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A STUDY ON DEVELOPMENT OF MAINTENANCE BUDGET PLAN FUNCTION FOR ROAD SIGN

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ABSTRACT

For the personnelin charge of road signs in land management offices and local governments, the most difficult and time-consuming task is preparing the road sign maintenance budget plan. Road sign maintenance tasksare required one or two times every year, and a large amount of time is spent for the preparation of a budget plan. This study aimed to develop and provide a computerized function for the formulation of the road sign maintenance budget plan in order to enhance the efficiency and convenience of those in charge of the road signs. The developed function can be used for all aspects of the road sign system. The maintenance budget plan can be easily drawn by simply selecting the road signs that require maintenance and the maintenance items. After gathering opinions from users, this function will be further enhanced so that it will be practically useful.

Key words: *Road sign, Maintenance budget, Road sign system.*

I. INTRODUCTION

The road sign system allows the personnel in charge of road signs in land management offices and local governments to easily perform road sign tasks and manage road sign information. While operating this system, we have continuously collected user opinions and suggestions for improvement. Especially in 2015, it was found through face-to-face interviews with the working-level staff that the most challenging taskfor them was to prepare the road sign maintenance budget plan.

Currently, road sign personnel in different offices plan the budget for new construction and maintenance of road signs once or twice a year. For this planning, they calculate the number of road signs to be maintained and the construction cost ofthe works (construction work types) to be carried out for the target road signs. Although the budget plans areprepared and managedusing the unique forms of each road sign management organization, the handover of this task is often insufficient, and the preservation and management of documents are difficult due to periodic job rotations and other reasons. In addition, the large workload further increases the difficulty of this task. Thus, to support the working-level staff in the preparation of road sign maintenance budget plans, a support function for preparation ofmaintenance budget plans using the road sign system was developed.

II. TECHNOLOGICAL DEVELOPMENT & APPLICATION

The results of analyzing the maintenance budget plans used in the field showed that a maintenance budget plan could be divided into the following parts: total quantity of road signs, in which the targets for road sign maintenance are selected and the area and number of road signs selected are counted; material quantity calculation for different road sign types, in which the quantity of materials consumed for each road sign being placed is calculated; unit cost calculation, in which the unit cost for constructions including the unit costs of materials, machinery, and manpower are calculated; schedule of rate, in which the costs for material, labor, and expense for each road sign type are calculated; and the derivation of budget, in which the appropriate construction cost and construction work are calculated based on the above results. Prior to the development of the support function, the following results were derived from the design of a database and module referenced by each part mentioned above. The following figure shows the data flow chart of this function:

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DFD Context

1. **Total quantity of road signs**
   The targets for road sign maintenance are selected and the area and number of road signs selected are counted.

2. **Material quantity calculation for different road sign types**
   The quantity of materials consumed for each road sign being placed is calculated.

3. **unit cost calculation**
   The unit cost for constructions including the unit costs of materials, machinery, and manpower are calculated.

4. **Schedule of rate**
   The costs for material, labor, and expense for each road sign type are calculated

5. **Derivation of budget**
   Proper construction cost and construction work are calculated based on the above results

