HM Treasury (2007) suggested that output specifications should be flexible in dealing with changes in delivering the service (e.g. by introducing new technology) without formally consulting the Authority.

7. A Best Practice Framework

Having discussed the desirable and undesirable features of an output specification, it is imperative that the specifier has a framework for use as a guiding checklist in this important task. From a comprehensive study of currently available templates held out as best practice in their respective specialities (e.g., PartnershipUK, National Health Service, Partnership for Schools, Partnerships Victoria, etc.), a framework has been developed, as shown in Table 5. Whilst the format of output

[1] This includes the Core Session in which the Service Performance Shortfall was recorded.

specifications can vary according to different work agencies' preferences, a list of common essential headings should be structured with an appropriate hierarchy of presentation. It is also recognized that different types of PPP/PFI projects entail different levels of technical details to be included. Therefore, only an example based on a school project is depicted. It is expected that users of this framework would provide the contents on a project-specific basis, yet covering the essential elements as depicted.

The proposed framework comprises of 2 themes and 2 levels. Theme I is a performance-based specification on the physical asset construction (in case the client wishes to include design and building works in the PPP package), which can be sub-divided into sections such as (i) Scope, (ii) Design Parameters, (iii) Structural Performance, (iv) Architectural Performance, (v) Electrical and Mechanical Performance, (vi) Special Installation Performance, and (vii) External Works and Landscaping Performance. Theme II contains the client's requirements on the service components. Generic requirements can be specified in Level 1 under the headings of (1) Scope, (2) Service Requirements; (2) Service Monitoring; (3) Availability, (4) Links to Payment Mechanism, (5) Rectification Requirements and (6) Change mechanism. Particular project types may need expansion of Level 1 generic requirements into more specific issues (e.g., in the school project sample shown in Table 5, vandalism damage can be distinguished into those committed during school hours and outside school hours, for which responsibilities fall on different parties). Whilst Level 1 and Level 2 can be combined for stand-alone projects, keeping them separate would be beneficial for projects of similar nature but say at different locations (e.g., fire stations). In cases when the clients wish to continue use of the facilities after hand-over, the conditions can be specified with terms such as residual life, condition survey and as-built documentation.

Within the proposed framework, references to tables depicted in the earlier sections of this paper are meant to indicate the possible format that can be adopted, but by no means restrict innovative ways of specifying as long as clarity is observed and measurement is practicable. As increased use is made of such framework, it is expected that standardization can be achieved whilst bringing in best practice for avoiding pitfalls.

Table 5: Output Specification Framework

Theme I: DESIGN AND CONSTRUCTION REQUIREMENTS							
Section	***Scope***	***Design Parameters*** *(e.g. site coverage %)*	***Structural Performance***	***Architectural Performance***	***Electrical & Mech. Performance***	***Special Installation Performance***	***External/Landscaping Requirements***
Theme II: POST-CONSTRUCTION REQUIREMENTS							
Issues	***Scope***	***Service Requirement***	***Service Monitoring***	***Availability***	***Links to Payment Mechanism***	***Rectifications Requirements***	***Changes***
Level 1: Generic Details							
1	Definitions	Service Delivery Plan	Performance Monitoring Plan	Unavailability Definition	Sinking Funds	Rectification procedures	Changes in Service *a. Changes in use/functionality* *b. Changes in capacity* *c. Changes in service specs. or performance standards*
2	Call for innovation	Service Management	Monitoring Methods	Availability Classification Guideline	Service Priority Category	Rectification Category Classification	
3	Payment Regime	Service Reporting System	Monitoring Frequencies	Required Availability Period	Service Failure Deductions Details	Temporary Rectification Period	
4	Timing/Phasing Issues	Communications with Authority	Monitoring Reports	Unavailability Scenarios *a. Unavailable* *b. Unavailable but still used* *c. Unavailable, which is out of control*	Service Payment	Permanent Rectification Period	Changes in Law *a. General changes in law* *b. Specific change in law* *c. Discriminatory Change in Law* *d. Change in Government policy*
5	Critical Design Standards	Project Integration Requirement	Performance Standards	Links to payment under the above 3 scenarios			
Level 2: Details for Particular Project Types (e.g. PFI School)							
1	***Service Delivery Plan:*** 1. Services' scope and services objectives 2. Items of services to be delivered		Submission of Monitoring Plan within a period of time before service is started	***Unavailability Definition:*** Properly defined	***Sinking Funds:*** Capital required to be set aside in meeting service obligations	***Rectification procedures:*** Notification and acceptance	***Change in Community Use/Involvement***
2	***Service Management:*** a. Service performance monitoring		***(Main) Monitoring***	***Availability Guideline:***	***Service Category Priority:***	***Priority Classification:***	***Change in Policy e.g., on curriculum***

	b. Quality assurance ➢ Continuous improvement and implement systems to facilitate objectives ➢ Quality assurance standard (in accordance with ISO 9001) c. Health and Safety	***Methods:*** a. By number of monthly user complaints b. By monthly audit from contractor itself *(e.g., Table 3)*	Prioritization of Availability Criteria	a. Low b. Medium c. High d. Super	a. Emergency: Affect health & safety b. Urgent: Affect operation Routine: Affect user's enjoyment	
3	***Service Reporting System:*** a. Helpdesk Facility: ➢ Report building faults and service delivery shortfalls and requests ➢ Reporting mechanism b. Complaints: Response requirements ➢ Complaints on services: Mitigation procedures ➢ Complaints on staff: Compliance procedures	***Monitoring Frequencies:*** Various services with different frequencies *(e.g., Table 3)*	***Responsible Duration:*** e.g. Vandalism: 8a.m. to 5.p.m. Authority responsible for maintenance; Outside the period, it is the service provider's obligation	***Service Failure Deductions:*** Magnitude of the deductions varies in the 4 categories *(e.g. Table 1)*	***Temporary Rectification:*** a. Emergency: 30 minutes b. Urgent: Before start of subsequent Core Session c. Routine:2 Core Sessions *(e.g., Table 4)*	***Asset conditions at hand-over (if applicable)*** a. Residual design life b. Condition survey report c. Recommendations on maintenance after hand-over d. Latest as-built documentation
4	***Communications with Authority*** a. Risk allocation on extra cost arising from the contract b. Meeting report requirements	***Monitoring Reports:*** Frequency and contents	***Unavailability Scenarios:*** *a. Unavailable* *b. Unavailable but still used* *c. Unavailable, which is out of control*	***Service Payment:*** a. Area based payment b. Service based payment	***Temporary Rectification:*** a. Emergency: 30 mins b. Urgent:4 Core Sessions Routine: 10 Core Sessions	
5	***Integration with School Policies and Operations:*** Scope of services integration ➢ Health and Safety; ➢ Quality Assurance; ➢ Environmental Management; ➢ Contingency Planning.	***Performance Standards:*** *The Educational (School Premises) Regulations 1999, UK*	***Payment:*** *a. Unavailable* *b. Unavailable but still used* *c. Unavailable, which is out of control*	***Payment linking to Indexation***		

8. Conclusion

In light of the trend of adopting output specifications as the basis of measurement, monitoring and payment for PFI projects, attention should be paid in doing them right to pave the way for success. Various aspects such as client's requirements; asset and service requirements, payment mechanism, performance evaluation and change mechanism should be deliberated carefully before incorporation. Potential pitfalls such as those outlined in this paper are to be avoided. It is crucial to make the output specification explicit, enforceable and flexible such that service requirements can be fulfilled in the most cost efficient manner. Hence, a best practice framework has been developed through a comprehensive study of existing templates in various specialities. Together with established guidelines published in Australia, the UK, Singapore and South Africa, etc., it is hoped that the framework can enhance the quality of output specifications for the betterment of PPP projects. In the course of developing this framework, the need to include proper change handling mechanism in output specifications has been noted and further research is necessary.

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A Ws Contextual Risk Analysis Framework: Mapping Knowledge Transfer Potential between Road and Port Public Private Partnerships

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Abstract

Public Private Partnerships (PPPs) have been used to advance the development of public infrastructure, especially, in the transport sector where cost intensive investments were/are required. Hence, there is a plethora of research findings concerning this sector, with a prime view on road infrastructure. Ports constitute an integral part of transport infrastructure and, with few exceptions, ports are governed by public port authorities, who are equally facing infrastructure development problems. However, very little is known on how PPPs are applied in this particular domain and how research findings applied to other transport infrastructure and services may be applied to ports. In order to address the identified subject, a critical comparison is made concerning risks – the most important element of PPPs - and the potential for knowledge transfer. The comparison is made using the proposed contextual risk analysis framework inspired by 6Ws risk analysis framework. Knowledge transfer is assumed feasible when risks stem from an equivalent risk structural basis. Study findings indicate the potential for the transfer of knowledge and experience on financial and environmental risks. Market and political risks have a different structural base and have limited potential for knowledge sharing. Port PPPs may benefit from the body of knowledge supporting technical risks in road PPP projects. Findings widen the risk analysis and the PPP research agenda and may be used to assist port authorities when addressing procurement issues.

Keywords: PPPs, risk analysis, knowledge transfer, road infrastructure, port infrastructure

1. Introduction

The most prominent feature of public procurement strategy during the last two decades has been the introduction of the private finance and services in sectors traditionally undertaken by the public sector. This public procurement strategy has been realized through a variety of well known contractual arrangements such as BOTs (Build-Operate -Transfer), BOOTs (Build-Own-Operate-Transfer), BOOs (Build-Own-Operate), DFBOs (Design-Finance-Build-Operate), BTOs (Build-Transfer-Operate), BLOs (Build-Lease-Operate) to name a few and characterized as "concessions" depending on the transfer of ownership during the contractual period. Since the early '90s, these contractual agreements have been considered under the umbrella of Public Private Partnerships (PPPs). As such, PPPs have received considerable attention by academia and practitioners describing the merits of the private sector's participation in the provision of services traditionally offered by the public sector. Core in this type of public procurement are the elements of co-financing and risk sharing.

Transport infrastructure is characterised by cost intensive investments and this has motivated the public sector in endorsing the scheme in view of large investments required to respond to the ever growing demand for improved and competitive transport infrastructure (cf DLA Piper, 2007; EIB, 2007). This trend has generated substantial institutional, archival and popular literature and debate concerning the political, social and economic acceptance of the scheme. The latter has been generally focused in varying forms around the issue of Value for Money (VfM) (Grimsey and Lewis, 2005; Akintoye et al., 2003; Debande, 2002). However, at its heart it remains a risk-sharing problem between two (or more) risk-averse agents, constrained by bounded rationality, stemming from the uniqueness of the undertaking and resulting in incomplete contracting (Martimort and Pouyet, 2008; Roumboutsos, 2008; Maskin and Tirole, 1999).

To this end, there is significant PPP literature on the topic of risk and risk allocation and how it impacts VfM. Published research is mostly on the topic of road PPPs as they represent roughly two thirds of PPPs in transport (Estache et al, 2007). Recently, there is growing literature on the subject of concessions (otherwise PPPs) in Ports, which does not take into account developments in mainstream transport PPP research. While, roads and ports constitute different business cases, it is important to identify similarities in project development that may form the grounds for knowledge transfer with mutual benefits.

The present paper takes an initial step in bridging this gap. Knowledge transfer is focused on the fundamental element of risks in PPPs. To this end, the paper makes an important contribution in proposing a Contextual Risk Analysis Methodology, as presented in section 2. Risks are systematically presented for ports and roads based on the proposed methodology (section 3) and identified differences and similarities of respective risks and their impact are discussed (section 4). Conclusions are drawn at the end focusing on items where transfer of knowledge and expertise may be realized.

2. A Ws contextual risk analysis framework

According to classical decision theory, risk is generally understood to be the distribution of possible outcomes, their likelihood, and their subjective values (March and Shapira, 1987). Some researchers (cf. Chapman and Ward, 2003) have proposed the term "uncertainty" (initially suggested by Knight in 1921) in order to describe the situations in which there is no historical data, where in contrast "risk" can be used in situations where success or failure is determined in probabilistic quantities by benefiting from previous available data. Risks are identified and assessed qualitatively and quantitatively by estimating the probability of occurrence and the impact on project value of the probable occurrence. Probability and impact are project specific. Risk identification is more generic and risk registers have been proposed to rationalise this task. The basic risks incurred in any transport project undertaking, although highly interconnected, may be summarized separately as follows:

1. Technical risks, such as physical conditions (e.g., soil, weather); problems during design, construction, operation, and maintenance; and natural disasters (e.g., earthquakes, flooding);

2. Market risks which may be considered as external to the project (e.g., gross domestic product, growth, inflation, market structure) and internal to the project (e.g., traffic demand, elasticity, competition from other modes or alternative routes);

3. Financial risks which may be considered external to the project (e.g., taxation currency, exchange rates, debt rating of the country), and internal (e.g., loan interest rate and payback period, grant financing, loans availability);

4. Environmental risks, related to possible changes of environmental laws, the protection of historical sites, the reaction of interest groups due to societal sensitivities about the environment; and

5. Political risks, related to country's political stability, record of government interventions and frequency of legal framework changes.

Risks vary in type and magnitude during the project life cycle. Some, like technical risks will diminish once construction is completed although construction features will have significant impact on all other groups of risks noted above. Market risks materialise during the operational life of the project, their severity depends on the scale of investment and the share of sunk costs involved. Financial risks are highest during project construction and remain during the operational life and the two former risk groups, i.e. technical and market, may enhance their potential impact. Environmental risks demonstrate during the initial project period and then again (if not properly addressed during design) at the end of the project life cycle. However, changing (more severe) environmental legislation may have significant impacts on operational and maintenance costs, especially if not timely foreseen. Finally, political risks are greater at the initiation phase and, to a large extent, country specific.

The above general risk categorisation is not exhaustive. For example it does not refer to risks stemming from the contractual agreement and possible partner asymmetries in information and power. It focuses only on the project per se. This categorisation of risks constitutes the object of analysis in the present study for the case of road and port PPPs.

Risks are analysed within a "context". The present study, inspired by the 6Ws framework introduced by Chapman and Ward (2003), proposes the extended Ws contextual risk framework of figure 1, where the basic structural elements of a PPP project are presented. In addition, as the transport sector is greatly influenced by the macroeconomic environment, this is also represented as the "Whole". Each risk group is analysed with respect to these structural elements. It is assumed that risks influenced or originating from the same structural elements present the potential for transfer of knowledge and research findings. This methodology is applied in the following sections.

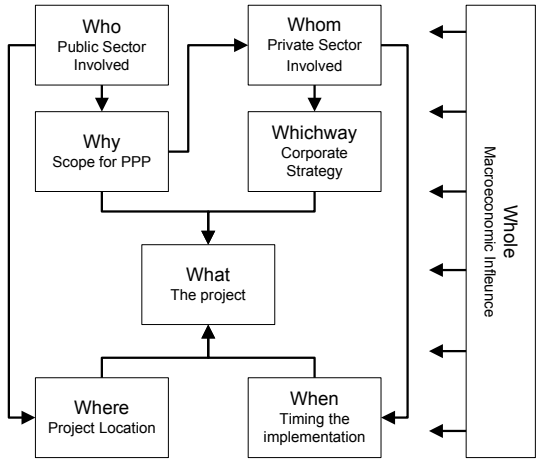

Figure 1: Contextual Ws Risk Analysis Framework

3. Contextual risks in port and road PPP projects

As a first step in mapping risks in port and road projects, it is important to identify the "public party" involved, the range of activities contracted, the scope of concessioning and the core business of the concessioner, i.e. the "who", "what", "why" and to "whom". This identification sets the context within which risks are evaluated.

Who: Roads and motorways are directly handled by central or regional governments, who are responsible for road routing, construction, operation and maintenance. Ports are more complex activity structures and to this end, constitute independent authorities, even in the case of arms-length public authorities. The main responsibilities and functions of port authorities can be described as follows: To provide and maintain harbour facilities; To ensure safe navigation within harbour waters by providing lighting and buoys, removing wrecks and maintaining approach channels of sufficient depth through dredging; To regulate vessel movements and berthing in the harbour; To license construction works within the harbour area; To provide pilotage service and other harbour operations

such as cargo handling. Private ports are responsible to shareholders, trust ports to a range of stakeholders and municipal ports to local communities via their local councils. Port authorities, as business managers, may outsource services but in most cases will sustain the role of regulator (Baird and Valentine, 2007).

What: Road routing is one of the most important responsibilities of central and local governments and this will define its usability. In most cases, this is a demand driven activity as a government response to growing traffic levels and in others, it is derived through a strategic development land use plan and policy, in which case respective infrastructure is put in place to create demand rather than serve it. The routing of a new road or the improvement of an old one has direct impacts on local and regional economy. Recently, traffic management has become of growing importance and from a road operational perspective involves ICT applications to inform users (drivers) of travel times and road incidents and assist them in making informed decisions concerning their travel alternatives.

Port locations are specific, developed historically due to their natural positioning and one of the major issues concerned is the availability of waterfront land to serve or procure demand. Within these land constraints, service optimisation is of paramount importance and port authorities are responsible for port development strategy and competitive positioning.

In general, investments in transport projects bear multiple impacts and are designed not only to address the principal issue of demand in transportation but also weight out, minimize or improve external present and future effects on time saving, air quality, noise, safety, energy consumption, economic growth, land use and real estate development. In the particular case of port investments, these may create additional capacity, increase productivity, boost international trade and create economic growth within the port and in other sectors of the economy. Finally, while investments in roads concern, principally, infrastructure, port investments may concern infrastructure, superstructure, investments in hinterland connections (road and rail), investments by logistics companies etc. The emphasis in the first place is to serve demand while in the latter to procure demand, i.e. business development. Within this context, managerial change becomes a key issue.

Why: In road infrastructure, the bundling of the construction and operation is expected to allow the private partner to exploit synergies between the project stages leading to improved outcomes as benefits are internalised (Hart, 2003; Bennett and Iossa, 2006; Martimort and Pouyet, 2008). This is expected to reduce the overall life cycle cost of the investment, whilst providing improved services to the user.

In ports, investment in infrastructure and superstructure is considered equally important, especially as infrastructure and superstructure has to follow suite innovations in transport technology, organisation & management, policy and legislation. However, as a port constitutes a business ensemble of independent business actors, concessioning is, also, considered a tool for reform and governance (Cheon et al, 2009; Notteboom, 2007; van Niekerk, 2005).

To Whom: The "Why" as defined for road and port PPPs justifies the key qualities and experience the concessioner in each case has to present. Hence, construction companies are usually the key

players in road PPPs, while terminal operators with potential or capacity or interest in vertical (industry) integration are the likely candidates for port PPPs.

3.1 Technical risks

Technical risks are present in any construction project. These risks, in principle, include: design deficiency; application of innovative techniques/design; late design changes; material / labour availability; poor quality of workmanship resulting in workovers; unforeseen adverse geotechnical conditions; weather; land acquisition/availability; delays in project approvals and permits; change in construction legislation; archaeological findings; construction contract variation; availability of finance (cash flow) and force majeure, which ultimately result in construction delays and cost overruns, which, ultimately impact the business case.

The probability of occurrence of the above noted technical risks is related to the historical knowledge of the construction site and the ability of the directly involved parties to handle it. Notably, this is irrespective of risk allocation within the partnership, as risks are seen in relation to the type of project and its general context and therefore probability is related to "where", "what" and to "whom" the construction responsibility lies with and possibly "when".

Where: In a brownfield project, whether road or port, site conditions and design requirements are known to a great extent. A greenfield project in ports bears similar characteristics, as the general prevailing conditions are known. Greenfield road projects are subject to more and greater risks, as there may be many unknowns.

Whom: Construction companies, traditionally, undertake most of the above mentioned risks depending on the contract type. In PPP road projects, the private party willingly accepts most technical risks with the exception of those related to the public sector such as land availability/acquisition, approvals and permits, changes in legislation and archaeological findings. There is evidence that the public sector accepts these risks as so (Roumboutsos and Anagnostopoulos, 2008; Li et al., 2005).

Contrary to road PPPs, port PPPs usually involve terminal operators whose core business is not construction. In this case, additional risks stem from the construction procurement decision (contract type: Design Bid Build, Design Build etc) and the ability of the "owner" (i.e. the concessioner) to oversee and manage the contract as an international assignment (WB Port Reform Toolkit, 2007).

What: While technical risks seem to be rather manageable, the construct itself defines the level of future uncertainties, as it involves sunk costs to be retrieved. One of the described merits of PPPs is the bundling of the construction and operation (Roumboutsos, 2008; 2009; Hart, 2003), as it is estimated that the private party will make "productive" investments for their benefits to be internalised during the operation and maintenance stage. This is the case when constructor and operator coincide, which is not the case in port PPPs and road PPPs in countries where a secondary market has developed. Finally, it is important to note that port PPPs may contain an infrastructure and

a significant superstructure part and most of the above risks concern infrastructure. Superstructure involves cranes, pipes, terminals, sheds etc. and is not characterized by sunk costs, has a significantly smaller operational life and is transferable.

When: In order to reduce or off-set the risk of investment, there is a trend in designing the project as a number of consecutive stages where the timing of each stage is valued as a real option. Recently, the "nature" of real options has been categorized as real options "on" and "in" projects. Real options "on" projects are mostly concerned with the valuation of investment opportunities, while real options "in" projects are mostly concerned with design flexibility (Wang and de Neufville, 2005). In ports, real options are viewed as "on" projects (example Meersman, 2005), while in other civil infrastructures the interest is "in" projects where they are combined with risk flexibility theory (Chiara and Garvin, 2008) and can be addressed effectively when constructor and operator interests coincide.

In all cases, the materialisation of technical risks will have important ramifications on financial risks and usually to this end, in construction, a budget is allocated to address such risks, while the presence of the "Independent Engineer" assures proper project completion. Force majeure risks are insured according to international construction law.

3.2 Market risks

Market risks may equally be considered as revenue or investment risks and these are dependent on the size of investment (as indicated in section 3.1) and reflect the uncertainty in predicted traffic volumes/transport demand and the willingness of users to pay for services rendered. When considering the long payback period required and the fact that traffic volumes/transport demand are correlated to regional and international market structure, economic growth and land-use patterns then addressing the investment risk becomes crucial. Hence, related to this risk is whether "who" or "whom" or both are responsible for demand predictions.

In road projects, as their strategic planning is left with central or regional governments – ***who***-, the investment decision and pay-back model are based on forecasted demand. Forecasts are a source of severe uncertainty which is attributed to structural model design assumptions and input data – technical uncertainties - (Niles and Nelson, 2001; Trujillo et al, 2002; Flyvbjerg et al, 2005) and strategic or optimism bias which is facilitated by technical uncertainties (Estache and Strong, 2000; Guasch, 2004; Flyvbjerg et al, 2005). Hence, in many cases the "best case scenario" is introduced as the "base scenario", neglecting that, moreover, traffic volumes are very sensitive to income and economic growth, i.e. macroeconomic conditions (Estache et al, 2007).

In any case, the magnitude of risks is dependent on the form of repayment and the financial structure of the investment. Toll roads are the riskiest as they not only depend on users' willingness to pay but also on the respective feeling of fairness (Fujii et al, 2004). Availability fees or shadow tolls reduce risk for the private party, as the public sector secures respective revenue, but not for the overall investment. Along the same lines, connecting the contractual period with an agreed ROE extends the

contract life ensuring expected returns but does not secure against financial risks (cash flow risks and ability to serve debt).

Equally, if not more, affected by macroeconomic conditions are ports, as, in contrast to roads usually positioned as natural monopolies, they may be faced with inter-port and intra-port competition or be suffering the results of aggressive strategies during the tendering stage. More specifically, as port concessioners' core business is, usually, port or freight transport related, their strategic interest in entry may lead to PPP agreements that are only feasible under positive macroeconomic scenarios and/or off-set by the strategic importance of securing port availability (example container port terminals). Ports are an exemplary case where market risks are in whole born by the concessioner – ***whom***-, who is responsible for port business development using valuable port land in exchange for services and fees (flat and per unit of cargo handled). The public sector's (port authority-***who***-), principal intervention lies in trying to set the inter- and intra- port competition by defining at the tendering/bidding stage the relation between flat rate and fees per unit of cargo handled (Pallis et al, 2008). However, under unfavourable macroeconomic conditions, both the concessioner's core business and the port concession-investment suffer loses, as in the case of the current credit crunch.

3.3 Financial risks

Financial risks are characterised as external to the project (e.g., taxation currency, exchange rates, debt rating of the country) related to "***where***" (country) the project is implemented, and internal (e.g., loan interest rate and payback period, grant financing, loans availability) related to "***whom***" the loan is provided. The "***what***" of the investment - and contrary to conventional wisdom – is of little importance. Blanc-Brude and Strange (2007) showed that, at the portfolio level, PPP lenders appear to price only "systematic" risks while managing other risks at the project level through contracts and project design. The cost of PPP debt is thus determined only by systematic risks, such as future market demand for a service, while project finance structures effectively shift or diversify most project-level, idiosyncratic risks, such as the risk of construction cost overruns or delays.

Hence, these risks while complex do not present significant differences when addressing ports and roads. What may present a difference is the share of the loan in the overall financial structure, its sources and its absolute value. In this aspect, road PPPs may be slightly more risky as, according to the WB database the average project size of ports was USD 105 million compared to roughly USD 180 million of road projects during the period 1990-2005 (Estache et al, 2007). Finally, financial risks are influenced by market risks, political risks and the macroeconomic environment.

3.4 Environmental risks

Environmental competent project design and impact studies are the norm in securing a project against this category of risks and a prerequisite in obtaining the respective approvals and permits. However, growing environmental concerns increase the risks of new environmental legislation which may influence operation and maintenance. Therefore, environmental risks may be seen as related to

"***what***" and the more complex the operation the greater the risks. In this aspect, ports are more exposed to environmental risks than road projects due to the complexity of their activities, the potential range of threats to the environment – related to ***where*** **-**, the multiple actors involved and the impact of developing legislation (***whole***).

3.5 Political risks

Political risks concern government or local stakeholder actions –***where***- that affect the ability to generate earnings. These may refer to actions terminating the agreement, imposing taxes or regulations which severely reduce the value to investors; restrictions of the ability to collect tariffs etc. In many cases these could be either the result of macroeconomic influence on political stability (example the effect of the credit crunch on many governments) or the resistance to change. Any project undertaking brings about change; the greater the change – the greater the resistance. In these terms the "***what***" and the "***why***" as described in earlier in this section take on significance.

4. Indentifying differences and similarities

The analysis of section 3 is summarised in table 1. As proposed in the methodology (section 2) risks are presented with respect to structural Ws they are related to. Risks are also qualitatively presented by the importance these Ws may have on risk probability, as analysed in section 3. The table is illustrative, developed based on estimates and may be further improved.

Table 1: Risk analysis summary table

Risks	*Technical Risks*		*Market Risks*		*Financial Risks*		*Environ. Risks*		*Political Risks*	
Ws	*Road*	*Port*	*Road*	*Port*	*Road*	*Port*	*Road*	*Port*	*Road*	*Port*
Who			+++	++						
Whom	+	+++		+	+	+				
Where	++	+		++	+	+	+	+	++	+++
When	+	+								
Why				++						+++
What	++	+			++	+	+	+++	+	++
Whole			+	++	++	++	+	+		

The comparative study of the table identifies the following similarities and differences:

- Financial and Environmental risks present the required similarities, which may enable the transfer of research findings,

- Technical Risks exhibit major similarities and but include qualitative differences. The major difference is sited in the core business of the concessioner. This presents an additional interest in transferring knowledge from road to port, and, finally,

- Political and Market risks present structural differences as different Ws are related to these risks. Hence, the transfer of knowledge and experience is not facilitated.

5. Conclusions

Knowledge transfer between disciplines and sectors is important in promoting research as transferred experience creates mutual benefit and produces added value. The present study focuses on the potential to transfer knowledge on the subject of risks from road, where a considerable body of knowledge has been generated, to port PPPs, where the subject is only recently being addressed. To this end, a methodology, based on the 6Ws framework for risk analysis, was devised to systematically compare the structural origins of risks in roads and ports. The proposed Ws Contextual Risk Analysis Framework may have wider applications than the current study.

