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# Critical success factors for PPP/PFI projects in the UK construction industry

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Public–private partnerships (PPPs) are increasingly used in the United Kingdom’s public facilities and services provision through the Private Finance Initiative (PFI). Despite some casualties, PPP/PFI projects have been undertaken successfully, but the reasons for success are not entirely clear. Questionnaire survey research examined the relative importance of 18 potential critical success factors (CSF) for PPP/PFI construction projects in the UK. The results show that the three most important factors are: ‘a strong and good private consortium’, ‘appropriate risk allocation’ and ‘available financial market’. Factor analysis revealed that appropriate factor groupings for the 18 CSFs are: effective procurement, project implementability, government guarantee, favourable economic conditions and available financial market. These findings should influence policy development towards PPPs and the manner in which partners go about the development of PFI projects.

**Keywords:** Critical success factors (CSF), factor analysis, procurement systems, PFI, PPP, project management

## Introduction

The involvement of the private sector in the development and financing of public facilities and services has increased substantially over the past decade. Approaches to these ‘public–private partnerships’ (PPPs) continue to be developed in order to draw the public and private sectors together to share the risks and rewards. Such approaches range from simple contracting-out of services to the involvement of the private sector in the financing, design, construction, operation, maintenance and, in some cases, concessional ownership of major facilities.

In the UK, the total capital expenditure on PPPs between 1992 and 1999 came to almost £10 billion (Brown, 1999). PPP projects were estimated to account for about 11% of UK government expenditure in 2002 (Robinson *et al.*, 2002).

PPPs in the UK have developed mainly through the Private Finance Initiative (PFI), first announced in 1992 by the then Conservative Government. Since 1997, the Labour Government has continued with PFI under its own PPPs policy.

However, PFP/PFI has attracted criticism (Owen and Merna, 1997). The first Bates Review (Bates, 1997) made 29 recommendations designed to streamline decision-making and procurement procedures, particularly in the public sector. These included the creation of a Treasury Taskforce, with decision-making powers, to take forward the other recommendations and provide a central focus for policy and project advice. The second Bates Review of PPP/PFI (Bates, 1999) examined the progress made by the government in the delivery of PPP/PFIs. It recommended improving public department resources, improving procedures for IT projects and developing the government’s ‘Wider Market Initiative’ (HM Treasury, 2001).

Problems reported with PPP/PFI procurement include issues such as: high costs in tendering, complex negotiation, cost restraints on innovation, and differing or conflicting objectives among the project stakeholders (Akintoye *et al.*, 2001a). Despite this, many PPP/PFI projects in the United Kingdom and overseas are regarded as successful, and the drivers of success have become a subject for investigation (e.g. Keene, 1998; Qiao *et al.*, 2001; Jefferies *et al.*, 2002). While these studies have developed different lists of critical success factors (CSF) for PPP/PFI projects,

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similarities can be found. Less is known about the relative importance of these CSFs. The aim of this paper is therefore to describe research that explores the relative importance of CSFs associated with construction PPP/PFI projects in the UK. Because the opportunity to adopt strategic measures to address project success is best exploited in the early stages of a project, the research examines CSFs in terms of their perceived importance at the project development phase.

## PPPs

The whole concept of PPP is underpinned by a government desire to resolve financial constraints in the provision of public facilities and services by calling upon private management skills to increase the efficiency, effectiveness and quality of facilities and services delivery (HM Treasury, 2000). The level of private sector involvement might range from simple service provision without recourse to public facilities, through service provision based on public facilities usage, up to and including full private ownership of public facilities and operation of their associated services.

The UK government has identified eight types of PPPs:

- (1) Asset sales: this relates to the sales of surplus public sector assets.
- (2) Wider market: this introduces the skills and finance of the private sector to help with better use of public sector assets.
- (3) Sales of business: this relates to the sales of shares in state owned businesses by flotation or trade sale.
- (4) Partnership companies: this includes introducing private sector ownership into state-owned business, while still preserving public interest through legislation, regulations, etc.
- (5) Private Finance Initiative.
- (6) Joint ventures, in which public and private sector partners pool their assets and resources together under joint management.
- (7) Partnership investments, in which the public sector contributes to the funding of investment by private sector parties, to ensure that the public sector shares in the return generated.
- (8) Policy partnerships, in which the private sector individuals, or parties, are involved in the development, or implementation, of public sector policy.

The most used PPP model in the UK is the PFI. Mountain (1998) argues that the only projects clearly open to PPP/PFI treatment are infrastructure projects

such as roads and highways, water transport and metropolitan transport systems but, given the range of PFI projects already established in the UK, this view must be regarded as unnecessarily restrictive. Schools, healthcare and prison facilities and waste management services clearly lie beyond infrastructure provision. The question then arises as to what success factors can be identified across this project range, and what is their relative importance?

