I The Need and Significance of the Research Topic

Over a hundred years ago private finance was being sought to develop major infrastructure projects, like the Trans-Siberian Railway and the Suez Canal, which could not be financed from government funds.

The main obstacle to carrying out infrastructure projects, apart from technical or environmental considerations, remains the difficulty of mobilizing capital.

Recent worldwide trend in road projects has been to introduce private capital in many areas to build and operate road infrastructure.

Developed countries, developing countries, and emerging markets all seek, each in its own way, methods to achieve common goals – economic growth, political independence, and more opportunities and higher standards of living for their people.

In short, the advantages of Private Participation in Infrastructure (PPI) are an increase in efficiency in the provision of services, avoidance of political interference in operations, and alternative of public sector budget constraints.

The success of PPI projects depends on a synthesis of the public and private sector strengths, skills and resources, which satisfies the priorities of both parties.

The private sector is to seek a reasonable return on capital investment, sharing of expertise and assumption of risk.

Fundamental objectives of the public sector in any PPI projects are to secure the best “value for money” and make the projects viable.

However, this deviation in objectives does not exclude a certain degree of commonality in the purposes behind pursuing the partnership, first among them being customer satisfaction.

In an optimal scenario, the result is a “win-win” situation where both parties along with the ultimate beneficiary—the service user—gain from the partnership.
PPI projects almost always comprise a high level of risk due to the magnitude of the financial stakes involved, uncertainties over construction and operation costs, and revenue-related uncertainties.

So, the analysis, mitigation and allocation of a project’s risks are very important to carry out PPI projects successfully.

A partnership-based project organization relies upon a balanced allocation of these risks and enables transferring a certain portion of them onto the private sector when the private sector is better able to shoulder them than the public sector.

Many projects have been undertaken and various kinds of guidance and research papers describing PPI (Private Participation in Infrastructure) / PPP (Public Private Partnership) / PFI (Private Finance Initiative) methods have been published especially during the last decade.

However, there is still insufficient recognition of what is the optimal risk allocation and how the government policy ensures it.

PPI projects generally need huge initial investment cost making continued private funding very difficult.

In addition, PPI projects take up too much time, thus making early retrieval hard.

In most of the road projects under consideration, the profitability and viability are often in doubt since the cash flow accrued from the project is insufficient and unstable without appropriate government support.

Financial support from the government is needed to make the project viable but the support should be carefully designed to avoid any efficiency deterioration.

So one of the most important factors in PPI is how to efficiently allocate, mitigate and overcome the risks that may arise in the course of PPI projects.

II Objectives, Hypotheses and Methodologies

South Korea has introduced private participation in many areas to build and operate toll road infrastructure like many countries.
Roads have been the most important infrastructure in Korea carrying over 90% of the country’s passenger and freight transport volume.

Road expansions began along with the economic development following the 1960s and have played the leading role in the country’s economic growth and territorial development.

The road sector investment accounts for almost 60% of the total investment in transport infrastructure currently planned in South Korea.

Various methods are being sought to secure the enormous funds necessary for infrastructure expansions, including active promotion of PPI projects, increasing fuel tax, and raising toll and other facility usage fees.

In PPI projects, every project is different and it is not possible to evaluate which method is good or bad to facilitate PPI projects.

What is a major risk for one project may be quite minor for another.

Moreover, PPI projects need many participants such as the public sector (central and local government, public authorities etc.) and the private sector (sponsor, lender, contractor, operator, technology owner, supplier, equity investor, multilateral and bilateral agencies etc.)

It is rather complicated and difficult to consider the optimal risk allocation and mitigation methods for all parties because their interests are often contradictory.

So my dissertation suggests methods and policies that are common to most projects for optimizing and mitigating risks mainly focused on the public sector, which is a key player to implement PPI projects.

But I tried to include private interest as far as possible because it cannot be ignored.

