

AN EFFECT ANALYSIS OF RISK FACTORS FOR BUILD TRANSFER LEASE PROJECTS

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Abstract

The Build-Transfer-Lease (BTL) projects have rapidly increased under the Government support during recent years. This paper presents the risk analysis of factors affecting BTL projects in the initial phase. This study resulted in 10 significant risk factors influencing on each phase of BTL projects and then factors were grouped into each phase. The sensitivity analysis was also performed to identify risk factors with more significant influence on BTL projects. The results may be useful to practitioners in order to cope with risks in initial phase of BTL projects. The paper resulted in the distribution of risks to project parties, thus it can be used as standards for risk assignment to competent authorities and private enterprises of BTL projects.

Keywords : BTL project, risk factor, sensitivity Analysis

1. Introduction

1.1 Background and Purpose

In the past ten years Private Infrastructure Projects, which is 18.6% of Social Overhead Capital (SOC) facilities investment in 2006, have developed in plenty. The government support extended into 44 facilities by adding the following fields: education, children nurture, old person nursing facilities and so on. The government also introduced BTL

(Build-transfer-Lease) as the promotion process. Although these rapidly developed, there are many unexpected problems because the development of BTL project was still in the initial phase. Therefore, this study presents analyzing the influence of major risk factors on BTL projects. Results of the study may be used as essential tools to manage Life Cycle Cost in all phases as well as to enhance the capacity of the risk management.

1.2 Scope and Methodology

There are a few studies related to BTL projects in Korea. Most of previous studies focused on deriving causes for each phase of BTL projects. In addition, little effort has been devoted to evaluate the affects or countermeasures on the outcome when it comes out. Consequently, this study analyzes positive aspects that were derived from step-by-step of project phase based on analyzing completed BTL projects. The reason of these analyses is that they can represent the order of priority for studying each risk factor in the management of Private Infrastructure Projects in the future. In the other hand, they can represent the distribution of risks by measuring risks between the competent authorities and private enterprises.

2. Risk Factors of BTL Projects

2.1 The work in each phase of BTL projects

When promoting BTL projects, the process can be divided into four phases. In the first phase of the BTL project, authorities have to perform the following works: selecting the appropriate projects, putting a notice and then contracting with private enterprises for the implementation of the BTL project. Facilities are constructed in the second phase. The third phase is the operation phase that private enterprises provide services to users during the lease period. Finally, the private enterprises transfer the facilities to the competent authorities in the fourth phase.

Works and procedures for four phases can be changed in accordance with the scale or the characteristic for each project. But most of facilities are performed as the same procedure. When these projects are implemented, risks are certainly generated. According to the cause

of risks, the competent authorities or private enterprises have to breakdown them for measuring risks. Thus this paper provides standards of the division to risks by measuring.

2.2 Risks during step-by-step of BTL projects

Previous studies on risks of BTL projects present 55 risk factors and the subject of rights about each risk factor by analyzing finished agreements about new building and rebuilding projects of education facilities.

There were many mistakes in the bid document. Moreover there were contract delays due to mistakes in bidding phase. It seems to hold few different views to share the responsibility because these risks are clear locus of responsibilities. But in case of a contract delay, it can be a dispute with the person concerned about the project to find a hide cause and then this problem can be solved through the arbitration.

In the planning phase, the main causes of risks were results of surveying and various matters that related to the design, changing plan.

In the agreement execution, regarding results of surveying and various matters, conducted agent covered the risk and then the risk was shared by finding a hide cause in case of design. The changes of project plan, for instance a project scope change, were covered by the competent authorities, but in case of the private enterprise's request, it depends on them.

The risks of construction phase were risks related sites as buying too much, a lot flaw, the increase of costs, the decrease of cost, construction delay, supervision, requests for function and technological level development etc.

It is difficult to predict the risks of operation phase because the private enterprise had insufficient experience in operating education facilities yet.

Most of risks related facility operations, except facility damages by misuse of users, were imputed a blame to private enterprises. Also for all cases studied, the maintenance cost was covered without the increased amount of working expenses because of providing the agreement with the scope of maintenance regardless of the cost. But there were concerns about lowering the maintenance level due to lack of maintenance cost in terms of low cost in bidding document.