## Critical success factors in PPP/PFI

Rockart (1982) defines Critical Success Factors (CSFs) as: 'those few key areas of activity in which favourable results are absolutely necessary for a manager to reach his/her goals'.

The CSF methodology is a procedure that attempts to make explicit the key areas that are essential for management success (Boynton and Zmud, 1984). This method has been used as a management measure since the 1970s in financial services (Boynton and Zmud, 1984), information systems (Rockart, 1982) and manufacturing industry (Mohr and Spekman, 1994). There have been attempts to apply it in construction management (Yeo, 1991; Sanvido *et al.*, 1992). Tiong (1996) explored CSFs for private contractors in competitive tendering and negotiation in build-operate-transfer (BOT) projects, while Jefferies *et al.* (2002) looked at how public clients successfully manage build-own-operate-transfer (BOOT) project procurement.

Qiao *et al.* (2001) established eight independent CSFs in BOT projects in China: appropriate project identification; stable political and economic situation; attractive financial package; acceptable toll/tariff levels; reasonable risk allocation; selection of suitable subcontractors; management control; and technology transfer.

For an Australian sports stadium project, Jefferies *et al.* (2002) identified the CSFs as: solid consortium with a wealth of expertise; considerable experience; high profile and a good reputation; an efficient approval process that assisted the stakeholders in a very tight timeframe; and innovation in the financing methods of the consortium.

Among other factors, good governance is identified by Frilet (1997) and Badshah (1998); government support by Zhang *et al.* (1998); a stable macro-economic environment by Dailami and Klein (1997); and suitable legal and administrative framework by Boyfield (1992), Stein (1995), Jones *et al.* (1996) and (Finnerty, 1996).

Sound economic policy (European Investment Bank, 2000), including available financing market (McCarthy and Tiong, 1991; Akintoye *et al.*, 2001b); strong and

good private consortium (Tiong, 1996; Birnie, 1999); feasibility study/cost–benefit analysis (Brodie, 1995; Hambros, 1999); and effective risk allocation (Grant, 1996) are all regarded as critical factors for the success of PPP procurement projects. An innovative technical solution (Tiong, 1996; Zantke and Mangels, 1999) is also thought to be important.

‘Soft’ critical success factors include: social support (Frilet, 1997); commitment (Stonehouse *et al.*, 1996; Kanter, 1999); mutual benefit (Grant, 1996). Kopp (1997) and Gentry and Fernandez (1997) have emphasized the importance of procurement transparency and competitive procurement process.

The factors noted above have been distilled into 19 CSFs, as shown in Table 1. However, one of these – the need to achieve successful technology transfer – is not considered appropriate to PPP/PFI projects in the UK context and has therefore been omitted from the research study.

While many CSFs have been identified, their importance relative to one another has received less attention. All are nominally regarded as ‘critical’ but, as some must be more important than others, it is sensible to attempt to rank them, particularly in terms of the attention that should be given to them in the development stages of projects.

## Research survey design and administration

The 18 CSFs were included in a questionnaire survey instrument that also addressed wider issues involved in PFI/PPP projects in the UK. The complete questionnaire comprised three parts: questions about the respondents’ individual and organizational backgrounds; issues about PPP/PFI projects, including questions about CSFs; and risk and risk management within PPP/PFI projects. Opinions emanating from respondents’ direct experiences were sought. This paper presents an analysis of the survey response data relating to the perceived relative importance of a catalogue of 18 CSFs for UK PPP/PFI projects.

The questionnaire survey was administered in 2001 among UK organizations with involvement in PFI projects. Convenience sampling, rather than random sampling, of UK organizations with experience or expressed interest in PPP/PFI was adopted, based on the database of PFI participants produced by PriceWaterhouseCooper and the PFI Research Team at Glasgow Caledonian University. There is no comprehensive, nor any standard, database of UK organizations involved in PFI/PPP projects. In addition, PPP/PFI procurement is evolving. As a result, the number of organizations involved is growing, but not in a form

that means that the overall number of these organizations involved can be determined easily. To use random sampling would demand that the number of organizations involved is sufficiently large and that the population is known (Diekhoff, 1992; Fellows and Liu, 1997).

The initial draft of the questionnaire was presented to the PFI research group at Glasgow Caledonian University for comment, and a further pilot study was administered to Carillion Services Ltd, which is active in PFI.

