

S12-1

A STUDY ON DEVELOPING THE CALCULATION SYSTEM OF DISBURSEMENT FOR GOVERNMENT ON THE BTL PROJRCTS

Chun-Kyong Lee¹ and Tae-Keun Park²

¹ Senior Researcher, Architecture & Urban Engineering Research Center, Mokwon University, Republic of Korea

² Professor, Department of Architectural Engineering, Mokwon University, Republic of Korea

Correspond to yi1305@hotmail.com

ABSTRACT: BTL projects, which has been 3 years since it was carried out in 2008, triggered the controversy on the adequacy in the calculation of disbursement for Government due to such problems as low earning rate and the burden of service level compared with the project suggestion. Thus, the purpose of this study is to offer a suggestion on the calculation system for the purpose of the standardized - expense appropriation by item and database including the antecedent study on the finance model and the feasibility in BTL projects. The system is composed of 4 steps - project management, basic database, an analysis on expense by item and the result, and an analysis on sensitivity, and it is possible to carry out a comparative analysis on single and multi alternatives by variable change along with the ground on expense calculation.

Keywords: BTL(Build-Transfer-Lease), Disbursement for Government, Private Investment, Feasibility Analysis

1. INTRODUCTION

1.1 Background and Purpose of the Study

The BTL (Build-Transfer-Lease) private investment projects that are greeting the 3rd year of implementation as of 2008 have been introduced into the construction market in Korea in order to provide high-level public services and to expand necessary facilities at proper timing with advanced inputs of private resources based on the early perception of the situation where the financial condition of the government was not good enough to provide the public services comparable to those of other OECD countries. However, although the burden of the cost for private businesses' revenues has been reduced compared to other private investment projects such as those under the BTO method, BTL projects in the 3rd year of implementation are revealing problems such as low project earning rates and the burden of high service levels required compared to the costs proposed for the projects thus controversies over the suitability of the calculation of government disbursements and demands for plans to solve problems are increasing.

For successful implementation and maintenance of the new construction project method, reasonable amounts of government disbursements should be calculated for each project participators and to that end, an algorithm should be established first. Also, counter plans by size and facility shall be compared and analyzed in order to ensure the financial sector of BTL projects will be carried out and then, based on the current results of calculation of already spent costs by item and the result of analysis of

project feasibility and according to the result of questionnaire surveys already carried out on BTL project participators, although the area of calculation of government disbursements is considered to be an area to be exclusively under the responsibility of accountants, the verification of feasibility of costs is being pointed out as an issue in SPC that implements practical works such as operation management.¹⁾

Therefore, this study is to begin with preceding studies on the financial models and feasibility analyses for BTL projects in order to propose a system to calculated government disbursements aiming at standardized cost appropriations for major items including the calculation of operation costs reflecting current practical works and making related databases.

1.2 Scope and Method

This study is to develop a system to calculate government disbursements for military residing facilities and education facilities that are the major facilities of BTL private investments in Korea. The scope will be limited to the total private investment cost, the total private project cost, and government disbursements including operation costs and facility rents among the total project cost items.

As for the method of the study, theoretical studies on

questionnaire on actual workers regarding plans to improve, the study will be focused on the development of system prototypes including cost calculation models,

system functions and analysis procedures and on researches into pilot tests for verification.

2. THEORETICAL REVIEW OF BTL

2.1 Comparison between BTL and BTO Projects

The project methods and evaluation items for the financial sector of BTO projects which are one of private investment project methods and those of BTL projects are to be reviewed. BTO projects and BTL projects have common features including the fact that the subject property is the right of management and operation (intangible asset) and the fact that the ownership is possessed by the government during the operation period and the ownership is transferred at the time point of completion and Table 1 shows the content of comparison and analysis of differences between BTL projects and BTO projects.

The financial evaluation items consist of stage 1 evaluation items to evaluate financial ability and stage 2 evaluation items to evaluate investor compositions and government disbursements. Of the stage 1 evaluations, evaluation of financial ability evaluates the financial ability of each investor which is essential for the success of projects. The stage 2 evaluation evaluates the methods

of investment of specialized operating companies and financial investors and compares and analyzes the government disbursements converted into present prices with the lowest proposed amount.