Findings indicated that there are grounds for knowledge transfer for financial and environmental risks, while the port sector may gain considerably by developments concerning technical risks in road PPP projects. Market and political risks stem from a different risk structural basis and knowledge transfer is not supported.

These findings may assist port authorities when addressing PPP procurement and development. In addition, the Ws Contextual Risk Analysis Framework presented may be used by public and private authorities and risk analysis experts to systematically study risk in any PPP undertaking.

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Public-Private Partnership
Recipe for a Financial Disaster?

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Abstract

Public-Private Partnership (PPP) is not a new joint venture of the era; where the Government endeavours to increase private sector involvement in the delivery of public services in a more effective and efficient manner. The expertise and resources of both the public and private sectors are augmented to provide services to the public at the best value for money over the tenure of the partnership. No matter what PPP model is being implemented, the partnership is not without problems or commercial risks; not only for the public or private sector, but even the investors and funders are not spared the dire consequences when things can, and do, turn out horribly wrong. This Paper evaluates the rudiments of some basic principles and objectives, the PPP Process and the Procurement Method, and presents some of the roles and responsibilities, risks and liabilities of the various PPP Parties and Stakeholders, and highlights the salient and pertinent areas where obvious risks and danger signposts are oftentimes ignored or brushed aside when parties seem so keen to tread on this minefield. A sampling of a couple of projects both in UK and overseas will illustrate the stark reality of how key players can get their fingers horribly burnt by such PPP Projects when lessons are not learnt.

Keywords: basic PPP principles, PPP models, roles and responsibilities, risks and liabilities, risks allocation

1. Introduction

"Behind every success story is a litany of failure" – so the maxim goes. One often fails to realise that behind every successful story there is at least twice the number of failures that you don't often hear much about. This paper does not intend to overly extol on the many success stories in relation to Public-Private Partnership (PPP) ventures, since the print, electronic and public media are replete with such glossy coverage; but will instead focus on the dismal background on why so many PPP ventures have failed and blundered when things go horribly wrong, despite the many success stories that ought to provide the impetus for such enterprises.

PPP is not a new joint venture of the era; where the Government endeavours to increase private sector involvement in the delivery of public services in a more effective and efficient manner. The expertise and resources of both the public and private sectors are augmented to provide services to the public at the best value for money over the tenure of the partnership. With promises of profits and dividends aplenty, the diverse advantages and usefulness of PPP, adopted worldwide in the UK, Continental Europe and throughout the world, as a popular procurement method for government projects like power stations, health and educational institutions, toll roads, water and waste management facilities, sports and recreational facilities, etcetera, need not be over emphasised. Such approach to finance these major public infrastructure improvements continues to grow unabated, and has been expanding exponentially particularly in third world and developing countries which are in dire need to improve their desperately deteriorating public services amidst a lack of funds to finance them.

2. PPP basic principles

The PPP principle is fundamentally simple: the private sector provides services that had previously been monopolised by the public sector, and is recompensed not as in the conventional model by a stage payment system like a contractor, but on the basis of a payment scheme to a Special Purpose Vehicle (SPV) formed by the contractor with other investor and funders, as the service is being used. The SPV bid takes into account the whole-of-life cost of the asset, repairs and maintenance, operating costs, costs of the services provided, and the cost of private finance. These SPVs are financed by banks, financing institutions and equity investors, contractor shareholders to the consortium. The value of the project to the equity investor is determined by the expectant performance of the project over its whole life span, resulting in positive returns on investment for the SPV. Joint venture agreements are executed between the Design & Build Contractor, Facilities Management or Service Operation Companies, and other contractors to deliver outputs specified in the project. The public starts paying when the asset becomes operational, or by the government taking on debt for bond issuance to fulfill its share of funding. The resultant revenue is derived from the project in terms of profits, interests and dividends, thus making PPP an aggressive and attractive genre of project finance model. The allure of such deals is supposedly that, governments need not have to come up with the entire up-front funding for a project. As for the fact that they won't control

the project, the government is supposed to regard this restriction as “freedom from risk” if anything goes wrong.

The crucial feature of the PPP model that distinguishes it from the more general forms of business partnership is its focus on the allocation of risk between the public and private sectors. Risks are hypothetically identified and their extrapolated occurrence and likely consequences expressly stipulated in the agreements, so as to ensure its viability and sustainability over the project duration; as well as to distribute responsibilities and bearing of risks by the party best able to manage them. Such risk transfer is the key to making PPPs work, because such risk management makes the offer to the public sector value for their money. The private sector subsumes the risk by investing their money and take on the construction risk, the development risk, the operational life cycle risk, *et al.* Put simply, the public sector transfers the risk of completing the project on time and to budget to the private sector, and the latter will receive no payment until the project is operational. To the private sector, the payment received must be adequate to maintain and operate the facilities, with surplus to cover the interests, dividends, profits, expenses and costs.

By transferring the risks to the private sector, it allows ownership of the project, and the associated debt, to be transferred off the books of the public sector. However, the cosmetic benefits of reducing measured debt do not change the fact that, eventually, the public must pay both the cost of the project and the high rates of return demanded by equity investors. The stark reality is that the private sector, when it gets into these projects, expects to make a reasonable return on its capital. Irrespective of how the contract is initially financed, the cost of services is ultimately met by taxation. The illusory effect, however, makes it possible to present such projects as providing infrastructure at zero cost to the government.

2.1 PPP pitfalls

So far, that’s the academic rhetoric: in real life the consequences can turn out to be a horrific nightmare to both the public and private sectors alike, with tax payers ultimately taking the tab. Insidiously, PPPs can undermine government sovereignty. When anything goes wrong, the revenue stream is low, the debt remains unpaid, or the construction work is defective, abounding with design deficiencies; then the fallback is to dump the whole mess, lock stock barrel, back into the government’s lap. Governments are being bilked repeatedly in such broad daylight swindles and scandals when PPPs go terribly wrong.

The vilest bane that plights PPP is always about finance. Bank loans and bond issuance to raise upfront cash to cover construction costs, are repaid only over the life of the concession as unitary charges in return for the use of the facilities. Throughout 2008, bank lending became more scarce and expensive in such volatile markets, in the light of the recent credit crunch and dodgy US sub prime mortgages. Ultimately, the high cost of borrowing is passed to the public sector.

PPP has also gained a dubious reputation for shoddy workmanship at the expense of minimising costs and maximising profit. Schools are replicated with bland architecture, hospitals built with poor quality cement so that operating theatres leak, and IT projects that completely fail to deliver, in spite of the control or supervision of an independent audit body to review the use of materials, quality of design. This is not to mention the cost of service provision to the public. What used to be free or subsidised public services to the less privileged, poor and elderly are now chargeable by these privatised services whose ultimate aim is to make the maximum profit.

PPP projects have been known to become surplus to requirements, leaving the government with huge bills for services they no longer need. PPP schools close because of a lack of enrolment. On the sociological front is the question of employment transfer and working conditions in relation to PPP profit orientated contractors and their wage structures for the employees in comparison with the public sector vis-à-vis the profitability of the PPP enterprise. Government failure through corruption, expropriation, excess bureaucracy and general incompetence is another exacerbating factor contributing to PPP debacles.

3. Case studies

3.1 UK infrastructure and public services

As a pioneer country in the adoption of PPPs, through the British government's continued support for PFI/PPP building programme, the UK has between 10% to 12% of the government's total infrastructure investments through PPPs. Following the collapse in bank lending to PFI/PPP projects, the government was compelled to committing taxpayers to a bill of more than £217bn worth of repayments between now and 2033/34 on just £64bn of PFI/PPP projects. This only proves the fundamental irony that PFI/PPP is supposed to give public infrastructure development programmes more rigor and strength, but has in fact exposed them to greater financial pitfalls and tainting by private failure.

Channel Tunnel – When the world's most successful investor, Warren Buffett, said, "if you overpay for an asset, there ain't no cure", he might have had the Eurotunnel in mind. In 1991, after almost 15 years of decision-making process of studies, financial forecasts, feasibility analysis, and debates, the British Government decided to implement the Channel Tunnel Rail Link (CTRL) Project to connect Central London with the Channel Tunnel as a 50-year concession PPP, with a budget cost of £5bn. It eventually cost £10bn.

From the word go, the project was blighted by delays and a rapid escalation of costs, major technical and financial difficulties. Financial distress forced some of the private partners to withdraw. The deal was restructured twice, with the government guaranteeing most of the construction loans and agreeing to lend more money as needed during the operational phase. The commercial risk that was meant to be subsumed by private firms ended up in the government's hand using tax payer's money. By the time Eurotunnel opened, it was one year

behind schedule, losing more than 6 months of revenue as a result, and £2bn over budget. Before the first passenger car had boarded, the original business plan was already in tatters. To make matters worse, the company's rose-tinted projections of demand for Eurostar, optimistically at 21 million passengers annually, turned out to be embarrassingly aggressive, to less than a third of that. Commuters anticipated to switch from using ferry to rail remained loyal to the company P&O Ferries, lured by improved and better ships and lower prices, with on-board duty-free shopping thrown in for good measure. Financial obligations, heavy losses and spiralling debts snowballed to more than £6.5bn, causing Eurotunnel to be unable to meet even its £700m annual interest bills, much less repay capital and returns to its shareholders.

London Underground Limited (LUL) – In 1998, the British government resorted to a 30-year complex PPP matrix worth over £15.7bn awarded to three infrastructure companies responsible for the maintenance and renewal of London Underground assets including its rolling stock, tracks, tunnels and signals, ostensibly as a clever means of funding improvements in the ailing transport network on a 'mortgage basis' that avoids up front capital from the Treasury, and requiring only an annual servicing cost. Essentially capital expenditure is converted into an inevitable recurring operating expenditure. Since its launch, this PPP procurement strategy has been shrouded in controversy that has been openly debated on the public stage most noticeably between the Government and London's Mayor. The government's belief that the private sector is better and their persistence on PPP as a means of financing the tube, eventually cost the British taxpayers more than £2bn after companies like Metronet eventually went bust. Balfour Beatty Capital lost its entire investment in the Metronet concession.

Ruth Sunderland, Business Editor of *The Observer*, commented on 10 Feb 2008, that "the bailout of collapsed Metronet, exposes the utter fiction that PPP and PFI Projects transfer risk and debt away from the public sector". Opponents assert that PPP is 'fatally flawed' and could ultimately result in the risk of horrors that occurred with the LUL privatisation, and advised that such infrastructure should remain in the public sector and financed through the issue of a bond and utilising private sector management skills to deliver the much sought after efficiencies. The consequential and detrimental financial impact as well as logistical costs following Metronet's collapse included job losses, pension cuts or forced transfers. In assessing what went wrong with the collapse of the PPP, the National Audit Office (NAO) cited reasons like competition from the buses affecting revenue; lack of feeder services, park and ride facilities to promote rail ridership; non-standardised design of systems, vehicles and construction methods leading to increased costs; excessive and unnecessary utility costs, etc..

National Physical Laboratory (NPL) – The construction of NPL by John Laing, a 150-year old business institution, was plagued by its failure and difficulties in achieving the specification, and delayed realisation of benefits required for the project. Costly mitigating actions were taken to protect the pristine quality of the scientific research conducted in the existing facilities. Eventually, DTI and SPV Laser agreed to terminate the PFI contract. John Laing Construction Ltd, the subsidiary of John Laing, buckling under the prohibitive costs of rectifying all the design deficiencies, and after suffering massive losses, compounded by the failed Millennium Stadium project in Cardiff which cost the company another £26m in losses,

sold the entire company to an Irish contractor O'Rourke for a mere £1. The total loss suffered by the private sector under this PPP was reported at approximately £101m in equity loss, bank repayments and liquidated damages combined. The new NPL was eventually built after 7 years late and at twice its proposed costs.

Norwich. A study by the University of East Anglia focusing on the funding of PFI financed hospitals, like the Norfolk and Norwich University Hospital, one of the earliest and most controversial hospital, revealed that the PFI hospital is costing nearly £20m a year too much to operate, and would save taxpayers £217m if they are bought out, instead of providing massive excessive profit to the private sector.

Scotland. In October 2009, two PFI schemes went bust. The sponsors of New Schools Cornwall and Realm, which runs the Defence Animal Centre in Leicestershire, were placed into administration. Both schemes had to be retendered at the expense of additional costs to the public bodies. The NHS Wandsworth Trust also had to pay more than £10m a year until 2034 to private company Catalyst healthcare for a new hospital. It is costing the company £73.5m to build and run, but taxpayers will pay £340m over the lifetime of the project. Local campaigners say it would have been more cost effective to refurbish the existing Bolingbroke site.

A recent study has concluded that support services provided by PFI hospitals are more costly and at a lower quality than those provided by non-PFI hospitals. The research compared the cost and quality of security services; linen and laundry services; portering and cleaning services in the first wave of PFI hospitals and non-PFI hospitals, and showed that all four services were cheaper and of better quality in non-PFI hospitals. In the spring of 2008, proposals by health chiefs in Glasgow that the £842m new adult and children's hospitals are being built using traditional procurement were widely welcomed across Scotland, in the confidence that public funding will be better value and more cost effective in the long term for the public purse, rather than going down the dubious PFI/PPP route, thus removing the inevitable spectre of privatisation that follows the PFI/PPP regime.

Even NHS Lothian's plans for Edinburgh's new Sick Kids hospital, the new South Glasgow Hospital and the children's hospital relocation from Yorkhill, along with the upgraded maternity hospital and other huge and modern healthcare campuses are being tabled to reject using PPP procurement route, to avoid turning off public generosity and goodwill towards any fund raising campaigns for the Sick Kids. A NHS spokesman said, "I am confident that PPP will wither on the vine, as unlamented as it was unloved".

3.2 Other regions

Hungary. In 1991, the debt ridden government allowed private sector involvement in motorway financing, construction and operation. By 1999, due to low traffic and dismal revenues, auto owners organisations' litigation on the high toll rate, etc., the concession company was unable to meet its debt payments, and the concession company was taken over by

the Hungarian government. Smitten by the earlier failed PPPs, other motorway projects proposed as PPPs between 1993 and 1995, were beset by environmental and other issues, never reached closure, or were found not economically or financially viable.

Australia. The Cross City Tunnel in Sydney, built and run by a PPP venture on a 40-year lease, has been the most controversial infrastructure project in the world. It went bankrupt after 16 months of operation with debts of A$687m. The consortium expected 90,000 drivers to use the tunnel every day but only 30,000 were prepared to pay the toll. Then the high tolls were reinforced by government closures of alternative routes, designed to force motorists onto the tollway. In the ensuing scandal, these routes have been reopened. In response, the tunnel operator demanded millions in dollars of government compensation for its lowered toll revenue.

In Queensland, with population growth generating increasing requirements for infrastructure investment, the Queensland government has yet to find any significant project where the benefits of PPP-style private sector risk management will offset the higher cost of equity capital. Queensland has done well to hold the line on demanding such value for money ventures despite an enthusiastic push from the finance industry and sections of the bureaucracy, keen to embrace PPPs in pursuit of their own agenda.

In the state of Victoria, where some 16 PPP projects have been undertaken over the past decade, a scandal erupted over a newly released national parliamentary report critical of PPPs, when it was revealed that 30 pages had been secretly deleted to make it less damning. The suppressed pages showed that the pattern in Victoria is that the big PPP projects have been over-budget, completed late, and done without proper scrutiny. The deleted pages warned of the increasing state debt arising from PPPs, and that the Victoria government was paying dearly for transferring project risks to the private sector, when "experience has shown large components of this risk have reverted back to the Government anyway".

And in the case of Melbourne's Spencer Street Station, when the private PPP parties threatened to walk away the Victorian State Government rearranged the project and pumped in millions of dollars of taxpayers' money in order to keep the station open.

United States of America. After selling public national assets such as roads, prisons and schools, law makers are often not well equipped to handle a breakdown crisis, and are vulnerable to the PPP pitch, that "private sourcing is the only way you can get the funds to have your infrastructure and keep your government functions going". For example, a security company was stripped of a contract to run prisons in Texas and Louisiana due to their mistreatment of prisoners, and trying to maximise profits at the expense of drug rehabilitation, counselling and literacy programmes.

Latin America. In Colombia, the government has paid large sums in cost overruns and traffic guarantees. In Argentina, the main problem has been that concessions were expensive for the government and for the highway users. Repeated renegotiations favouring concessionaires ultimately resulted in the detriment of users and taxpayers.

Mexico. As the first country in Latin America to experiment with highway privatisation programme with an investment value of some US$13bn after much pomp and fanfare, Mexico was quickly subjected to the highway robbery treatment. In the 1990s, the government had to inject US$13bn bailout fund to re-nationalise 23 private highways and two bridges from over 20 concessions which were going belly up. Equity holders lost about US$3bn. The government was under direct pressure from banks which want their debts served and from companies which are losing money.

Undoubtedly, the Mexican government has learnt from this painful experience, and now corrects the error by operating road infrastructure using a traditional model with cost recovery based on user fees, and a model used in the case of toll free roads or other projects in the health, education and transport sectors, and corresponds to availability contracts, in which the government pays partly on asset availability and partly on the basis of shadow tolls.

India. Despite attractive synergies in pooling together the capital deploying and risk-bearing capacities of the public and private sectors to expedite the much needed infrastructure development, not very many PPP projects have actually gotten off the ground. The reason is a reflection of how distant India's policy planners and file moving government officers remain from ground zero realities. With much fanfare, the Government of India mooted the Karnataka State Highway Network Development Strategy, a mega PPP venture of national highways and road network totalling some 210,000km, with roadside amenities as a source of ancillary revenue for the SPVs. 30 companies expressed interest in the pre-bid meeting. By October 2009, not a single company indicated an intention to take up the bid for the PPP development of the state highways and major district roads.

Poor global economic recession aside, reasons for such aversion and lack of interests ranged from corruption, lack of clarity on land acquisition policies, planning authority and rights on land adjoining the road, unprofitability of potential revenue (village roads) to the over-fragmentation of the more than 50 odd packages in this exercise.

4. Empirical survey

From a global survey conducted by Standard & Poor's (London) in 2006, involving 300 plus professional from 22 countries, mainly in Europe, USA, Canada, Latin America, Africa and the Asia-Pacific region, in a widely publicised construction risk research, respondents were asked to draw from their PPP related experience and to list the main reasons behind the more common problems encountered with construction budgets and schedules. The most commonly reported responses are summarised in *Table 1*.

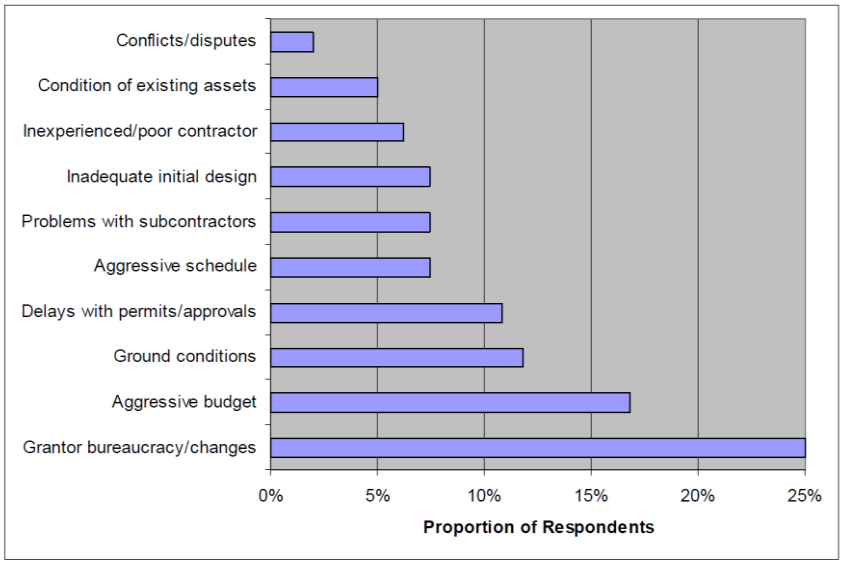

Table 1. Main Reasons for Construction Budget / Schedule Problems

It was observed that many such problems were attributed to the public sector, and that their encounters were not restricted to countries new to PPPs, but rather those that purportedly do possess the experience, technical skills, or resources to manage the public-sector obligations associated with long-term, active partnership with private sector providers. A clear notion was the adversarial faction with explicit or implicit political agenda, which was averse to the concept of private sector participation of public sector services.

There were many recurring factors in which the public sector had frustrated the construction of PPP projects. For example, management style was based on conventional design and build contracts, including using amended design and build contracts, in an adversarial, 'them-and-us' acrimonious environment of mistrust and resistance. This was compounded by the laggardness to define a clear output specification, to facilitate enabling works, to secure land, or to grant permits or approvals expeditiously. Expectations of who is responsible for what, and what has to be delivered (by when) failed to synchronise with the private sector's understanding. Crucial streamlined, transparent procedures for day-today liaison with its private-sector partners were wanting; bureaucracy and red-tape were slow and resistant, and projects were dogged by extended negotiation periods and delays in achieving signoff. There were glaring deficiencies in the client's project supervision and control procedures.

5. The way forward

Bringing back public ownership and shifting towards design and build contracts, without the finance and operation of PFI/PPP regime, can alleviate the need for private financing and obliviate the privatisation and fragmentation of support services. Diverse advantages in a publicly run and funded set of such building programmes include greater transparency and simplicity, more flexibility and better design, whilst eliminating excessive profiteering. In terms of funding, PPPs can never truly deliver value for money since private firms borrow at a higher

cost than the government, with higher interest rates. The government can always borrow more cheaply than the private sector and it will always be cheaper to borrow against the tax base or rating base than to borrow with security over a particular asset. Despite PPPs' greater efficiency and cost savings from the much more proficient private sector innovation and experience, that does not justify the more prevailing need to revamp the civil service sector to improve their performance so as to better serve the needs of the public interest.

Shifting of appropriate risks is possible by using a form of "alliance" agreement, where parties can share ownership of the risks. Some risks are allocated at the outset of the project while those less likely to occur are addressed on a shared basis when and if they arise with any cost savings or cost overruns allocated between parties. Setting up a guarantee fund is one cog in the wheel that can shield the private partner from unforeseeable risks. Efficiency incentives can also be incorporated. What is important is to identify such advantageous components of PPPs and to construct a model that selects the best and avoids the inappropriate. Call it by any other name, but whatever it is called, let it be on viable terms that suit the situation, driven by the need for better and more efficient service delivery.

Attention to probity issues, an important factor in PPPs, as demonstrated in cases such as *Hughes Aircraft Systems v Airservices Australia*[1] and *Cubic Transportation Systems Inc v State of New South Wales*[2], highlights the need for the public sector to review the manner in which they carry out procurement processes. Probity is broadly defined as the "evidence of ethical behavior in a particular process which contributes to the sound procurement processes that accord equal opportunities to all participants". Fairness and integrity of process is at the core of probity. Increasingly, the media and the public have lobbied that the governments "address the public mistrust of private involvement in the provision of public infrastructure and services". Accordingly, the process of probity has not only been elevated in importance, but has also been expanded in an attempt to deal with the demands of fairness, equality, impartiality and transparency, by developing a probity plan early in the procurement cycle to ensure a level playing field, and that probity principles underpinning the procurement process are observed from the outset.

Persistent effort in legislative reforms to curb corruption in PPP procurement is another crucial priority. Challenges remain, where improvements need to be incorporated in the establishing of comprehensive statutory regulations and frameworks, strengthening of institutions, standardising of practices, conduct and procedures; and stalwartly implementing these rules strictly and uniformly, with the concerted objective of ensuring transparent and integrity in procurement processes. These tangible measures will in turn restore trust for all participants in this global economy, and attract bidders and assure truly competitive and favourable outcomes for the infrastructure development, instead of frightening off *bona fide* stakeholders spooked by the getting of their fingers burnt, yet again.

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[1] (1997) 76 FCR 151
[2] [2002] NSWSC 656 (Unreported, Adams J, 26 July 2002)

6. Conclusion

Despite all these bad experiences, industry experts believe the rising trend in using PPP as a major policy instrument will continue globally for many years to come.

PPPs have been a slow, long and wasteful experiment, and have now descended into a pathetic farce, producing only very poor results in terms of design, cost control and manageability, and proven to not even being able to fiancé itself. Governments should look forward, instead, to a return to more convenient and conventional public procurement, a more traditional public funded framework, a more efficient, more flexible and ultimately more valuable way of building infrastructure and public facilities that every taxpaying citizen deserves.

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The Application of the Life-Cycle Costing Technique on UK PPP/PFI Education Projects: Theory versus Practice

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Abstract

With the advent of PPP/PFI projects one of the most substantial barriers to the implementation of the life-cycle costing (LCC) technique in the UK construction industry, the separation of capital and operational expenditure, has been diminished. However, despite considerable academic and governmental advocacy and the publication of a new international standard for LCC (ISO 15686-5), the technique is still criticised for being *inter alia* complicated and expensive to implement, overly reliant on diffuse data and inherently imprecise. Consequently, there is considerable interest in understanding to what extent, per the recommendations of both theory and the new standard, LCC is actually being practiced on UK PPP/PFI projects. A review of pertinent literature was undertaken together with an investigation concerning the contractual arrangements of a facilities management (FM) partner on a number of PPP/PFI education projects in order to understand the appropriateness and effectiveness of any conducted LCC analyses relative to defined theory and the standard. Further, risk and sustainability, concepts traditionally associated with the approach, were examined within an LCC context. The investigation revealed that due to tender requirements only major maintenance and replacement costs associated with a small number of cost significant items were analysed and that this activity, which eschewed discounted cash flows in favour of index-linked present costs, was conducted in isolation by a single PPP/PFI consortium member (the FM provider). In effect, this was not an LCC study. Consideration of theoretical LCC requirements during the operational phase was similarly sparse, in part hindered by the lack of LCC analysis during the preceding stages. Further, risk and uncertainty were not given formal treatment, sustainability issues were not addressed and ISO 15686-5 did not feature in any of the analyses conducted. Current LCC practice would appear to have some way to go in order to realise its full potential. To supplement the standard, LCC implementation should be enforced contractually or by regulation, issues relating to data must be addressed, implementation must move beyond a single project partner and take on a project life-cycle perspective, and risk and sustainability should be more comprehensively featured in the application of the technique.

Keywords: life-cycle costing, whole life costing, PPP/PFI, facilities management, risk, sustainability

1. Introduction

This paper will consider the application of life-cycle costing (LCC) within the context of UK PPP/PFI education projects in an attempt to discover to what extent the technique is applied per theoretical guidelines and the recently issued international standard (ISO 15686-5). LCC will be defined as a term before a brief outline of its historical application is provided. Barriers to the implementation of LCC within the construction industry will then be summarised together with the major features of the standardised methodology. The paper concludes with a discussion relating to the application of the technique based on a number of PPP/PFI education contracts and makes recommendations to enable more widespread usage and for further research.

2. Definition and brief history of LCC

LCC has been defined by a number of sources (Flanagan *et al.*, 1987; Dale, 1993; Fuller & Petersen, 1995). An early and robust characterisation is provided by Dell'Isola & Kirk (1981) who define LCC as "an economic assessment of competing design alternatives, considering all significant costs of ownership over the economic life of each alternative, expressed in terms of equivalent dollars". Such an analysis may include costs associated with construction, operation and maintenance (O&M), and disposal/demolition and typically features the use of discounted cash flows to enable meaningful financial comparisons to be made. Although LCC can be used to estimate future costs and for cost benchmarking purposes (BSI, 2008), it is primarily a technique to determine the best available option. Attention has been drawn to the contribution that LCC analyses can make to the sustainability agenda through promoting efficient use of construction materials and reductions in waste and operational energy consumption (Clift & Bourke, 1999; Bogenstätter, 2000) while the inherent uncertainty associated with forecasting requires LCC to interface with the discipline of risk management (Cole & Sterner, 2000).