In all, 61 completed questionnaires were returned of the 500 distributed. Of these, 16 responses came from public sector organizations and 45 from the private sector. The effective return rate is 12%. This rate is higher than that of an earlier Institute for Public Policy Research (IPPR, 2000) survey dealing with PPP which achieved a response rate of 9.6% and similar to return rates achieved in comparable contemporary survey research reported in construction and project management journals.

All respondents were either directors or managers in their respective organizations. Table 2 shows the roles undertaken by the survey respondents in PPP projects. Table 3 shows that the respondents share an average of 21.7 years of cognate experience [standard deviation (SD)=8.7]. Table 4 shows the PFI/PPP project types in which survey respondents have been involved.

## Survey data analysis and results

The relative importance of the 18 CSFs identified from the literature review was explored by means of Likert rating scale questions in the survey instrument. This type of scale has been found to be acceptable in other construction management research. For example, Wang *et al.* (1999) used a similar approach to investigate risk criticality in China’s BOT projects.

The data were analysed using the SPSS statistical package. Statistical analyses undertaken included: descriptive analysis, reliability tests using Cronbach’s alpha, one-way analysis of variance and factor analysis. The Cronbach alpha reliability for the factors is 0.767 suggesting that the data collected for the critical factor analysis are reliable (Norusis, 1992).

## Ranking of the perceived importance of CSF in PPP/PFI

The analysis of the survey response data produced mean importance values for the eighteen CSFs ranging from 4.11 to 2.81. Table 5 shows that three factors

**Table 1** Summary of CSFs for PPP projects

Critical success factor	Source
Strong private consortium	Jefferies <i>et al.</i> (2002) Tiong (1996) Birnie (1999);
Appropriate risk allocation and risk sharing	Qiao <i>et al.</i> (2001) Grant (1996)
Competitive procurement process	Jefferies <i>et al.</i> (2002) Kopp (1997) Gentry and Fernandez (1997)
Commitment/responsibility of public/private sectors	Stonehouse <i>et al.</i> (1996) Kanter (1999) NAO (2001b)
Thorough and realistic cost/benefit assessment	Qiao <i>et al.</i> (2001) Brodie (1995) Hambros (1999)
Project technical feasibility	Qiao <i>et al.</i> (2001) Tiong (1996) Zantke and Mangels (1999)
Transparency in the procurement process	Jefferies <i>et al.</i> (2002) Kopp (1997) Gentry and Fernandez (1997)
Good governance	Qiao <i>et al.</i> (2001) Frilet (1997) Badshah (1998)
Favorable legal framework	Bennett (1998) Boyfield (1992) Stein (1995) Jones <i>et al.</i> (1996)
Available financial market	Qiao <i>et al.</i> (2001) Jefferies <i>et al.</i> (2002) McCarthy and Tiong (1991) Akintoye <i>et al.</i> (2001b)
Political support	Qiao <i>et al.</i> (2001) Zhang <i>et al.</i> (1998)
Multi-benefit objectives	Grant (1996)
Government involvement by providing guarantees	Stonehouse <i>et al.</i> (1996) Kanter (1999) Qiao <i>et al.</i> (2001) Zhang <i>et al.</i> (1998)
Sound economic policy	EIB (2000)
Stable macro-economic environment	Qiao <i>et al.</i> (2001) Dailami and Klein (1997)
Well-organized public agency	Boyfield (1992) Stein (1995) Jones <i>et al.</i> (1996) Finnerty (1996)
Shared authority between public and private sectors	Stonehouse <i>et al.</i> (1996) Kanter (1999)
Social support	Frilet, 1997
Technology transfer (NB: not included in this PPP/PFI research)	Qiao <i>et al.</i> (2001)

**Table 2** Survey respondents' roles in PFI/PPP projects

Sector	Role/area	Count	%	Cumulative %
Public	Central government	9	56.25	56.25
	Local government	4	25	81.25
	Government agency	2	12.5	93.75
	Public enterprise	1	6.25	100
	Subtotal	16	100	
Private	Financier	2	4.44	4.44
	Main contractor and designer	5	11.11	15.55
	Designer	3	6.67	22.22
	Constructor	2	4.44	26.66
	Consultant/adviser	16	35.55	62.21
	Operator	1	2.22	64.43
	Supplier	1	2.22	66.66
	Financier and main contractor and designer	3	6.67	73.32
	Financier, main contractor and operator	5	11.11	84.43
	Financier, main/subcontractor and operator	1	2.22	86.66
	Financier, constructor, consultant and operator	1	2.22	88.88
	Main contractor, consultant	1	2.22	91.11
	Main contractor and operator	3	6.67	97.78
	No indication	1	2.22	100
	Subtotal	45	100	

scored mean values greater than 4.0, 13 factors displayed mean importance values between 3.0 and 4.0, and the remaining two factors scored mean values between 2.0 to 3.0.