2.2 Financial Model

The financial model of BTL project is composed of 9 stages (establishment of basic assumptions ~ sensitivity analysis) and the contents and procedures by item are as per Figure 1.

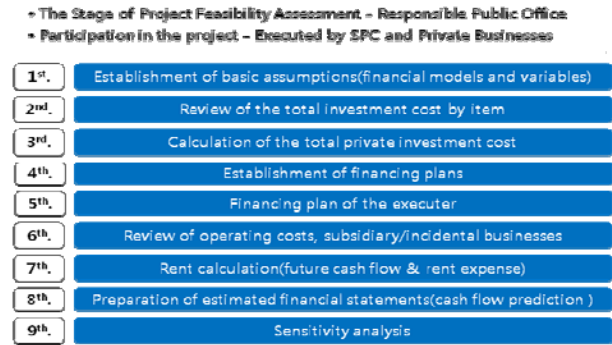


Figure1. Procedure of Financial Model in BTL

Table1. Comparison Analysis of BTL Projects and BTO Projects

Division	BTL	BTO
Definition	<input type="checkbox"/> The method to receive lease charges from the government for a certain period for the facility to be lease(Build-Transfer-Lease)	<input type="checkbox"/> The method to receive use charges from the public for a certain period for use of the facility constructed (Build-Transfer-Operate)
Project Earning Rate	<input type="checkbox"/> National bond interest rate + α (nominal in principle)	<input type="checkbox"/> To be calculated by the cash flow calculation formula used to determine use charges (actual in principle)
Cash Flow	<input type="checkbox"/> Current in principle (no change in operating cost)	<input type="checkbox"/> No change principle
Financial Support	<input type="checkbox"/> No financial support for construction of facilities <input type="checkbox"/> The responsible public office may provide financial support in case necessary to reduce long-term lease charges	<input type="checkbox"/> Shares of construction costs during construction periods <input type="checkbox"/> Guarantee of operating revenues during operation periods
Recovery of Investment Cost	<input type="checkbox"/> Government disbursement = facility rents + operating costs – money paid by government budgets	<input type="checkbox"/> Operating revenues (passing charge/use charge etc) – principle of payment by beneficiaries
Sales Cost	<input type="checkbox"/> The same in principle (but, there may be differences depending on various taxes and imposts during operation periods imposed on the ownership of facilities)	<input type="checkbox"/> The same as BTL
Financial Evaluation Item	<input type="checkbox"/> Financial ability <input type="checkbox"/> Investor composition - Ratio of equity capital/ ratio of others' capital <input type="checkbox"/> Financial ability of investors <input type="checkbox"/> Government disbursement - Project earning rate - Operating costs & government disbursement	<input type="checkbox"/> Investor composition <input type="checkbox"/> Investors' financial ability <input type="checkbox"/> Financing plan <input type="checkbox"/> Project earning rate <input type="checkbox"/> Suitability of use charges <input type="checkbox"/> Suitability of the total project cost <input type="checkbox"/> Government support requirements <input type="checkbox"/> Suitability of operating costs

2.3 Cost Structure

The cost items of BTL projects consist of the total private project cost and government disbursements (=the

total private investment cost) and relations between each item are as per Figure 2.

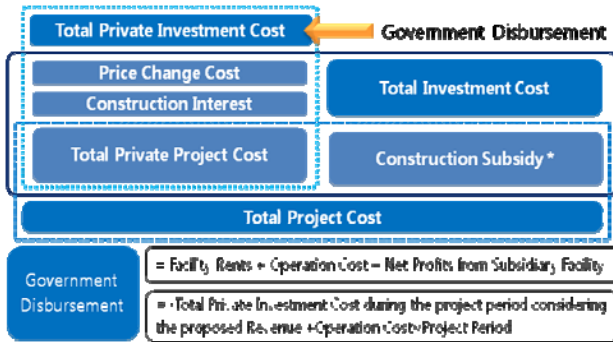


Figure 2. Cost Structure of BTL Project

(1) Government disbursement

Government disbursements consist of operating costs and facility rents and the details are as follows:

- Operating cost : Operating costs are the money spent by the private business to maintain the facility while it is responsible for the operation of the facility during the lease period after the completion of the facility and the operating costs consist of labor costs, expenses, maintenance costs, insurance premiums, tangible asset purchasing costs for replacement etc. These are calculated by applying price increase rates to the invariable operating costs fixed in advance in the same amount for each of the period (the total operating cost on the basis of constant prices/lease period).