The term whole life costing (WLC) has in the past been used interchangeably with LCC; El-Haram *et al.* (2002) describe WLC as a technique for determining both the direct and indirect financial costs resulting from the design, construction, operational management and disposal of a building throughout its entire service life. The Office of Government Commence (2007) describes the concept in similar terms, again emphasising the total cost of ownership.

The origins of LCC can be traced to improvements in procurement practice implemented by the US Department of Defence during the mid-1960s (Epstein, 1996). Later, the oil crisis of the 1970s gave rise to a statutory requirement in the USA for LCC to be performed in the procurement of federal buildings (Clift & Bourke, 1999), specifically to assess and compare the benefits of alternative energy design options (Cole & Sterner, 2000). In the 1980s, attempts were made to adapt the methodology for application within the construction industry (Dell'Isola & Kirk, 1981; Flanagan & Norman, 1987; Flanagan *et al.*, 1987). In the UK, despite government support for its implementation (Latham, 1994; Egan, 1998), evidence would suggest that this effort has not been entirely successful (Clift & Bourke, 1999) and that a number of barriers exist to inhibit the widespread application of

LCC within a construction context. Interestingly, this experience has been replicated internationally in studies from Sweden (Sterner, 2000) and Canada (Larsson & Clark, 2000).

3. Barriers to the implementation of LCC

Research conducted by Clift & Bourke (1999) concluded that despite a general willingness to use WLC techniques across the 87 diverse construction industry organisations surveyed the lack of a standardised approach and availability and confidentiality issues surrounding input data acted as significant impediments to its implementation. Further, insufficient requests from clients to conduct such analyses and a lack of long-term interest in constructed assets amongst many key industry stakeholders, as a result of procurement strategies and tax implications, were also cited as inhibiting LCC uptake.

Cole & Sterner (2000), in a discussion regarding the gap between LCC theory and practice, list four principle reasons that act to prevent the general acceptance of LCC, namely:

- a lack of motivation to use the technique due to low-confidence in its treatment of uncertainty and poor awareness of the benefits that it can convey;

- contextual issues, including fixed building procurement strategies and the separation of capital and revenue budgets;

- methodological issues, including the complexity of the analysis, the lack of a standard approach and the unique nature of the construction product; and

- problems relating to data availability and consistency, and the suitability for application of this data.

El-Haram et al. (2002) also define the pertinence, reliability and consistency of data as an issue. Gluch & Baumann (2004) agree and warn of the dangers in applying historical data out of context as buildings differ by type, use and regional location. Other related issues highlighted include problems regarding the quality of both cost and performance data (Bird, 1987; Nicolini et al., 2000), that incomplete data can lead to subjective assessment (Bromilow & Pawsey, 1987; Kishk, 2004) and that there are often no processes in place that allows for cost and performance data to be captured and disseminated for the purposes of understanding and improvement (Bird, 1987; Kishk et al., 2003). Despite this Ferry & Flanagan (1991) propose that extensive historical databases are not essential to the implementation of LCC and, in areas of technological advance, can actually be misleading. Existing sources of data that do exist, such as those provided by the British Cost Information Service (BCIS), often do not determine the optimum payoff between capital and operational expenditure (Al-Hajj & Horner, 1998) and high variability in life expectations are frequently stated with little in the way of justification (Gluch & Baumann, 2004).

While the past failure of the construction industry to coalesce on a universal methodology for LCC has undoubtedly contributed to problems surrounding data (El-Haram *et al.*, 2002), the technique itself is also criticised for limiting its own application. Pelzeter (2009) notes that the manner of the LCC analysis can often determine the form of the result and the relative ranking of alternatives, while the common use of net present value to facilitate the financial comparison of competing options cannot be used to compare different life spans (Flanagan *et al.*, 1987) (although, as pointed out by Kishk *et al.* (2003), the equivalent annual cost measure can be used instead). Kishk *et al.* (2003) comment on the large investment of resource required to complete an LCC study. Flanagan *et al.* (1987) refer to the difficulty in selecting reasonable values for parameters utilised by the technique, such as the discount rate and any inflationary considerations, and the essential uncertainty in LCC application. Uncertainty is classified by Arja *et al.* (2009) in terms of either internal factors, including the effectiveness of a building maintenance regime, or external factors, consisting of *inter alia* regulatory, technological and functional advances together with social and economic changes. Even if standardisation is achieved, Cole & Sterner (2000) caution that substantial customisation of the technique is often required to suit the needs of individual organisations.

4. ISO 15686-5 – the new LCC standard

ISO 15686-5 (BSI, 2008), which forms part of the 15685 suite of standards relating to the service life planning of buildings and construction assets, was introduced in 2008 with objectives including:

- establishing a clear terminology and a common methodology for LCC, thus enabling the wider use of LCC in the construction industry;
- addressing concerns over uncertainties and risks and improving the confidence in LCC forecasting, including making assumptions more transparent and robust;
- setting out the guiding principles, instructions and definitions for different forms of LCC and reporting;
- providing guidance on when to undertake LCC, to what level and what cost headings are appropriate for consideration; and
- providing a generic menu of costs for LCC/WLC compatible with and customisable for specific national or international cost codes and data-structure conventions.

As a standard intended for international implementation, ISO 15686-5 attempts to address the lack of an authoritative methodology for LCC and a marked effort has been made to clearly define all the terminology that would be encountered when implementing the technique. In particular, a distinction has been drawn between LCC and WLC; the definition of LCC remains focused on direct economic assessment but WLC is ascribed a broader meaning that not only includes LCC as a constituent part but may also consider externalities (i.e. social, environmental and business costs and benefits), non-construction costs and income streams, depending of the scope of the analysis. It is also worth noting

that, in an attempt to further the goals of the sustainability agenda, the standard also states that consideration of applicable environmental costs should be suffused throughout LCC and WLC analyses. The relationship between WLC and LCC can be seen from figure 1.

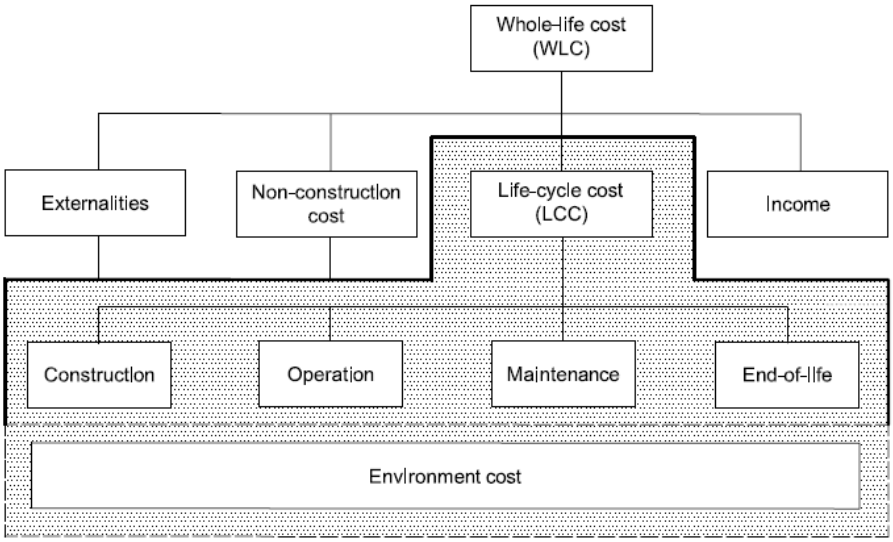

Figure 1: WLC and LCC elements (BSI, 2008)

This same elemental breakdown as shown in figure 1 provides the basis for a generic classification of costs that helps to "define the specific scope of the analysis, providing a structured basis for comparative analysis that is intended to accommodate local practices" (BSI, 2008). In this way, a framework is established that lends itself to improved cost comparisons and benchmarking.

The standard states that LCC can be implemented at four key stages in the life-cycle of any constructed asset, namely at the project investment stage, throughout design and construction, during occupation and upon disposal, and that analyses from preceding stages should help to inform studies conducted later on. All analyses should be bounded by the requirements of the client so that option selection, financial prediction or cost benchmarking can be appropriately determined. The studies can be performed either at a strategic level (e.g. relating to the construction of a complete new building or the refurbishment of an existing one), at a system level (e.g. the selection of an external facade type) or at a detailed level (e.g. in choosing between different types of paint finish). Importantly the standard states that "decisions, data feedback and continual monitoring and optimization of LCC should continue through the service life of the facility" (BSI, 2008) and that reliance on historical costs should be supplanted with robust, determined costs applicable to the project under analysis. The reporting of the results of any LCC analysis is also considered with recommendations provided relating to headings and content.

The standard highlights that risk and uncertainty are inherent in any LCC analysis and that the extent of each is dependent on the scoping, pricing assumptions and methods of calculation employed (BSI, 2008). A comprehensive list of risks and uncertainties attributable to these headings is presented. Sensitivity analysis (i.e. systematic variation of a single input factor on a parametric basis) and

statistical confidence modelling, specifically Monte Carlo Analysis, are put forwards as methods of addressing this consideration. Although the standard stops short of prescribing how these techniques should be applied a useful example of sensitivity analysis is provided in an appendix. Further, the standard emphasises at every opportunity that all assumptions should be made explicit and states that detailed guidance on reviewing assumptions and decisions is given in the related document ISO 15686-3, which deals with performance audits and reviews.

5. Commentary on ISO 15686-5

The standard has been formulated with a keen awareness of both LCC theoretical requirements and many of the barriers to implementing LCC in the construction industry, and has made advances in lowering at least some of these inhibitors. The fact that an international standard now exists is in itself an achievement which addresses the principle concern of several authors. Clarification of terminology (in particular the difference between LCC and WLC), a generic cost structure that enables analysis and benchmarking and confidence expressed in the correct use of techniques to address risk and uncertainty, amongst other features highlighted, will serve to aid the acceptance of LCC as a valid financial technique in a construction context. However, the question remains as to what extent is ISO 15686-5, or indeed more generally LCC theory, being applied in practice within the UK construction industry. It was anticipated that an investigation of an organisation in the PPP/PFI sector would prove to be illustrative as LCC (or indeed WLC) has definite relevance where clients take a long-term view of property.

6. PPP/PFI contracts

Although Bordass (2000, cited in Cole & Sterner, 2000) alludes to the decline in the owner-occupier client base, one area where a comprehensive time-based perspective is a prerequisite is in Public Private Partnership / Private Finance Initiative (PPP/PFI) contracts. Defined as “a long term relationship between the public and private sectors that has the purpose of producing public services or infrastructure” (Cartlidge, 2006), PPP/PFI seeks to attract private sector funds, resources, management skills, expertise and innovation to realise public sector goals (Akintoye *et al.*, 2003). PPP/PFI contracts typically have concession periods extending up to 30 years and set out obligations to ensure that private sector organisations have sufficient financial resources in place to provide the required service for the duration of the concession. Therefore, LCC has the promise to be a vital tool in assessing long-term financial outlay and to help distribute risk between contracting parties. Further, PPP/PFI projects, through use of innovative practice, are key to furthering the UK government’s objectives relating to sustainability in the built environment, although Dixon *et al.* (2005) note that there are areas for improvement in this regard.

7. Application of LCC on PPP/PFI education projects

In attempting to understand the extent to which LCC is being performed in practice and to determine the impact, if any, that ISO 15686-5 is having on its application, an evaluation was conducted of life-cycle related activities within a facilities management (FM) company involved in PPP/PFI education projects. This effort took place under the auspices of a currently active two-year Knowledge Transfer Partnership (KTP) project, involving the FM organisation and the School of the Built Environment at Heriot-Watt University, where the authors, acting as agents of change in an instance of action-based research, seek to apply contemporary theoretical knowledge in a commercial setting in order to improve LCC practice within the company. The FM organisation that was studied is presently engaged in the operational phase of 11 PPP/PFI projects, including several education concessions featuring primary and secondary schools and community campuses. Further, at the time of writing, the company was involved in tender submissions for a number of other PPP/PFI schools. With upwards of 600 employees and a commercial reach extending throughout the whole of the UK, this entity can be regarded as medium-sized organisation within the national FM sector. The evaluation, which was conducted over a period of several weeks, consisted of:

- a review of the output from all LCC analyses performed relating to each of the PPP/PFI contracts that the partner company was involved with (i.e. in either the tendering stage or the operational phase);

- an examination of clauses in each of the PPP/PFI contracts that correspond to the life-cycle related responsibilities of the FM organisation throughout the concession; and

- a series of informal interviews with individuals internal to the FM company who were involved to a greater or lesser degree with either performing the life-cycle cost related analyses themselves or interpreting and acting upon their outputs.

On completion of the evaluation it was determined that, despite similar outcomes relating to the application of LCC in both bidding and operational phases of the projects, differences were observed regarding the priorities of the causal drivers for these findings. Therefore the description of the findings will deal with the bidding and operational contexts separately.

7.1 Application of LCC during the tendering stage

A requirement existed in each of the PPP/PFI tender documents, both completed and being considered at the time of the study, for a projection of the estimated life-cycle costs over the concession period to be provided by the FM partner within the overall consortium tender submission. This projection was for a range of preselected cost-significant building elements and components only. The time-based cost profile of each such analysis formed the basis of negotiations to determine a ‘life-cycle account’ – in effect, at least from the perspective of the FM organisation, a capital budget provided by the client that permits a predetermined annual draw down of cash by the FM provider, per the projected cost profile, to facilitate major maintenance and replacement only of the

aforementioned assets. Note that as this assessment was not to include operational exigencies, energy consumption was not taken into account in the analysis despite historically the evaluation of competing energy efficient design options providing the basis of LCC practice relating to constructed assets. Energy consumption reduction targets were dealt with by a separate, unrelated section in each of the contracts.

The tender condition to perform an assessment relating to life-cycle costs did not extend to any other member group of the consortium; evidence indicated that this activity was performed in isolation by the FM partner. Although best practice guidelines suggest that an LCC analysis relating to the O&M phase of a constructed asset should be based on previous analyses implemented by stakeholders involved earlier in the project life-cycle (BSI, 2008), no pertinent information was forthcoming from the designers, constructors, etc. Moreover, this activity was undertaken over a short period of time, typically 3-4 weeks as constrained by the tender receipt, evaluation and submission period, and after many of the design parameters were already set. This resulted in heightened risk exposure for the FM organisation and did not serve to inform the design to the benefit of the FM organisation and ultimately the client at this, or indeed any other, stage of the project life-cycle. In some cases where sufficient pressure was exerted by the client's representatives regarding the final definition of the life-cycle account and/or where the FM organisation had identified success in a particular bid as a business priority, the latter party accepted the risk of agreeing to (what was in their view) a non-optimal cost profile in the hope that any monetary shortfall, which per the contract the FM organisation would have responsibility for meeting from their own financial resources, would be offset by O&M improvements and efficiencies made when the service being provided was in use. However, this could not be construed as an attempt at a WLC analysis, where potential savings would have been treated as being included in the income cost group.

Each analysis that did take place did not make use of discounted cash flows as the tender requirements were for the estimation of present costs only, which would be index-linked for future payment. No comparison of alternative options was performed but rather replacement costs and service lives associated with generic elements, aligned to a breakdown structure defined by the BCIS (BCIS, 2009), were determined based on a limited number of published external sources and the personal experience and intuition of those within the FM organisation who were involved in the tendering process. Risk and uncertainty were not rigorously considered when arriving at cost values but based upon an informal judgement a premium was added to particular costs associated with elements or components perceived to be potentially problematic. Therefore, this process could not be regarded as conforming to the established theoretical requirements of an LCC study or to best practice as encapsulated in ISO 15686-5 but rather had more in common with a standard cost projection.

Issues relating to sustainability were not considered by the FM service provider within the context of this exercise, in part because there was no tender requirement to do so or direct business benefit relating to the tender submission that could be derived from doing so. ISO 15686-5 was published too late to provide assistance with the formulation of life-cycle costs for any of the concessions that are currently in their operational phase, but no explicit cognisance of the standard was taken by any of the consortium stakeholders (whether designer, constructor or FM provider) in the new tender bids.

This was despite a general awareness, on the part of the FM organisation at the very least, of its existence and the potential benefits it could convey.

A lack of contractual incentive and excessively short timescales were determined to be the principle reasons for limited application of LCC per theoretical and standard requirements within the context of the PPP/PFI education tender submissions analysed. However, what was unexpected was the extent to which the PPP/PFI tendering process itself inhibited the adoption of best practice LCC on the part of the FM organisation. Moreover, concerns existed within the FM organisation regarding the cost and complexity of conducting an extensive LCC study relative to the benefits that such activity would provide at that point in the procurement process, where there was no guarantee of the bid being successful. In any case, a lack of available historical and predictive data, whether internally or externally sourced, would have inhibited its execution. Finally, although knowledge existed within the organisation regarding formulating discounted cash flows there was no process for doing so that could be readily called upon.

7.2 Application of LCC during the operational phase

ISO 15686-5 compliant and typical theoretical LCC conventions were also absent in assisting the management of O&M costs on any of the existing contracts. Here the lack of a methodology and associated processes (whether standardised or otherwise), a deficit of experience in the requirements of LCC in an O&M context, and issues relating to the gathering and analysis of appropriate data where regarded the major inhibitors. Pertinently, the lack of a project-wide consideration of life-cycle costs by all relevant stakeholders at each stage of the project life-cycle had the effect of depriving the FM organisation of useful LCC data that could be used in this phase. Dealing with risk and uncertainty in any life-cycle cost calculations was not viewed as an issue. However, as there was no formal approach being used to model risk and select uncertain parameters for analysis this aspect had perhaps not been given full consideration.

No process was in place to support the integration of sustainability concerns when selecting replacements. As all of the PPP/PFI contracts were no more than 5 years into their concession period, and therefore there was a limited need to replace any building elements or components, and, again, because there was no requirement from the client to do so, sustainability considerations were not viewed by the FM organisation as a pressing concern. Nonetheless, there was an awareness of existing environmental assessment techniques appropriate to construction material and component selection, such as the Building Research Establishment's Green Guide to Specification and Environmental Profile assessment technique (Anderson *et al.*, 2009).

The FM organisation was conscious of the benefits of applying LCC within an operational context and had engaged in the KTP project in an effort to develop its knowledge of the technique and introduce LCC throughout the organisation's contract portfolio (i.e. not just on PPP/PFI projects). This effort, which focuses specifically on the replacement of building elements and components during the operational phase of existing projects, seeks to integrate risk and sustainability considerations within the context of a LCC economic appraisal and will result in the establishment of

supporting processes, data repositories and a computer software-based tool to facilitate the analyses. It is also anticipated that the findings of these analyses will help to inform future design decisions. The project is due for completion at the end of 2010.

8. Conclusions

Although PPP/PFI projects, with their long-term view of costs and concurrent consideration of capital and operational expenditure, have the potential act as a significant enabler for the implementation of the LCC technique, the findings of this investigation would seem to suggest that a lack of contractual incentive together with issues relating to data availability will continue to serve as barriers to more widespread adoption of LCC going forward. This is despite the introduction of ISO 15686-5 which although addressing concerns regarding the lack of a formalised methodology cannot resolve issues relating to procurement or the multifarious and often organisation-specific requirements of data gathering and processing. Further, the innate potential of LCC, or indeed WLC, cannot be fully realised if its application does not take on a focus that encompasses all project stakeholders across the complete service life of constructed assets (i.e. from conception through to disposal) while incorporating a more thorough treatment of risk and uncertainty and sustainability.

Although the investigation was limited to a comparatively small number of contracts of the same basic type and related to a restricted contractual nexus, it is the authors' contention that there is no reason to suggest that these findings relating to the application of LCC would be any different elsewhere in the wider PPP/PFI sector or in the construction industry in general, where there is often little incentive for a long-term focus to be retained. Progression will require a willingness on the part of procuring organisations or regulatory enforcement to increase the application of the LCC technique in addition to concerted efforts by all industry players to improve the collection and publishing of relevant data, whether to internal or external audiences. This last point will prove to be especially challenging as such an undertaking is likely to be expensive to instigate and maintain and, where data is published externally, may have issues relating to commercial confidentiality and insurance (Cole & Sterner, 2000). Further research in the area of LCC data capture and configuration is therefore warranted.

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Adoption of Private Finance Initiative (PFI) in Malaysian Public Works Projects: Are We Ready?

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Abstract

In the United Kingdom (UK), Public Private Partnerships (PPP), in the guise of the Private Finance Initiative (PFI), has become an integral part of national government policy in the delivery of public facilities and services. The aim of introducing the PFI was to achieve closer partnering between the public and private sectors at both central government and local authority levels. Despite the PFI may have been tested for more than a decade in developed countries, the idea is just beginning to germinate in Malaysia. Government has embarked on using PFI as one of the methods to procure building and infrastructure development projects. In all likelihood, Malaysia is coming up with its own version of PFI, which deviates somewhat from the ideal PFI principle. This is to take into account the business and political reality of the country. Therefore, this paper describes the key issues and challenges in implementing PFI in the Malaysian construction industry under the Ninth Malaysia Plan. Based on the interviews conducted with government agencies, a Main Board listed construction companies, and consultancy firms, the results revealed that Malaysia is coming up with its own version of the PFI in that its financing arrangement is different from UK's PFI. In the Malaysia context, the government provides financing support indirectly through Employees Provident Fund (EPF) that provides Ringgit Malaysia (RM) 20 billion for PFIs.

Keywords: private finance initiative (PFI), implementation, public and private sector

1. Introduction

Private Finance Initiative (PFI) is a privatization scheme develops initially by the UK government, to provide financial support for partnership between the public and private sector. PFI has become an integral part of national government policy of the UK in the delivery of public facilities and services (HM Treasury, 2000). The PFI scheme has been implemented in many countries around the world and this form of procurement system has been increasingly important over the past decade (Kato, 2001; Endicott, 2001; Beeston, 2002; Imamura, 2002; JETRO, 2003). However, in terms of the implementation process, the PFI arrangements are not similar from country to country (NAO, 2003).

In the Malaysia context, the Ninth Malaysia Plan (9MP) defines PFI as involving the transfer of the responsibility of financing and managing capital investment and services in relation to public sector assets to private sector (Economic Planning Unit, 2006). Private sector will be responsible for financing, constructing, managing, maintaining and operating the facility in order to deliver the service to the public sector throughout the concession period. In return, public sector will pay the private sector in the form of lease rental charges which commensurate with the quality of the services provided.

Currently, in Malaysia, the demand for the efficiency in public services has increased towards the promptness of development (Imtiaz et al. 2007). The government accorded a very high priority to infrastructure development (Wen, 2006). In a conventional procurement process, projects with a broad scope are generally broken down into their component parts and managed as separate units that have to be implemented sequentially due to budget limitations. As a result, the opportunity to develop an integrated solution that effectively addresses a public sector need is often missed. To a certain extent, most of the public projects have been plagued by delays and shoddy workmanship, which is inherently seen as a major problem to the government (Jayaseelan & Tan, 2006; Endut, 2008). Furthermore, the Malaysian government is reluctant to spend big bucks on development of public infrastructure projects due to insufficient public sector capital funding (Netto, 2006). Therefore, to bridge these issues the Malaysian government is turning to Private Finance Initiative (PFI) for transforming the public projects. With PFI procurement, the scope of procurement is expanded to reflect a broader content with the focus being shifted to developing an integrated solution.

Despite PFI being perceived by most governments as the most cost effective means of procuring public infrastructure projects, a debate about the nature of this approach is still widespread among the practitioners. In the case of Malaysia, the implementation and policy of PFI has been the subject of considerable debate and critiques. Some of the reasons as mentioned by Abdul Rashid (2007) are leading to the issues of cronyism, unfair monopolistic advantages, lack of transparency in competitive bidding and, lack of PFI experiences and knowledge in PFI. Besides, there are many aspects within this approach that require fine tuning and improvements in order to make it more cost effective. Areas related to the improvement of key functional skills in technical aspects, finance, personnel management, and value for money, risk allocation and,

public knowledge are important to be highlighted. As such, the need for a comprehensive regulatory framework is a matter of some urgency for PFI in Malaysia. A significant reason for this matter is to further encourage participation from the private sector and to make them feel less restrained to exploit their market power.

2. Aim of the study

The aim of these studies is therefore to investigate the key issues and challenges in implementing Private Finance Initiative (PFI) in the Malaysian construction industry under the Ninth Malaysia Plan. The objectives are:

- To provide a general overview of the implementation of Private Finance Initiative (PFI) in Malaysian construction industry
- To identify and understand the similarities and differences between the practice of Malaysia's own version of PFI and its principle in the UK.
- To indentifies the issues and challenges in implementing PFI in Malaysia.

These studies is based on field study which involved of interviews conducted with government agencies, a Main Board listed construction companies, and consultancy firms, the results revealed that Malaysia is coming up with its own version of the PFI in that its financing arrangement is different from UK's PFI.

3. Key principles in the implementation of PFI under 9MP

According to Yong and Kok (2006), the Ninth Malaysia Plan (9MP) spells out certain key issues. Below are some of the key issues of the implementation of PFI under 9MP:

3.1 Output specification and KPIs;

All the privatized projects in Malaysia will have output specifications and KPIs. In other words, the privatized entities will be marked to set performance targets. The output specification will be clearly defined to ensure the private companies deliver. The government will stipulate the output or services it requires. The government is contracted to pay for the services, and not the assets. As the private sector own capital is at risk, they have the incentive to deliver on time and to budget. Hence, there will be no late deliveries, no shoddy workmanship and definitely no abandoned projects. This is due to the payment for services, which is linked to their performances.

3.2 Financing mechanism;

Under PFI, the government is able to tap the quintessential private sector financing sources, and those of the provident funds. According to The Edge Daily (2006) on October 3, 2006, The Employees Provident Fund (EPF) will be providing RM20 billion in loans to kick-start the country's PFI. PFI Sdn Bhd is established under the Ministry of Finance. The government wholly owns this Special Purpose Vehicle (SPV). EPF will channel funds for the PFI projects through PFI Sdn Bhd (refer Figure 1).

Former Prime minister Dato' Seri Abdullah Ahmad Badawi spelled out in The Edge Daily (2006) on July 19, 2006 that SPV will then repay EPF the principle amount plus a return using the lease payment received from government. Commenting on the mechanism of the SPV, Abdullah said it will select contractors through a tender process to build the facilities, for which it will then pay the contractors with fund from the EPF. Besides, a separate RM5 billion facilitation fund will be set up to assist private companies undertaking PFI projects in the 9MP. Abdullah claimed that the government will not invest in the PFI projects as the RM5 billion funds is meant to assist in facilitating land acquisitions, power, and other necessary initial help to get the projects going.