For closed-out phase, when a facility is transferred, there were risks related facility conditions and the transfer procedure.

In connection with facility conditions, agreements executed vaguely without an accurate standard. Consequently, there was a lot of controversy related the maintenance cost.

Table 1. Major risk factors of BTL projects

| classification of risk | | No | contents of risk | frequency | importance | rank | |
|---|---|------------------------------|---|---|------------|------|----|
| c o m m o n e s s | bid | bid package | 1 | A mistake of a bid manual, mistake of a bid formality, etc | 3.5 | 14.0 | 52 |
| | | contract | 2 | A delay of contract or A rupture with entente parties | 4.2 | 22.2 | 44 |
| | legislat ion chang e | legislation change | 3 | A change of the ordinance or the establishment of the regulation legislation about pertinent project. | 5.6 | 29.8 | 36 |
| | | | 4 | as well as that enterprise, extensively typically change of applied ordinance or new legislation | 5.7 | 31.5 | 31 |
| | | | 5 | legislation or change of regulation laws about construction to occurred in a term of construction | 6.1 | 31.3 | 33 |
| | | tax change | 6 | change of tax rates or legislation of establishment tax about that enterprise | 5.8 | 30.7 | 34 |
| | | | 7 | change of tax system to affect directly an enter price of an earning rate | 5.0 | 30.6 | 35 |
| | | confirmation | 8 | delay of official permission business or a design of competent authorities | 6.1 | 36.4 | 26 |
| | | | 9 | delay business to submit documents or official permission by the enterprise in building or operation term | 5.9 | 32.4 | 29 |
| | | policy | 10 | cancel of an agreement or change of business purview by change of a policy with out a political reason | 3.9 | 22.8 | 43 |
| | social | number of persons | 11 | a civil application about facilities for operation or installation | 6.5 | 49.6 | 11 |
| | | | 12 | a civil application about investigation, construction, maintenance by a man of enterprise | 6.8 | 42.6 | 20 |
| | | environment | 13 | a civil application about environment problem in business by a man of enterprise | 4.9 | 23.5 | 42 |
| | | third person compensation | 14 | an accident from a construct of a man of business or operation business damage to a third party because of an accident from default of maintenance by a man of business | 4.1 | 25.4 | 41 |
| | | | 15 | situation to damage to a third party from unavoidable noise, occurrence of a bed smell in construction of this facility maintenance | 3.9 | 25.7 | 40 |
| | | | 16 | a selection of a site, a civil application about cultural treasure | 5.4 | 31.3 | 32 |
| | econo mics | financing | 17 | insurance of funds for a business | 6.3 | 42.4 | 21 |
| | | price fluctuation | 18 | price fluctuation in the stage of building or the design | 7.4 | 47.8 | 16 |
| | | | 19 | price fluctuation in the stage of maintenance or operating | 8.0 | 40.8 | 23 |
| | | interest fluctuation | 20 | interest fluctuation in the stage of building or the design | 8.1 | 56.4 | 5 |
| | | | 21 | interest fluctuation in the stage of maintenance or operating | 7.8 | 53.0 | 10 |
| | irresistible force | 22 | a war or a natural disaster beyond expectation in a stage of design | 3.2 | 20.6 | 45 | |
| | p l a n p h a s e | surveying | 23 | situation to have a problem from investigation by competent authorities | 3.6 | 15.8 | 50 |
| | | | 24 | situation to have a problem from investigation by a man of enterprise | 4.1 | 16.1 | 49 |
| | | design | 25 | situation to have a problem from design by competent authorities | 2.9 | 16.6 | 48 |
| | | | 26 | situation to have a problem from design condition or the demanded substance by competent authorities | 3.0 | 15.4 | 51 |
| | | | 27 | situation to have a problem from design by a man of enterprise | 4.2 | 33.4 | 28 |
| | | change of | 28 | situation to execute a change of plan belong a demand of competent authorities | 5.5 | 34.2 | 27 |