-Facility rents : Facility rents are paid in the amount of the investment principal and interests calculated by reflecting the proposed earning rate on the facility investment cost invested by the private business (=the total private investment cost) evenly divided over the lease period (to be calculated with the current prices reflecting price changes during the construction period). As mentioned above, the total private investment cost is calculated by adding reserve costs(=price increase costs) and construction interests to the total project cost with current prices and since the reserve costs are determined reflecting the price increase rate as forecasted by the private business, actual price increase rates are not reflected on settlements of payments due. The project earning rate is the reference interest rate (interest rate for 5 year term national bonds) + α ²⁾ and the lease period refers to the set period of management and operation.

(2) Total private project cost³⁾

1) Questionnaire surveys were carried out on actual BTL project participators and the necessity of this study was obtained through the preceding study. Chun-kyong Lee et al., Surveys of present statuses for calculation of efficient project costs of BTL projects and surveys and studies of experts' perception of improvement plans, a collection of learned papers, the Architectural Institute of Korea(structural system), 2008.07, p.117 ~ 125.

2) Reference interest rate: The average value of the

The total private project cost is the sum of the calculated costs under the 8 items of survey costs, design costs, work costs, compensation costs, incidental costs, operating equipment costs, various taxes and imports and operation preparation costs and the invest timing and amount for each of the items are to be determined quarterly. However, the investment amounts and timing of certain project cost items including work insurance premiums, financial incidental costs, business opening costs⁴⁾ shall be individually calculated and summed up.

3. ESTABLISHMENT OF BTL DFG SYSTEM PROTOTYPE

3.1 Overview of the System

As mentioned above, the government disbursement calculation system for BTL projects (hereinafter BTL DFG⁷⁾ was developed to calculate government disbursements for BTL projects for educational facilities, military residing facilities and university dormitories.

The system has been developed as a C/S type⁸⁾ system so that it would work independently under Windows systems and the calculation module forms 4 groups including Project Management, Database, Analysis and Sensitivity Analysis. If basic data of a project are entered, sub items of the total project cost including government disbursements can be calculated and the grounds of cost calculations will be presented. Also, the system was developed to enable users to review change trends of calculated costs resulting from changes in variables and to compare and analyze them. The configuration of the BTL DFG calculation system module is as per Figure 3.

interest rates during 5 days immediately before the month that includes the date of notification of the master plan of the facility projects, α : This is finally fixed through competition between private businesses considering liquidity, long-term investment & construction operating risk premiums etc.

3) This is calculated based on the engineering project price standards pursuant to the provision under article 10 of the engineering technology promotion act.

4) Work insurance premiums comprise premiums for construction work insurance, expected profit loss insurance, user indemnity insurance, project performance guarantee insurance and incidental financing costs comprise management fees, agreement fees and agency bank fees.

7) BTL DFG: government disbursements for BTL projects (DFG - Disbursement For Government)

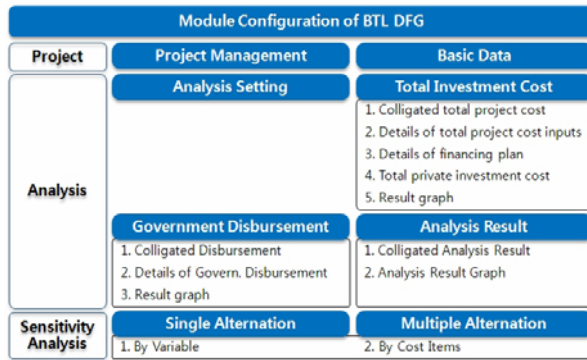


Figure3. Configuration of the BTL DFG System

3.2 Structure and Major Functions by System Stage

The configuration of the operation window of the program interconnects menus, tool bars and tree menus adding to the convenience of users in using the system. The images in front of each item of the tree menu and the images of the tool bar have been made the same so that users can easily locate the items to be analyzed even without reading the detailed descriptions in the tool bar. As mentioned in 3.1 above, the BTL DFG calculation system is composed of 4 groups and each group is configured in Level Breakdown Structures (LBS: Level 1 stage ~ Level 3 stage). Major functions of these are as per Figure 4.

