RISKS AND RISK TREATMENTS IN PUBLIC PRIVATE PARTNERSHIP PROJECTS

Bing Li, A. Akintoye and C.Hardcastle

School of Built and Natural Environment, Glasgow Caledonian University, Glasgow G4 0BA, UK

Public Private Partnership (PPP)/Private Finance Initiative (PFI) projects have been increasingly used in the public sector services and infrastructure provisions in the UK since the last decade. However, there are many risks and uncertainties associated with PPP projects. Risk management is a widely recognised technique in helping decision making and project management.

The experiences of private financed projects across the world have suggested that the risks within PPPs are more complicated under the innovative procurement arrangement. The hierarchical structure - main, principal and individual risk - had been used to identify and organise the risk factors within PPP projects. The three main risk categories have been highlighted as macro, meso and micro. Forty-six risk factors associated PPP projects have been identified from literature reviews. This study was conducted through a questionnaire survey to produce criticality of risk factors for PPP projects, and options for risk treatment techniques on risk factor basis. Statistic analyses were carried out using descriptive analysis (mean value analysis and ranking) and informative analysis using analysis of variance (ANOVA).

Results show that three major categories of risk have different impacts on PPP projects. Most of the critical risks belong to the meso (project) level. Micro risk has minor to moderate impact on PPP projects, while the macro level risks range in a wider spectrum. The results also show that the public and private sectors have differential opinions of the risk factors. Results also indicate that among four general risk treatment measures, risk avoidance and risk reduction are seldom used compared with risk retention and risk transfer. Risk retention of the risks assigned to both public and private sectors is the preferred measure for dealing with the less critical risks, while the private sector prefers to transfer the critical risk to third parties.

Keywords**:** public private partnerships, risk, risk treatment.

INTRODUCTION

The Private Finance Initiative (PFI) was originally designed to attract private investment into public services projects. When the Labour Party took over power in 1997, it not only succeeded to promote the PFI procurement route but also expanded the PFI concept into a wider arena as Public Private Partnerships (PPPs), and claimed that PPP was one of the corner stones in delivering modern public services (HM, 2000).

PPP projects now cover a wide range of government infrastructure spending. There are projects in rail, road, bridge, prisons, hospitals, schools and other government buildings, water supply and a range of defence procurements (Robinson, 1999). The difference between PFI/PPP projects and traditional projects is that a PFI/PPP project usually involves the creation of an infrastructure property by a private company or consortium – Special Purpose Vehicle (SPV) - which is also contracted to manage the asset on behalf of the government for a contractual period (HM, 1995).

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The introduction of PFI/PPP approaches does not reduce the project risks. However, it allows the public and private sectors a better share of the risks between the partners through competitive tender and negotiation (Anoymous, 1998). Typically, the public client and private contractor should agree a future risk management framework, including treatment techniques, before the PFI/PPP contract is awarded. This paper presents criticality of PFI/PPP risk factors, and the favourable risk treatment techniques for PPP/PFI projects in the UK. The results are expected to provide useful information on risk treatment techniques for the PFI/PPP project decision-makers, and to assist in establishing a smooth and successful PFI/PPP contract.

OVERVIEW OF RISKS AND RISK TREATMENT

Risks in PPP/PFI are perceived differently by different parties involved in a PFI project including client, contractor and lenders (Akintoye, *et al.*, 1998). For instance, risk may refer to planned service delivery not being met, or delayed, and risk of financial loss, fraud, waste and inefficiency, to the governments. The private consortium may face large capital outlays, long lead-time and reliance on project cash flow for future return. The partnerships bring government and private consortium together for the delivery of the same services based on multi-benefit objectives. It is important for the decision-makers to identify all the risks involved in PPP/PFI projects, no matter who will manage them later, before the delivery takes place.