| | | | | | | | |
|--|-------------------------------|--|--|--|------|------|----|
| | | plan | | | | | |
| c o n s t r u c t i o n | land | acquisition | 29 | situation to be over the budget of the land acquisition cost, a change of plan because it could not acquire or acquisition delay of a site about facility maintenance | 5.4 | 31.6 | 30 |
| | | flaw | 30 | a change of plan because of buried property, ground pollution of planned site | 2.4 | 11.9 | 53 |
| | | the nature of soil, ground | 31 | situation to occur changing a term of work, a method of construction, result of ground condition, geological feature to impossible foresight at original investigation | 3.1 | 16.7 | 47 |
| | constr uction | cost increase | 32 | situation to be over original estimated cost of construction because of mistake by a man of enterprise | 7.4 | 56.7 | 4 |
| | | | 33 | situation to be over original estimated construction cost because of mistakes by a design change by a factor of competent authorities | 8.6 | 71.3 | 1 |
| | | | 34 | situation to be over original estimated construction cost by irresistible force | 3.4 | 28.1 | 38 |
| | | term of works delay | 35 | situation to do not complete facility maintenance until the term of a contract because of a mistake of a man of enterprise | 6.2 | 38.6 | 25 |
| | | | 36 | situation to do not complete facility maintenance until the term of a contract because of a factor of competent authorities | 7.1 | 44.4 | 18 |
| | | | 37 | situation to do not complete facility maintenance until the term of a contract because of irresistible force | 3.8 | 26.0 | 39 |
| | supervision | 38 | occurrence at a term of work, the substance of construction by problem of construction supervision | 2.2 | 10.1 | 55 | |
| requested capability shortage | 39 | after facility completion, situation to detect an unexpected part of demanded performance or inferior building by investigation of the competent authorities | 2.8 | 18.6 | 46 | | |
| technical improvement | 40 | situation to be necessary changing contents of facilities or equipments by technological progress in the stage of design or construction | 7.4 | 53.7 | 9 | | |
| o p e r a t i o n | maintena nce | requested capability shortage | 41 | situation to be below the substance of maintenance business with a man of enterprise than the fixed level in a written contract | 8.0 | 49.3 | 12 |
| | | facility blemish | 42 | situation to be occurred a blemish of facilities in a term of a project(in a term of warranty) | 7.1 | 48.0 | 15 |
| | | | 43 | situation to be occurred a blemish of facilities in a term of a project(after the term of warranty, in a valid durability) | 8.3 | 63.9 | 2 |
| | | | 44 | situation to be occurred a blemish of facilities in a term of a project(after the valid durability) | 8.1 | 60.2 | 3 |
| | | increase of the cost | 45 | situation for increase of the cost of maintenance except ordering by the competent authorities | 8.8 | 53.9 | 8 |
| maintena nce | facility damage | 46 | damage of facilities because a man of enterprise don't perform maintenance business | 8.7 | 49.3 | 13 | |
| | | 47 | damage of facilities because of a mistake of a user | 6.6 | 40.4 | 24 | |
| | | 48 | damage of facilities because of a fire or a an accident by a mistake neither a public nor a private | 7.1 | 44.4 | 19 | |
| operation scope | requested capability shortage | 49 | situation to be below the substance of service about operation business to offer by a man of enterprise than the fixed level in a written contract | 8.9 | 55.1 | 7 | |
| | demand fluctuation | 50 | situation for more increasing, more decreasing(decrease of income) operation business demand due to a facility user of increase and decrease than first expectation | 7.7 | 55.1 | 6 | |
| | subsidiary enterprise | 51 | situation for more increasing, decreasing operation business demand due to a facility user of increase and decrease than toe original expectation about subsidiary facilities work | 6.8 | 42.1 | 22 | |
| | business change | 52 | fluctuation of operating business by ordering the competent authorities | 7.3 | 48.9 | 14 | |
| technical improvement | 53 | situation for changing operating business or maintenance business due to technological | 6.5 | 29.2 | 37 | | |

| | | | | | | |
|---------------------------------|------------------|----|--|-----|------|----|
| | | | progress | | | |
| t r a s f e r | facility blemish | 54 | situation to detect a blemish of facilities at a point of inspection before delivery due to the expiration of the term of enterprise | 6.6 | 46.6 | 17 |
| | report of change | 55 | because of the expiration of the term of enterprise, occurrence of sundry expenses from transfer of business, occurrence of appraisal profit and loss from liquidation of the enterprise company | 3.1 | 10.5 | 54 |

3. Measuring risks through the cases analysis

3.1 The case selection and cost analysis

The study performed analyzing the influenced level of risk on BTL projects based on the actual cases study.