A *strong private consortium*, ranked first in the survey analysis (Table 5: mean value 4.11) has been identified as a CSF in international BOT experiences (Tiong, 1996). In the UK it is mainly the large and well-established construction companies who have won PFI contracts (Birnie, 1999). This suggests that private companies wishing to participate in PPP/PFI markets should explore other participants' strengths and weaknesses and, where appropriate, join together to form consortia capable of synergizing and exploiting their individual strengths. It also suggests that, in the development stage of PFI projects, sponsors should

pay strategic attention to private participant consortia and how they might best be encouraged.

*Appropriate risk allocation and risk sharing* is ranked as the second most important factor for achieving successful PPP/PFI projects (Table 5: mean value 4.05). In general terms, this means allocating each risk to the party best able to manage it. In theory, this reduces individual risk premiums and the overall cost of the project, because the party in the best position to manage a particular risk should be able to do so at the lowest price. A strategic approach to risk allocation is therefore essential during project development.

The third ranked factor is that the private contractor/concessionaire *can easily access a financial market* (Table 5: mean value 4.04) with the associated benefits of lower financial costs. An accessible financial market

**Table 3** Survey respondents' experience and associated status

Years of experience	Directors		Managers		Overall	Total %
	Public	Private	Public	Private		
Undeclared	1	1	1	1	4	6
0–10	0	3	0	1	4	6
10–20	1	9	3	6	19	31
20–30	0	13	3	5	21	34
>30	3	5	4	2	14	23
Total	5	31	11	14	61	100

**Table 4** PPP/PFI project type involvement of survey respondents

Project type	Public	%	Private	Percentage	Total	%
Hospital	1	4.3	29	18.2%	29	16.2
Transportation	6	26.1	21	13.2%	27	15.1
Water and sanitary	1	4.3	9	5.7%	9	5.0
Power and energy	2	8.7	6	3.8%	8	4.5
IT and communication	4	17.4	2	1.3%	6	3.4
Housing and office	5	21.7	15	9.4%	20	11.2
Defence and military	0	0.0	18	11.3%	18	10.1
Police and prison	2	8.7	19	11.9%	21	11.7
School and education	1	4.3	34	21.4%	34	19.0
Others	1	4.3	6	3.8%	7	3.9

is an incentive to private sector interests in taking part in PPP/PFI projects (Akintoye *et al.*, 2001b). One approach is to tie the finance provider(s) into the consortium or entity created for the project (known in PFI as the Special Purpose Vehicle or SPV). In the UK, several domestic and international banks have developed substantial expertise and experience in PFI schemes. These include the Bank of Scotland, ABN Amro, the Royal Bank of Scotland, DMG, Bank of America and Dresdner Kleinwort Benson. The financial market in PPP/PFI is itself evolving and maturing, and due attention must be paid to the state of this market during project development. This might mean accelerating or delaying projects to match particular financial market trends.

The *commitment and responsibility* of both public and private participants are important for successful PPP/PFI projects (Table 5: mean value 3.98). The National Audit Office (NAO, 2001b) points out that, to secure a successful PFI project, it is important to manage the relationship. All parties should commit their best resources (financial, human, etc.) to the partnership project. Commitment should be established throughout all management levels, not only within the SPV established for the project, but also in the parent companies or steering boards. How such commitment can be assessed (or benchmarked) raises interesting issues for further research.

An important CSF is *thorough and realistic assessment of the costs and benefits* (Table 5: mean value 3.95). The