One of the common methods when considering the most frequent and severe risk factors, is to classify them according to their sources and to use a hierarchical structure (Saaty, 1980). Such classification will make it easier for the risk manager to visualise risks clearly and to deal with them in a logical, systematic way. The three main risks associated with PPP projects have been proposed in Li (*et al.*, 2001), as macro risk at ecological level, meso risk at project level and micro risk within partnership relationship. Each main risk composes several principal risk, and each principal risk consisted of several individual risks as detailed in Table 1.

Table 1: Risk factors associated with PPP projects

Main risk	Macro	Meso	Micro
Principal risk	Political, economic, legal, social, natural, industrial	Demand, residual, planning, design, construction, technical, operation	Relationship, third party
Individual risk	Government stability, expropriation/nationalisation, corruption, economic performance, inflation, interest rate, influence economic events; legislation change, tax regulation, industrial regulatory change, unavailability of labour/material; force majeure, weather, ground condition,	Selection, permit and work land acquisition, residual value, investment attraction, finance cost, design deficiency, construction cost overrun, construction time delay, design alteration, poor workmanship, operation cost overrun, income under par, low productivity, Contract variance	Inexperience, Inadequate distribution of responsibilities an authorities, lengthy negotiation, difference in working methods, Staff crisis; Tort liability

Perry and Haynes (1985) highlighted three processes to describe risk management in construction, namely risk identification, risk analysis and risk treatment. On the other hand, there are four possible techniques for risk treatment: risk retention, risk avoidance (elimination), risk reduction and risk transfer (Baker, *et al.*, 1999).

Risk Retention: This risk treatment technique is adopted when the risk prevention is not possible, or the likelihood of occurrence is negligible, or transfer cost is uneconomical. There are two categories of risk retention: involuntary retention and voluntary (Hampton, 1993). It is important, however, for managers to prepare for incidents that affect the continuity of their project development and operation. In relation to risk retention, all projects should have a contingency plan (or contingency finance) which can be used in the event of significant loss.

Risk Avoidance: This involves an organisation's refusal to accept the exposure which can cause a future loss. Risk avoidance can be instituted during pre-contract negotiation of a project (Flanagan and Norman, 1993). For example, the authorities can decide not to develop a public facility to avoid environmental risk, particularly when its result would cause great deterioration on the environment, or avoid using asbestos to eliminate this safety risk.

Risk Reduction: If risk cannot be avoided in total, it may be possible to reduce the likelihood of loss. Baker *et al.* (1999) argued that risk reduction is a part of risk retention. In public projects, typical action to reduce risk can take the form of redesign, more detailed design or different method of construction. However, risk reduction may lead to an increase in the cost estimate for the project or services.

Risk Transfer: This can take the form of contract strategy or through insurance. Contract transfer of risk is one of the most important measure in allocating project risks. In traditional public project procurement, design risk is transferred to the consultant company in the professional service contract (Perry and Hayes, 1985). Insurance is another means of transferring risk, for which the insurance company bears the risk, particularly where the organisation cannot bear the full exposure (Hampton, 1993).

RESEARCH METHODOLOGY

This study presented in this paper is based on a questionnaire survey of participants in PFI/PPP projects. Five hundred questionnaires were sent to both private and public sector organisations that are listed in the database of PricewaterhouseCoopers and Glasgow Caledonian University PFI research team. The response from this survey is 61, representing 12% of response rate. Forty people did not complete the questionnaire, and had contacted the researcher by means of letter, email, or telephone to apologise for not responding to the questionnaire. Although this rate is lower than other construction research survey, it is high compared to IPPR consultant PPP responding rate, 9.9% by 68 out of 700 (IPPR, 2000). The reasons for this low response rate include:

Some of the individual people targeted did not have direct experience in PPP/PFI projects as anticipated.

When some of the individuals had experience of PPP/PFI projects, their level of experience was limited, they felt they could not satisfactorily answer the questions.

The questionnaire is divided into three sections. This paper presents the section 3 element of the questionnaire dealing with risk criticality and risk treatments. Only 44 respondents completed section 3 of the questionnaire. The reason for low response in risk management issues may rest on the fact that not every manager practised risk management in the construction industry, and neither did government departments, as NAO (2000d) reported.