To this end, my research methodologies are based on the following:

• Case studies about PPI projects
• Review of relevant academic theories, dissertations and seminar papers
• Internet sites and magazines etc.
III Structure of the Dissertation

Following the introduction chapter, the structure of the dissertation is as follows:

Chapter 2 introduces sources of development capital in infrastructure projects
Chapter 3 analyzes toll road development models in PPI
Chapter 4 demonstrates international experiences in PPI toll road projects
Chapter 5 reviews developing and comparison of appraisal methodologies for financial and economic feasibility of road project development by PPI
Chapter 6 identifies and analyzes main risk factors through PPI case studies in some model countries
Chapter 7 develops optimal risk mitigation and allocation measures
Chapter 8 recommends government policy to facilitate PPI
Chapter 9: the final chapter, conclusion, recommendations, limitation and further issues are to be presented.

To accomplish the overall task in a rather clear and well-based argument, the dissertation contains tables and figures and uses related references.

IV Recommendations and Achievement of the Dissertation

The implementation of PPI road projects requires acting with extreme precaution and needs appropriate government measures.

Risk in PPI projects brings in the uncertainty over an outcome where total investment cost will be greater than the final project benefit or result.

Risk also bears on the likelihood that the project schedule will be longer than planned or not delivered at all.

To deal with these issues more efficiently, my findings and recommendations are listed below.

1 Establish Standard Cost/Benefit Appraisal Procedure

As a result of my research I suggest establishing especially further developed, and standardised cost/benefit appraisal procedure for PPI road projects, which consider the special characters of this type of projects.

Except for some developed countries, most countries have no official units for
measuring benefits and cost items and inconsistent units have been applied.

This often causes different results by individual view of appraiser.

The results of the road projects appraisal have a significant impact on the decision making of the people directly and indirectly concerned, whatsoever the results are from an economic appraisal or comprehensive analysis.

Since this standard procedure is to prevent the decision makers from subjective or risky decision, the objective appraisal criteria should be used, and a reasonable and transparent appraisal procedure should be applied.

This is very important in PPI projects because the private sector is willing to believe the results of a project appraisal done by the public sector has already done.

So this can also reduce time and cost, and avoid unnecessary political intervention etc.

Provided sufficient demand exists for road projects, revenue streams can be identified and the commercial viability determined by the private sector.

The validity of a road project is satisfied when 1) the benefit is greater than the cost, and 2) profitability is greater than those of other alternatives.

2 Creation of a Complex Framework for a Secure Political Consensus and to Provide Acceptance of Tolling by the Public

As a product of my research, I developed a complex framework, which provides the secure political consensus and acceptance of tolling by public.

The framework includes the followings:

- Government willingness must be stated clearly.
- Promoting public hearing in the planning process and dealing with relocation and resettlement in most countries; noise, air pollution, and ecology (e.g. the M3 project in Hungary, the Birmingham Northern Relief Road in the UK. Etc); public relations campaigns (e.g. the Citra Metro Manila Tollways in the Philippines, the Incheon International Airport Expressway in South Korea etc.).
- The necessity for implementation of a PPI project and the benefits that it will bring must be explained clearly.
- Service value related pricing, as a tolling principal, is important. The toll should either be levied accordingly to the distance covered on a road or according to the time spend on it.
· The choice of financing means and especially the decision to toll should be justified in depth.
· The method for awarding the concession must be transparent and the choice of the concessionaire clearly stated.
· The case of low-income road users should be considered. In some cases this might lead to specific tariff arrangements or to maintaining possible free alternatives to the tolled road.
· Implementation of tolling must be carefully prepared. If the existing free roads are to be rehabilitated, it is advisable to start tolling only after the improvements to the level of service are noticeable.
· On new infrastructures, the reason for resorting to tolling should be explained and the service improvements, which it offers should be emphasized. Users become clients. They have the right to expect a service corresponding to the price paid. In particular, this service should not be lower than the service of a comparable toll-free road.

3 Use Various Risk Analysis Theories and Techniques

Risk analysis is a key feature of modern decision making, for both public and private sector.

We cannot know what the future holds, but we need to be able to make informed, realistic and justifiable decisions in the face of uncertainty.

Assessing and quantifying risks provide us with the means to understand, value and manage the risks inherent in an uncertain world.