**Table 5** Survey respondents' perceptions of the relative importance of CSFs in PPP/PFI projects

Critical success factor	Public sector		Private sector		Total			
	Mean	Rank	Mean	Rank	Mean	Rank	F	Sign.
Strong private consortium	3.87	5	4.19	1	4.11	1	1.379	0.245
Appropriate risk allocation and risk sharing	3.73	8	4.17	2	4.05	2	2.011	0.162
Available financial market	3.80	7	4.12	4	4.04	3	1.681	0.200
Commitment/responsibility of public/private sectors	3.60	10	4.12	3	3.98	4	3.107	0.084
Thorough and realistic cost/benefit assessment	3.87	6	3.98	5	3.95	5	0.138	0.711
Project technical feasibility	3.53	11	3.88	6	3.79	6	1.465	0.231
Well-organized public agency	3.93	4	3.67	8	3.74	7	0.567	0.455
Good governance	3.93	2	3.64	9	3.72	8	0.940	0.337
Favourable legal framework	3.47	12	3.69	7	3.63	9	0.748	0.391
Transparency in the procurement process	3.73	9	3.55	10	3.60	10	0.271	0.605
Political support	3.93	3	3.43	11	3.56	11	2.115	0.152
Competitive procurement process	4.00	1	3.14	16	3.37	12	4.694	0.035*
Sound economic policy	3.07	15	3.24	13	3.19	13	0.401	0.529
Multi-benefit objectives	3.13	14	3.21	14	3.19	14	0.058	0.811
Stable macro-economic environment	3.27	13	3.17	15	3.19	15	0.100	0.753
Government involvement by providing guarantees	2.87	18	3.26	12	3.16	16	0.779	0.381
Shared authority between public and private sectors	3.00	17	2.98	17	2.98	17	0.005	0.945
Social support	3.07	16	2.71	18	2.81	18	0.774	0.383

public and private sectors have different views on project financial analysis (Hambros SG, 1999). Of great importance is how uncertainty is to be treated in such assessment, as in the project development stage both costs and benefits are derived from forecasts projected over anything from three to 30 years. Although much of this assessment is treated as commercial-in-confidence, some forecasts may need to withstand open public scrutiny.

*Project technical feasibility* (Table 5: mean value 3.79) is important to the private sector for winning a PPP/PFI contract (Tiong, 1996). A SPV must demonstrate that the technical aspects of a proposal will satisfy all relevant regulatory requirements. Novel technology adds to the riskiness of projects. In an Australian PPP BOOT project for a new city tollway, commissioning difficulties with an advanced electronic tolling system delayed the opening of the road for several months. Government pressure (resulting from newspaper criticism) then forced the opening as a toll-free facility for a part of this period, thus significantly affecting project revenue streams until the defective tolling system could be rectified. On the same project, the need to find an effective solution to water leaks in a newly built tunnel delayed the opening of another section of the tollway and led to adverse reactions by potential users.

A *well-organized and committed public agency* to negotiate on behalf of the public body is essential for a PPP/PFI project (Table 5: mean value 3.74). In project procurement generally, the team, including project owner, project sponsor and project manager, should possess essential management ability and technical ability (HM Treasury, 1999). It might be appropriate to seek external skills and experience from competent advisers to complement public sector skills. However, the cost of such advice has to be built in to the financial assessment of the project at the outset.

*Good governance* (Table 5: mean value 3.72) is important for the success of PPP/PFI in terms of developing sound economic policy and in administering projects. Badshah (1998) emphasizes that good governance is essential to attract private sector participation in public services delivery. Mustafa (1999) puts the policymakers at the apex of PPP/PFI structures, and recognizes their dominant influence in determining the development of PPP/PFI. The National Health Service (NHS, 1999) regards the Chief Executive as its highest level of PFI project governance, with ultimate responsibility for delivering the project. In UK PFI projects, most authorities and contractors consider that governance arrangements are working well (NAO, 2001b).

A *favourable legal framework* is a fundamental issue in establishing PPP/PFIs (Table 5: mean value 3.63). Bennett (1998) notes that an enabling regulatory, legal and political environment is the cornerstone of

sustainable private sector participation in urban infrastructure services. In the UK, there is no specific law on PPP/PFI, unlike the BOT laws in Turkey (Islamoglu, 1998). All UK projects procured under PPP/PFI are based on a wide variety of law blended together, including legislation relating to planning and the environment, employment, health and safety, corporate and commercial law, construction, finance and insurance (Payne, 1997).

*Transparency and competition* in the procurement process are critical for the public client in PPP/PFI project procurement (Table 5: mean values 3.60 and 3.37, respectively). Transparency in tender processes, or negotiation, lies with the public client, private contractor and their advisers (NAO, 2001a), which further suggests that three features are important for transparency: good communication between the public and private contractor and their advisers; the private sector openly consulting with the public sector and its adviser, while keeping responsibility for all decisions; and the private sector establishing a clear basis for making decisions.

Hall (1998) insists that value for money (VFM) gains depend on the existence of a competitive bidding process. The National Audit Office (NAO, 1999) notes that government departments should establish three key conditions for successful competitive tender: a good tender list of firms invited to bid; a clear specification in requirements; and competitive tension maintained throughout the procurement process. Transparency of process therefore requires effective communication that is open as far as possible to public scrutiny.

Another CSF is *political support* for PPP/PFI (Table 5: mean value 3.56). Politics has a close relationship with the development and implementation of public policy. A positive political attitude towards the private sector involved in an infrastructure project would support the growth of PPP/PFI. On the other hand, inadequate political support would pose a great risk to PPP/PFI projects.