The respondents to the questionnaire occupied senior positions in their organisations, either directors or managers. Participants from large companies (>1000 employees) covered over fifty percent (see Table 2) of the respondents.

Table 2: Respondents' designations and associated organisation scale

Number of employee	Director		Manager		Total	Percentage
	Public	Private	Public	Private		
0-100		5	1		6	14%
100-500	1	4	2		7	16%
500-1000		1	1	4	6	14%
1000-5000	2	7	4	2	15	34%
>5000	1	4	2	3	10	23%
Total	4	21	10	9	44	100%

The participants in the questionnaire survey were involved in various ways in PFI/PPP projects, from a single role as contractor, client, financier, operator and consultant, to multiple roles and complicated responsibilities as shown in Table 3. Among the 30 private sector respondents, 12 organisations had participated in at least two roles in the project development.

Table 3: Participant roles in PFI/PPP projects

		Frequency	Percent	Cumulative Percent
Public	Central government	9	64%	64%
	Local government	3	21%	86%
	Government agency	1	7%	93%
	Public enterprise	1	7%	100%
Private	Financier	1	3%	3%
	Main contractor & designer	3	10%	13%
	Designer	1	3%	17%
	Constructor	2	7%	23%
	Consultant/advisor	10	33%	57%
	Operator	1	3%	60%
	Financier and main contractor & designer	2	7%	67%
	Financier, main contractor and operator	5	17%	83%
	Financier, main contractor, subcontractor and operator	1	3%	87%
	Financier, constructor, consultant and operator	1	3%	90%
	Main contractor, consultant	1	3%	93%
	Main contractor and operator	2	7%	100%

RESULT ANALYSIS

Analyses of PFI/PPP risk factor criticality were carried out, as shown in Tables 4-6 based on mean values and rankings. The tables divided the principal risk factors on the basis of whether they are meso risks, macro risks, and micro risks (Li *et al.*, 2001). The means values for the risk factors vary from the highest at 3.56 to the lowest at 0.79. In general, the forty-six factors are subjectively divided into three groups: critical risk (with mean value > 3.0), moderate risk (mean values between 2.0 – 3.0) and minor influence risks (mean values < 2.0). Analysis and discussion are based on the main group, and those with significantly different values by different PFI/PPP participants.

Analysis of Risks in the Main Risk Categories

Macro risks on PPP projects

Among the nineteen risk factors in Table 4, there are two factors which can be regarded as being critical risks. Ten risk factors fall within the moderate risk category, and seven risk factors have a minor impact on PPP projects. When considered in terms of the principal risk groups, legal and economic factors have critical and moderate impact on PPP projects, natural factors have moderate impact; while social and political risks have minor impacts on PPP projects.

- Legal Risks: There are three risk factors of the legal aspect identified in this study: general legislation, tax regulation and industry regulation. The results show that the risk of legislation change is the most critical, and ranks in first place within the macro risk group. The tax regulation change has a moderate impact on PPP projects with a ranking in sixth place. The risk of "industrial regulation change" is ranked in 9th position.
- Economic Risks: The economic influence on PFI/PPP projects is significant in many aspects and the associated risks are those related to: interest rate, financial market, inflation, availability of finance, financing cost and influential economic events. The risk of interest rate receives a mean value over 3.02 and is ranked in 2nd place in the macro risk group. Three other factors – financial market, inflation and availability of finance, are very close to critical level with mean values over 2.95, and ranked 3rd, 4th and 5th place respectively.
- Natural Risks: Four risk items are identified – force majeure, environment, ground condition and weather in this study, and they are ranked in 8th, 10th, 11th and 13th respectively. All of them fall within the category of moderate risk for PPP projects.
- Political Risks: Political risks are regarded as very critical in some country's BOT project development. However, they are not critical within the UK. Four risk factors of political nature are identified for study – poor political decision-making process, government stability, political opposition and nationalisation/expropriation. They have very low mean values which suggests that they have low risk impact on PFI/PPP project in the UK.
- Social Risks: Social factors have significant impacts on PPP in the area of the urban development programme (Savitch, 1998). However, in the capital project development, two of the social risks – tradition of private provision of public services and level of public support – did not show much influence on PFO/PPP project compared to those of urban development programme.