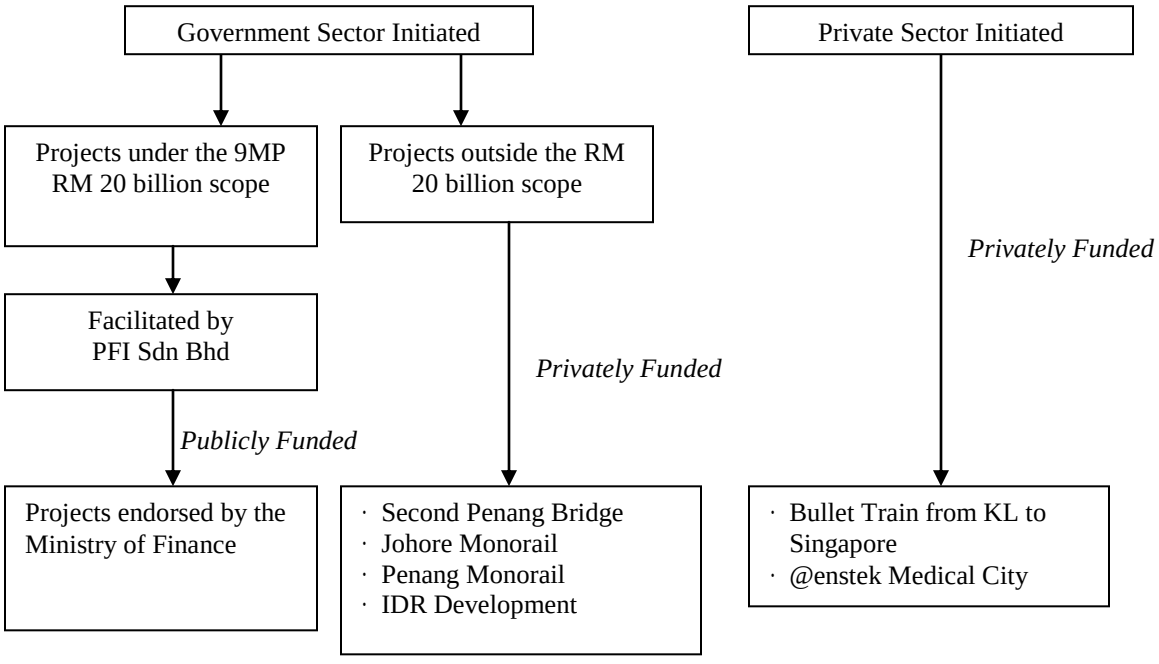

Figure 1: Malaysian PFI Structure. Adopted from: Abdul Razak A.H.N, (2007)

The EPF's involvement is a major concern of Malaysia's PFI. The EPF is a social security organization set up by the government to provide retirement benefits for private sector employees and non-pensionable public service employees. A key question raised is whether the EPF is going to bear the risk if the contractors fail to deliver (Jayaseelan and Tan, 2006).

3.3 Risk Distribution;

This is nothing more than ensuring that the private sector assumes the major risks involved in design, construction, operations and maintenance while the government assumes the risk of traffic volume. The privatized entities will now have to ensure that the facilities built are functional, and also last to deliver the services for the duration of the concession periods. Risks inherent in the project should be borne by the party best capable to manage the risks.

Since the EPF will provide the funding for PFIs, it seems that it will be the public sector rather than the private sector that takes the financing risks. Under a true PFI as being practiced in UK, private sector will have to rise their funding with no or very limited government support to finance the PFI projects. However, the EPF has stressed that it would not take any risk in the PFI (The Edge Daily, 2006).

3.4 Competition;

This is one of the important issues of PFI. It is premised on the belief that open competition will induce greater efficiency. The projects are open to competitive bidding from all players. The procedures and bidding processes are transparent and clearly spelt out. Short-listed candidates are given invitations to negotiate. However in the Malaysia context, some companies have already been awarded projects under the PFI without any competitive bidding. The good example is the Penang Second Bridge that is awarded to UEM Builders Bhd under PFI without any open tenders. Besides, Ekovest Bhd and Faber Group will build a National Institute for Natural Products, Vaccines and Biotechnology for the Ministry of Health in a joint venture. It is one of the first PFI projects but how Ekovest and Faber won the contract was not disclosed and made public.

4. Setting Questionnaire and Data Collection

In this research, I have decided to use open-ended questions for the personal interviews as these types of questions are most appropriate to construct with interview questionnaires. The company's background and the position level of the interviewee were asked as these information are important to know how reliability of the answers given. All the interview questions must comply with my research aim and objectives.

In this research, all the data and information are collected from two sources: the primary data and secondary data. The primary data is the information that collected through interview and questionnaire. The secondary data is the information that collected through articles, journals, internet, reference books which can be used to support the primary data. After analyzing the current news and articles from the newspapers, I have identified organizations that have been involving or have the potential to get involved in PFI projects in Malaysian construction industry. Eleven organizations have been selected to produce a

list of respondents for the personal interviews. Subsequently, I have sent letter requesting for personal interviews to all the respondents. After that, I called them up to request for personal interviews.

As a result, there are six interviews were conducted with a government agency, a Main Board listed Construction Company, and consultancy firms. Fourteen questions have been prepared to query the respondents before the interviews. Besides, few additional questions arose during the interview sessions and were asked of the respondents. The interviews were successfully conducted and following are the findings. The primary data of this research is analyzed through qualitative approaches.

5. Key Finding

5.1 Types of Project Suitable to Adopt PFI

Based on the result of the interviews, some of the respondents claimed that those projects where its revenue and risks involved can be clearly defined as suitable to adopt PFI. They should be able to derive income. Respondents B claimed those projects suitable for PFI should substantially large. It means that only mega projects are appropriate for PFI.

It is proven as according to the report of '*PFI: Meeting the investment challenge'* published by HM Treasury (2003), PFI approach will only suitable for certain types of investment. This report suggests that PFI can offer significant advantages for certain major capital projects, but has not offered the same advantages for small capital projects. As the PFI contracts are complex long-term arrangements, the cost associated with the transaction itself may be significant (HM Treasury, 2000). This tends to make them appropriate for the larger value projects. Therefore, in order for a project to be suitable for adopting the PFI, it must ensure a level of profitability and can be clearly defined their outputs.

Besides, Respondent C claimed that those projects suitable for PFI are those which private sector can provide value-added and innovation. He said that private sector has to bear risks with public sector monitoring the project. HM Treasury (2003) suggested the PFI model is likely to be applicable where the private sector could provide value for money. In addition, the nature of the assets and services identified as part of the PFI scheme are capable of being cost on a whole of life, long-term basic.

Basically there are few criteria to examine suitability of a project for PFI. Firstly, the project must be able to be clearly defined its income or revenue. The reason is that private sector has to ensure that the project is able bring them profit in a long-term basis before they are going to secure the contract of project. Secondly, those projects appropriate for PFI are large capital projects. As the PFI is a long-term investment, the contract period must have a time-horizon of 20-30 years. Therefore, only certain projects with large scale of complexity are appropriate to derive income to the private sector in that long-term period.

Besides, there should be an opportunity for private sector to provide value-added in a project in order to adopt PFI. It should encourage innovation of private sector who able to provide innovative solution to achieve client's objectives. Another criterion for suitability of adopting PFI is that risk involved in a project can be clearly identified. PFI promotes optimal overall risk allocation, with risk distributed to the party best able to bear. It is to ensure the possibility for transfer of risk from public sector to private sector.

The types of project best suited to be implemented using PFI are education (e.g. schools and universities), health (e.g. hospitals), transportation, energy, water and sewerage, prison, government building, sport facilities, infrastructure, etc. Nowadays the range of PFI project has extended to various sectors.

5.2 The Similarities and Differences between the Malaysia's PFI and UK's PFI.

From the findings, it seems that most of the respondents are agreed there are a lot of differences between the Malaysia's own version of PFI and the UK model of PFI. Respondent A claimed the similarity is that both model of PFI are considered procurement process. HM Treasury (2000) of the UK defined the PFI as a procurement method. Another the similarity raised by the Respondent C is that the private sector is taking more risks from the public sector. It contradicts with what was said by Minister in the Prime Minister Department Dato' Seri Effendi Norwawi (2006) during the speech at the 2nd Annual Conference on Privatization, Public-Private Partnerships and Private Finance Initiative 2006. He spelled out, "The PFI under the 9th Malaysia Plan will ensure that there is fair distribution of risks and rewards between the Government and private sector. According to Chapter 10 of the Ninth Malaysia Plan (Economic Planning Unit, 2006), it stated that "Optimal distribution of risks between the public and private sectors will be emphasized".

The difference given by Respondent A is Malaysia's PFI is a central management which is controlled by Ministry of Finance (MoF) while the UK's PFI is usually done by local authorities. However, PFI is used at both central and local government in the UK (Eaton and Akbiyikli, 2005). He also added that difference of MoF is a government agency while Partnership UK is a corporation of joint venture between public and private sector. However, this point is doubted as the Partnership UK is an advisory agency while MoF of Malaysia is government agency.

Respondent B claimed that the difference between the Malaysia's own version of PFI and its principle in UK is the loan arrangement. Besides, Respondent C and D said the difference is that the private sector gets funding from the government instead of the bankers. In the Malaysian context, Employees Provident Fund (EPF) will provide loans to the private sector via PFI Sdn. Bhd, an entity owned by the Ministry of Finance. The government of Malaysia is not letting the bankers to drive the financing for PFI. However, in the UK bankers and financial institutions provide the majority of the banking up to 80 – 90% for PFI projects.

Another difference with raised by Respondent C related to the bidding. He claimed that the government of Malaysia is not ready yet for open competitive procurement. In the UK, the competitive tendering has been applied to select the best private company.

Respondent D believed that cultural difference will make an impact on implementation of PFI in Malaysia. He added that both model of PFI still could not be compared as the government has not yet firmed with PFI policy. The difference he gave is that Malaysia's PFI lacks of KPI. This contradicts with the statement in 9MP where it stated the output specifications and Key Performance Indicators (KPIs) will be clearly stipulated in the PFI projects.

According to Respondent E, financial institutions are not ready to give commitment for PFI project that have long concession period. In his experience in project finance, many financial institutions are only willing to finance a project for duration up to 15 years. More than that period, bank will make restrict condition to follow such as deposit payment and debt restructuring (the company to resolve old loan before make new loan) from financial institution before they can give commitment to the project. Similar scenario also occur when company intend to raise fund from bond through financial institution. Unlike in Europe where PPP/PFI is flourished because financial institution there is more open in provide debt to company to participate in PFI project.

From Respondent F point of view, PFI will not be open competition as conventional project. It will be like other concession project. Usually, the construction companies will prepare a proposal to the government. If the government is interested, the negotiation stage will take place. He believed that transparency is hard to achieve because interest of certain parties, political agenda and other sensitive issues.

From the findings, there are few similarities between Malaysia's PFI and UK's PFI have been identified. Both countries considered the PFI as a procurement method. PFI is a form of PPP that serves as a procurement method to replace inefficient public procurement. The PFI emphasizes the transfer of risk to the private sector equitably instead of to allow the party to bear more of the risks. Under the 9MP, as well-managed risk allocation is vital for a successful PFI project. Thus, similarity in that private sector taking more risks for both PFI models is not accepted. It has to be the transfer of the risks to party best capable to manage the risk.

The important key issue that been identified in comparing the UK model of PFI with Malaysia's own version of PFI is the financing. This is the clear difference of PFI for both countries as three of the respondents came out with the statement. Prime Minister said in The Edge Daily on July 19, 2006 that PFI projects in Malaysia will be funded through loans from Employees Provident Fund (EPF). In the UK, the private sector arrange debt financing from bank loans, bonds and equity to finance the upfront cost, design and build the facility and then deliver the services for PFI project (Akbiyikli and Eaton, 2005). In

the Malaysia context, the funding is provided by EPF to the private sector where the bankers did not want to. It can be concluded that the main difference is the financing arrangement.

Minister in the Prime Minister Department Dato' Seri Effendi Norwawi said on June 12, 2006 in the Edge that PFI project would have output specification while the KPI targets would be clearly stipulated. According to him, the government is drawing on a framework for PFI to enforce KPIs. It shows that the government has not come out with the KPIs yet. It is still early to make comparison in this aspect. Therefore this fact could not be considered as the one of differences.

PFI is unique for each project as well as country. In other words, the Malaysia's own version of PFI is created as there are many differences on several aspects such as cultural, economy, social between Malaysia and the UK. Since the concept of PFI is embarked after launching of 9MP recently, the detailed difference and similarities still could not be defined clearly. However, with understanding the similarities and differences between the Malaysia PFI and the UK model of PFI, the key issues can be identified. Understanding the differences well will provide a better understanding on why the differences arise, and the success and failure experience of PFI in the UK.

5.3 Key Principles in Applying PFI

According to Respondent A, he claimed that maintenance will be the key principle to be considered when applying PFI. Another key principle is responsibility of the private company to perform well. Besides, financing of the PFI project is a significant aspect. He added that bidding as part of procurement process to select the best concessionaire is an important aspect to be considered,

In the opinion of Respondent B, he believed that economic value is the key principle in adopting PFI. He added that whole life costing and risk distribution should be taken into account to ensure successful implementation of PFI. According to Respondent C, the competitive procurement needs to be used to select the most qualified contractor. Singapore Ministry of Finance (2004) suggested that as PFI project spans over long durations, it is critical that a PFI provider who can deliver on its commitments and work well with public sector throughout the entire duration of the partnership. Based on the interview with Respondent D, the key principles in applying PFI are value for money, risk distribution, output specification and the competition. He also mentioned about Public Sector Comparator which is used to evaluate the proposal.

In implementing PFI, there are several key principles to be considered carefully as they can determine whether the PFI project could provide value for money to client. In order to achieve efficiency and successful delivery of PFI projects, the most important key principle is the competitive bidding. These respondents have spelled out the importance of building to achieve excellence in PFI projects. Through open competitive tender, the most qualified concessionaire in terms of expertise and experience is appointed. Singapore Ministry Finance (2004) suggested that as PFI project spans over long durations, it

is critical that a PFI provider who can deliver on its commitments and work well with public sector throughout the entire duration of the partnership.

Two of the respondents suggested that risk distribution is vital in adopting PFI. Sharing of risks among the public and private sector is essential to obtain value for money. There should be optimal, not maximum transfer of risks to the private sector. The golden role of risk allocation is transferring risks to party best capable to bear the risk. Failure of PFI project may happen if the risks involved are not equitably distributed.

Value for money will be another key aspect to ensure PFI sustainable over the contract duration. Achieving value for money is the aim of a PFI project. Value for money is obtained through a combination of service quality, cost reduction and risk transfer. PFI will deliver value for money if implemented properly. Whole life costing is used interchangeably with value for money as it is associated with running and maintenance cost.

5.4 Risk Allocation for PFI Projects

Based on the interviews, Respondent B and D claimed that majority of risks should be passed to the private sector as they are making more money. Nevertheless, all of the respondents believed that the risks involved in the PFI project should be borne by the party best capable to manage the risks. According to Grahame Allen (2001), the government of the UK recognizes the principle that "risk should be allocated to whoever is able to manage it" not risk transfer for its own sake.

Respondent A stated that construction risk will be borne by private sector while the government has their own risks in case that the private company cannot perform. According to Respondent B, the risk undertaken by the funders may be reduced. Private company will undertake construction risk, operation risk, and actual traffic projection risk. The government takes risk of reliability of the private company to perform.

Respondent C said the risk of financing, construction and operation are borne by the private sector while the government will take the risks of payment and other risks such as change of law. According to Respondent D, in risk allocation, construction risk should be borne by the private sector be borne by the private sector while the government bear the risk of allocation of the land. According to Grahame Allen (2003), the general rule PFI schemes are to transfer design, construction and operating risks (both cost and performance) to the supplier. Risks retained by the public sector include the risk of a wrongly specified requirement and risk of criticism.

Respondent E and F stressed that financial risk such as inflation and interest rate should be bear by the government. Government has to decide these rates along the concession period. He added government

should decide the volume and the demand of services so that risk of wear and tear that concurrence with the maintenance costs stay with government.

He pointed that performance risk from construction and operation will be bear by the SPV. If SPV does not perform according to output specification then payment for services will be not released. However, this only applies when future event is anticipated such as if suddenly the economic slump happens. As a result, the payment for the project should be review.

Risk transfer is one of the key aspects for a successful PFI. Better risk allocation will demonstrate the increasing of value for money. The golden rule of PFI is that risks should be undertaken by the party best able to take the risks. The risk allocation between the public and private sector should be well understood. The risks involved need to be identified as they depend on the characteristics of a particular project. Then the risks are retained, transferred or shared. There is an argument that more risks should be transferred to the private sector because they are the party in the structure of PFI make the highest revenue. However, this can be done through the financiers as funding provider to drive the balancing and transparency of risk allocation between public and private sector in order to deliver value for money.

5.5 The Main Advantages of PFI Compared With Previous Modes of Privatization

Based on interview, there are some differences between PFI and previous modes of privatization such as BOT. Respondent A claimed that the difference is different source of financing. Under BOT, the government provides support to private company. Besides, the PFI is tight to output specification where the KPIs will be applied. The design and construction will provide improved defined quality of service.

Respondent B claimed that BOT is a form of contract that privately financed. The advantage is design improvement through competitive tender. Respondent C suggested two differences that are firstly, contractor will not get paid if the services they deliver do not content the government, secondly, there is obligation to operate and maintain for PFI. Respondent D claimed that the advantages of PFI are that PFI emphasized on the use of KPIs. PFI is driven by economists but BOT is not. PFI provides better value for money and promotes maintenance culture.

Firstly, the differences between the PFI and BOT are identified. The main difference is the KPIs. Under PFI in Malaysia, KPIs will enforced and ensure the level of standard performance is met. Concessionaires may also be subjected to a reward-penalty system. The performance of concessionaires is tight to a clearly defined output specification. Another difference is that BOT is not driven by economist in that it is done under PFI.

From that all, the PFI benefits from the differences distinguish PFI from BOT. with using KPIs, it is has given incentives to the concessionaires to perform well. Quality of services is ensured as the

concessionaire has to fulfill the requirements and standard of performance. Thus it provides better value for money. PFI which is driven by economists will provide social cost benefit which could not be acquired through BOT. basically, accountants, lawyers, engineers and economic will drive PFI to the excellence of implementation of PFI. The social-economic benefit is clearly defined and gained via PFI.

Another advantage is that the design will be improved as the best proposal is selected through competitive bidding. It ensures the whole life-cycle costing is applied rather than the lowest bidding cost is considered. This is because the concessionaires have to take into account the future maintenance and running cost. They need to provide best design in terms of whole life cost to enable them to compete with other candidates in the bidding.

It is concluded that the PFI is the 'upgrade version' of previous modes of privatization such as BOT. in the Malaysia context, since the most of the funding for PFI will come from EPF, private sector is not providing more funding themselves via PFI. It means that the PFI is not fully privately as it has been done in the UK. The same roles of private sector in terms of getting the funding, is brought from BOT to PFI. The government in Malaysia stressed on the output specification to come out with KPIs which will used to measure the performance of the concessionaire during the concession period. This is the only clear benefit provided by the upgrading the BOT version of the PFI version.

5.6 Challenges in executing PFI in Malaysia

From the interview, Respondent A raised the point that one of the main challenges is lack of understanding of the PFI concept by the government and private sector. Obtaining funding will be another challenge in executing PFI in Malaysia. As this new concept is still not yet marketable, it is difficult for the bankers and financial institutions to provide the loans for funding. Meanwhile Respondent B claimed that the inaccurate projection of certain aspects will lead to financial problem. He added another challenge faced is the failure of private company to deliver.

The recommendation on implementation of PFI in Malaysia given by Respondent D is that there should be more collaborative between the public and private sector. Respondent C and E recommended that the transparent and competitive bidding should carry out in Malaysia to identify the most capable private company to undertake the PFI project.

However, Respondent A and B gave recommendation that the government should come out with a clear set of guidelines. An effective regular evaluating and monitoring the performance should be established according to Respondent E. At last, Respondent B insisted that the government should employ advisory agency to assist them in implementation of PFI.

It is concluded that the main challenges faced by the government and private sector in Malaysia are lack of understanding of PFI concept, the difficulties to get funding, inaccurate projection and failure of

concessionaire to deliver services required. The challenges will arise because the new PFI concept is not well understood by public and private sector. In order to confront challenges in implementing PFI in Malaysia, some recommendations are identified. One of the recommendations is that the government should come out with a clear set of guidelines and framework as soon as possible. The government seems to be not firm in mind what the PFI is all about? They adapted the PFI Malaysia's own version but did not provide more effective training programme to the public officers as well as private sector.

To achieve the optimum value for money, the best way is to have open competitive bidding to evaluate all the proposals before making any decision on selecting the most qualified private company to build the asset and deliver the services. Competitive bidding has been successfully used to seek for the most optimum choice of cost-saving solution. It could be significant step to deliver value for money over the duration of the contract.

At last, the government should be more transparent to spell out the mechanism and structure of PFI project. The process for selecting a PFI provider must be transparent while ensuring value for money.

6. Conclusion

The aim of this research is to investigate the key issues and challenges in implementation of Private Finance Initiative (PFI) in Malaysian construction industry under Ninth Malaysia Plan. Overall, the initiative of Malaysia government to embark the Private Finance Initiative (PFI) for delivery of public service and facilities under the Ninth Malaysia Plan is an effective measure to overcome the maintenance problems since a long time ago. The advantages of PFI can be fully gained if there is a firm collaboration between the government and the private sector. Even thought there are several issues of PFI are not finalized yet due to its newly introduced concept, the key issues and challenges are addressed through investigation of several aspects. It is believed that the PFI will be panacea to the shortage of government funds and poor maintenance culture if the PFI executed in more efficient and transparent manner.

PFI also offers some benefits which are traditional procurement could not offer. If properly implemented, the Government has a unique and timely opportunity to use the PFI Programmed under the 9MP to tackle many of the weaknesses in the existing implementation of privatized projects. The Government should not longer have to bear the financial and political costs of failed projects undertaken by the private sector, which were intended to benefit the public. Let the risk be passed on to those in the private sector who can rise to the challenges of undertaking projects to provide public services under the PFI.

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The Significance and Co-Dependency of 'Robustness' From the Perspective of The Granting Authority in a PFI Project Environment

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Abstract

The use of Public Private Partnerships (PPPs) in the construction environment at the project conceptual stage has been well established globally. In the UK, the practice of using the PPP philosophy began as early as 1992. There are many different methodologies of PPP, however the Private Finance Initiative (PFI) approach has been widely accepted in the UK and other parts of Europe. From January 1996 to June 2008, a total of 628 PFI contracts have been undertaken in the UK with a total capital value of £62.8 billion. The PFI model is particularly prominent when compared to other models, for example, Build-Operate-Transfer (BOT), Build-Own-Operate-Transfer (BOOT) and Design-Build-Finance-Operate (DBFO) due to the additional element of Value for Money (VfM). It has been established that VfM can be achieved within PFI provided a balanced risk transfer assessment is carried out by the parties involved. The PFI model also needs to provide elements of affordability in order to sustain itself throughout the duration of the contract, usually 25-30 years. With the investment of time and cost in a PFI project, the element of Robustness in a PFI model will lead to it being reproduced to fit similar or related projects, thus providing sustainability to the PFI model. This indicates that the four key critical success factors towards a sustainable PPP (PFI) model are Risk Transfer; VfM; Affordability; and Robustness. The research aim is to examine the impact of these four critical success factors, individually and collectively, exploring the co-dependency between Risk Transfer-VfM-Affordability-Robustness in a PPP (PFI) model. The study, based on this co-dependency, will probe to explore a balance of the four critical success factors in the PPP/PFI model. The research will be approached from the perspective of the Granting Authority being the largest purchaser of services through the PFI model. The research being at the early stage of a PhD study is based on comprehensive investigation on existing literature review.

Keywords: PFI, robustness, granting authority, sustainability

1. Introduction

This paper is presented as part of ongoing PhD research undertaken at the University of Salford. As the research is currently in the early stage, the findings are based on a comprehensive investigation of existing literature. Primary data and its analysis are not present in this paper. The paper focuses on the Public Private Partnership (PPP) in general and the Private Finance Initiative (PFI) specifically. A blurry demarcation exists between the two terms as the latter is more widely used in the UK. The research will explore the significance and co-dependency of 'Robustness' within a PFI project environment from the perspective of the Granting Authority. A brief background to the birth of the UK PFI initiative is provided and its transformation into a larger agenda under the umbrella of the Public Private Partnership (PPP) in the UK is presented. However the demarcation between the two exists globally.

2. Background

The Private Finance Initiative (PFI) was first introduced in the United Kingdom in 1992 to further engage the participation of the private sector in the delivery of public services. This innovative procurement concept, born in the UK, attracted Governments from various countries as public financial constraint was taking a toll globally and was coupled with increasing development expenditures. Besides the option of 'off-balance sheet' accounting, PFI provided numerous benefits to the public sector and the private sector. The interaction between the private sector and the public sector in delivering public services has been well established in the construction industry globally (Ghobadian *et al*, 2004). Examples of collaboration between the two sectors date back to the 1950s in Hong Kong which in the form of a privatised vehicle tunnel (Grimsey & Lewis, 2002). Grimsey and Lewis (ibid) go further to indicate that Manod, (1982) stated that the first concession was granted in 1782 in France. The US federal government has been using PPP as a tool to stimulate private sector investment since the 1960s (Pongsiri, 2002). This reflects the acceptance of PPP, not just in the UK but globally as an alternative procurement mechanism to the traditional procurement system.

3. Global perspective

The growing need for infrastructure development is experienced globally, which drives both developed and developing economies to seek innovative ways to meet the increasing capital expenditure within the public sector (Eaton, 2007). Given the diversity of the social, economic and political scenarios, PPP has been widely present as an alternative procurement method throughout the continents. Asia, being the largest continent, has a mixture of developed and developing economies. Japan and Korea have relied heavily on the PPP procurement alternative to reduce government capital expenditure, mainly through BOT, BOO, BTL and other models (COG, 2008). China and India, being the only sizeable economies to project a growth rate over five percent in 2009 (IMF, 2009) continues to attract private sector investment in its race for infrastructure development. China is estimated to acquire some £26.9 billion by 2010 in development forecast and India requires £199.6 billion in its 11th plan, 2007-2011 for their infrastructure sector. The common form of PPP in Asian behemoths is the BOT, BOOT, outsourcing and concessionaire models. Southeast Asia countries have reported experiencing large private investments mainly in Indonesia and the Philippines primarily in Greenfield and rehabilitation projects (World Bank, 2009). A

study by Deloitte (2006) indicated that US$19 billion worth of investment is needed in the South Pacific region, whereby 95% of the investment demand is generated by Australia. Traditional means of procurement takes up the majority of the provisions for public services; however PPP makes its presence felt in complex projects. For example, the proportion of PPP projects in the Victoria State amounts to 10% of the provision for public infrastructure. The binding principal in considering the PPP approach has been similar to the UK, which requires the project to demonstrate the elements of value for money. The flexibility of the partnerships approach is reflected by the diversity in which this concept is used, ranging from telecommunication to waste water management projects.

PPP transportation infrastructure projects in Europe date back to the 1960s and 1970s' and were pioneered by Spain and France, inviting concessionaires for the development of tolled motorways and as concessions, engaging private funding sources thus abstaining from public funding (Perez & March, 2006). The progression of PPP took a setback due to the oil crisis in the 1970s which escalated construction costs, while vehicle traffic volume expansion was sluggish. A study by Piper (2007) over the development of the PPP market in Europe indicated a healthy progression between 2005 and 2006 with a growth of 37%. Currently on the European front, the PPP and PFI procurement method has been widely received. As of 2001, signed projects in this continent amounts to €37 billion (£32.4 billion), which is more than half of €61 billion (£53.4 billion) in the UK over the same duration (IFSL, 2009). Table 1 (IFSL, 2009; Piper, 2007) provides an overview of the value of PPP contracts signed in this region between 2001 and 2008. Over the last 15 years, an estimated one thousand PPP contracts have been executed in EU member states, leading to a capital value of 200 billion Euros (Blanc-Brude *et al.*, 2007).