Economic factors critical to the success of PPP/PFI include *sound economic policy* and a *stable macro-economic environment* (Table 5: both mean values 3.19). Li (2003) has found that the level of PFI project value by region in the UK is strongly associated with that region's GDP. A stable macro-economic environment, where the market exhibits reasonable certainty and market risk is correspondingly low, does a great deal to reduce risks for private investors. The government can help to create and maintain a stable environment by manipulating economic policy levers to ensure stable prices and by maintaining a balanced budget. Good macro-economic policy affects the credibility of a price regimen and trust in the convertibility of the currency,



which is essential for foreign investors (Dailami and Klein, 1997).

To develop a successful PPP/PFI project, all parties should agree on *multi-benefit objectives* (Table 5: mean value 3.19). For a long-term partnership, PPP/PFI partners must understand and respect each other's goals. Typically, the objectives of the public sector party relate to reduction in financial restraints, avoiding public finance restriction, effective provision of public goods and services (detailed by specific project), the transfer of risk and the achievement of VFM. Private sector objectives are typically profit generation and market penetration, diversification and technology and skills acquisition, while the objectives of the stakeholder user communities are to receive better services or to occupy a better environment.

A further CSF for a PPP/PFI project is *government involvement through providing guarantees* (Table 5: mean value 3.16). Governments provide PPP/PFI project guarantees in a variety of ways. Subsidy guarantees for housing, agriculture, students, exports and public corporations tend to dominate the picture in OECD countries, especially where prices or user charges have been set too low and the government is not willing to raise them, nor allow them to be raised by the private sector provider (Dailami and Klein, 1997).

Zhang *et al.* (1998) note that guarantees tend to lower the risk taken by the concessionaire, support the cash flows of the concessionaire, and raise the level of confidence of investors and lenders. In the Shanghai YD 2nd Tunnel project (Zhang *et al.*, 1997), the local authority provided six major guarantees for the concessionaire. However, in developed countries, the government would not provide such a direct and attractive package to private investors. In the UK, some desirable infrastructure projects are given a tax holiday of five to ten years (Merna and Smith, 1999), or bond guarantees (Wright, 1999).

Clearly demarcated *shared authority and responsibility* (Table 5: mean value 2.98) are important in maintaining the type of long-term alliance desirable in PPP/PFI projects.

*Social support* (Table 5: mean value 2.81) is based on the public acceptance of the concept of private provision. Issues involved in this CSF need to be addressed at an early stage of project development. The public traditionally regards delivery of promised services and benefits at reasonable prices as desirable, whether delivered by the public or private sector. The social tradition has influenced PPP/PFI models in different countries (Savitch, 1998). Bennett (1998) recognizes that another important social issue is the placement of public employees. The UK government recognizes that public sector staff are also partners in

PPP/PFIs, and that the future success of the partnership relies on their dedication and commitment. In addition to the application of TUPE [Transfer Undertakings (Protection of Employment) Regulations, 1981] in PPP/PFI, other governmental policies to protect staff benefits were announced in 1999 and 2000 (HM Treasury, 2000).

## Factor analysis of CSFs for PPP/PFI projects

Factor analysis is used to identify a relatively small number of factor groupings that can be used to represent relationships among sets of many inter-related variables (Kleinbaum *et al.*, 1988; Norusis, 1992). This technique was applied to the survey data to explore the groupings that might exist among the CSFs.

A correlation matrix of 18 community variables from the research survey data was calculated. The value of the test statistic for sphericity was large (Bartlett test of sphericity=464.4103) and the associated significance level was small ( $p=0.000$ ), suggesting that the population correlation matrix is not an identity matrix. All the variables show a significant correlation at the 5% level, suggesting that there is no need to eliminate any of the variables for the principal component analysis. The value of the KMO statistic is 0.754, which according to Kaiser (Norusis, 1992) is satisfactory for factor analysis.

Principal component analysis produced a *five-factor* solution with eigenvalues greater than 1.000, explaining 69.24% of the variance, as shown in Table 6. The remaining factors together accounted for 36.55% of the variance.

The factor grouping based on varimax rotation is shown in Table 7. Each variable belongs to only one of the factors, with the loading on each factor exceeding 0.50. It is noticed that the CSF *political support* does not belong to any of the factor groupings, and therefore cannot be grouped in this way.