Firstly, the cost analysis of actual cases is conducted to perform sensitivity analysis and the findings are shown in Table 3. In order to perform cost analysis, main premises were taken: (1) a returns rate is 6%; (2) a price rising ratio is 3%; (3) a discounted rate is 6%; (4) the interest rate is 6.5% and (5) the lease period is 20years.

The result of cost analysis in case of private investment alternative indicated that the facility lease cost was 513 hundred million won (20year), operation cost was 199 hundred million won including operation and maintenance costs. Therefore, the government provided the total fund of 712 hundred million won. The present value, which used 6% to the discount rate, is about 374 hundred million won on 1st January 2008 at the time of project completion.

3.2 The method of measuring the impact of risk factors

There were 55 risk factors on the step-by-step of BTL projects, thus the limitation is needed to analyze the impact of risk factors. This study only analyzed 10 factors which have the significant impaction on the BTL projects

According to the classification, table 4 presents risk factors which are analyzed in the final impact. It is interesting to note that among top 10 significant risk factors, five factors were distributed to the competent authorities and the remaining factors to a private enterprise.

Table 3. Measuring the effect of risk factors

| Rank | No. | Risk | responsibility of the competent authorities | responsibility of the private enterprise |
|------|-----|----------------------------------|---|--|
| 1 | 33 | Increasing construction expenses | O | |
| 3 | 44 | Facility blemish | O | |
| 5 | 19 | Price fluctuation | O | |
| 6 | 50 | Demand fluctuation | O | |
| 9 | 40 | Technical improvement | O | |
| 2 | 43 | Facility blemish | | O |
| 4 | 32 | Increasing construction expenses | | O |
| 7 | 49 | Requested capability shortage | | O |
| 8 | 45 | Increase of the cost | | O |
| 10 | 20 | Interest fluctuation | | O |

3.3 Analyzing the impact of risk factors on the BTL project parties

(1) The impact of risk factors on the competent authorities

The influence of risk factors on competent authorities was measured through changing money provided from the government using sensitivity analysis when each risk comes into existence.

The ‘construction expenses increase’ risk (number 33) was analyzed increasing and decreasing construction expenses. Similarly, the ‘facility blemish (number 43)’, ‘price fluctuation (number 19)’, ‘demand fluctuation (number 50)’, ‘technical improvement (number 40)’ risks were analyzed changing of maintenance costs, changing price of fluctuation rate, changing in maintenance and repair cost, and operation equipment, respectively.

The measuring of risk factors comes out in linear regression (Figure 2). The ‘construction expenses increase’ risk was the highest reaction response among five risk factors which

was conducted with sensitivity analysis for money provided from the government. While the ‘facility cost change for skill development’ risk was the lowest reaction response.

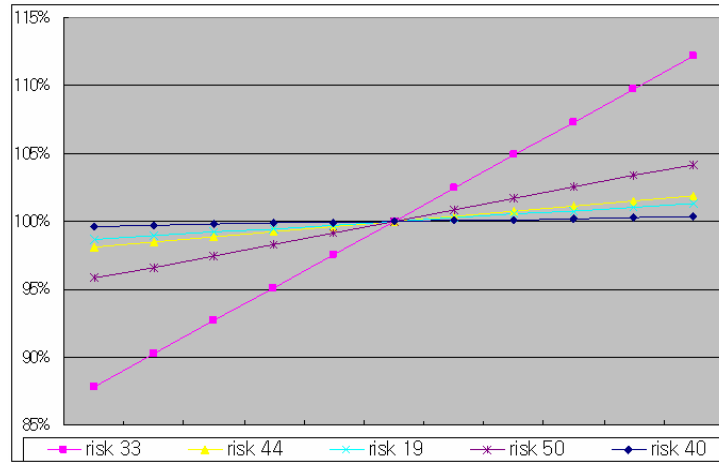


Figure 1. Conclusion of the sensitivity analysis - the competent authorities

It is revealed that the financial government has the highest important degree of most sensitive risk factors among 10 factors. However the importance degree of the ‘demand fluctuation risk’ risk is low although it is the second highest in sensitivity degree, thus it will need to pay more attention to risk management. In addition, the change of the money provided from the government changed 3% increase and decrease to each risk factor. Table 4 present the above findings.