Table 1: Value of PPP contracts signed in Europe (Excluding UK)

Country	*2001-2004 €m*	*2005 €m*	*2006 €m*	*2007 €m*	*2008 €m*	*Total €m*	*Number of signed deals 2001-2008*
Spain	*1000*	*1154*	*1664*	*309*	*-*	*4127*	*38*
France	*-*	*1788*	*735*	*329*	*1241*	*4093*	*34*
Italy	*890*	*2179*	*439*	*55*	*-*	*3563*	*20*
Ireland	*720*	*121*	*623*	*1489*	*300*	*3253*	*19*
Greece	*-*	*798*	*1600*	*3885*	*1000*	*7283*	*8*
Germany	*440*	*830*	*177*	*465*	*117*	*2029*	*40*
Belgium	*1300*	*480*	*-*	*300*	*680*	*2760*	*6*
Netherlands	*1302*	*-*	*431*	*-*	*1020*	*2753*	*9*
Poland	*1520*	*-*	*-*	*-*	*-*	*1520*	*2*
Austria	*49*	*-*	*850*	*-*	*-*	*899*	*6*
Finland	*-*	*700*	*-*	*-*	*-*	*700*	*1*
Bulgaria	*-*	*366*	*288*	*366*	*-*	*1020*	*6*
Hungary	*-*	*-*	*38*	*15*	*500*	*553*	*11*
Cyprus	*-*	*500*	*-*	*-*	*-*	*500*	*1*
Portugal	*278*	*-*	*32*	*140*	*-*	*450*	*7*
Other countries	*485*	*2*	*490*	*-*	*-*	*977*	*7*
Total	*7984*	*8918*	*7367*	*7353*	*4858*	*36480*	*215*

4. The UK experience

The change in the Government's approach in the delivery of public services started during the Thatcher administration in 1979 by reversing the nationalisation of key industries such as shipbuilding, vehicle manufacturing, and public services such as electricity, telecommunication and water through the concept of privatisation (Ghobadian *et al.*, 2004). The privatisation practice under the Conservative Party allowed the private sector to participate actively in the delivery of public services, notwithstanding the fact that the private sector has always provided services for the public sector through the conventional procurement method and contracting out; nevertheless privatisation was the catalyst in allowing the private sector to play a leading role in the delivery of public services for much time to come. Based on deficiencies in the implementation of privatisation highlighted by the HM Treasury (2000), the PFI initiative gave a new breath of fresh air to the private sector in sustaining its role in the provision of public services. The initial progression of PFI had been relatively slow both within central government and local authorities (Harding *et al*, 2000). This was caused by several factors which have been extensively identified (Ezulike *et al*., 1997). These barriers have been in existence due to the 'change' factor which was required to push the PFI agenda. The feeling of operating in unfamiliar ground by both the public and private sector raised numerous questions which needed immediate action, notably from the public sector. The response was delivered via a number of political initiatives: the Public Private Partnership Program (4Ps), 1996; the Bates Review I, 1997; the Treasury Taskforce, 1997; the Bates Review II, 1999; the Gershon Review, 1999; the establishment of the Office of Government Commerce (OGC), 1999 and Partnership UK (PUK), 2000 (Eaton, 2005). The Government had identified eight PPP models for public services and facilities procurement (HM Treasure, 2000). There was a constant drive from both the public and private sector to see the success of the PFI policy. Nevertheless shortfalls in implementing PFI projects particularly in the health sector was present due to the complexity, flexibility, quality and cost (McKee *et al.*, 2006). The UK stands out among the EU countries as the longest and most substantial experienced member in implementing PPP and PFI projects with PPP deals value accumulating to €61 billion (£53.5 billion) as reflected in Table 2 (IFSL, 2009; PricewaterhouseCoopers, 2004). The tools used in this procurement framework can be seen in a variety of models from concessions, contracting out, joint ventures, PFI and out-sourcing. The PFI model has also allowed the various contract formats such as DBFO, BLT, BOT, BOOT, PFI and others to be formally recognized as part of a larger framework which is the PPP. De Lemos (2003) claimed that PFI has established a competitive advantage over traditional procurement methods used by the UK Government; nevertheless this advantage is still subjective due to the nature of PFI contracts existing over a 15-30 year period, thus subjecting it to the whole life cycle factor.

Table 2.0 Value of PPP contracts signed in the UK

Country	*2001-2004 €m*	*2005 €m*	*2006 €m*	*2007 €m*	*2008 €m*	*Total €m*	*Number of signed deals 2001-2008*
UK	*21849*	*6237*	*14111*	*10698*	*8236*	*61131*	*536*

5. PFI whole life cycle (WLC)

De Lemos (2002) defined the life cycle of a project as the time span over which the project develops from the very beginning until the end. Comparatively in a PFI project environment context, the life cycle would span from the procurement stage through to delivery and occupation by the end users (Dixon *et al.*, 2005).The life cycle of a PFI can be generally categorised into four phases, Planning, Tendering, Construction and Service Delivery. With respect to PFI schemes usually lasting for a period of 25-30 years, the possibility of retendering the service delivery component to the private sector lies open. The importance of approaching PFI projects from a WLC perspective is to achieve an economical and a sustainable financial environment throughout the duration of the project and asset. The relationship of the Critical Success Factors (CSFs) within a PFI project environment is explored through the life cycle of a PFI initiative.

6. Critical success factors (CSFs)

Rockart (1982) defined CSFs as '*the few key areas of activity in which favourable results are absolutely necessary to achieve goals*'. The application of CSFs in construction management and in PPP/PFI projects has been extensively established (Li *et al*., 2005; Zhang, 2005). The underpinning factors of a successful PFI initiative, governed by Affordability, VfM and Risk Transfer has been well documented by several authors (Eaton *et al*., 2006; Li *et al*., 2005; Zhang, 2005). The resilience of a PFI model over such a period of time depends on the VfM, Risk Transfer and Affordability factors. The co-existence of these factors simultaneously in a PFI project environment is crystal clear. Nevertheless with the emphasis in a PFI project environment stressed to ensure that VfM is attained, the Risk Transfer procedure in ascertaining that the best party to manage risks are determined and that Affordability is accounted for, failures of realising the objectives set to be achieved still arise. Thus the existence of an interrelationship among these three factors is valid but incomplete. Therefore a fourth element to this equation is required. The role of this fourth factor is to provide equilibrium and interconnectivity within the equation to achieve sustainability throughout the whole life cycle of the PFI project. This fourth factor of resilience is Robustness. The research will explore the element of Robustness to determine the significance and co-dependency within a PFI project environment. Therefore it is the deduction of this research that the CSFs for a PFI project are mainly VfM, Risk Transfer, Affordability and Robustness.

6.1 Value for money (VfM) & risk transfer

HM Treasury (2003) defines VfM as "*the optimum combination of whole-life cost and quality (or fitness for purpose) to meet the user requirement"*; in pursuing Value for Money, the Government plans to achieve:

- The evaluation of which procurement option to use is undertaken with no inherent preference for one option over another. There should be no dogmatism in this choice. Decisions should be made on the best evidence available;

- Value for Money is not taken to be least cost. There is a need to ensure that quality standards are maintained, for example in the design of public infrastructure, and the long-term viability of the PFI contractor is assured;

- The commitment to Value for Money should not be at the expense of the items and conditions of employees transferred or subsequently employed by a PFI contractor; and

- A full evaluation of the costs and benefits on a whole-life basis is always undertaken, including an assessment of risk.

The approach of quantifying VfM in the UK has been through the Public Sector Comparator (PSC). A study by the UK Government to measure the impact of VfM in PFI projects was executed through Arthur Andersen and Enterprise LSE in 2000. The outcome of that study indicated an average savings of 17% being achieved in PFI procured projects evaluated comparative to traditional forms of procurement. Thus the VfM was seen driving economy, efficiency and effectiveness but the reality was still being argued (Heald, 2002). The lack of a legally distinctive definition of VfM in the context of PFI points to the uncertainty of attaining VfM in PFI projects (Pitt *et al.*, 2006). Kirk and Wall (2001) claimed that VfM is achievable through a genuine risk transfer process from public to private sector, indicating the strong relationship between Value for Money and Risk Transfer. However the factors that lead to a successful PFI project is beyond monetary savings alone obtained from VfM (Asenova *et al.*, 2002), but rather a combination of factors and in this study it is perceived to be the four CSFs. The operating mechanism of a PFI project transfers a series of responsibilities from the public to the private sector as part of the contract arrangement that allows the provision of public services by the private sector (Corner, 2006). The transfer of responsibilities is accompanied by the transfer of risk and the intensity of the risk varies throughout the whole-life cycle of a PFI project beginning from the project inception stage up to the provision of public services. However the process is more complex than just transferring 'lock stock and barrel' from public to private but rather allotting the risk to the party best able to manage it. Various studies have been conducted to look at different fields pertaining to PFI projects by various authors throughout the last three decades, among them Akintoye *et al*., 1998; Froud, 2003; Gallimore *et al*., 1997; Sachs *et al*., 2007. The risk transfer exercise is coupled with elements of dynamic variety due to its nature, its intensity and occurrence within a PFI project environment. Failure to acknowledge the seriousness of risk transfer could lead to cost overrun, delay in time and level of quality.

6.2 Affordability & robustness

The affordability factor is critically important in PFI projects due to the duration of such projects existing over a long term basis, 25-30 years and the responsibility of the Granting Authority as the purchaser of services to sustain the unitary payments to the service provider throughout the concession period (Shaoul, 2009). This reaffirms the definition by Grimsey and Graham (1997) that affordability is "*the ability for the granting authority to budget for the projected unitary service fee required by the PFI project sponsor when taking into account central Government imposed financial constraints and the strategic and policy objectives of the granting authority*". With the affordability factor behind the scenes, the need to satisfy the VfM factor is insufficient as it is the initial hurdle of two parts of the financial sustainability in a PFI project. Thus the evaluation of a PFI project environment should account for both VfM and affordability

simultaneously to provide sustainability. The engineering definition of robustness is described as the ability for a particular system to maintain its performance subjected to internal and external uncertainty parameters (Carlson and Doyle, 2002). Anderies *et al*. (2004) stressed that robustness accentuates the close relationship between cost benefit trade-offs and system design to cope with uncertainty. An allied concept to robustness is that projected by resilience which is defined as the persistence of relationships within a system and the measure of the ability of the system to absorb changes (Holling, 1973). Extending this approach of robustness into the PFI project environment it is vital to allow for viability over the long term concession period (Grimsey and Graham, 1997). The presence of Robustness from a whole-life cycle costing (WLCC) perspective within the context of a PFI project has been established in previous work (Akbiyikli, 2005). This can also be witnessed in the commitment by the UK Government towards ensuring that the VfM exercise achieves its objective through a rigorous assessment before going down the PFI path. Continuation along this direction increases the confidence level among its users, providers and financiers over time. The four CSFs, VfM, Risk Transfer, Affordability and Robustness are perceived to be the key contributing factors in the effective delivering of a PFI project. The significance and co-dependency of these four factors as a system will be pursued in this research. The response and behaviour of these CSFs are governed by a series of drivers in the construction industry with regards to PPP and is defined through the SLEEPT methodology as discussed in the next section.

7. SLEEPT

The SLEEPT methodology has been established by The Centre for Risk Management Research (CRMR) at the University of Salford as a device for categorising 'drivers' of a process or object (Eaton *et al.*, 2006). The SLEEPT mnemonic is based on an isolation process of the activities concerned into six components both endogenous and exogenous of the unit of appraisal (Eaton and Akbiyikli, 2008). This research will only focus on the exogenous enablers of the unit of appraisal. The six components of SLEEPT are:

- Social **S**
- Legal framework **L**
- Economic **E**
- Environmental **E**
- Political framework **P**
- Technological **T**

The role of SLEEPT in the research will contribute to the overall conceptual framework of the PhD research towards determining the significance and co-dependency of robustness in a PFI project environment.

8. Research methodology

This section provides a description of the research processes that have been identified to achieve the research aims and objectives. An overview of the research framework formulated to elicit the significance and co-dependency of robustness in a PFI project environment is covered as well. The research design depicts the structured mechanism adopted in identifying the problem, the research type, the data collection and analysis techniques deployed.

8.1 Research aim & questions

The purpose of this research was to undertake a study into the Private Finance Initiative. The PFI initiative is approaching its second decade of existence which has been flourished with both praise and criticism. As the environment in which PFI is used becomes more unpredictable to external and internal factors, the robustness of the PFI initiative is questioned in resisting these challenges. Thus the research aims to determine the significance and co-dependency of robustness in a PFI project environment. Research questions are constructed as a method to provide clarity (Saunders, 2003) to the researcher in his or her direction. This also allows for the overall aim of the research which is being addressed to be achieved and avoid deviations. Four research questions have been determined as follows:

Q1: What is the significance and co-dependency of Robustness in a PFI project environment?

Q2: What is the link between Risk Transfer, Value for Money, Affordability and Robustness?

Q3: What are the Critical Success Factors that provides sustainability in a PFI initiative?

Q4: How can Robustness provide sustainability to the PFI initiative in a PFI project environment?

These questions will explore the presence of Robustness in PFI initiatives and its significance as well as to determine the CSFs that provides sustainability in a PFI initiative.

8.2 Research objectives

To provide solutions to the research questions and subsequently achieve the research aims, it is important to establish research objectives that are result orientated as they play a significant role in the entire research process. Four research objectives have been identified at this stage of the research.

i. To determine the significance and co-dependency of Robustness in a PFI project environment;

ii. To determine the interdependency and co-dependency of Risk Transfer, Value for Money, Affordability and Robustness;

iii. To identify the Critical Success Factors in a PFI initiative that leads to its sustainability

iv. To determine a sustainable PFI model/framework.

8.3 Research framework & design

Based on the nature and the complexity of the study, an interpretivism perspective is taken. This research is carried out from a deductive-inductive approach and will be conducted using several case studies to retrieve data as the research strategy. In order to achieve the objectives of the research within a limited time frame, a cross-sectional study will be undertaken. Data collection techniques comprise of secondary data and interviews. The interviews will be based on a semi-structured style. These interviews will also be recorded using digital recording and in the data analysis, NVivo, which is a qualitative research and data analysis software will be used coupled with a cognitive mapping technique. The research design is divided into four phases. Phase one focuses on extensive literature as part of the mechanism, in formulating the research aim and research questions as well as to identify key themes which will be the focus during the case studies. In Phase two, the measurement tool, which is the interview questions, will be developed. A pilot study will be conducted in this phase as part of refining the questions in order to obtain an initial assessment. This also contributes to the validity and reliability of the data to be collected. Phase three will comprise of a two step approach. The first set of interviews will be fact finding and the second set of interviews will validate and verify the data obtained. Phase four will focus on data analysis and presenting the results.

9. Conclusion

The PFI initiative has been an important innovation in the UK construction industry. This procurement initiative has been adopted beyond the shores of the UK throughout Europe, Asia and Africa. The parameters in which the PFI operates today have undergone tremendous changes comparatively to when it was first introduced. Thus the element of resilience surfaces and brings about the question of robustness of PFI and the critical success factors surrounding this factor. Therefore this research will take an exploratory path leading to an explanatory route. Through this nature, the answers to the research questions would be obtained. CSFs have been used in management fields for the improvement of a particular process. This research hopes to emulate this nature in identifying the CSFs that contribute to the robustness of the PFI initiative. The research also targets to develop a model or framework that will provide the Granting Authority the architecture required of a PFI that is robust from their perspective and to obtain valuable information that will assist them in general when utilising the PFI initiative for the provision of public services.

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Analysing Traffic Demand Risk in Road Concessions

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Abstract

In spite of many decades of experiences in privately financed, built and operated toll road projects around the world one key challenge still remains for the stakeholders: managing traffic demand risk. It is supposed to be one of the most critical factors with respect to the overall success of the project. Forecasts of traffic volume and achievable revenues represent the basis of the project's economical and financial structure. Their reliability is crucial for its success or failure. Most risks occurring in BOT (build, operate, transfer) projects can be clearly allocated to one of the project's stakeholders, as they are supposed to have control over causes and effects and are able to manage them efficiently. While this is available for the majority of risks in BOT road projects, the allocation of traffic demand risk has to be considered very thoroughly. None of the stakeholders has complete control over this risk because a substantial part of the factors influencing traffic demand risk are of a systematic nature. Therefore an inappropriate allocation can lead to inefficient solutions consuming the economic advantages of this procurement method. To understand the complexity of traffic demand risk better, this paper will look at the different factors influencing traffic demand and assesses the level of uncertainty attached to them. To achieve a substantial understanding of this field, expert interviews have been conducted. This will lead to a scheme of practical relevance used to produce a project specific risk profile, since the level of uncertainty varies within the framework condition of the project (e.g. greenfield or brownfield project, economic volatility). In the next step determinants for efficient risk allocation of traffic demand risk will be identified. Among them are control over certain influences, costs of risk bearing and choice of risk allocation instruments. Along these determinants an approach of how to deal with the complexity of traffic demand and how to allocate it efficiently will be developed. It will be shown that knowing about the nature of traffic demand risk, about economic characteristics of allocation instruments as well as of potential risk bearers in road concession can enhance the projects overall efficiency.

Keywords: BOT projects, road concessions, risk allocation, traffic demand risk

1. Relevance and problems of traffic demand risk

1.1 Private engagement in the provision of road infrastructure

Considerable meaning has to be attached to the location factor of road infrastructure in an economy. However, worldwide it can be observed that the gap between demand and the public financial scope for the provision of infrastructure - to meet the high demand - is constantly growing. Hereby, demand comprises several measures starting from newly built roads to extensions and refurbishment. The lack of public budgets requires the postponement of costs to the future as well as to user finance (Boede (2004), p. 4). It is the dictate of lacking financial resources ruling over the sector (Spiegl (2002), p. 41).

In industrial nations it is more about modernisation and adjustment of the already well developed road network to meet the current demand, in less developed countries the focus is set on the provision of basic facilities (Alfen et al. (2006), p. 40). To provide urgently required infrastructure while being able to realise efficiency advantages expected with private engagement at the same time, the state turns to the private sector.

Therefore, it can be considered a logical development that the private sector's role becomes more important for an efficient provision of major road infrastructure. The volume of private investments and engagement in major road infrastructure and the number of projects with functional privatisation have increased steadily at an international level during the last decades. The worldwide total investment of privately financed and operated toll roads was estimated to be approximately €45bn from 1999 to 2009. This corresponds to approximately 150 to 200 projects with a respective project volume of $200 to 250mn. (Hochtief (2004)). These figures clearly emphasise that there exists a considerable market potential and it can be assumed that in the future continuous optimisation will be necessary and reasonable.

1.2 Relevance of traffic demand risk

Given this overarching mandate it is the state's duty to provide adequate infrastructure for the sake of welfare. The delegation of formerly state tasks to the private sector, for example BOT projects, creates new interfaces. Solutions have to be developed to set up the best possible arrangement of this partnership in order to realise expected economic advantages. Especially the long duration of the contractual relationship, being one of the typical characteristics for public private partnerships, requires a clear and at the same time flexible set of rules considering the high specificity and complexity of the contract's subject matter.

In this context an essential issue represents the question for the allocation of risks, the issue being - which project partner takes on which risks and at which phase during the project. Unanimously, a fair and optimal risk transfer is required among the project partners in literature (Hauptverband der

Deutschen Bauindustrie (1999), p. 33; Vassallo (2006), p. 360). In this, an optimal transfer implies the most efficient solution to the risk allocation. The principle for efficient risk allocation postulates that risks should be allocated to the party best able to influence a risk. Following this, the lowest cost of risk bearing will be generated (Fishbein/ Babbar (1996), p. 10).

This principle is applicable to many risks in road infrastructure projects. However, a key risk remains very unpredictable and thus uncontrollable - traffic demand risk. It is often referred to as being the most critical risk for a BOT project's economic success (Fishbein/Babbar (1996), p. 12; Thomas et al. (2006), p. 411; Singh/Kalidindi (2006), p. 605, p. 612; Beckers/Miksch (2002) p. 14; Beckers (2005), p. 109). This statement is justified and supported by studies analysing the accuracy and reliability of traffic forecasts. Flyvbjerg et al. (2006) have shown for toll road projects that the risk is subject to a high degree of uncertainty. In this analysis 210 BOT road projects from 14 countries with an investment volume of US$58bn were taken into account (also citing this source: JTRC/ITF (2007), p. 133). Up to 50% of the projects examined show deviations of plus or minus 20% of the forecasted traffic after the start-up phase. 25% of the projects even presented deviations of more than 40%, plus or minus, of the forecasted figures.

Other authors come to similar results: In half the projects surveyed by Bain/Platagie (2004) the standard deviations were on average 0.20-0.30 in the first year of operation. 87 projects were examined. Further studies with similar results were conducted again by Flyvbjerg et al. (2005) who examined 183 projects and Vassallo (2006) who studied 18 projects.

In concession projects in Mexico, an average of only 68% of the state licensor's projected traffic volume could be achieved. In only five out of 32 projects, the forecasts had been exceeded, and half of the 32 projects did not even approach 50% of the forecasted demand. Similar figures were observed on the M1 project in Hungary. Even more striking developments were seen with the Dulles Greenway project in the U.S., in which only one third of the projected traffic materialised. Even after a reduction of tolls by 40% the traffic volume increased to only two thirds of the forecast values (Estache et al. (2000), p. 5). However, not only significant shortfalls are reported internationally, but they do obtain much more attention in literature because of their critical importance for a concession project.

The data discloses the extent of risk to which risk bearers are exposed to. This is of special relevance for the concessionaire in the event that the volume of traffic risk is fully transferred to him and his revenue is linked to traffic volume. This is a critical factor when the level of uncertainty connected with the forecast traffic demand is assumed to be high. This is because all investments by the concessionaire are of highly irreversible nature and unreliable traffic forecasts form the basis for the economic structure of the concession project. If toll payments by users are the only source of income for the concessionaire during the operation phase, the special relevance of an accurate forecast in terms of amount and time component becomes clear. So the management of traffic demand risk in the road concession models represents one of the biggest challenges in the successful implementation of public-privately provided highway infrastructure.

1.3 Problems arising from traffic demand risk

As mentioned before, a problem under these circumstances represents the fact that the economic existence of a private concessionaire depends on the forecast's accuracy especially in the case when his payments are linked to traffic. While the majority of influences on different types of risks are controllable by one or the other party, traffic demand strongly depends on macroeconomic developments such as the development of the economy, the general user acceptance or intermodal competition. This reduces the concessionaire's influence to a minimum. Moreover, if the concessions duration as well as the amount of toll tariff to be levied is fixed by the regulating entity refinancing his investment becomes a kind of random match. However, economic failure will lead to a loss of all efficiency potential expected with private provision. In the end road users and tax payers might have to pay the bill.

In addition, it has been observed that the uncertainty about future development of traffic can result in one or the other party seeking their individual advantages. This can lead to strategic bids and realisation of white elephants (economically not viable projects), both going along with a loss of welfare. Depending on the design of the procurement process, the bidder has the opportunity for optimistic forecasts allowing him to pretend more efficiency in his bid than actually realistic. If a bidder with a strategic bid wins the concession, the overall efficiency of the project is likely to suffer.

On an international level different approaches to allocate traffic demand risk have been developed. Approaches range from full risk bearing by the private sector to large state guarantees, for example in terms of minimum traffic revenue. In addition, there are also models in which the remuneration is made independently from traffic demand. Similarly, other approaches exist in which road users will be obliged to be risk bearers. The continuous concern to develop instruments for the allocation of traffic demand risk to several parties, without eliminating economic incentives and achieving an efficient allocation mirrors the complexity of the problem.

2. Characterising traffic demand risk

Traffic demand risk represents one of the most critical risks on toll road project's success (Fishbein/Babbar (1996), p. 12; Estache et al. (2000), p. 19; Thomas et al. (2006), p. 411; Singh /Kalidindi (2006), p. 605 / p. 612; Beckers/Miksch (2002), p. 14; Beckers (2005), p. 109 / p. 136; World Bank (2002); Hauptverband der Deutschen Bauindustrie (1999), p. 29, Gomez-Lobo/Hinojosa (2000): Broad Roads, S. 27). This chapter will take a closer look at the characteristics of traffic demand risk as well as traffic and revenue forecasts as tools of risk reduction. Later, an in-depth analysis of the various factors influencing traffic will be conducted to lay down the foundation for efficient allocation of traffic volume risk and to present the complexity of the problem, transparently.

2.1 Features of traffic demand risk

According to the definitions of degrees of uncertainty (see Tegner (2003), p. 28f; JTRC/ITF (2007), p. 125) traffic demand risk can be classified as indistinctness. This characterises a condition that certain statements can be made neither about the date of an event nor about the likelihood of occurrence nor the possible extent.

Traffic demand risk incorporates many influences, that are partly systematic and partly specific in nature. This is because it is subject to the general economy on the one hand and to sector-specific conditions on the other hand.

Due to the uniqueness of each road project and the lack of a collective of identical activities under constant conditions, traffic demand risk can be classified as a subjective risk with subjective probability of occurrence. Every statement about probabilities is based on the analysed data and extrapolated past experience.

2.2 Traffic and revenue forecasts

In concession projects traffic and revenue forecasts represent the method of choice to produce insights into the economic feasibility of a project. They have the status of a market analysis (Walther (2001), p. 1). They form the essential foundation for the economic structure of the project and represent a risk reduction strategy from a risk management's perspective (Hauptverband der Deutschen Bauindustrie (1999), p. 29).

In particular, the high complexity of real traffic requires that the input data and traffic models are condensed to the essentials. In transport models relationships of causes and effect are taken into account under various conditions and activities that arise from the demand of the sector's stakeholders and are depicted as realistically as possible. Traffic models are used on the one hand as ex-post analyses to explain certain developments that have taken place. On the other hand they are used for ex-ante analyses and therefore forecasting purposes. For the forecasts' accuracy the robustness of the models and the input data key are the most important criterions (Eckey/Stock (2000), p. 176).

To reduce the traffic demand and revenue risks, forecasts are prepared by the state grantor and often also by the bidding consortia. Preparation of forecasts by different parties is due to the high relevance of the prediction for the individual party. Moreover, an exclusive relationship to a traffic consultant conducting the forecast is of high relevance. The bidders have to rely on the forecast's robustness in terms of the projected traffic volume and the willingness of users to pay a certain toll, before they use an alternative route (Hauptverband der Deutschen Bauindustrie (1999), p. 29).

Of particular relevance is the long duration of the concession contract period and therefore also the period of the forecast which can comprise several years to decades. In addition to the risk of methodological errors, overly optimistic assumptions are common to both the public and the bidding consortia, they are one of the main reasons for variances between the forecasts and real traffic in the

course of the project. This *optimism bias* can be found more frequently in toll road projects than one would expect (Estache et al. (2000), p. 19).

To sum up, the causes for discrepancies between traffic and revenue forecasts and the actual performance can be described as follows:

- limited rationality of the stakeholder, as they are naturally not able to foresee future developments;
- high complexity and interdependencies of the influences on traffic demand;
- incomplete data to be used for the forecasts;
- general error in the forecast;
- optimism bias, i.e. the (human) tendency to overestimate positive development and to underestimate negative development (e.g. overestimation of economic and population growth, demand during ramp-up phase and operation phase, underestimation of the influence of competing modes etc.) (Mackie/Preston (1998), p. 5);
- opportunism by seeking self-interest with the help of cunning and guile;
- negligence and lack of care in the preparation of forecasts.

Considering the great relevance of forecasts in concession projects it becomes clear that the first five of these causes show systematic characteristics and that there is little chance of eliminating them. The possibility to opportunistically exploit their individual scope of action, however, is related to the contractual structure of the concession. The same applies for incentives, to prepare forecasts in their own interest as carefully as possible.

2.3 Influences on traffic demand risk

Many investment decisions depend on the existence of an efficient transport sector. In turn economic developments influence the transport sector's development, so that one can speak of interdependency. In the following, factors will be identified that have an effect on fluctuation in demand and have therefore to be considered as part of traffic demand risk. These factors can be assigned to the cost and the revenue side of a concession project.

- **Traffic volume risk on the revenue side:** The requirement for any revenue is the existence of physical traffic on the tolled road. The uncertainty attached to the future development of traffic is called traffic demand risk. It is mainly characterised by the number of road users. In case of different pricing systems for different types of vehicles also the composition of users is of relevance. Economic, socio-economic and political factors can be identified as major

influences on the traffic demand risk on the revenue side. Moreover, the availability of the road and the user acceptance play important roles.

- **Traffic demand risk on the cost side:** On the cost side the so-called indirect traffic demand risk is of importance, since in particular heavy vehicles impact maintenance costs due to the high wear and tear of the road. [1]
- **Toll collection risks on revenue side:** In addition, toll collection itself is subject to different types of risks. One can therefore speak of toll collection risks arising from uncertainty about the actual collectable amount of toll. The influences on these revenues are of a legal and technical nature: the legal basis for toll collection, the reliability of electronic toll collection technology, and the enforcement of toll collection and the debt collection. The following figure illustrates the correlations described above.