Although all the CSFs are nominally considered to be 'critical' in the literature, the factor analysis shows that the residual 17 CSFs can be grouped into five principal factors and be interpreted as follows:

- (a) Factor grouping 1 represents *effective procurement*.
- (b) Factor grouping 2 represents *project implementability*.
- (c) Factor grouping 3 represents *government guarantee*.
- (d) Factor grouping 4 represents *favourable economic conditions*.
- (e) factor grouping 5 represents *available financial market*.

**Table 6** Total rotated factor variance explained for critical success factors for PPP/PFI projects

Component	Initial eigenvalues			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	5.9726	33.1813	33.1813	4.0585	22.5471	22.5471
2	2.2708	12.6153	45.7966	3.1779	17.6553	40.2023
3	1.9120	10.6220	56.4186	1.9310	10.7280	50.9304
4	1.2408	6.8934	63.3121	1.8834	10.4631	61.3935
5	1.0667	5.9260	69.2381	1.4120	7.8446	69.2381
6	0.8057	4.4760	73.7141			
7	0.7758	4.3100	78.0241			
8	0.7411	4.1170	82.1411			
9	0.5743	3.1907	85.3318			
10	0.4987	2.7706	88.1024			
11	0.4376	2.4308	90.5332			
12	0.3729	2.0719	92.6051			
13	0.3340	1.8557	94.4609			
14	0.3012	1.6735	96.1344			
15	0.2133	1.1849	97.3193			
16	0.1792	0.9957	98.3150			
17	0.1680	0.9335	99.2485			
18	0.1353	0.7515	100.0000			

Extraction method: principal component analysis.

#### Factor grouping 1 – effective procurement

This factor grouping accounts for 22.5% (Table 6) of the total variances between critical success factors. The CSF components of Effective Procurement are:

- transparency in the procurement process,
- competitive procurement process,
- good governance,
- well-organized and committed public agency,
- social support,
- shared authority between public and private sectors, and
- thorough and realistic assessment of the costs and benefits.

**Table 7** Rotated factor matrix (loading) of critical success factors for PPP/PFI

Factor components	Component				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Transparency procurement process	0.7817				
Competitive procurement process	0.7501				
Good governance	0.7362				
Well-organized and committed public agency	0.7121				
Social support	0.7007				
Shared authority between the public and private sector	0.6557				
Thorough and realistic cost/benefits assessment	0.5448				
Project technical feasibility		0.8181			
Appropriate risk allocation and risk sharing		0.6970			
Commitment/responsibility of public/private sectors		0.6657			
Strong and good private consortium		0.6603			
Favourable legal framework		0.6390			
Government involvement by providing guarantees			0.7046		
Multi-benefit objectives			0.6054		
Political support					
Stable macro-economic conditions				0.9266	
Sound economic policy				0.8231	
Available financial market					0.8685

Extraction method: principal component analysis.

Rotation method: varimax with Kaiser normalization.

Rotation converged in 10 iterations.

An effective procurement process must demonstrate transparency and be competitive throughout the whole procurement process. These two components have a high loading (Table 7: significance 0.7817 and 0.7501, respectively). Transparency and a competitive procurement process enhance project value for money.

The other two high loading components are good governance and a well-organized and committed public agency (Table 7: significance 0.7362 and 0.7121, respectively). Effective procurement cannot be separated from the actors (stakeholders). This supports the institutional structure for a PFI/PPP project (Mustafa, 1999) in that policy makers, government departments and their agency are fundamental for successful PPP/PFI implementation.

To conduct PPP/PFI procurement, social support is an important component (Table 7: significance 0.7007). Public opinion against PPP/PFI could slow, or even prevent, the project development. Social support therefore helps a PPP/PFI development and procurement process to go smoothly, particularly at the earlier stages, such as during land acquisition.

Shared authority between the public and private sector is another important component related to effective procurement (Table 7: significance 0.6557). This suggests that the public and private sector should respect each other when carrying out negotiations during the procurement process. A fairly high loading is associated with a thorough and realistic assessment of the costs and benefits (Table 7: significance 0.5448). Before a project is subjected to the procurement process, the public client should ensure that all the potential options that are beneficial to the government and end users are considered as part of the complete project feasibility study.

### **Factor grouping 2 – project implementability**

This principal factor is responsible for 17.7% (Table 6) of the total variances of critical success factors. There are five CSF components in the Project Implementability group:

- favourable legal framework,
- project technical feasibility,
- appropriate risk allocation and risk sharing,
- commitment and responsibility of public and private sectors, and
- strong private consortium.

A favourable legal framework (Table 7: significance 0.8181) allows a PPP/PFI project to be developed without undue legal restriction on the private sector involvement. An appropriate risk framework should guarantee the legal status for project implementation.