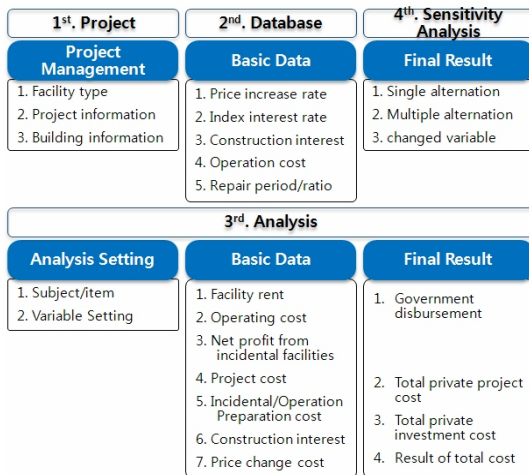


Figure4. LBS of the BTL DFG System

3.3 System Procedure

To break down the BTL DFG calculation system processes composed of 5 stages, the processes consist of DB establishment stage (basic data entry), project management stage(entry of basic information such as facility type, structure etc), major variable setting stage(entry of major variables in cost calculation including time point variables), itemized cost calculation stage(calculation of the total project costs including government disbursements), sensitivity analysis stage(comparison between single counter plans and financial projects). (Refer to Figure 5)

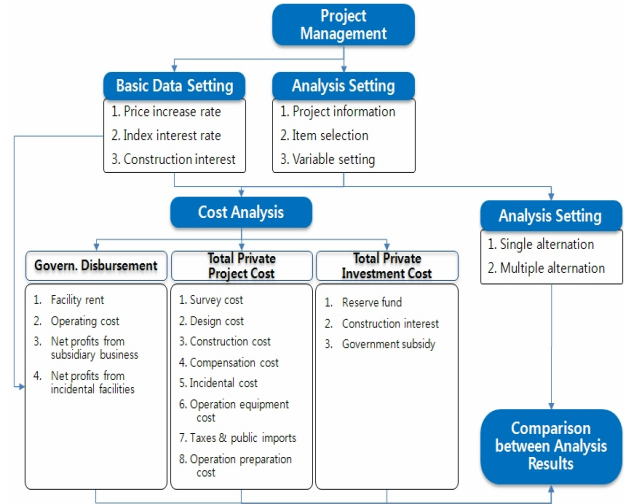


Figure5. Calculation Procedure of the BTL DFG System

(1) DB establishment stage

The DB is a Warehouse of basic data for cost calculation and actual cost calculation variables such as price increase rates, index interest rates, construction interests etc are put into the DB and data for major decision items (repair periods and repair ratios by facility etc) for operation management and maintenance management cost calculation are stored.

(2)Project management stage

This is a stage to enter basic information on the subject facility such as facility types and structure formats which is configured so that one project would be perceived as one object.

(3) Major variable setting stage

This is a stage to set time point variables and sensitivity variables⁹⁾ associated with work cost payments considering the characteristics of BTL projects and this stage works as an important factor in cost calculations. The time point variables are temporal basic variables necessary for project cost calculation and reimbursement and the sensitivity variables are setting dependent variables intended for changes in variables for single counter plans which directly affect change trend analyses (Refer to Table 2).

(4) Itemized cost calculation stage

The total project cost is divided into the total private investment cost, the total private project cost and government disbursements and government disbursements are calculated considering operating costs, facility rents, net profits from incidental businesses projects. Especially, operating costs can be calculated by

⁸⁾ In the C/S system, the Client responds to the request for transmission control protocol (TOP) connection and information and the server serves the role of sending the selected item list or content and as of 2008, the system is being developed as a C/S(Client/Server) type, but it is being planned to introduce and implement an ASP based internet validation system for linkage with LCC analysis systems, DB management and users' convenience in using the system.

sub item.