Meso Risks on with PPP Projects

Project risks are the most important factors in PPP projects, as shown in Table 6. Among the nineteen risk factors, nine of them fall within the critical risk category with mean values over 3.0. These nine risk factors are those associated with construction, design and operation, three principal risks. The other nine risk factors have lower mean values, fall within the moderate impact category of PPP projects.

- Construction Risks: Construction risks usually refer to the failure of cost, time and quality in construction activity. These three factors all fall within the critical risk category, especially cost and time, which were ranked in first and second place in the PPP meso group, while "quality factor" was in 9th position.

- Operation Risks: Operation risks are another critical principal risk of PPP projects. Five aspects – operation cost overrun, higher maintenance cost, frequency of maintenance, low operating productivity and operational revenue below par - are all considered to be critical from the survey results. They rank in 3rd, 4th, 6th, 7th 8th places in the meso risk group.
- Design Risks: Design deficiency is a critical risk with ranking of 5 in the meso risk group. Frequently design changes disrupt the progress of the construction works, and may lead to time and cost over runs. It is regarded as a moderate risk to PPP projects, and ranked in 10th position among meso risk factors.
- Others: There are eight other factors reflecting on diversified project problems. From the top ranking to bottom ranking, these eight risk factors are contract variation, insolvency of subcontractors/suppliers, project approval and permit, financial attraction of project, residual risk, availability of labour/material, site availability, unproven engineering techniques, and level of demanding project. All of them fall within the moderate risk category.

Micro Risks

Micro risk factors involved in PPP projects include those associated with the relationship management between the public and private sectors and risk from a third party. NAO (2001a) had pointed out that only by managing the relationship successfully would a successful partnership in PFI projects be secured. "Third party tort liability" and "different working methods" are the only two minor impacting risks in the minor risk group with criticality mean value less than 2.0. The components of the relationship group include: Organisation and co-ordination risk, Authority, responsibilities and risk distribution, lack of commitment from public/private partner and different working methods. Third party risks consist: staff crisis and third party liability. The results show that the micro risks have minor and moderate impacts on PPP projects.

Analysis Different Perspectives by the Public and Private Sectors

F statistic was used to compare the opinions of the public and private sectors. The confidence interval is based on 95% level. The results in Tables 4-6 show that the public and private sectors have different views on some risk factors. It is surprising to find out that the risk mean values from the private sector are greatly higher than that from the public sector (with one exception – quality of workmanship). This may be explained by the fact that in PPPs arrangements, the private sector takes over more responsibilities. Any risks which occur through the financial loss or project disturbance reduces the project revenue, and the profit driven private sector is sensitive to them.

There are nine risk factors (out of nineteen) which are regarded as having different criticality between the public and private sectors at 5% confidence level. Three of them are legal, four are natural, one is political and one is economic principal levels. The legal risks – legislation, tax regulation and industrial regulation changes - are considered more critical by the private sector than the public sector. The natural risks – force majeure, environment, ground condition and weather - are considered more critical by the private sector than the public sector. Interest rate is critical to the private sector because the private sector is in charge of the financial arrangements. Interest rates are sensitive to the cash flow and project net present value. The other discriminate risk is Government stability.

At the meso risk level, there are three factors, with significantly different opinions from the public and private sector at 5% confidence level. They are higher maintenance cost, contract variation and project approval and permit. High maintenance cost directly increases PFI/PPP project costs, while the other two factors usually cause project delay. They would affect the private company's cash flow and project revenue.