To deal with this issue more efficiently I recommend using various theories and techniques for the different identified risk factors as follows:

· Probabilistic Techniques
· Sensitivity Analysis
· Break-Even Analysis
· Monte Carlo Simulation
· Time-Series forecasting
· Delphi Group Opinion
· Game theory.

I proved the cost reduction impact of risk optimization through a simplified case.
4 Develop Useful Methods to Forecast Future Traffic Volume

Forecasting the volume of traffic that will use a proposed road project is a key input into the appraisal process.

Given that projects frequently take ten years to plan, design and build, and are extremely long-lived, it is necessary to forecast a long way into the future.

The benefits from a scheme usually rise more than proportionately with the traffic volume, as increased volume leads to worse congestion.

Thus the forecast rate of increase in traffic is very important, as well as being subject to great uncertainty and risk.

I suggest to use special combination of different approaches to forecasting range from simple time series models based on aggregate growth in population, incomes and petrol prices to more detailed modeling of trips by purpose and destination etc.

- Traffic surveys are carried out in the corridor of the proposed toll road, usually comprising some (but rarely all) of traffic counts classified by vehicle type, origin-destination surveys, stated or revealed preference surveys to establish users’ willingness-to-pay tolls, and journey time surveys.

- Other data are collated on land uses (current and projected), historic traffic, and economic growth.

- A traffic-forecasting model is developed, validated to base year conditions, which produces traffic and revenue forecasts for a few specific future years, for a range of scenarios.

5 Development of Optimal Risk Allocation Methods

Referring to and summarizing the experience gained worldwide in this respect, an optimal risk allocation can be defined as one in which the risks in a project are allocated to the party (i.e. the public or the private sector party) best able to manage them.
5.1 Identification of the Main Clusters of Risks taken by the Public, the Private Sector, and the Shared

In other words, where a risk is best managed by the public it should take that risk; with private sector taking these risks which it is better placed to manage.

In some cases a risk can be shared, where management of the risk is best shared. As I studied and reviewed most cases of PPI projects, I arrived to the conclusion that the main clusters of risks taken by the public, the private sector and shared risks are as follows:

- Public sector: land acquisition, change of law, force majeure (long-term)
- Private sector: construction (time and cost), operation performance
- Shared: foreign exchange loss, force majeure (short-term)

The reason why optimal risk allocation involves allocation risks to the party best able to manage them is that this minimizes the financial impact of the risk on the overall project.

Optimal allocation of risks is not the same as maximizing the transfer of risks to the private sector

5.2 Organize a Joint Venture as a Risk Mitigation Device

Taking into consideration the complexity and difficulty of PPI project implementation, I recommend organizing a joint venture.

A joint venture is a form of risk sharing used in project financing. In a joint venture, sometimes called a joint development company, two or more parties join to develop a project or series of projects jointly.

Joint ventures might include a company particularly skilled in construction, another skilled in project development and a third in the political and developmental climate of the host country.

Together, each brings different, useful skills to project development, while allowing for a risk sharing that may be more attractive to them than if one of the entities developed the project singly.
Also, joint ventures provide the framework for accelerating the negotiation process with governments and financial institutions. Further, the increased creditworthiness and experience of individual companies combined into joint ventures allow the joint venture to be competitive though the individual members, acting alone, would not have the resources necessary to compete with other, larger and more experienced companies.

6 Identification of Further Tool Package for Risk Reduction

I strongly recommend using further tool packages for reducing PPI project risks as follows.

6.1 Limit The Number of Pre-Qualifiers and Develop Suitable Pre-Qualification Criteria

The advantage of a pre-qualification process is that it enables inappropriate prospective bidders to be eliminated at a very early stage.

In addition, on very large projects the costs of bidding are very substantial.

The private sector is extremely nervous about being in a position where the chances of winning the competition are small.

Thus on large projects it is not unusual to see the number of pre-qualifiers reduced to 3-5.

All projects have different needs.

The private sector needs to know the basis on which pre-qualification will be made.