(5) Sensitivity analysis stage

This is a stage to compare, analyze by facility and by variable for single/multiple counter plans and provide feed backs.

3.4 Cost Calculation Model

This study analyzed detailed cost items and impact elements of 3 cost items including government disbursement, the total private project cost and the total private investment cost to configure the model.

In the case of BTL projects, cost input plans are established based on process progression ratios (applicable ratios thus applicable rates are applied to offered prices for detailed items. Especially, the incidental cost column has been configured to allow addition of items to be prepared for cases where items to be added would occur.

3.5 Cost Evaluation (BSC ; Business Scorecard)

This system has been developed to enable BTL project bidders and responsible public offices to calculate project costs by facility project and to evaluate the feasibility of the costs and as shown in Figure 6, this system has established evaluation items and indexes for cost evaluation (BSC).¹⁰⁾

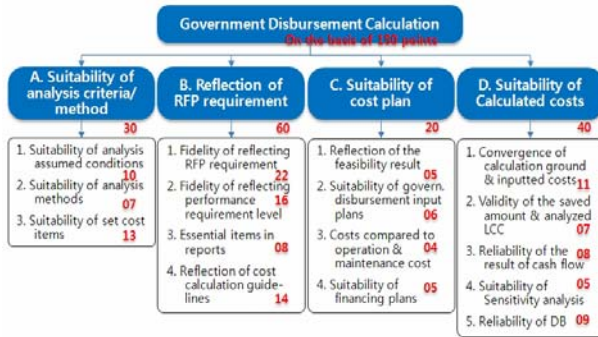


Figure6. Cost Evaluation BSC

4. PILOT TEST OF BTL DFG CALCULATION SYSTEM

To verify the suitability of the BTL DFG calculation system, a Pilot Test¹¹⁾ was carried out on the calculation of government disbursements for military residing (barrack) facility C official residence. The test carried out case studies in order to revise and complement the system

⁹⁾ The variables in this system have been drawn through reviews of 06 ~ 08 BTL project RFP, interview survey of practical SPC workers and consulting with accountants dedicated to private investment projects and only the variables considered in the present RFP have been considered.

¹⁰⁾ By utilizing AHP method on actual BTL project workers, evaluation items for primary BTL projects and secondary evaluation indexes were extracted.

under development and to verify the possibility to apply the systems to practical works.

4.1 Project and Database (DB)

(1) Project information

The facility type, structural format, basic information and building information DB of the facility for which government disbursements are to be calculated are entered. The contents to be entered by sub-items are as per Table 2.

(2) Basic data

As shown in Figure 7, a detailed setting window for the 3 items (price increase rate, index interest rate, construction interest) applied to government disbursement calculation is provided thus the details and change trends can be reviewed.

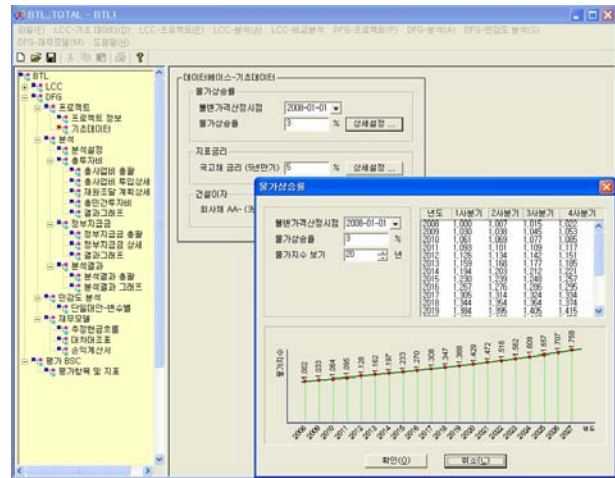
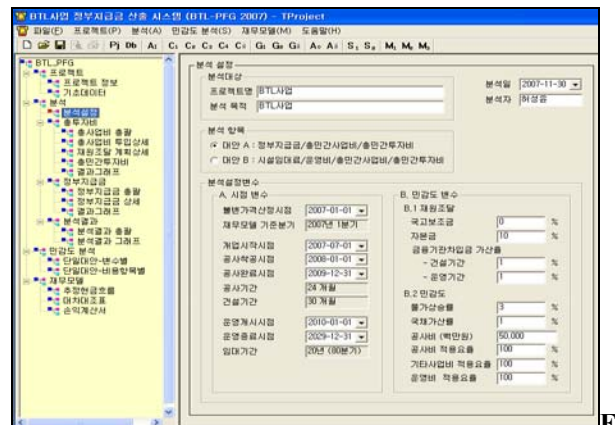