Within the micro risk category, "staff crisis" and "third party tort liabilities" the mean values for the public and private sector are significantly different at 5% level confidence level. These risk factors received a higher value and ranking from the private sector than the public sector. And both of them are caused by a third party rather than a relationship. The reason behind might be explained by the fact that the private sector take over all implementing responsibilities in PPP projects,

Risk Treatment in PPP/PFI Projects

The questionnaire ascertained which risk treatment techniques have more frequently been employed by the PPP participants. The responses to the four principal methods – retention, avoidance, reduction and transfer - are summarised in Tables 4-6 based on the main risk groups. Opinions vary as to which option is favoured, and how they are ranked among four options based on percentage.

For macro risks, risk retention is the most popular choice for settling political and social risks, and parts of economic and legal risks. Except for the risk of legislation change which is critical and the risk of availability of finance which is moderate, the other ten risk factors are low moderate and minor impacting factors. Risk transfer is the most favoured option to deal interest rate and the natural risks. Those risks are critical or moderate in their weights. Risk reduction is the best choice for treating financial market, force majeure and inflation. Risk avoidance is always the least favoured option, although this was considered a second option for dealing with political risks.

For meso risks, almost all the construction and operation risks, and the risk of design deficiency, are assumed to be dealt with using risk transfer technique. Risk retention is the second favoured choice in treating these three risks. Risk retention is the most popular technique for other meso risks, such as demand, residual, and contract, etc. Risk avoidance is still the least favoured options in 3rd or 4th place. Risk reduction technique is the first favoured option for project demand risk.

Risk retention is the most frequent choice for both public and private sectors in dealing with micro risks. Six risk factors have risk retention as the first option and second option out of a total 8 individual risk factors. Risk transfer is the most favoured in dealing with the risk of third party liability through insurance transfer. The best risk management technique for the risk of "responsibilities and risk distribution" is risk reduction. Risk avoidance is the least favoured option in dealing with micro risks as well as in the case of macro and meso risks.

CONCLUSION AND DISCUSSION

The PPP/PFI scheme is a new procurement process for the private provision and management of public services in the UK. Literature reviews suggest that there is a wider range of risks associated with these privately financed projects. Through the process of a questionnaire survey, the perception of risk and risk treatment measures were investigated. Risk management is complex in practice. The objective of this

study is only to provide useful information for decision-makers, both public and private sector, in approaching agreement smoothly.

Several results emanated from the analysis of the survey. Most critical risks associated with PFI/PPP projects belong to the meso (project) level. These critical risks are those related to construction, operation and design risk groups. Micro risk has minor to moderate impact on PPP projects. The macro level factors which strongly influence the PPP/PFI projects are interest rate and legislation change risks with high criticality, and natural risks with high moderate criticality. The political and social factors are the least critical risks in relation to the UK PFI/PPP projects.

The results also indicate that the public and private sectors have different opinions on some risks. The risk factors which received the most varied mean values are macro risks. The legal risks (legislation, tax regulation and industrial regulation) the natural risks (force majeure, environment, ground condition and weather), interest rate risk (economic) and government stability risk (political) are considered more critical by the private sector than the public sector. Three risk factors at the meso level (higher maintenance cost, contract variation and project approval and permit) together with staff crisis and third party tort liabilities from micro risk level are all perceived differently in evaluation.

Risk management is one of the useful measures to achieve project best value in the public project procurement. Results also indicate that among the four risk treatment measures, risk avoidance and risk reduction are two far less used measures, when compared with risk retention and risk transfer. Retention of the risks assigned to both the public and private sectors is the most preferred measure in dealing with the less critical risks, such as political, social risk at macro risks level, demand, residual and other meso risks, and all of the micro risks. The technique of risk transfer appears most likely in dealing with those risks which receive critical value, like the risks of construction, operation, design and interest rate.