Technical feasibility has a significance of 0.6970 (Table 7) in the factor analysis. Traditionally, technical issues are among the most important considerations in a project feasibility study. When considering PPP/PFI procurement options, it is important to review the associated technical problems. In particular, the private contractor needs to ensure that any engineering uncertainties are resolved.

The third variable in this group is appropriate risk allocation and risk sharing (Table 7: significance 0.6657).

The commitment and responsibility of the public and private sectors is the fourth important component (Table 7: significance 0.6603). The attitude of the actors (or stakeholders) in a PPP/PFI project has an influence on the quality of outputs. Thus 'soft' factors such as stakeholder relationships and stakeholder management must also be considered.

A strong private consortium is another high loading component (Table 7: significance 0.6390). This relates to project implementability in the sense that where a project has the right actors (stakeholders), with common goals, the project is most likely to be implemented successfully.

### **Factor grouping 3 – government guarantee**

Government guarantee is important in the early stage of PPP/PFI evolution. It accounts for 10.8% (Table 6) of the total variances in the factor analysis of CSFs. There are two components in this principal factor: government involvement by providing a guarantee; and multi-benefit objectives.

Higher loading is associated with a government guarantee (Table 7: significance 0.7046). In the current UK situation, the private sector does not yet have full confidence in PPP/PFI procurement and is subsequently demanding revenue guarantees or firmly committed policies from government to ensure that investments are protected.

Lower loading is associated with multi-benefit objectives (Table 7: significance 0.6054). Apart from the direct objectives in achieving public services, a PPP/PFI project needs to consider the private contractor's business objectives. If necessary, government guarantees can be used to protect the project revenue streams.

### **Factor grouping 4 – favourable economic conditions**

Favourable economic conditions are very important for PPP/PFI project development both in developed and developing countries. This factor grouping is responsible for 10.4% (Table 6) of the total factor variances in the critical successful factor analysis. There are two

CSF components involved: stable macroeconomic conditions and sound economic policy.

A high loading is given to stable macroeconomic conditions (Table 7: significance 0.9266). For successful PPP/PFI project implementation, governments must ensure that economic conditions are favourable. For example, a lower risk market can increase the opportunities for success.

A high loading is also associated with sound economic policy (Table 7: significance 0.8231). Governments should adopt economic policies to maintain a stable and growing economic environment, where the private sector can operate with confidence.

### Factor grouping 5 – available financial market

This factor accounts for 7.8% (Table 6) of the total variability between critical success factors. There is only one CSF component under this factor grouping: the availability of a suitable and adequate financial market (Table 7: significance 0.8685).

## Conclusions

Governments believe that PPP/PFI procurement can provide a wide variety of net benefits for society, including: enhanced government capacity; innovation in delivering public services; reduction in the cost and time of project implementation; and transfer of major risk to the private sector, in order to secure value for money for taxpayers.

The essence of PPP/PFI can be summarized as a long-term contract arrangement between private and public sector entities. On the basis of input and output sharing, the private sector carries out the delivery of a service or project development. The mostly commonly used PPP model in the UK is the PFI concessionary contract. Many factors contribute to the success of PPP/PFI projects, and it is possible to rank the relative importance of these factors.

Mean score values of response data from survey respondents has been used to rank the relative importance of a catalogue of eighteen critical success factors in the UK PPP/PFI environment. Three factors – a *strong private consortium*, *appropriate risk allocation* and *available financial market* – emerge as being most important in the development of successful UK PPP/PFI projects.

Thereafter, in descending order of importance, the ranking of the remaining CSFs is: commitment/responsibility of public/private sectors; thorough and realistic cost/benefit assessment; project technical feasibility; a well-organized public agency; good

governance; a favourable legal framework; a transparent procurement process; political support; competitive procurement; sound economic policy; multi-benefit objectives; stable macro-economic environment; and government guarantee. Two factors are regarded as less important for project success: *shared authority* and *social support*.

Given that all the factors are nominally regarded as critical in the literature, factor analysis was used to determine the principal success factor groupings that underlie project procurement. This revealed five factor groupings (accounting for about 70% of the overall variances between factors) for CSFs for UK construction PPP/PFI projects: effective procurement; project implementability; government guarantee; favourable economic conditions and available financial market. The five factor groupings therefore represent the basic elements of CSFs for PPP/PFI project development, and should always be considered by public sector sponsors in informing and shaping their PPP/PFI policy development, and by private sector concessionaires in managing their projects. The CSF of *political support* lies outside these principal factor groupings for PPP/PFI projects in the UK and, like *technology transfer*, is more relevant to projects undertaken in developing countries.

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