Figure7. Basic data for DB –Price increase rate

4.2 Analysis

(1) Analysis setting

The subject of analysis, items and variables are to be entered and as mentioned earlier in section 3.3, the analysis setting variables(Refer to Table 2 and Figure 8) consisting of time point variables and sensitivity factors are major impact factors to total projects cost calculations and financing plans.



(2) Total project cost
This was configured to calculate the values of the 8 cost items based on the applicable rates for their offered prices. As shown in Figure 8, Analysis setting item grouping

As shown in Figure 9, a detailed setting window for all

Table2. Analysis Setting Variables

Time Point Variables	Sensitivity Variables	
	Financing	Sensitivity
<input type="checkbox"/> Time Point of Constant Price Calculation	<input type="checkbox"/> Government subsidy	<input type="checkbox"/> Price increase rate
<input type="checkbox"/> Reference Year/Quarter for Financial Models	<input type="checkbox"/> Capital	<input type="checkbox"/> National bond addition rate
<input type="checkbox"/> Completion/Beginning time point	<input type="checkbox"/> Loan	<input type="checkbox"/> Construction cost
<input type="checkbox"/> Construction Period	<input type="checkbox"/> Addition rate	<input type="checkbox"/> Operating cost
<input type="checkbox"/> Time point of operation ending/beginning	-	<input type="checkbox"/> Applicable rate
<input type="checkbox"/> Lease Period	-	-

the cost items is provided thus detailed calculations are possible and the details of the total project cost inputs are divided into process progression ratios by subject and amounts by subject. The sheet of process progression ratios by subject is configured to enable users to enter or revise and the column is configured to enable users to identify constant prices and current prices.¹²⁾

investment cost column can be used to identify the accumulated amount for each of the relevant quarter.

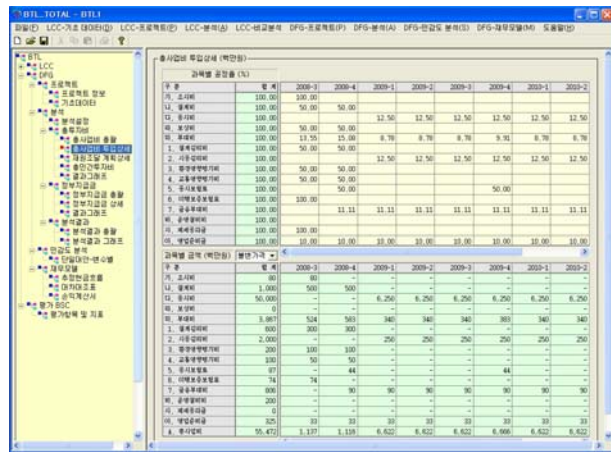


Figure9. Details of total project cost inputs

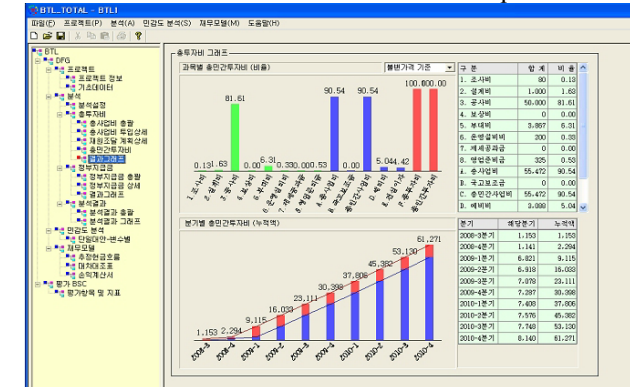


Figure10. Result graph of total investment cost

4.3 Government Disbursement

(1) Colligated/detailed

The sheet has been configured so that facility rents would be automatically added up by the cost calculation model and operating costs would be added up through the detailed setting window(refer to Figure 11) and the change variables by cost item are as per Table 3.