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Table 4: Macro Risks and Risk Treatments in PPP Projects

Principal Risk	Individual Risk Factor	Total Mean	Rank	Risk Impact	F	Sig.	Treatment (%, rank) Retention	Avoidance	Reduction	Transfer
Economic	Interest rate	3.18	1	Critical	16.902	0.000**	25.70% (2)	5.70% (4)	25.70% (2)	42.90% (1)
Legal	Legislation change	3.02	2	Critical	5.714	0.022*	35.30% (1)	8.80% (4)	32.40% (2)	23.50% (3)
Economic	Availability of finance	2.97	3	Moderate	0.993	0.326	44.40% (1)	7.40% (4)	14.80% (3)	33.30% (2)
Natural	Environment	2.95	4	Moderate	3.857	0.057	31.30% (2)	3.10% (4)	28.10% (3)	37.50% (1)
Economic	Financial market	2.95	5	Moderate	1.352	0.253	21.90% (3)	15.60% (4)	34.40% (1)	28.10% (2)
Natural	Force majeure	2.85	6	Moderate	6.436	0.016*	32.50% (2)	5.00% (4)	47.50% (1)	15.00% (3)
Natural	Ground condition	2.68	7	Moderate	2.491	0.123	20.60% (3)	14.70% (4)	23.50% (2)	41.20% (1)
Economic	High financing cost	2.43	8	Moderate	12.588	0.001**	26.90% (3)	11.50% (4)	30.80% (1)	30.80% (1)
Legal	Industrial regulatory change	2.43	9	Moderate	5.5	0.024*	25.00% (3)	3.10% (4)	34.40% (2)	37.50% (1)
Economic	Inflation	2.41	10	Moderate	4.989	0.032*	31.40% (1)	8.60% (4)	31.40% (1)	28.60% (3)
Economic	Influential economic events	2.39	11	Moderate	8.168	0.007**	35.70% (1)	14.30% (4)	28.60% (2)	21.40% (3)
Legal	Tax regulation change	2.28	12	Moderate	2.472	0.124	46.70% (1)	13.30% (4)	20.00% (2)	20.00% (2)
Natural	Weather	2.03	13	Moderate	4.667	0.037*	33.30% (1)	6.10% (4)	27.30% (3)	33.30% (1)
Political	Government stability	1.92	14	Minor	0.799	0.378	71.40% (1)	17.90% (2)	7.10% (3)	3.60% (4)
Social	Level of public support	1.44	15	Minor	0.962	0.334	60.90% (1)	21.70% (2)	8.70% (3)	8.70% (3)
Political	Nationalisation/expropriation	1.36	16	Minor	1.093	0.303	60.00% (1)	24.00% (2)	12.00% (3)	4.00% (4)
Political	Political opposition	1.31	17	Minor	5.823	0.021*	76.00% (1)	16.00% (2)	8.00% (3)	0.00% (4)
Political	Poor political decision-making process	1.05	18	Minor	2.932	0.096	54.20% (1)	25.00% (2)	12.50% (3)	8.30% (4)
Social	Tradition of private provision of public service	0.79	19	Minor	0.189	0.666	40.00% (1)	10.00% (4)	25.00% (2)	25.00% (2)

Table 5: Meso Risks and Risk Treatments in PPP Projects

Principal Risk	Individual Risk Factor	Total Mean	Rank	Risk Impact	F	Sig.	Treatment (%, rank) Retention	Avoidance	Reduction	Transfer
Construction	Construction cost overrun	3.56	1	Critical	0.936	0.339	22.90% (2)	11.40% (3)	11.40% (3)	54.30% (1)
Construction	Construction time delay	3.51	2	Critical	0.581	0.451	25.00% (2)	16.70% (3)	11.10% (4)	47.20% (1)
Design	Design deficiency	3.5	3	Critical	2.103	0.155	26.50% (2)	2.90% (4)	17.60% (3)	52.90% (1)
Operation	Frequency of maintenance	3.45	4	Critical	7.542	0.009**	31.30% (2)	9.40% (4)	18.80% (3)	40.60% (1)
Operation	Higher maintenance cost	3.27	5	Critical	1.586	0.215	35.30% (2)	14.70% (3)	8.80% (4)	41.20% (1)
Table 5 (Cont'd)										
Operation	Low operating productivity	3.23	6	Critical	3.261	0.079	33.30% (2)	12.10% (3)	9.10% (4)	45.50% (1)