It is appropriate to allow public sector officials to exercise subjective discretions in applying pre-qualification criteria.

Criteria might include:

- Technical, financial, commercial, management track record
- Proven understanding of project operations
- Potential to meet the government’s requirements for the project
- Willingness to proceed with a bid, which will comply with government’s requirements
· Avoidance of conflicts

6.2 Prepare Well Organized Contractual Framework

Reconciling the differing objects of parties to a PPI project will involve a complex set of contractual relationships.

The underlying contractual framework of a project is of course fundamental to the success of any project.

The primary risk allocation and mitigation measures are mainly determined through the concession agreements.

So concession agreements should also contain both the rights of the parties and obligations between public sector and private sector.

Many of the general and specific terms of the concession can be found in concession agreements, but terms relating to the governing law, insurances, termination, force majeure and disputes are common to all concession agreements.

Whilst the general and specific terms of the concession will inevitably have a bearing on such common terms, standard clauses could determine the parameters under which the concession is to be carried out.

An accumulation of experience over industrial best practices provides us with a base for suitable contractual framework.

Countries, which apply to the continental law (statutory law) will be a good way to use common law (case law) complementary for reflecting changeable situation in PPI projects.

When the public sector grants a road a concession agreement, the revenues of the private sector depend to a great extent on the users, the length of the agreement is substantially longer, and thus the contract must include covenants that allow for the changing economic environment.

In the case of a toll road, the contract could limit the construction of alternate routes (also for a certain number of years) or could guarantee a minimum volume of traffic.
6.3 Special Financial Support to Promote PPI

Aiming to achieve a successful deal of PPI projects, I found that most if not all PPI projects will require some financial support from the government.

This can take several forms:

Government may provide grants to reflect the wider economic, environmental and social benefits, which cannot be easily captured through fees to users.

Contributions from property developers usually only capture a small fraction of the total development gain, where external benefits are widespread; a contribution from national or local taxation may be appropriate.

The cost of raising finance tends to rise with project size. The government can share the financial risk of larger projects by subordinating debt, bearing part of the capital costs or taking an equity stake in the project.

Public sector funding should be focused at the front end of a project, as this is where the financing risk is great.

6.4 Adopt Co-Financing Methods

Analyzing the situation of PPI projects, multilateral organizations (the World Bank Group, EBRD, ADB, IDB) are also involved in PPI projects alongside commercial banks and export credit organizations.

This is referred to as co-financing.

In practice, the involvement of a multilateral agency in this type of set-up leads to the financial credit being structured at two levels.

• A-Loans granted by the multilateral organization itself
• B-Loans underwritten by commercial banks under the multilateral umbrella

As far as B-Loans are concerned, the notion of “multilateral umbrella” does not mean that multilateral organization gives the commercial banks any kind of guarantee on this credit. It simply means that the banks will feel reassured.
The host states are unlikely to take detrimental measures against the projects, because of the presence of a multilateral organization in the financing structure.

6.5 Make Dispute Resolution Procedure Clear

Taking into consideration the characters of PPI projects, agreements must set out what happens if there is a change in circumstance in future.

Inevitably, a dispute resolution mechanism will be required such as mediation, conciliation, mini trial, panel, litigation, arbitration etc.

The complexity of the contractual documents and the project may make it difficult to find a dispute forum, which has all the expertise required.

Parties may be nervous about relying on the courts, or indeed on ICC (Interstate Commerce Commission) arbitration.

V Expected Practical Results

As a result of my research, expected practical results are as follows:

· Analyzed case studies give some lessons on how to design and operate PPI projects successfully.
· Suggested standard cost/benefit appraisal procedure for PPI road projects prevents the decision makers from subjective or risky decision and makes the private sector to believe the results of a project appraisal done by the public sector has already done. So this will reduce time and cost, and avoid unnecessary political intervention etc.
· Recommended various theories and techniques for mitigating and allocating risks will contribute to implement PPI project smoothly based on the public private partnership principal
· Mentioned comprehensive risk analyses would be helpful for further studies related to more detailed and specified risk management measures
V Corresponding Publications