The values entered into the government disbursement colligation sheet will be provided in the sub items divided into required amounts per quarter, averages per quarter, annual averages and totals on the detail sheet.

(3) Financing plan

The Financing Plan divided into Government Subsidies and Privately Procured Amount is automatically calculated based on values in ‘analysis setting’ or ‘total project cost’. The Government Subsidies column can be used to identify the total project cost, process progression rate, price index information and the Privately Procured Amount column can be used to identify the extent of private financing including the total investment cost, capital and loans from financing institutes.

(4) Total private investment cost

The Total Private Investment Cost including the total private project cost, reserve funds and construction interests is composed of quarterly and yearly sums and the values are indicated in constant prices and current prices. Also, as shown in Figure 10, the quarterly

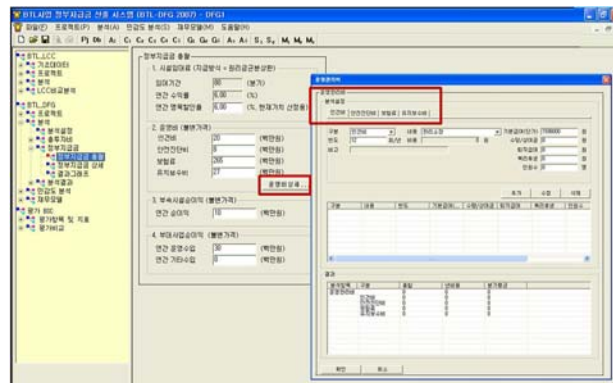


Figure11. Government disbursement – operating cost

(2) Result/graph

The values are distinguished by item/quarter and can be identified on the basis of present/constant/current prices

¹¹⁾ By the request from the operating company, the information on the facility subjected to the pilot test is not disclosed (initials are indicated).

as of the time of completion. Government Disbursements by item are set forth in Tables and the graph indicates ratios and quarterly government disbursements are **Table3.** Government Disbursement change Variable

indicated in the amount during the relevant quarter and accumulated amount by the quarter.

Division	Facility Rent	Operating Costs
Item	<input type="checkbox"/> Current/constant/present prices	<input type="checkbox"/> Current/constant prices
Variables	<input type="checkbox"/> Months of lease	<input type="checkbox"/> Labor cost <input type="checkbox"/> Expense
	<input type="checkbox"/> Earning Rate	<input type="checkbox"/> Maintenance & Maintenance cost
		<input type="checkbox"/> Insurance premium

Table4. Comparison between existing results of executions and results of executions utilizing the system

Division	Existing Results of Execution	Results of Executions Utilizing the System
Number of Participators	<input type="checkbox"/> A specialized accountant and two others	<input type="checkbox"/> 1 ~ 2 persons
Time for Analysis	<input type="checkbox"/> 2 days	<input type="checkbox"/> 5 hours
Content of Analysis	<input type="checkbox"/> SPC - Entire project cost <input type="checkbox"/> Accountant - Financing <input type="checkbox"/> Operator - Operating costs	<input type="checkbox"/> Entire project cost including government disbursements
Characteristics	<input type="checkbox"/> The accountant will receive information on the amounts by item and establish cash flow plans, financing plans etc	<input type="checkbox"/> The operator(SPC) and the responsible public office will calculate costs by item based on the characteristics of each of facility projects
Problems	<input type="checkbox"/> The validity of calculation by cost item can't be easily evaluated. <input type="checkbox"/> Lack of expertise in construction projects	-

4.4 Analysis Result

The resultant values from calculations made in each item of cost analysis can be identified as shown in Figure 12. The results are divided into 3 groups including Analysis Setting, Total Investment Cost and Government Disbursements and the result of calculation of government disbursements indicating the total private investment cost at current prices and the present price as of the time point of completion is displayed in a graph.