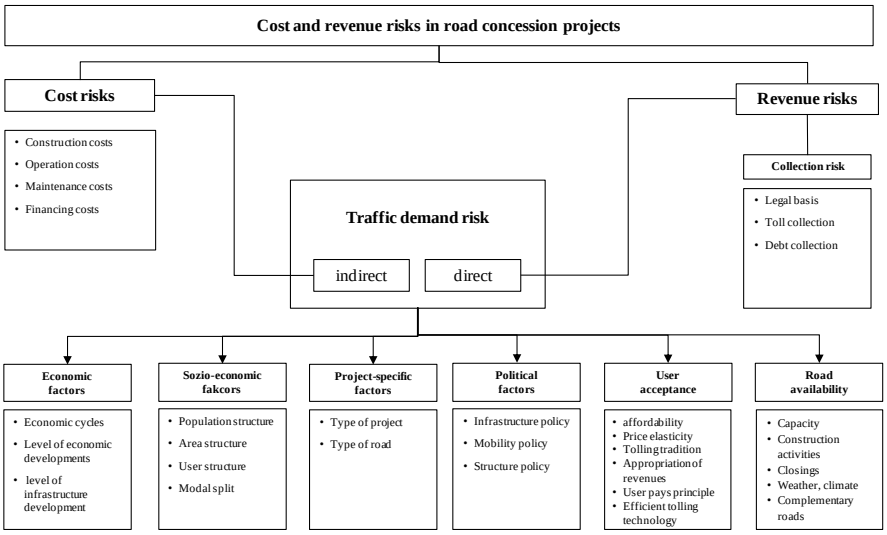

Figure 1: Influences on cost and revenue risks in road concession projects (own)

The large number of influencing factors in particular on the revenue side supports the hypothesis that dealing with traffic demand risk represents a challenge to all project stakeholders. It therefore seems reasonable to prioritise the influences. This enables the participants to find out which factors require special attention in the forecast. This in turn depends on the level of uncertainty since a factor with a high level of uncertainty should be looked at more carefully when being forecasted. Table 1 summarises the author's considerations about specific levels of uncertainty assumed with influences on traffic demand in forecasts. The justifications for the assumed uncertainty levels are listed in the last column of the table.

[1] While heavy good vehicle traffic causes high wear and tear to the road, passenger cars do not increase maintenance costs to a high extent. (Beckers (2005), p. 110)

Influencing factors on traffic demand	Level of uncertainty in forecast	Comment on reason for assessment
Economic factors		
• in industrial nations	medium	• economic cycles are not steady • special effects and structural breaks unpredictable with respect to timing and impact • less fluctuation from the average in developed countries due to stabilizing economic systems • higher economic volatility in less developed countries
• in less developed countries	high	
Socio-economic factors		
• in industrial nations	medium	• data base critical to robustness of forecast • more substantial data base in economically developed countries (higher density of data, longer retention periods)
• in less developed countries	high	
Project specific factors		
• greenfield projects	high	• lack of experience on traffic demand development on greenfield projects • revenues in greenfield projects generated further in the future
• brownfield projects	high	
Political factors		
• in industrial nations	high	• high probability of political risk due to long project duration • impact on specific project hardly to be estimated
• in less developed countries	high	
User acceptance		
• countries with tolling tradition	medium	• habituation effect results in higher acceptance, higher willingness to pay respectively lower price elasticity of demand
• countries without tolling tradition	high	
Availability of road		
(general)	medium	• danger of limiting the availability of the trail through political lobbying, local conditions, user behavior

Table 1: Level of uncertainty assumed with influences on traffic demand in forecasts (own)

This summary shows that none of the factors examined can be forecasted with a low level of uncertainty but are all associated with medium to high levels of uncertainty. The table can provide an early indication of the total level of uncertainty connected with forecasts of traffic demand in toll road projects.

2.4 Project specific risk profiles

The findings of this analysis can now be applied to concrete projects. By way of example the specific risk profile of two fictitious projects will be developed. The illustration is supposed to raise awareness to which factors special attention has to be paid to, since they are associated with a high level of uncertainty. In the example, the different priorities of each project can be indicated easily: The factors associated with a high level of uncertainty in their prediction can be found in the top area of the figure. Therefore, they should be taken into account very carefully in the forecast.

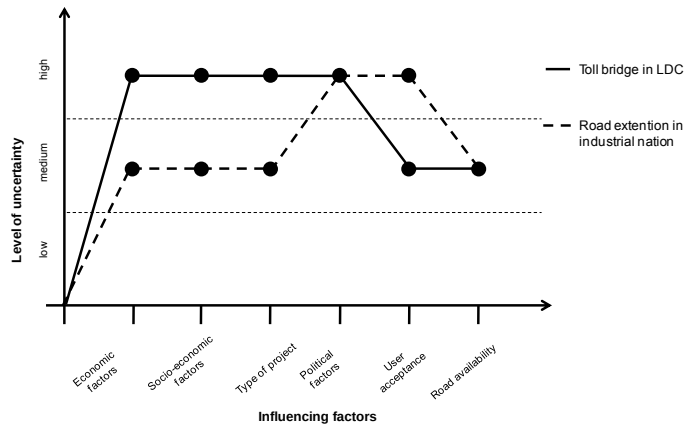

Figure 2: Project specific risk profiles (own)

3. Efficiency in the allocation of traffic demand risk

3.1 Principles of efficient risk allocation

After having analysed the influences on traffic demand, their uncertainties and relevance for road concessions, the next step is the focus on the allocation of traffic demand risk. To find a realistic and efficient allocation of risk that contributes to the overall efficiency of the project and increase its value, it is necessary to observe certain principles of allocation:
The maxim for an efficient risk allocation, as it is often referred to in literature, requires that risks are transferred to the partner best able to control the risk (Meyer-Hofmann et al. (2005), p. 121; Kerf (1998), p. 42; ADB (2000), p.101; World Bank (2002); Kerali (1999), p. 7; Partnership Victoria (2001), p. 20; Irwin (2007), p. 54/57f; Estache et al. (2000), p. 16; Irwin et al. (1999), p. 234).

Besides this main principle, more statements of efficient risk allocation can be found:

- *Divide and manage* (Irwin (2007), p. 54) risks.
- In case that none of the parties are able to control the causes of risk, it should be borne by the party with the lowest risk bearing costs (Irwin (2007), p. 6; Kerf (1998), p. 42).
- Risks should be borne by the stakeholder, who has the potential benefits from the realisation of the project (Bergmann et al. (1990), p. 5). This principle meets the requirement for a fair allocation of risk (Hauptverband der Deutschen Bauindustrie (1999), p. 33).

- That partner who can diversify the risks should bear it (Kerf (1998), p. 42). Hereby, hedging respectively diversification means to reduce total risk by variation of oppositely correlating single risks. Risks and chances balance each other in the risk portfolio. (Gabler (1997), p. 1766f).
- The allocation of risk should always be accompanied with the establishment of incentives structures (World Bank (2002)). The objective is to create incentives for the risk bearing party to reduce risk to the utmost (Kerf (1998), p. 42).
- Due to long-term contracts the risks allocation should be understood as flexible position to allow for renegotiation in case of major changes in the project. (World Bank (2002)).

In practice, difficulties to implement the guidelines of risk allocation in a project often occur for several reasons (JTRC/ITF (2007), p. 128; Kerf (1998), p. 42). Often it cannot be uniquely determined which party has the most control over the cause or effect of each risk. Moreover, out of all the factors influencing traffic demand none of them has significant influence, and therefore no conclusion can be drawn to which potential risk bearer the risk should be clearly assigned to (Vassallo/Sánchez-Soliña (2007), p. 11). The question for allocation becomes even more complex due to the large number of influencing factors on traffic demand, their interdependencies and the different causes of the risk.

3.2 Development of the analytical framework

To develop an approach for efficient allocation of traffic demand risk a framework was set up containing criteria to assess efficiency. Two main areas can be identified, they have to be taken into account when assessing efficiency of risk allocation: First, there are the characteristics of the potential risk bearers, namely the public authority, the private concessionaire and the road users. The choice of different risk allocation instruments decides if traffic demand risk remains with the public authority, is transferred to the concessionaire or assigned to the road users, either partly or in total. In the analysis the characteristics of the potential risk bearers is examined with respect to the following principles of efficient risk allocation:

- Which potential risk bearer has control over which influences of traffic demand?
- Which potential risk bearer benefits individually from the realisation of the toll road project?
- What costs of risk bearing result from the different risk bearers, if uncontrollable risk is transferred to them?

The second scope of analysis is represented by the characteristics of the different risk allocation instruments applied in road concession projects on an international level. Internationally, a wide range of instruments for allocation of traffic demand risk is available. Main categories of instruments are, e.g. state subsidies and grants, guarantees, user-based payment mechanisms and performance-based payment mechanisms. The following principles of efficient risk allocation were applied to assess the efficiency of risk allocation mechanisms:

- Does the particular instrument allow for risk-sharing among the parties?
- What incentive structures are established by the design of property rights? Do they enable exploitation of individual scope of action that goes along with a loss of welfare?
    - *prior to contract closing:* are there incentives for opportunistic and less careful forecasts, which can lead to strategic bidding and thus support implementation of projects that are not economically viable, so called *white elephants*?
    - *after contract closing:* are there incentives for less economic provision of road infrastructure, for exploitation of scope of action, for renegotiations and incentives to influence traffic demand as far as possible.
- What transaction costs result from the application of the instrument?
- Do principal-agent problems occur? Do they generate agency-costs?

The figure below illustrates the analytical framework for efficiency assessment.

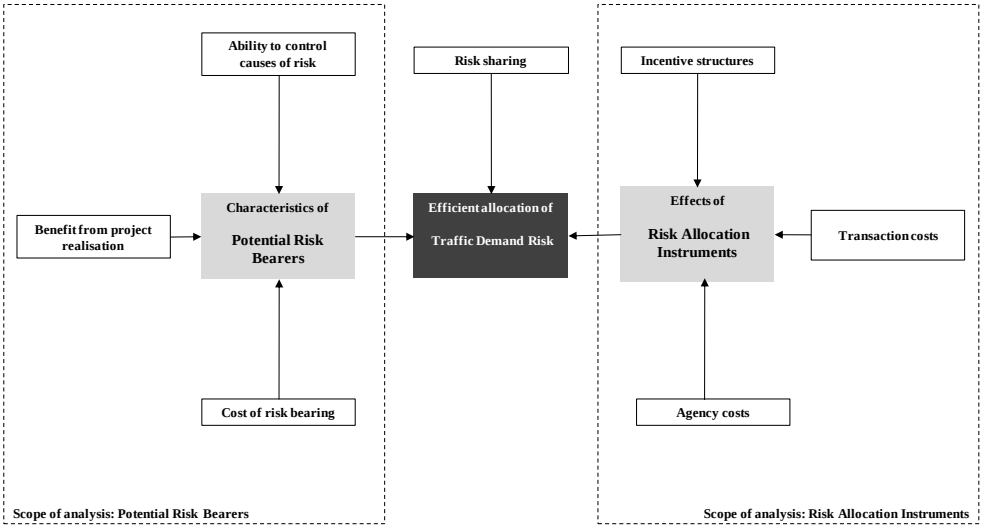

Figure 3: Framework for efficiency assessment (own)

3.3 Results of analysis

According to this framework a substantial analysis has been conducted by the author, but would be to extensive to be displayed here. Therefore, only the most important results are presented in the following.

It appeared that in principle, for economic reasons, a **risk-sharing** between the **potential risk bearers** represents a requirement for efficient risk allocation. Reasons can be found in the characteristics of the road as good (e.g. high sunk costs, high specificity and heterogeneous groups of uses), the fixed duration of most concession contracts and the need to transfer risk for establishment of incentive structures.

In the next step each influence on traffic demand was scrutinised for **controllability** by the potential risk bearers. It turned out that most influences on road availability can be controlled by the concessionaire and should therefore be borne by him. With respect to the users representing a risk for road availability they too should also be considered as risk bearers.

Political influences on traffic demand are controlled by the public authority. However, they need to be distinguished between project-specific and systematic influences. In the case that project-specific political risks (e.g. speed limits, construction due to changes in quality and safety standards) occur the concessionaire should be compensated for the losses. In the case of political risks which have an impact on the whole system (e.g. changes in taxes concerning the transport sector) a case-to-case consideration is needed. The table below summarises the extent of each parties' control over the different influencing factors of traffic demand.

Table 2: Control over influencing factors on traffic demand (own)

	Public authority	Concessionaire	Users
Economic factors	+	o	o
Socio-economic factors	+	o	o
Project specific factors	+	o	o
Political factors	++	o	o
User acceptance	+	+	o
Road availability	+	++	+

- Control over political factors-> project specific political risks remain with the public authority
- Case-to-case decisions with systematic political risks

- Control over road availability -> transferred to concessionaire

++ substantial control / + little control / o no control

Afterwards, it was found that the three potential groups of risk bearers, state, concessionaire and user, have individual **benefits** from the implementation of a road project, and should, in accordance with the principles for fair allocation, therefore be considered as risk bearers for the remaining systematic parts of traffic demand risk.

The next aspect in the analysis looked at the **cost of risk bearing** resulting from the individual risk bearer groups. The main point here was that all parties incur costs for risk bearing. This finding was in contrast to the frequently cited argument that the state can take risks at no or at least lower cost than the private sector. This assumption was disproved. Also the road users costs of risk bearing was identified. Thus, with respect to cost of risk bearing, no clear statement could be made to which party causes the lowest cost and should therefore bear the remaining traffic demand risk.

The next step in the analysis was to look at the effects of **risk allocation instruments** on the overall efficiency of a road concession project. A selection of internationally applied risk allocation instruments was introduced, the way in which they allocate risk was explained and their characteristics were evaluated by their **incentive structures**, their associated **transaction costs** and

their **agency costs** originating from principal-agent problems. The qualitative results were transferred to a semi-quantitative assessment for easier comparison. It turned out that state grants and guarantees always come along with strong incentive problems and high agency costs. Their application should be considered thoroughly and put into relation to the project's benefit for the economy. With user-based payment mechanisms too much uncontrollable influences on traffic demand is transferred to the private party, causes high risk premiums and opens up potential for exploitation of scope of action resulting in adverse selection and winner's curse. Performance-based payment mechanisms such as availability payment and active management payments offer the highest overall efficiency. Here the problem of uncertainty in traffic demand development with its negative consequences for the concession agreement does not come into effect and only the risk that can be controlled by the concessionaire is transferred to him. The table below shows half-quantitative assessment of all instruments examined.

Table 3: Effects of risk allocation instruments on efficiency (own)

Risk allocation instruments	Incentive structure	Transaction costs	Agency costs	Total assessment
Initial state grant (ex ante)	- -	+/-	- -	*very negative*
Guarantee of *Economic Balance*	- -	- -	-	*very negative*
Traffic and revenue guarantee (p.a.)	- -	+/-	-	*very negative*
Traffic and revenue guarantie (least present value)	+	-	+	*positive*
Revenue Distribution Mechanism	++	+/-	++	*very positive*
User toll payment	- -	-	-	*very negative*
Shadow toll payments	-	-	-	*negative*
availability / active management payment	++	+/-	+	*very positive*

-- very negative effect - negative effect +/- neutral + positive effect ++ very positive effect

4. Conclusion

Private engagement in the provision of road infrastructure is worldwide required to meet the high demand while public budgets are scarce. Concessions represent a frequently applied arrangement to close this gap. Among other issues in these public private partnerships the allocation of traffic demand risk represents one of the most critical risks. Due to its high level of uncertainty problems of a different nature arise in the phases before and after contract closing. They can lead to loss of total project efficiency and welfare. It was shown in the analysis that to achieve an efficient allocation of this risk is it necessary to look at several components which determine the allocation's efficiency: the factors that influence traffic demand and therefore also traffic demand risk, the characteristics of the potential risk bearers in concession projects, the public authority, the private concessionaire and the road users, and the effects of risk allocation instruments on project efficiency. These three areas were analysed and assessed with regard to allocation of traffic demand risk.

Although there were some findings on more or less efficient approaches one has to bear in mind that there cannot be only one solution to this problem. The project stakeholders always have to consider the concrete framework of the project and to decide about allocation in accordance to it.

Beside all considerations one cannot expect to achieve overall efficiency in a concession project while disregarding the most relevant issue of all: the common willingness for a real partnership between the public and the private side.

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Real Estate Investment Funds as a Possible form of Public Private Partnership

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Abstract

Private real-estate investment funds have not yet been fully developed in Slovenia as opposed to public real-estate funds. Both fund forms differ in their basic purpose: public funds act as instruments of housing policy and in public interest only, while private funds pursue profit by investing mainly in development and rental of commercial real-estate. On a basis of comparison a conclusion is made, that private funds normally do not have any interest investing in non-profit segment. The non-profit segment in Slovenia is facing a significant lack of supply. Analysis shows that the enactment of legal regulation of REITs could be a possible and useful addition to the Slovenian housing market. Furthermore, a concrete proposal has been issued to consider REITs as private partners in public-private partnerships (PPPs) established for the development of non-profit rental housing.

Keywords: public real estate funds, REITs, housing policy, social housing, PPP

1. Real estate funds as an instrument of the Slovenian housing policy

1.1 Introduction and methodology

In this research an attempt is made to present the field of real estate funds in Slovenia, to point out the fact that private real estate funds have not yet been incorporated in Slovenian legislation, and explore some possibilities of public private partnerships in this field. Eurostat (2009) data shows that in 2007 Slovenia belonged among states which have more than 80% of owner occupied dwellings in their total housing stock. 4,8% of the stock present commercial rental units and only 1,3% of the stock consists of non-profit rental apartments. This issue is being examined in order to find out whether an introduction of REITS to Slovenian legislation and their cooperation with public funds could contribute to solving the problematic lack of rental apartments in Slovenia, especially in the non-profit segment.

The descriptive method has been used to present particular elements of research and the comparative method to illuminate the differences between the different fund forms. Information mostly derives from our own resources and experience and also from domestic and foreign literature. Other authors' views have been gathered with the compiling method. In order to get a deeper insight into current activities of the legislator, an interview has been conducted with an official within the governing ministry.

1.2 Slovenian housing sector

Slovenia is one of the European states with highest ownership units rate and faces a significant lack of commercial and non-profit rental units (apartments). The current state of the Slovenian housing market is first and foremost a result of historical developments since the end of the second world war until 1990. Mandič (1996) states that there were only two types of housing dominating in Slovenia's socialist times: ownership housing and »solidarity housing« (Hegedues, 2007, p. 172). The rental segment was under the domain of the state and was not treated and institutionalized as a special economic activity. The supply of housing and rentals were part of the collective consumption within the working organizations. Each of them formed its own housing stocks which were led by special commissions. Similarly Hegedues (2007) claims, that in the East-European Housing Model (EEHM), social housing had a special meaning: it was 'state' housing. The state (in the broad sense) controlled both the demand side and the supply side of the housing sector and did not allow the market to act as an integrating social mechanism (p. 165).

Mandič (1996) points out that after the change of political system in 1991, several new mechanisms were introduced, however, two of these were key: the sale of state-owned apartments to long-term leases (privatisation) and the return of ownership to previously nationalised real-estate owners (denationalisation). Namely, The Housing Act from 1991 defined the fundamentals for the

abolishment of socially-owned property in the housing sector. The bill abolished »socially-owned rental apartments« and defined a new type of housing called »housing-for-profit«. This was characterised by ownership with the intention to profit from renting to third parties.

According to the National Housing Programme, Slovenia should have assured 10.000 apartments per year – of these 4.500 non-profit, 500 for-profit and 5.000 private or state-owned apartments (Internet source1). Statistics show that the total number of housing units follows those goals, however, there is no data on the types of apartments built. In its 2009 publication »Consumers in Europe«, Eurostat states that 67% of all households actually owned their own housing in the EU-27 in 2007. 21% of households paid market rates for rent, while 8% paid non-profit rent and 7% received free housing. In 2007, Slovenia, alongside Latvia, Estonia, Spain, Hungary and Slovakia, was amongst countries where ownership rates were above 80%. Lithuania tops the list with over 90% of household ownership of real-estate. Germany, Holland and Denmark may be found at the bottom of this list with household ownership just above 40%. According this same source, Slovenia had only 4.8% market rent apartments and 1.3% non-profit apartments.

1.3 Absence of legal framework for private real estate investment funds in Slovenia

Regardless of certain variations, the real estate environment in Slovenia is developed and operates both in economic, as well as legal and organisational terms. Legislation enables market transactions and provides a framework. In respect to this, Balchin and Rhoden (2002) state that in the long-term, market forces and government intervention are keys in assessing the size of housing funds and segments within such funds (p. 3). Even the Slovenian constitution states that the State is obliged to create opportunities so that everyone may gain access to appropriate housing. Several instruments are at hand to assist in achieving this goal, however, activity on the global and Slovenian real estate market shows that the legal framework still does not fully support certain types of real estate operations. One of these types are real estate investment funds.

The National Association of Real Estate Investment Trusts (2009) states that over 30 nations have adopted adapted versions of REITS in their legislative frameworks due to the positive effects they have on the financial and real estate markets. Even more countries are currently considering the introduction of REITs. The same can be said for Slovenia, but current legislation does not enable REIT incorporation. Even though existing national strategic guideline documents, as well as pre-electoral promises and coalition contracts all express their inclination to such investment instruments, insufficient political will has been found to actually transform these intentions to legislation.

The existing Investment Trusts and Management Companies Act does not cite real estate as an investment class to be managed by investment trusts. Neither the original Act, nor subsequent amendments, foresees the existence of real estate investment trusts in Slovenia. It seems the most important issues facing the implementation of private investment funds are related to tax implications of such funds, which should be comparable to those of REITs. Whether an investor invests through private investment trusts or directly, the result should be a tax-neutral position. Starovič (2005)

argues that such a system is already incorporated in Slovenia's tax legislation: Article 54 of the Corporate Profit Tax Act assigns a 0% tax rate for investment funds that disburse at least 90% of their net profit.

A need for the introduction of private investment trusts and the positive effects these would bring to the real estate and financial markets is evident in the Slovenian business environment. Following a study of management companies and asset managers, Koritnik (2006) reports they find one of the most limiting factors of current legislation the fact that it does not enable some alternative investment classes, funds and investments – particularly closed mutual funds, real estate funds and high risk investment funds. However, they do admit that such legislation protects non-informed investors, but they also argue that there is a significant number of well-informed investors that consequently do not have the opportunity to invest in these types of asset classes.

To assess the need and appropriateness of the introduction of private investment trusts into Slovenian legislation a comprehensive analysis of needs and possible effects is needed both for the real estate and financial markets. For the purposes of this research, we limited ourselves to the needs and possible effects of the real estate market.

1.4 Slovenian public real estate funds

As opposed to private investment trusts, public real estate funds (public funds) are comprehensively incorporated into Slovenian legislations. Public Funds Act as an instrument through which the State implements its housing policy to assure housing access to all citizens and to assure housing access to groups within the population with special rights granted. Yescombe (2007) talks about assuring a »social infrastructure« which also includes, for example, schools, hospitals, prisons and the like that are absolutely necessary for society as a whole.

There are three such institutions dealing with the implementation of national housing policy:

1) Housing Fund of the Republic of Slovenia
2) Municipal housing funds
3) Non-profit housing organizations

All these institutions act as possible investors into non-profit housing. The national Housing Fund's size and amount of assets enable it to invest in a wider range of housing types, so non-profit development and renting represents just one part of its operations. It may also participate as a real estate investment fund that accelerates the development and, consequently, the supply of all types of real estate on the market.

The Housing Fund of the Republic of Slovenia, on the basis of the Public Funds Act, operates as a public fund, meaning it manages assets the State allocated at the establishment of the fund, but since then no significant allocations were made, although the National Housing Programme provided for the legal base of it. It is also the only fund in Slovenia that has assets in its full ownership and not in the management for the realisation of public interest. It operates as a public financial and real estate

fund founded with the intention to finance the national housing programme and to actively manage public housing. In terms of Housing Act, the Housing Fund performs mainly the following:

1) Sale of open-market housing at discounted prices through public invitations to tender,
2) Offers attractive long-term real estate loans to buyers,
3) Encourages the development and acquisition of new non-profit units through financing, co-investment and partnerships,
4) Rents and manages the existing stock of non-profit housing units.

A comparison between private investment trusts and the Housing Fund was conducted, but only in the segment where the Housing Fund acts as a co-investor or buyer of non-profit developments which are then rented to households that gained non-profit renting rights. The Fund's development of open-market housing and its subsequent sale of units at discount pricing cannot be compared directly to activities of a private investment trust because the Fund's apartments are sold to applicants from special groups and are also not rented out as is the case with non-profit apartments.

It is rather obvious that the criteria of (non)public and (non)profit orientation are the key differentiators that make a direct comparison of these two types of funds impossible. Other differences are derived from these two criteria and we notice that the only common element these two fund share is the way the investment projects are managed. Both forms rely on common economic, urban planning, engineering, development and legal procedure to assure successful project development. The introduction of private investment trusts alone would not guarantee an increase in non-profit units as these are not in the interest of such private trusts and they are not inclined to invest in these. However, our study still seeks to identify whether there are areas of interest common to both fund types that could lead to synergies in the Slovenian real estate market.

Municipal public housing funds are directly responsible for housing policy at the municipal level. They are mandated to prepare and implement municipal housing policy. Following the reorganisation of the National Housing Fund, a major breakthrough was made when the new legislation enabled the National Housing Fund to also finance municipal funds and even co-invest in municipal housing projects. Municipalities and their funds are also mandated to manage local non-profit housing units.

This is supervised on an annual basis by the Ministry of the Environment through its Housing Council which demands accurate unit counts and statistics on applications, fund equity disbursed and still available, as well future plans and budgets, rent movements, forecasted problems, etc. Data shows that almost all municipalities allocate funds to housing development, but shortages still remain. Hegler (2006) quotes that on average only around 20% of all non-profit rental applications get approved.

All municipalities face a shortage of funds to finance new non-profit housing units. Moskalyk (2008) exposes the problem of excessively fragmented financing in various local programmes and policies in addition to the lack of a nationwide programme at the State level. Another problem also stems from the fact that municipal funds cannot influence the work of municipal urban planning departments that actually decide which lots are acceptable and which lots should receive connections to communal

infrastructure. A lack of such lots has been cited as the major obstacle to the development of new non-profit housing units in the past.

Table 1: Comparison of private investment trusts and the Housing Fund in terms of development and renting of non-profit apartments

	Private Investment Trust	*National Housing Fund of the Republic of Slovenia*
Statutory form	*Legal entity of civil law*	*Legal entity of public law*
Legislative background	*Does not exist*	*Housing Act* *Public Funds Act,* *Act on the establishment of the Housing Fund of the Republic of Slovenia*
Equity source	*Private*	*Public*
Intention of investment	*Profit*	*Implementation of the National Housing Programme*
Project acquisition	*Internal or public developer selection process*	*Mandatory public tenders*
Project development process	*Follows expert guidelines*	*Follows expert guidelines*
Budget supervision	*Internal planning and supervision*	*Administratively allocated budget defining the maximum possible value of construction work costs (internal act)*
Definition of rent amount	*According to market rates*	*Non-profit rent defined by secondary legislation*
Unit distribution/household selection	*Internal rules*	*Public tender / Definition of priority groups*
Rental agreements	*In accordance with housing legislation*	*In accordance with housing legislation and regulations governing rental of non-profit housing*

Non-profit housing organisations (NPHO) are also an institutional form mandated to carry out housing policy, however, they are not incorporated as public real estate funds, but rather as legal entities of civil law. The Housing Act mentions them as key organisations responsible for assuring adequate supply of non-profit housing. They hold a special status that grants them benefits whilst financing the development of non-profit and own housing projects. They do this primarily with loans from the National Housing Fund, their domicile municipalities, and own funding. Historically, NPHOs have always faced shortages of funding. They have struggled to maintain existing housing stock, not to mention how difficult they have found it to develop new non-profit housing units. In Slovenia, NPHOs primarily received into management housing units not sold during the privatisation process that were badly maintained and required above average investment and running costs.