Operation	Operation cost overrun	3.23	7	Critical	2.193	0.147	31.40% (2)	11.40% (3)	8.60% (4)	48.60% (1)
Operation	Operational revenue below par	3.18	8	Critical	1.007	0.322	42.90% (1)	7.10% (4)	17.90% (3)	32.10% (2)
Construction	Quality of workmanship	3.17	9	Critical	0.234	0.631	25.00% (2)	11.10% (3)	11.10% (3)	52.80% (1)
Others	Availability of labour/material	2.95	10	Moderate	0.12	0.731	36.70% (2)	10.00% (3)	13.30% (3)	40.00% (1)
Others	Contract variation	2.85	11	Moderate	4.736	0.036*	36.70% (1)	16.70% (4)	26.70% (2)	20.00% (3)
Others	Financial attraction of project	2.78	12	Moderate	0	0.984	44.80% (1)	13.80% (4)	20.70% (2)	20.70% (2)
Residual	Residual risk	2.72	13	Moderate	16.467	0.000**	55.20% (1)	3.40% (4)	20.70% (2)	20.70% (2)
	Insolvency of subcontractors/suppliers	2.59	14	Moderate	0.434	0.514	38.70% (1)	9.70% (4)	12.90% (3)	38.70% (1)
Design	Late design changes	2.56	15	Moderate	3.364	0.077	50.00% (1)	10.50% (4)	18.40% (3)	21.10% (2)
Demand	Level of demanding project	2.53	16	Moderate	1.075	0.306	27.30% (2)	18.20% (4)	31.80% (1)	22.70% (3)
	Project approval and permit	2.51	17	Moderate	1.542	0.223	51.70% (1)	6.90% (4)	20.70% (2)	20.70% (2)
	Site availability	2.3	18	Moderate	0.042	0.839	59.30% (1)	7.40% (3)	25.90% (2)	7.40% (3)
	Unproven engineering techniques	2.06	19	Moderate	0.426	0.519	30.80% (2)	11.50% (3)	11.50% (3)	46.20% (1)

Table 6: Micro Risks and Risk Treatments in PPP Projects

Principal		Total		Risk			Treatment (%, rank)			
Risk	**Individual Risk Factor**	Mean	Rank	Impact	F	Sig.	Retention	Avoidance	Reduction	Transfer
Relationship	Authority distribution between partnerships	2.57	1	Moderate	1.681	0.203	54.50% (1)	13.60% (3)	22.70% (2)	9.10% (4)
Relationship	Lack of commitment from public/private partner	2.53	2	Moderate	2.992	0.093	41.70% (1)	33.30% (2)	20.80% (3)	4.20% (4)
Relationship	Lack of experiences in PPP arrangement	2.25	3	Moderate	0.289	0.595	40.90% (1)	22.70% (3)	31.80% (2)	4.50% (4)
Relationship	Organisation and co-ordination risk	2.22	4	Moderate	0.861	0.36	46.70% (1)	10.00% (4)	20.00% (3)	23.30% (2)
Relationship	Responsibilities and risk distribution	2.22	4	Moderate	0.357	0.554	31.00% (2)	6.90% (4)	51.70% (1)	10.30% (3)
Third Party	Staff crisis	2.14	6	Moderate	4.501	0.041*	45.50% (1)	13.60% (3)	27.30% (2)	13.60% (3)
Relationship	Different working methods	1.97	7	Minor	5.274	0.028*	34.80% (1)	17.40% (3)	30.40% (2)	17.40% (3)
Third Party	Third party tort liability	1.74	8	Minor	1.546	0.222	25.00% (2)	8.30% (4)	20.80% (3)	45.80% (1)