This sheet has been implemented to enable comparisons between values resulting from changes in sensitivity for 4 alternative plans (refer to Figure 13).

If sensitivity variables are directly revised on the yellow sheet, the results will be displayed on the sheet on the bottom of the screen. In the cases of facility rents and operating costs, the economic efficiency of per alternative plan compared to investment costs can be compared and analyzed with each other through the calculation of future values (current price) applied with discount rates.



Figure12. Government disbursement details

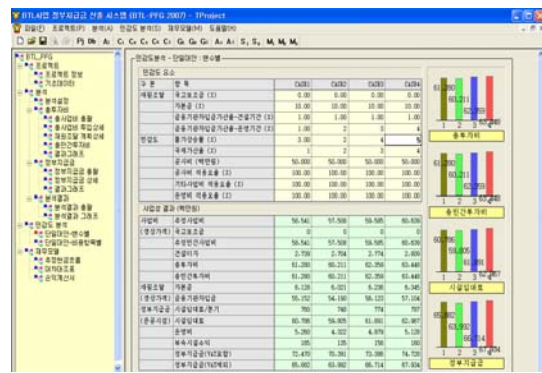


Figure13. Value resulting from changes variables

4.5 Financial Statement

This system developed Presumed Cash flow, a balance sheet & profit and loss statement per each project. Through Presumed Cash flow, it would analyze whether SPC push ahead BTL project.

4.6 Sensitivity Analysis

4.7 Preliminary Conclusion

The result of the pilot test of the BTL DFG calculation system carried out in this study showed differences from existing results of execution as shows in Table 4. Existing results of execution were surveyed through telephone

interview surveys on the staffs in charge of project costs in the SPC (including the operating company) currently participating in BTL projects. As mentioned earlier, the system has been developed to enable responsible public offices and private business to simply and easily calculate project costs and determine intention to participate in projects through trends of changes depending on variables and Background Data. To review prevailing methods to calculate project costs including government disbursements, the costs calculated by cost item are gathered by specialized accountants to establish financing plans and calculate estimated cash flow.

5. CONCLUSIONS

The BTL DFG calculation system that is the outcome of this study has been developed for calculation of the total project costs including government disbursements for BTL projects for military residing facilities and educational facilities. Also, it is considered that this system will serve a role of background data that will enable the responsible public office and the private business to calculate government disbursements on their own standpoint and determine the validity of projects and intention to participate through evaluation of changes resulting from changes in variables. Especially, this system has been configured to be usable in the stage to re-evaluate the plan and suitability of operating costs compared to the beginning of project implementation in the course of project implementation ranging from the stage of project feasibility surveys to the stage of operation and management.

The BTL DFG calculation system consists of 4 stages including database, project, cost analysis and results and sensitivity analysis and it has divided cost items into total project costs, government disbursements, total private project costs and total private investment costs and

presented a calculation algorithm for each of the cost items. The BTL DFG calculation system established in an attempt to maximize government disbursement calculation functions for non-experts reflecting the features of BTL projects is based on the Prototype established based on questionnaire surveys on experienced experts. The system has been established to enable DB establishments by major issue item of government disbursement calculation and by facility. Also a sensitivity analysis stage has been implemented for evaluation by alternative plan in an attempt to help evaluation of project feasibility and decision making on project implementation. To maximally consider characteristics by facility project, calculation Background data by facility project have been made into DB. However, to apply this system to practical works, the cost items and variables occurring in the course of project implementation shall be flexibly applied. Greeting the 3rd year of implementation, BTL projects are facing demands for the establishment of diverse criteria and studies on evaluation methods in the course of calculating government disbursements, thus continued studies are required in relation to the said matters. Also, this system shall be developed into a more specialized system through application of the system to financial models and cash flows along with calculation by cost item and linkage with valid cost prediction programs such as LCC analysis.

ACKNOWLEDGEMENT

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