The considerable age disparity and unbalance between the housing stock did not enable younger housing units burdened with loans to be financed by cash flow from rents of older housing stock that was considerably less burdened by financial liabilities. Currently, amendments are being made to the rules governing NPHOs. The most noticeable changes will be the deregulation of allowed additional business services the NPHO may offer and the possibility to establish partnerships with third parties in some areas - all with the intention to increase potential revenue and to follow European housing policy trends. Partnerships are meant to include both public and private (the NPHO) partners with the aim of securing more non-profit housing units. The public partner may be either the National Housing Fund or the municipalities. However, in practice, this form of public private partnership has not proved fruitful, nor may we expect that it alone will help find a solution for the lack of non-profit housing. Therefore, we must seek alternative types of cooperation between the public and private sectors in this field.

2. Public and private real estate investment funds as partners in non-profit rental housing segment

2.1 Introduction

The state acts as an investor in non-profit housing and acts as a competitor to private investors and developers in pursuing profit. All mandated housing policy institutions in Slovenia aim to attract private equity to the development of non-profit, as well as open-market housing. This is due to the fact that demand exceeds supply considerably and because there are limited funds for the realisation of the nation's housing policy – both on the national and municipal level.

An efficient public private partnership is defined by three key elements:

1) Both partners must have interest,
2) Both partners must bear risks,
3) A legal framework must enable such a partnership.

We have already discovered that the greatest lack of supply occurs in open-market and non-profit rental housing. By conducting a comparative analysis, we have assessed in this study that public and private real estate funds are not directly comparable or competitive and that the introduction or existence of private investment trusts would not necessarily significantly increase the supply of non-profit housing stock. In the following chapter, we will examine whether the introduction of private investment trusts could help increase non-profit housing stock by means of forming a public private partnership.

2.2 Proposal of most suitable model of PPP in Slovenian non-profit rental housing segment

In order to investigate further possibilities, we must first examine which subjects may act as public entities and which as private and in what combinations so as to ascertain whether private investment trusts could act as a private partner and to define their potential role in the development of non-profit housing. Our analysis of the legal framework shows that private investment trusts could act as private partners to the National Housing Fund and municipal real estate funds. Legislation makes it mandatory that private partners of the National Housing Fund register themselves as non-profit housing organisations (NPHO), whereas this is not required of private partners of municipal real estate funds. Therefore, a municipality's good knowledge of local needs and likely lack of municipal funding suggest that should private investment funds be introduced in Slovenia, it would make most sense to partner at the municipal level.

In regard to the particular partners' interests in a PPP, a private investment trust aims to develop or buy certain real estate with the intention to receive profit from collected rent. Chan, Erickson and Wang (2003) speak of making profit by offering so-called auxiliary management services and other services for occupants like concierge services, laundry, as well as property sale. As the private partner in a PPP they are inclined to also manage public services because an investment of this sort usually brings secure and constant returns. For their investment into such a project, the private trust would expect returns corresponding to their input and risk. They would be interested in investing in such a manner only if these returns were guaranteed to them. Such returns may only be guaranteed if a combination of open-market and non-profit development in projected where the public partner contributes the complete plot of land or grants non-payable building rights along with rights to offer commercial or auxiliary housing services on-site such as building management and other rental services.

On the other hand, the public partner pursues public interest by increasing housing stock and distributing non-profit housing as part of its housing policy. Through this model of cooperation, the public partner may achieve that the private partner uses its expertise, experience and funding to ensure the public's interest is best served with lower costs, greater scale and better quality as opposed to if the public partner acted alone.

Akintoye et al. (2003) claim, that each organisation has stakeholders whose attitudes, values and expectations usually have an impact on risk considerations. The partners cooperate in a PPP project each with their own input and both bear part of the risk. Li and Akintoye (2003) also state, that each of the partners has to transfer some resources – material or immaterial – to the partnership (p. 6). Furthermore, Bohinc, Mužina and Tičar (2007) state that if one partner bears all the risk, we may not classify such a partnership as a PPP. The table below represents optimal risk distribution in PPP for the development and rental of non-profit housing

Considering a variety of different possible PPP forms, we deem the most appropriate model of PPP for the intention of developing non-profit housing is a statutory partnership by the incorporation of a new legal entity (SPV). This would be of particularly to the private partner because it would enable

the transfer of non-profit activities away from the mother-company whilst not interfering with profit accumulation and disbursement from profitable operations. This model is also appropriate for the public partner as it paves the way for successful implementation of housing policy.

Table 2: Proposition of risk distribution amongst partners

PUBLIC PARTNER	*PRIVATE PARTNER*
Appropriate identification of needs and opportunity *Private partner selection* *Appropriate selection of PPP model* *Appropriate setup of contractual relations* *Project financing in the form of non-cash contribution (plot of land) or non-payable building rights granted*	*Administrative procedures (licences & rights)* *Project execution quality* *Timeline of project execution* *Unforeseeable events* *Supervision* *Financing of project engineering, licensing and development* *Project profitability*

Both partners' rights and obligations would be defined in a statutory partnership contract which would include the following:

- type and goals of statutory partnership,
- type and amount of assets invested,
- timeline of usage of public funds,
- types of supervision of usage of funds,
- timeline of potential investments and fulfilment of other liabilities,
- property ownership allocation,
- conditions for inclusion of sub-contractors,
- contractual penalties for the contract's termination and the partners' rights and liabilities should termination occur,

- definition of statutory relations within the new legal entity (SPV).

The private investment trust will likely focus on the financial plan, timeline, amount of contribution of the public partner and how they intend to guarantee it, ownership transfer, special management agreements, and conditions for employing sub-contractors.

In regard to the transfer of ownership of the fully developed project to the public partner, both the B-O-T and B-T-O models are possible, however, we believe it would be economically most viable and in the interest of both parties if ownership remained on the side of the SPV for the duration of the PPP. The duration of the partnership is defined to assure the private partner a stable and secure investment and the possibility of efficient and secure investment financing and coverage of incurred costs. During the duration of the partnership the private partner must also an appropriate market return while retaining and managing some of the business risk.

3. Conclusion

The Slovenian real estate environment is developed and operates both in economic as well as legal and organisational terms and entities. Nevertheless, Slovenian legislation does not recognise some institutional types of real estate transactions. One of these types is the private investment trust. Correspondingly, only public real estate funds operate and strive to achieve the goals of housing policy. They do so predominately through financing and offering new housing capacity for the non-profit market segment, and only partially in profit market.

Private investment trusts are institutional entities that function both on financial and real estate markets. This paper is limited to those operating in the real estate market. In regard to this it has been established that Slovenia is one of the countries with the most housing ownership. In 2007, only 4.8% of total housing units were rental properties and only 1.3% were non-profit rental properties. A lack of capacity is especially evident in the latter. We established through a comparative study that public and private real estate trusts are not comparable in their core characteristics and also cannot compete with each other. We concluded that the introduction of private investment trusts would not necessarily result in an increase of capacity of non-profit housing. Furthermore, we investigated the possibility of using private-public-partnerships with private investments trusts to try to tackle the lack of non-profit apartments. We sought to outline how such partnerships could be arranged, whether the fundamental requirements of PPP would be fulfilled, and what forms would be most appropriate. We researched this to either confirm or deny our hypothesis that the introduction of private investment trusts could contribute to a more balanced and efficient real estate market in Slovenia.

Analysis of the existing legislative framework showed that private investment trusts could participate as private partners of the national housing fund and particularly of municipal real estate funds. Partnering with municipal funds makes the most sense primarily because of the deep understanding municipal funds have of local housing needs and also their constant lack of funds for their housing policy. If required returns were guaranteed, private investment trusts would be interested in such partnerships, if not, their management companies would find it hard to put together a viable

investment case. Therefore, a PPP would have to enable a combination of non-profit housing as well as apartments built for sale to the open market. In this arrangement the public partner would contribute the entire plot for development or the non-payable building rights, as well as rights to offer commercial services such as building management and other rental services on-site.

Success of such a project would depend on both partners contributing with their respective inputs and also bearing part of the risk. A recommendation of optimal risk allocation amongst the partners has been provided in this paper. Based on a variety of possible PPP types, we concluded that a statutory partnership would be most appropriate for the development of non-profit rental apartments. This could be done by incorporating a new legal entity such as a project management company. All partners' rights and obligation would be defined in a statutory partnership contract. After the project structure is defined, the parties would need to add adequate content that would offer a certain degree of flexibility due to the long-term nature of such a relationship. Such an operation, together with expert and political engagement of all partners, could lead to the project's success and, ultimately, to a more efficient real estate market.

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A Multi-objective Decision Support Model for Concession-based Public Private Partnerships Schemes

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Abstract

A public private partnership (PPP) scheme is successful only if the major stakeholders namely the public sector, private investor, and end-users are all satisfied with the project outcomes. Therefore, it is important to balance the interests of the key stakeholders when considering and designing the concession items of a PPP project. In view of the capability of the multi-objective decision theory in optimising conflicting objectives, it is necessary to examine how this technique can be applied to solve the diverse interests of PPP participants. In this paper, a set of criteria related to the success or best value of PPP procurement is first identified through literature review and interview. Then, the framework of a multi-objective decision support model for evaluating the concession items against the satisfaction of the key stakeholders of a PPP scheme is presented. It is envisaged that appropriate solutions for the concession items can be deduced by the proposed model and these can help decision-makers to balance the interests of different parties before a PPP scheme is rolled out so as to maximise the chance of project success.

Keywords public private partnerships, multi-objective decision, best value criteria, concession items

1. Introduction

Public private partnerships (PPP) is a cooperative arrangement between the public and private sectors for public facility or service delivery with a desire to best meet the needs and interests of the general public through appropriate allocation of risks, rewards and resources (Canadian Council for PPPs, 2004). A successful PPP scheme should thus be one which could offer satisfactory outcomes to all key stakeholders namely the public agency, private investor and end-users. To do that necessitates the interests of all stakeholders be carefully evaluated and balanced.

Over the past decade, PPP has been extensively applied to the construction industry around the world. While there are no shortage of successful PPP examples, problems like conflicting objectives among project stakeholders, high tendering costs, complex negotiation procedure, and so on have been reported (Li et al, 2005). This has instigated researchers to examine what contribute to the success of a PPP project. Critical success factors (CFSs) and best value contributing factors (BVCFs) for this type of project delivery arrangement have been identified by Akintoye et al (2003), Chan et al (2004), Li et al (2005), Zhang (2005; 2006) and Chen and Chen (2007).

The studies on CSFs and BVCFs should help decision-makers to understand the underlying reasons for success so as to ensure the risks between the public and private sectors is appropriately allocated with due consideration of the interests of the general public. Despite that, the commonly used public sector comparator (PSC) focuses primarily on value-for-money from the perspective of the public client and investor. Little attention has been attributed to devising an effective framework to assess the impact of a PPP scheme to the society.

While a successful PPP is one which could meet the key decision items while satisfying the interests of the three major stakeholders, it is difficult to establish a solution which can satisfy all participants simultaneously as the interests and objectives amongst the government, investor and users may be conflicting. The multi-objective decision techniques being widely applied to trade-off two or more conflicting objectives based on certain constraints may have a strong avenue to result in a mutually acceptable PPP decision.

In this paper, the possibility of applying a multi-objective decision model to solve the conflicting interests of stakeholders in a PPP scheme is examined. The paper begins by highlighting the key decision items to be considered by the public agency when a PPP project is proposed. Determining the values or states of those decision items is crucial in view of the diverse interests of stakeholders involved. In order to measure the satisfaction of each stakeholder on a given PPP solution, a list of CFSs and BVCFs is drawn up, and interviews are then conducted to verify whether the factors as identified can truly reflect the satisfaction of different stakeholders. Finally, a framework for the multi-objective decision support model which aims to establish a balanced solution for PPP projects based on the best value concept is presented.

2. Decision items in concession-based PPP schemes

When the public agency determines whether to apply PPP or not, they should have a clear idea about the service specifications, financial viability and legal implications of the scheme (HM Treasury, 2003; Efficiency Unit, 2008). Apart from certain general items such as those statutory requirements, there are some essential aspects which should be determined by the decision-maker according to the characteristics of the project. Examples of these include the level of charge the end-users should pay for the enjoyment of the facility or service, the performance level the private sectors should achieve, the most suitable technical scheme the private sectors should develop, the value of applying a more complex technical scheme to improve the life cycle and environment sustainability of the facility, the subside to be offered by the public sector, the risks to be allocated to the private sectors, etc. Prudent decisions should be made when identifying those items as their choice might affect the degree of satisfaction of the three stakeholders in a PPP scheme and finally determine the project success.

To have a better understanding on the decision items, various PPP guidelines produced by the governments (e.g. HM Treasury, 2003; Canada Council for PPPs, 2004; Efficiency Unit, 2008) as well as literatures were reviewed. Consequently, seven key decision items were drawn up, which include the (i) technical scheme; (ii) service requirement; (iii) tariff/toll level; (iv) public financing; (v) PPP type; (vi) risk allocation; and (vii) concession period. Interviews with government officials, consultants and financial expert were then conducted to determine whether the identified decision items can cover the requirements of a PPP scheme. All of them agreed that the seven identified decision items should be considered comprehensively when planning for a PPP scheme. Some interviewees believed that the tariff/toll level, public financing and concession period are particularly important as governments are inclined to encourage private investment when they have to boost the country's development under a tense budget. Some, however, opined that the technical scheme and service requirement are not as demanding as the governments could apply relevant regulations to monitor the technical and environmental concerns.

3. Best value evaluating criteria

To achieve the best value while maximising the satisfaction of the three PPP stakeholders is the primary goal of the public agent when applying PPP in facility or service provision. To do that, a set of evaluation criteria should be established to measure the effectiveness of a PPP solution in achieving the satisfaction of public sector, private sector and end users. The selection of criteria is therefore of paramount importance to the overall decision making process.

Many researchers have examined the drivers or factors contributing to the success or best value of PPP projects. Though the CSFs or BVCFs identified in these literatures are factors related to the operation and implementation stages of PPP projects, these factors may also reveal the reasons or conditions contributing to the success / failure of PPP projects at the early planning stage including the initial proposing and feasibility study process.

Table 1: Summarising the successful / best value criteria for evaluating the PPP solution

Criteria	*Abdel Aziz (2007)*	*Akintoye et al (2003)*	*Ashley et al (1998)*	*Chan et al (2004)*	*Efficiency Unit (2008)*	*Grasman et al (2008)*	*HM Treasury (2004)*	*Ozdoganm & Birgonul*	*Zhong et al (2008)*	*Sobhiyah et al (2008)*	*NCPPPs (2002)*	*Wong (2006)*	*Zhang (2005)*	*Zhang (2006)*
Technical Aspect														
○ Available of potential private sectors					✓	✓	✓	✓				✓	✓	
○ Utilisation of resource, managerial skill and technologies of private, and stimulation of innovation	✓	✓		✓	✓	✓	✓			✓	✓	✓	✓	✓
○ Good service quality	✓	✓		✓	✓		✓			✓	✓	✓		
○ Long project life span					✓					✓				✓
○ Modular and repeatable design / construction					✓									✓
Financial Aspect														
○ Good financial viability / value for money	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
○ Risks transfer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
○ Reduce public off-balance budget						✓	✓	✓	✓	✓		✓		✓
○ Reduce public administrative costs		✓												✓
○ Reduce transaction cost of procurement process		✓					✓							
○ Early project completion / product or service delivery		✓		✓	✓									✓
○ Acceptable tariffs / tolls	✓		✓		✓				✓	✓		✓	✓	✓
○ Low project life cycle costs														✓
○ Low construction, operation and maintenance costs		✓						✓					✓	✓
○ Acquisition of a fully completed and operational facility			✓											✓
○ Benefits to local economy												✓		✓
Political Aspect														
○ Political sensitivity of the project												✓		
○ Political support to the project	✓		✓					✓	✓			✓	✓	
Social and Environmental Aspect														
○ Acceptable to the interest group and general public					✓			✓				✓	✓	
○ Environmentally sustainable			✓		✓		✓	✓				✓	✓	✓
Other Aspect														
○ More job opportunities					✓						✓	✓		
○ Fairness to staff							✓					✓		
○ Supportiveness and commitment of staff												✓		

From the relevant literatures, there are many different methods to classify the CSFs and BVCFs. Among various classification methods, the one proposed by Ozdoganm and Birgonul (2000) was found to be the most suitable as it categorises the factors systemically according to the characteristics of different aspects of risks involved in a PPP project. Risks in different aspects including the technical, financial and economic, social, environmental, as well as political and legal are important

factors to be considered by decision-makers (Han and Diekmann, 2001). Classifying those criteria according to their risk categories is also relevant when the feasible of a PPP scheme is examined. Since a successful PPP scheme should be economically viable, socially acceptable and environmentally friendly (Heinke and Wei, 2000; Zhang, 2004), the evaluation criteria are categorised under these four groups. Table 1 shows the detailed list of criteria with their sources of reference provided.

These 23 evaluation criteria were presented to the experts who include the government officials, consultants and financial expert during the interview process. They were asked to rate the degree of importance of each evaluation criterion to the success of a PPP project based on a seven-point Likert scale, with 1 being the lowest level of importance and 7 denoting the greatest importance. The statistic results are presented in Table 2.

Table 2: Means and Standard Deviations of the Importance of evaluating criteria

Criteria	***Importance***	
	Mean	*s.d.*
Technical Aspect		
○ Available of potential private sectors	*5.0*	*1.22*
○ Utilisation of resource, managerial skill and technologies of private, and stimulation of innovation	*5.0*	*0.71*
○ Good service quality	*5.2*	*1.10*
○ Long project life span	*4.6*	*1.34*
○ Modular and repeatable design / construction	*4.2*	*1.79*
Financial Aspect		
○ Good financial viability / value for money	*6.2*	*0.45*
○ Risks transfer	*5.2*	*0.84*
○ Reduce public off-balance budget	*6.2*	*0.84*
○ Reduce public administrative costs	*4.8*	*0.84*
○ Reduce transaction cost of procurement process	*4.0*	*1.00*
○ Early project completion / product or service delivery	*5.0*	*0.71*
○ Acceptable tariffs / tolls	*6.0*	*1.00*
○ Low project life cycle costs	*4.2*	*1.64*
○ Low construction, operation and maintenance costs	*5.0*	*1.58*
○ Acquisition of a fully completed and operational facility	*4.8*	*0.84*
○ Benefits to local economy	*4.8*	*1.10*
Political Aspect		
○ Political sensitivity of the project	*5.2*	*0.84*
○ Political support to the project	*4.8*	*1.92*
Social and Environmental Aspect		
○ Acceptable to the interest group and general public	*5.8*	*1.30*
○ Environmentally sustainable	*6.0*	*1.22*
Other Aspect		
○ More job opportunities	*3.6*	*1.52*
○ Fairness to staff	*3.0*	*1.41*
○ Supportiveness and commitment of staff	*3.0*	*1.41*

Considering the complexity of the proposed evaluation model as the number of criteria increases, twelve most important criteria with their arithmetical mean equal to or greater than five were drawn up. Those criteria are listed in Table 3.

Table 3: Twelve most important criteria for evaluating the PPP solution

Important Criteria
Technical Aspect
○ Available of potential private sectors
○ Utilisation of resource, managerial skill and technologies of private, and stimulation of innovation
○ Good service quality
Financial Aspect
○ Good financial viability/Value for Money
○ Risks transfer
○ Reduce public off-balance budget
○ Early project completion/product or service delivery
○ Acceptable tariffs/tolls
○ Low construction, operation and maintenance costs
Political Aspect
○ Political support to the project
Social and Environmental Aspect
○ Acceptable to the interest group and general public
○ Environmentally sustainable

4. Multi-objective decision framework for selecting appropriate PPP solution

Multi-objective optimisation is widely applied to simultaneously optimise two or more conflicting objectives subject to certain constraints. According to Blecic et al (2007), multi-objective decisions have the following characteristics:

- decision-maker needs to simultaneously undertake actions to make decisions on different items / variables;

- decision maker needs to achieve a trade-off among different and often conflicting objectives which are probabilistically dependent on simultaneous actions; and

- the model must be built out of the knowledge provider by human experts.

Since the objectives of the government, investor and users are not the same, an optimal PPP solution cannot be reached easily. Therefore, one would normally aim for searching a non-inferior solutions for this type of problems instead. The non-inferior solution is reached no other solution which can improve one of the objective while not damage any other objectives can be found.

From those non-inferior solutions, decision-makers can then apply some techniques, e.g. by transforming the multi-objective problem into a single objective one by maximising the expected utility. Through this, an ultimate PPP decision can be established (cf: Evans, 1984).

To develop a multi-objective decision model for selecting the most appropriate PPP solution, an eight-step decision framework as shown in Figure 1 is devised.

Step 1: Construct a solution by determining a set of values for the decision items. The decision items and their possible value are pre-defined by decision makers. As discussed in Section 2, the decision items in our problem include: (i) technical scheme; (ii) service requirement; (iii) tariff/toll level; (iv) public financing; (v) PPP type; (vi) risk allocation; and (vii) concession period.

Step 2: Evaluate the solution under the criteria package. The criteria based on CSFs or BVCFs are divided to five aspects, namely: technical, financial, political, social and environmental, and other. To reduce the complexity of the evaluation model, 12 most important criteria are drawn up accordingly.

Step 3: Calculate the objective values for the solution. There are three conflicting objectives, i.e. satisfaction of the public sector, private investor and end-users. It is necessary to compute the three objective values for the current solution based on the evaluation results in Step 2.

Step 4: Compare the objective values of this solution with other solutions in the non-inferior solution pool, and establish a non-inferior solution pool in the first iterative, i.e. to send the first solution to this pool. Then in the following iteration, compare current solution with each solution in the pool.

Step 5: Determine whether the current solution is a non-inferior solution or not. If it is, it will proceed to Step 6. Otherwise, it will jump to Step 7.

Step 6: Adjust the non-inferior solution pool and send the current solution to the pool while removing any solution(s) which show inferior in all three objective values simultaneously during the comparisons.

Step 7: Determine whether all the possible solutions have been evaluated. If so, go to Step 8. Otherwise, return to Step 1 to begin another iteration.

Step 8: Further decision shall be made to select an appropriate solution based on the non-inferior solutions. There is seldom a best solution for a multi-objective problem. Therefore, one way to obtain an optimised solution is to assign weightings to the objectives and to compute a weighted average objective value for each solution in the non-inferior solution pool. Through which, an optimal solution can be derived.

The result generated by the proposed multi-objective decision model should provide a solution which achieves the highest weighted average objective value, and this can support the public sectors in determining an appropriate solution to balance the interests of different PPP stakeholders and achieve success / best value ultimately.

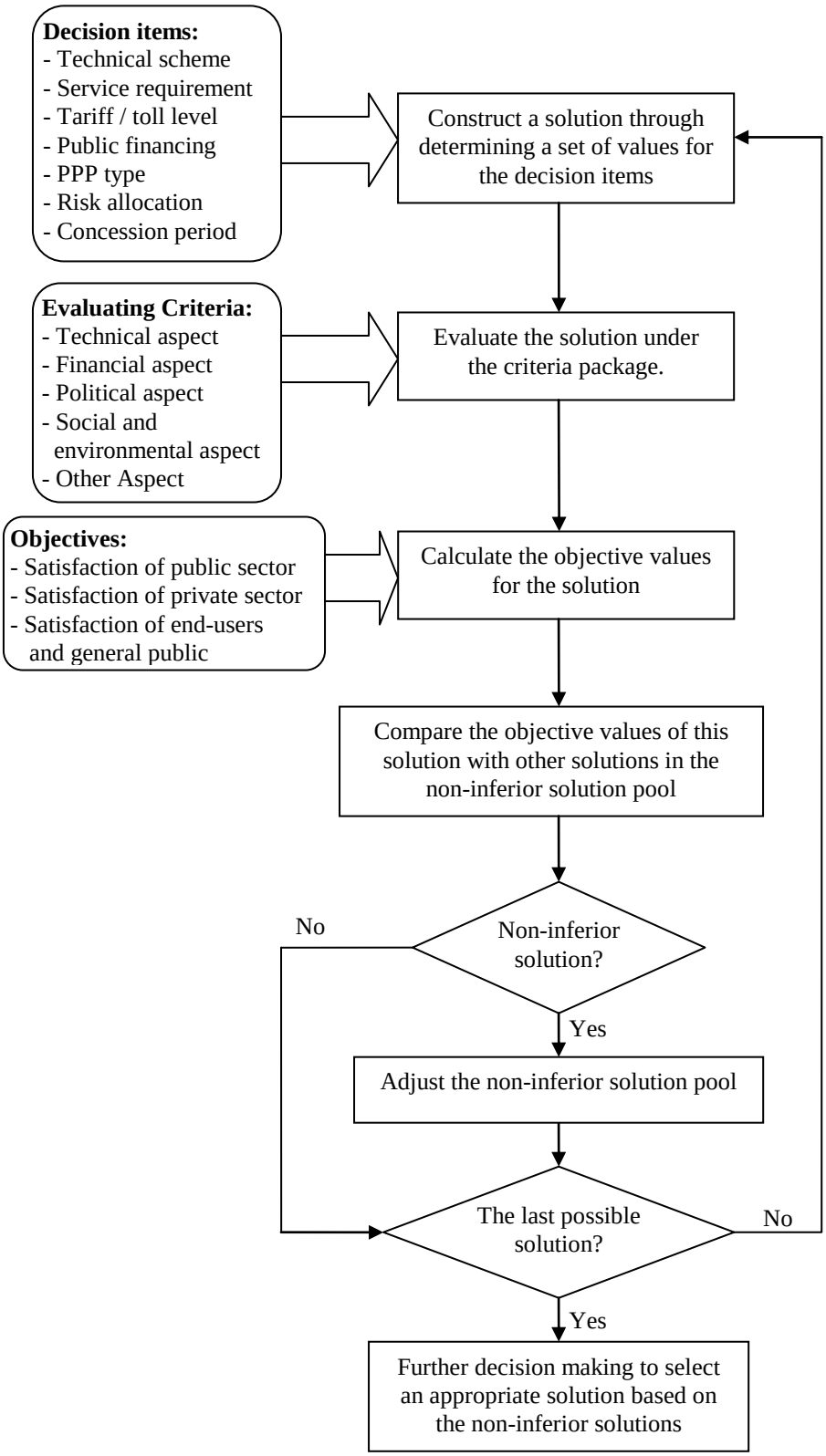

Figure 1: Flowchart of Multi-objective decision process for selecting appropriate PPP solution

5. Conclusion

Gaining a "win-win-win" result or the best value is the ultimate goal for the governments when applying PPPs to procure infrastructure facilities or public service. It is important to balance the interests of the three key main stakeholders right from the beginning of a PPP scheme. Therefore, proposing a PPP solution toward achieving best value is significant to the success of this type of project delivery approach.

In this paper, a framework for the multi-objective decision support model is designed to help the public agency to select appropriate PPP solution by trading off the interests of three main stakeholders. Firstly, seven pivotal decision items that are concerned by different stakeholders have been identified by studying PPP practice worldwide and referring to various literatures. Interviews have also been conducted to validate their importance. Then, a list of evaluation criteria is established based on critical success factors and best-value contributing factors as identified from the literatures. Finally, a framework for the multi-objective decision model is proposed to support the government decision making.The result shows that there is a strong potential for developing a multi-objective decision model to assist decision-makers in establishing a mutually satisfactory PPP scheme. The next stage of research is to conduct a more extensive round of interviews to improve the credibility of the best value criteria and to uncover the relationship between concession items, evaluating criteria and ultimate objectives. Moreover, some advanced techniques including the Bayesian Network, Noisy-OR gate, genetic algorithm, etc. would be used to realise the multi-objective decision model presented here. Ultimately, a computerised decision model will be produced in order to provide a easily and reliable tool for supporting this type of decisions.