Table 4. Each risk factors increase and decrease level (for 3% change) - the competent authorities

| No | A type of risks | A functional formula |
|----|--------------------------------|------------------------|
| 33 | Construction expenses increase | $Y = 0.0244X + 0.8538$ |
| 44 | facility blemish | $Y = 0.0037X + 0.9778$ |
| 19 | price fluctuation | $Y = 0.0037X + 0.9778$ |
| 50 | demand fluctuation | $Y = 0.0084X + 0.9497$ |
| 40 | technical improvement | $Y = 0.0007X + 0.996$ |

(2) The impact of risk factors on the private enterprise sector

The impact of risk factors on the private enterprise sector was measured using sensitivity analysis on the fluctuation of earning rate. Interestingly, the results were similar with competent authorities, analysis range is every 3% for ±15%.

An earning rate of the private enterprise is calculated based on the result for cost analysis. It is without change of the money provided from the government.

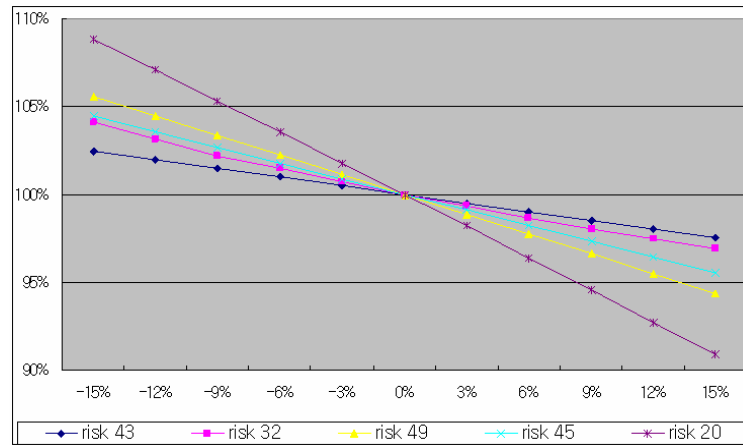


Figure 2. Conclusion of the sensitivity analysis - the private enterprise

Table 5. Each risk factors increase and decrease level (for 3% change) - the private enterprise

| No | A type of risks | A functional formula |
|----|--------------------------------|-------------------------|
| 43 | Facility blemish | $Y = -0.0049X + 1.0296$ |
| 32 | construction expenses increase | $Y = -0.0071X + 1.0446$ |
| 49 | requested capability shortage | $Y = -0.0112X + 1.0673$ |
| 45 | increase of the cost | $Y = -0.0089X + 1.0532$ |
| 20 | interest fluctuation | $Y = -0.0179X + 1.107$ |

4. Conclusion

In this paper, ten important risk factors were derived from 55 risks to enhance abilities of risk management to BTL projects. Ten risk factors are also reclassified as the risk distribution. Finally, this paper presents how each risk factor can effect on projects using sensitivity analysis.

Based on measuring sensitivity changes for distributed risk factors to the competent authorities' assignment, the results indicated that risk factors of the cost increase and demand fluctuation strongly affected on the BTL projects. For distributed risk factors to the private enterprise, the findings pointed out that changes can affect on BTL projects largely by sensitivity analysis for a business earning rate in case of lack of the level and interest. Thus the risk plan should be extended on over all process of BTL projects in order to ready for the future.

But as early mentioned each risk factor is limited to just one project. Therefore, it may be somewhat impracticable to generalize a risk influence of all BTL projects. Consequently, for further studies, it is required more efforts to measure other influences of each risk by investigating differential cases.

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