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Public Sector Comparator (PSC): A Value for Money (VFM) Assessment Instrument for Public Private Partnership (PPP)

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Abstract

Economy, efficiency and effectiveness of service provisions known as value for money (VFM) have been the main catalyst for Public Private Partnership (PPP) procurement. VFM can be achieved through the evaluation of quantitative and qualitative aspects of projects. The method commonly used in the assessment of VFM for PPP project is the Public Sector Comparator (PSC) which is the key management tool in the quantitative assessment of VFM. However, this method had been criticised on numerous grounds such as: lack of accuracy of risk transfer; discount rate methodology; complexity of financial modeling; assumptions underlying and limitation scope of qualitative and intangible aspects in the PSC calculations. Using the information derived from the review of PSC models from Hong Kong, South Africa, Ireland and Australia, important elements are captured. These are: components of PSC; the developing of PSC, PSC assessment stages and development of PSC criteria. In this respects, the study suggests that in order to produce a robust PSC model across project phases (strategy formulation, procurement stage, construction stage and operation stage), the assessment of PSC for VFM is to embrace both the qualitative (non financial) and quantitative (financial) aspects. Considering these elements, a further empirical research is needed for validation of findings.

Keywords: public sector comparator, value for money and public private partnership

1. Introduction

The need for infrastructure development to provide better services for public entities requires the use of an alternative method for procuring project and financing strategies. The introduction of partnership arrangements for the provision of infrastructure could be one of the alternative options for government to procure public projects. In this regard, Public Private Partnership (PPP) is an increasingly popular infrastructure development model with government in many provinces and countries. Between 2000 and 2007, many governments across the globe used PPPs to deliver some of the world's most important infrastructure (Raisbeck, 2009). PPPs refer to the private sector designing, building, maintaining, operating and financing infrastructure assets traditionally provided by the public sector (William, 2005). Public Private Partnership brings a single private sector entity to undertake and provide public infrastructure assets for their "whole-of-life", generally 20-30 years.

PPPs and other similar types of public/private finance projects have proven their usefulness as may be seen in the examples of countries with the most experience, such as the United Kingdom, Ireland, the Netherlands, the Scandinavian countries, Portugal, Spain, France, Canada, Australia, New Zealand, Japan, Chile or Republic of South Africa. Nevertheless, the objective of PPP is not only to be an alternative for financing but also to combine public and private sector efforts in enhancing innovation, business spirit and effectiveness in delivery of public services (Demirag et al. 2004). This concept is well known as value for money (VFM) which means that the whole investment project life has to be realised at lower cost and optimum output and in line with the opinions of Victorian Partnership (2008) and Cheung et al (2009).

In PPP projects, VFM refers to the best available outcome through a comparative analysis of all benefits, costs and risks over the whole life of the procurement. The notion of Value for Money (VFM) is associated with the concepts of three Es: economy, efficiency and effectiveness which refer to the whole life value of service provided. According to Demirag et al. (2004), economy is acquiring resources of an appropriate quality for the minimum cost. While, efficiency is about ensuring that maximum output is obtained from a given amount of resources and effectiveness regards to the desired results of the output. The achievement of a VFM outcome is a crucial concept throughout the procurement process in all aspects of the project. Assessing the value of these variables requires a degree of judgment and the use of both quantitative and qualitative analysis.

VFM assessment is a continuous process across the following project phases: programme level, project level, procurement and project construction phase in order to achieve project effectiveness (Takim et al. 2009). VFM involves the process of developing and comparing costs between PPP project, traditional project delivery and bid price of private sector, which relies on discount rate and value of risk transfer (Murray, 2006 and Ontario, 2007). Many researchers are of the view that VFM is achieved through the savings resulting from the integration of synergies between designs, build and service operation throughout the procurement process.

Therefore, based on the above definitions, VFM is not the lowest cost option but an understanding of the whole life benefits and appropriate risk allocation between public and private sectors. It is usually associated with utilizing innovative capabilities and skills, efficiency savings and best possible risk transfer to private sector. There are many techniques in quantifying the VFM in PPP projects. For example, there are four main alternative approaches to provide the core test of VFM by researchers (Grimsey and Lewis, 2005). These are full cost benefit analysis, PSC-PPP comparison, UK style PSC –PPP, and competitive bidding (Sach et al. 2005). Nevertheless, PSC is one of the most popular techniques in assessing VFM which has been adopted by many countries such as Australia, United Kingdom, Hong Kong, Japan, and Canada. This is in line with the Malaysian PPP, which highlighted that PSC will play an important role as a benchmark to ensure that the government gets value for money (Ninth Malaysia Plan, 2006).

The Public Sector Comparator (PSC) is the technical construct developed to test whether privately financed arrangements provide superior VFM to traditional bundled procurement methods. English & Guthrie (2003), describe PSC as an estimated reference project to provide the same level and quality of service expected of the private sector alternatives. It requires assessment of net present costs and risks over the life of the project. Public Sector Comparator (PSC) has been the most common tool used by the public sector to show how much it would cost the government to build the asset through public funding.

Nevertheless, the PSC method has come under growing criticism and debate about their reliability and accuracy of calculation as the method is prone to errors because of the complexity of its financial modeling (Grimsey & Lewis, 2005). The arguments against the use of the PSC method also questioned the appropriateness of this method to evaluate VFM due to its ambiguity and complexity problems. The ambiguity within this technique involved forecasting future cash flow, underlying assumption and choosing an appropriate discount rate in the PSC calculation (Khadaroo, 2007).

However, although this method had emerged with many weaknesses, it is still being accepted and widely applied in most countries. Hence, this paper provides an overview of PSC practices across the globe, focusing particularly on the practice of four countries: Hong Kong, South Africa, Ireland and Australia. The key issues of these models are to enlighten the core components of PSC, the development of PSC instrument, PSC assessment stages and development of PSC criteria that are needed to make a comprehensive assessment for VFM in the PPP projects. From the analysis point of view, this method is mainly focused on the quantitative approach. Furthermore, it is also noted that there is lack of consideration on long - term evaluation in the VFM assessment process as practiced by most countries. It is vital that a complete VFM assessment requires consideration of qualitative factors and long term evaluation in conjunction with the quantitative assessment.

Therefore, this study aims to review on primary issue of the concept of PSC as a VFM tool for PPP project undertaken by Hong Kong, South Africa, Ireland and Australia. The research

findings will then form the basis of a robust PSC model by giving emphasis to quantitative, qualitative aspects and the whole life project cycle during the VFM assessment.

2. Public sector comparator

The implementation of the Public Sector Comparator (PSC) has been a trademark of most countries across the world in establishing value for money (VFM) for PPP projects. The PSC is a hypothetical construct that describes in detail all costs to the public sector, if the project was developed in a traditional way. The PSC is expressed in terms of the net present cost by using a discounted cash flow analysis that adjusts the future value of expected cash flows to a common reference date. The basic idea is to provide a quantitative benchmark in VFM assessment. Thus, the key elements in PSC are: Hypothetical costing and a forecast, Net Present Value (NPV), life cycle costing and risk adjusted.

PSC test examines life cycle project costs, including initial construction costs, maintenance, operation costs and additional capital improvement costs that will be incurred over the whole life of projects. PSC may be used at different stages of the project preparation process. The main distinction is between using the PSC before and after the private sector bids are received. A PSC also seeks to quantify the value of various types of risks transferred to the private sector. The PSC consists of four components which aim to reflect the full and true costs to the government and compared to the private sector bids. It is based on using the NPV of all cash flow, based on a specific discount rate over the life of the concession period.

The PSC is developed at a preliminary stage in the business phase and to be finalised before the completion of the project brief at detailed project development phase. The PSC provides a means of testing private party bids for value for money. It has four components as shown in figure 1.

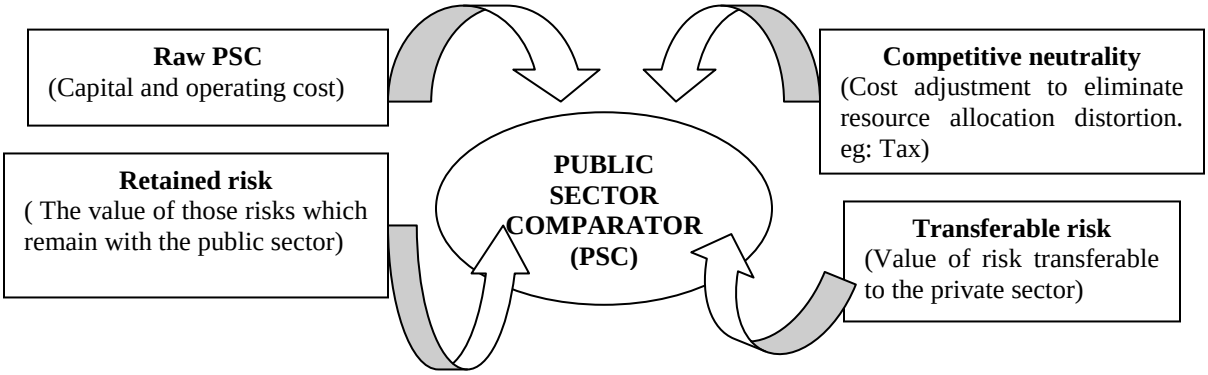

Figure 1: The components of PSC (Source: Victoria partnership, 2008)

The four components start with ‘raw PSC’ (Capital and operating cost). Raw PSC deals with the base cost of delivering the services specified in the project brief under the public procurement method. Secondly, is the ‘competitive neutrality’ which concerns with cost adjustment to remove any net competitive advantages that accrues to a government business (i.e., the nonpayment of insurance premium or taxes by a government). Thirdly, is the ‘transferable risk’ which deals with the value of risks in which the government would transfer to the private sector (example: design and construction, operating, maintenance and technology risks). Finally, is the ‘retained risk’ with regards to the value of those risks that are likely to be retained by the government (example: demand and security risks).

3. Methodology

This is an initial phase of research and purely based on the literature review. It reviews PSC assessment models applied in the Hong Kong, South Africa, Ireland and Australia. It addresses four areas of concern: components of the PSC, discount rate methodology, refining the PSC process and evaluation criteria of PSC. A rigorous literature review would provide area and scope to the study to be undertaken. Furthermore, a comprehensive empirical research in the form of triangulation approach (questionnaires and case studies) is planned for the findings and conclusions.

4. Synthesis of public sector comparator (PSC) models

In spite of many criticisms of PSC, PSC is seen to play an important role in justifying VFM for PPP projects. Table 1 and 2 shows a summary of PSC models as practiced by several countries such as Hong Kong, South Africa, Ireland and Australia. As seen in Table 1 and 2, Hong Kong, South Africa and Ireland had developed the PSC model based on the financial aspects (quantitative) only. Meanwhile, Australian PSC model had taken assessment for both aspects of financial (quantitative) and non financial (qualitative) aspects. Thus, the next section explores some of the key issues of the PSC model as a tool in VFM assessment as practiced by Australia, Hong Kong, Ireland and South Africa. These models are discussed in turn.

4.1 Hong Kong

The Hong Kong PPP efficiency unit works on the premise that PSC is an estimated, risk adjusted, cost of the government itself delivering the project output. The PSC provides the basis of comparison between the PPP and the public sector alternatives in creating the early appraisal of project and allocation of risks that encourages bidder competition in line with the government needs. The Hong Kong PSC model has three core components: Raw PSC; competitive neutrality and the value of transferable risks. A further component, the value of retained risk, may be calculated and added to each private sector bid. According to the PPP unit, this will be necessary if different bidders accept different levels of risk transfer.

In Hong Kong, the Economic Analysis and Business Facilitation Unit (EABFU) will regulate on the appropriate discount rate to be applied. Conversely, the government does not advocate a rate to use for the discount rate in the VFM assessment for PPP projects. The PSC may be used at a different stage of the project preparation phase. The current practice by most countries such as Hong Kong is for the PSC to be developed at the early stage of the project phase. The PSC process in Hong Kong starts by formulating output specification, defining reference project and finally identifying all raw PSC components

Table 1: Summary of Public Sector Comparator (PSC) guidance for Australia and Hong Kong

Items	Hong Kong	South Africa
Definition & Characteristics	• An estimated, risk adjusted, cost of the government itself in delivering the project output. • The PSC is expressed in terms of the NPV to the government, using a discounted cash flow analysis that adjusts the future value of the expected cash flow to a common reference date.	• The base PSC model represents the full costs to the institution of delivering the required service according to the specified outputs via the preferred solution option using conventional public sector procurement. • Expressed as the NPV of a projected cash flow based on the appropriate discount rate for the public sector. • Based on the cost for the most recent similar public sector project or a best estimate.
Purpose	• To provide the basis of comparison between the PPP and the Public sector alternatives. • To provide a benchmark of what the government believes is an appropriate level of investment	• Promote full cost pricing at early stage • Initial indication of VFM. • Consistent benchmark and evaluation tool • Encourage bidding competition by creating confidence in the financial robustness and integrity of the feasibility process.
Components of PSC	• **Raw PSC** –Direct cost , indirect cost and expected third party revenue. i. Expected cash flow of the raw PSC need to be forecast over the life of the ref. project • **Competitive neutrality** (government rent, taxes, duties, fees and charges, accommodation costs) • **Transferable risks** • **Retained risk**	• **Base cost** (Capital and operating costs) i. Direct and indirect cost ii. Revenue cost iii. Assumption Depreciation cost are not included • Cost of risk adjusted
Discount rate	• Sought from the economic analysis division of EABFU on the appropriate discount rate to be applied.	• Discount rate to be the same as the risk adjusted cost of capital to government. • Treasury does not prescribe a rate to use. • Using the yield of a government bond with a remaining maturity similar to the duration of the project.
Refining the PSC process	• Conducted at the strategy formulation stage and procurement stage	• Conducted at the strategy formulation stage and procurement stage
The criteria of PSC	• **Quantitative factors** (Raw cost, competitive neutrality and risk) i. Evaluate private bids against the PSC. ii. Identify the least cost procurement option. iii. Output specification and allocation of risk	• **Quantitative factors** (Raw cost and risk) i. Evaluate private bids against the PSC. ii. Identify the least cost procurement option. iii. Output specification and allocation of risk

Sources: National PPP guidelines. Volume 4: Public sector comparator (2008) and PPP Hong Kong guide (2006)

Table 2: Summary of Public Sector Comparator (PSC) guidance for South Africa and Ireland

Items	Ireland	Australia
Definition & Characteristics	• It is represented as a single monetary value that represents the full estimated cost, risk, income to the public of delivering the project by using traditional public sector procurement.. • Presented as estimated annual values arising over the whole lifetime of the project. These values will then be discounted back to a present day value. • PSB does not include any costs/income/risks that will be retained by the sponsoring agency itself.	• An estimate of the hypothetical, whole life cost of a public sector project if delivered by government. It is developed in accordance with the required output specification, risk allocation based on the most efficient form of government delivery, adjusted for the lifecycle risks of the project. • Expressed as the Net Present cost of a projected cash flow based on the project specific discount rate over the life of the contract. Included an adjustment for competitive neutrality • Contain an assessment of the value of the risks transferred to bidders and risk retained by government.
Purpose	• Provide a structured approach to the costing of a PPP project at an early stage before invitations to tender are issued. • To reassess at an early stage prior to the initiation of the tendering process whether the project and the procurement method chosen have the potential to offer value for money. • To be used as a quantitative benchmark against which are the highest ranking bids can be evaluated in the formal VFM comparison.	• To provide government with a quantitative measure of the VFM. It provides the government with an approximate measure of the range of outcomes. It is accompanied by qualitative consideration, subject to sensitivity testing and scenario analysis.
Components of PSC	• Capital cost (upfront cost of providing a capital asset for the project eg: design cost, raw materials, off site works, equipment, professional fees, service connection and building cost) • Operating, maintenance and life cycle costs (costs of daily running of the capital asset to meet the output specification eg: consumables cost, waste management, security, asset refurbishment, facilities management, administration and staffing cost) • Third part income (income that can be generated by charging third parties for the use of an asset. • Transferred risk (Risks for which the private sector will be asked to tender)	• Raw PSC (base costing of direct and indirect cost – using discount rate, real pre- tax rate and inflation assumption). i. Financial costs and revenue (economic and cost benefit analysis are considered) ii. cash flow forecast (excluding depreciation costs, including fixed asset and maintenance costs) iii. Exclude risk and contingencies • Retained risk (operating risk, demand risk and security risk) • Competitive neutrality(Land tax, local government rate, stamp duty and payroll tax) • Transferred risk (Design and construction risk, operating risk, maintenance risk and technology risk)
Discount rate	• Equivalent public sector project and reflect the relative value of the cash flows from the state authority's perspective..	• Risk free rate and adjusting for risk using classic methods based on the capital asset pricing model (CAPM). • Real discount rate used 6.5%
Refining the PSC process	• Conducted at the strategy formulation stage and procurement stage	• Conducted at the strategy formulation stage and procurement stage
The criteria of PSC	• Quantitative factors (Capital, operating, maintenance, life cycle cost, third party income and transferred risk) i. In light of the quantifications in the PSB should the project still proceed using a PPP ii. Does the highest ranking bid compare favorably with the PSB from a quantitative perspective in term of the impact.	• Quantitative factors (Raw cost, competitive neutrality and risk) i. Evaluate private bids against the PSC. ii. Identify the least cost procurement option. iii. Output specification and allocation of risk • Qualitative factors (reputation of the bidder, sustainability of service delivery and design amenity) i. Identify material factors which have been included in the PSC ii. Consider impact of qualitative factors on the private bids Construct the list of all qualitative factors at an early stage conjunction with PSC

Sources: National Treasury PPP, South Africa (2004) and PPP Guideline (2007), Ireland government

(base cost, competitive neutrality and risk). It is clear that the process of constructing the PSC is similar to other countries at the early project stage. Nevertheless, the PSC process in Hong Kong tends to focus on the quantitative assessment without implying the qualitative factors.

4.2 South Africa

The PPP manual of South Africa states that the PSC model represents the full costs by using conventional public sector procurement (National Treasury, 2004). The purpose of the PSC to South Africa is to promote full cost pricing at an early project stage apart from initial indication and benchmark of VFM for PPP projects. The National Treasury of South Africa takes a different mode in constructing the PSC model. The PSC model is based on two basic components: base cost (including capital and operating costs) and cost of risk adjusted. The Treasury does not prescribe a rate to use for the discount rate. However, it states that one should begin by using the yield of a government bond with a remaining maturity similar to the duration of the project. Similar to Australia, the PSC is constructed at the procurement stage.

The PSC was constructed based on two significant elements. Firstly, the development of the base PSC model which includes numerous steps; provide a technical definition, calculation of direct, indirect and revenue costs and compilation of project assumption. Secondly, the development of the risk adjusted PSC model. This process is basically engaged with the identification, estimation, mitigation and allocation of risks that may occur in the PPP projects. The South Africa PSC guideline provides a complete example of the process outlined in constructing the PSC model. There are six steps involved such as providing a technical definition of the project; calculating direct, indirect costs and revenues; explaining all assumption used and finally, constructing the base PSC model. Nevertheless, the South Africa PSC model merely emphasises the assessment at the pre-contract stage and failing to assess on the post-contract stage of PPP projects. In addition, qualitative factors are not stated clearly in the PSC calculation as they are not accurately quantifiable.

4.3 Ireland

In Ireland, there have been slight differences of the PSC mode called Public Sector benchmark (PSB). According to Central Guidance in Ireland State (2007), PSB is a key tool in the PPP procurement process. It is seen as a single monetary value that represents the full estimated cost, taking income and risks into account to the public sectors in delivering the project using traditional public sector procurement. The ultimate purpose of the PSB is to act as a reference throughout the PPP procurement process. It also plays an important role in the assessment of whether the highest ranking bid received has the potential to offer VFM for PPP projects.

There are four main components included in the PSB approach. These are: capital costs, operating & maintenance costs, party income, and cost of risk transferred. The approach demonstrates the dissimilarity from other countries as Ireland takes account of third party revenue into the PSB calculation. According to the Ireland government, a revenue stream from third party income could reduce

the overall costs of funding a project. However, it should only be included where there is a clear policy that third parties can be charged for using a public sector asset or service. The Ireland PSB approach does not take in account any costs/income or risks that will be retained by the public sector irrespective of the procurement method used. In this way, the PSB can serve as a direct like-with-like comparator against the highest ranking bid received.

Central guidance in Ireland states that the discount rate to be used in VFM assessment was equivalent to public sector project. It should reflect the relative value of the cash flows from the state authority's perspective. The government will ensure that the discount rate used has been updated. However, there is no clear narrative into the rate of discount rate used in the VFM assessment. As a general practice, once the output specification for a project has been completed, the PSB can be compiled. According to the Ireland government, the PSB for each project in the PPP project must be finalised before the tender for each project is received at project procurement stages.

Depending on the type of PPP arrangement being pursued, some or all of the following process will be carried out using the PSB approach. The process starts by compiling the PSB in conjunction with output specification, cost, risk and third party income; project cash flow; valuation used in the PSB; compiling the assumption and finally consideration of other key aspects that may affect the PSB process. The assessment of VFM is an overarching concern throughout the PPP procurement process. In practice, four formal VFM tests are carried out at various stages of the PPP process i.e., procurement, completion of the PSB, tender evaluation and contract awarding stage. Hence, the weakness in Ireland model of PSC is that the PSB assessment is concentrated purely at the pre-contract stage. Undoubtedly, a comprehensive VFM assessment requires consideration of a long-term evaluation and should also incorporate qualitative factors in conjunction with the PSC as part of a fully informed evaluation process (Victoria Partnership, 2008 and Blanken, 2008).

4.4 Victoria Australia Partnerships

Analysis of the use of PSC in Australia is focusing on the assessment for both quantitative and qualitative aspects of PPP projects. Victoria Partnership (2008) has defined PSC as an estimate of the hypothetical, whole life cost of a public sector project (if delivered by government). It was developed in accordance with the required output specification and risk allocation. The main purpose of PSC according to Victoria Partnership is to provide government with a quantitative measure and range of outcomes. The assessment is accompanied by qualitative consideration. The PSC Australia model is the sum of four components: Raw PSC; Competitive neutrality; risk transferred and retained risk. The Victoria Partnership takes a different approach from Hong Kong, South Africa and Ireland. They build up the discount rate by beginning with a risk free rate by adjusting for risk using classic method based on the capital asset pricing model (CAPM).

The PSC was constructed and refined during the initial assessment and pre market stages of a project prior to release of the project brief. Fundamentally, the PSC process starts by defining the reference project and subsequently by identifying all raw PSC components (direct, indirect cost, competitive neutrality and risk allocation). The reference project is the most likely form of public sector delivery that

could be employed to satisfy all elements of the output specification. The PSC in Australia uses a pragmatic mode of assessment which deals with two important aspects of evaluation; quantitative and qualitative factors. In a quantitative assessment, the evaluation of private bids against the PSC will be carried out and identify the least cost procurement option. Some other factors for instance, material costs, credit standing and proven reputation of the bidder and social benefit which are not capable of being quantified for a project will be identified during the qualitative assessment in the process. It should be noted that PSC approach in Australia is the only method that signify for both aspects of quantitative and qualitative factors during the assessment of VFM process. However, once again the appraisal was carried out at the pre-contract stage of the PPP process. The model does not provide possibilities assessment over the long term period of the whole life PPP projects.

5. Summary and discussion of the public sector comparator (PSC) models

Based on the considerations of these models, by and large, the PSC is required to address all costs, income and risk of the PPP projects comprehensively across project phases. Most of the PSC models, if not all, are focusing on the definitions, characteristics, purposes, components, discount rate, process and the criteria of PSCs. The PSC of Hong Kong provides a basis of comparison between PPP and the Public Sector alternatives based on four fundamental components (i.e., raw PSC, competitive neutrality, transferable and retained risk). The appropriate discount rate was sought from the Economic Analysis and Business Facilitation Unit EABFU). The quantitative assessment is underlined as core criteria in PSC calculation. Nevertheless, this model is lack of many important elements in PSC calculation such as qualitative aspects and long term factors.

The South Africa PSC model offers a near complete and ample process outlined of PSC calculations. All the processes involved are spelled out clearly and comprehensively. However, the model is less focusing on the discount rate and appropriate assumption aspects which are one of the crucial items of PSC. Meanwhile, the model of Ireland of PSC (known as PSB) seems to be broad and comprehensive which takes into consideration the full estimated costs, income and risks as key components of PSB. Nevertheless, once again, the PSB model failed to consider further on the qualitative and long terms aspects which is vital in the VFM assessment process.

Among others, the Australia PSC model is the most applicable to be adopted and practiced in the assessment of VFM for PPP projects. The model commences based on two crucial assessments, qualitative and quantitative aspects. All the processes involved in terms of discount rate, components and calculation of PSC, major assumptions in the raw PSC and the qualitative aspects associated with PPP projects are clearly clarified. Conversely, the model fails to discuss long term and post contract assessments which are paramount to a complete VFM assessment. This could be due to the difficulty to specify outputs clearly and obtaining the future data for cost estimate.

Most of the models above failed to consider in detail the qualitative (except for Australian model) and long term assessment in the PSC calculations. The implementation of PSC across project phases is

required to ensure the project benefits for the whole life cycle of the PPP project by considering for both factors quantitative and qualitative. This is in line with Broadbent and Laughlin (2003) and Blanken (2008), who state that there is a need for a more comprehensive and preferable assessment systems by emphasising on both the pre and post stages of the PPP project.

Further, the development of PSC approach should consider the criteria from both quantitative (base and risk cost) and qualitative elements (non-financial aspects) to become a robust assessment approach. In VFM assessment, every evaluation will consider a range of quantitative and qualitative factors. Usually the quantitative aspect benchmarks the cost of the PSC against the cost in the bids received. The quantitative assessment considers how the quantifiable costs of using the PPP approach compared to those of the conventional procurement. Assessing the private bids against the PSC provides a quantitative answer to the VFM question.

In addition, a complete VFM assessment requires consideration of qualitative factors along with quantitative assessment. Following Broadbent et al. (2003), it is essential to draw a VFM framework by considering both financial and non financial appraisals to provide pointers for relevant factors during the evaluation process. Apart from that, there are a range of qualitative factors that need to be considered alongside the quantitative assessment to determine whether a PPP project is likely to give value for money. Principally, there are two evaluations that can be considered concurrently in the qualitative assessment: identify material factors and the impact of qualitative factors on the private bids. Those assessments of qualitative factors will relate into the viability, achievability and desirability of the PPP projects (HM Treasury, 2006). Generally, the viability involves the assessment on the equity, efficiency and accountability of project objectives, outputs and operational flexibility. Whereas, the assessment of desirability entails into the relative benefit provided through the PPP projects such as innovation, risk transfer, service provision and lifecycle cost. The achievability assessment basically involves gauging the level of likely market interest, skill and capacity of the private sector and their perception into risk in the PPP project.

6. Conclusions

This paper attempts to review and synthesise various models of PSC from, Hong Kong, South Africa, Ireland and Australia to highlight the critical components and factors in the development of a robust PSC model as a VFM tools. Based on the consideration of these PSC models, many lessons can be learned. It appears that the PSC model is dominated by quantitative aspects (financial) and short-term estimation and fails to consider the qualitative and long term aspects of a project. Therefore, it is imperative to take into consideration both factors (qualitative and quantitative) in the formulation of PSC.

However, most of the PSC methods as explained previously are surrounded by many deficiencies. These deficiencies are related to the accuracy of risk transfer, discount rate methodology, and complexity of financial modeling, the underlying assumptions and limited scope of qualitative and intangible aspects in the PSC calculations. A combined approach of both quantitative and qualitative methodologies would be useful for data collection prior to further validation processes.

The research presented in this paper is part of an ongoing PhD research at the Faculty of Architecture, Planning and Surveying, UiTM Malaysia to develop a framework of Value for Money (VFM) assessment for Public Private Partnership (PPP) projects focusing on Public Sector Projects. The results of the study could provide an insight into the Malaysian construction project development and will hopefully provide valuable guidelines, especially to public or private sectors in Malaysia.

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