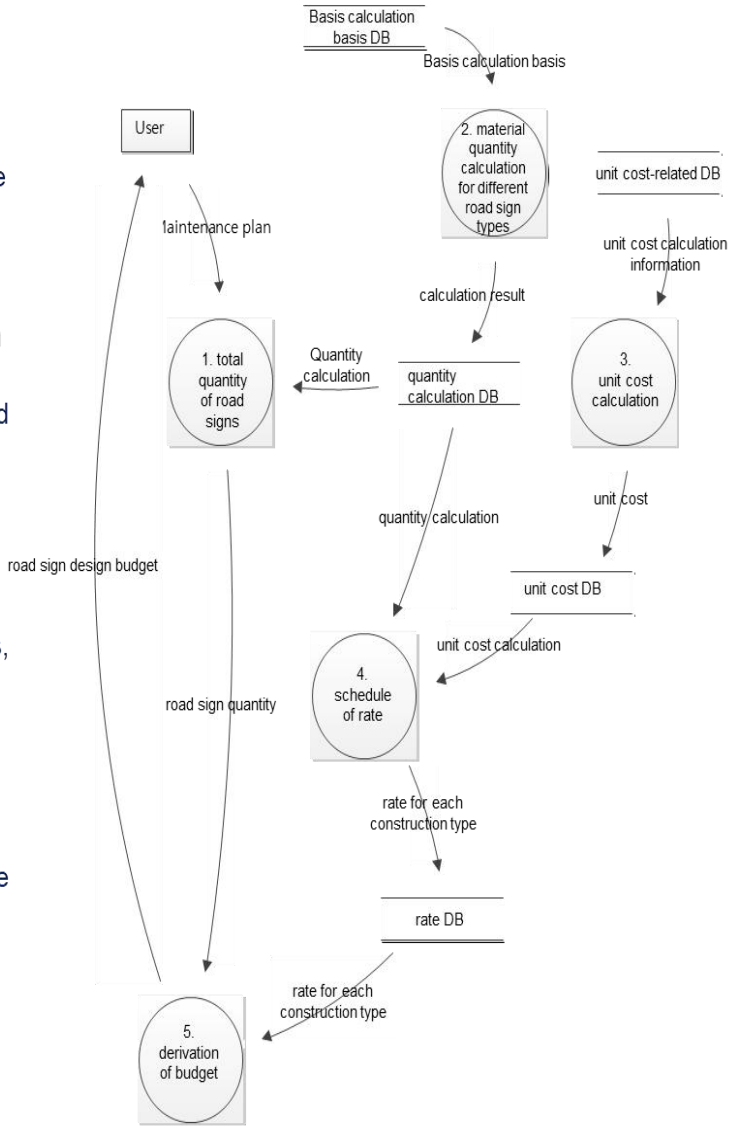

Figure1. Maintenance budget plan data flow Diagram

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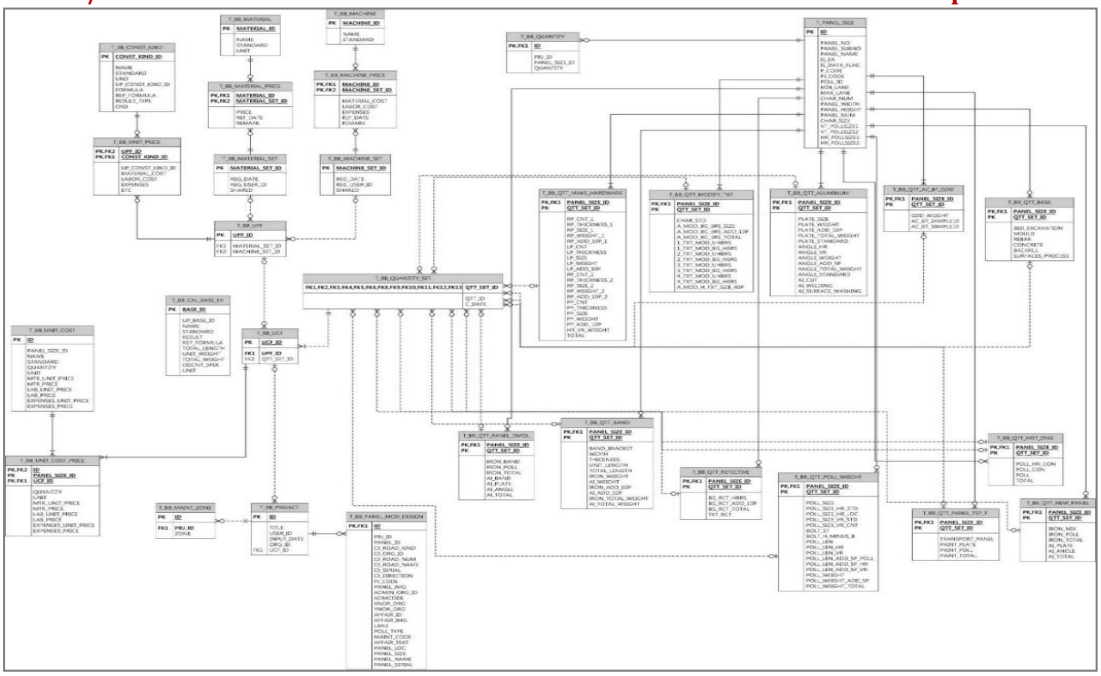

Figure2. Analysis results for maintenance budget plan

The support function for preparing the maintenance budget plan is designed to provide users with a writing section and aninquiry section separately. The user 's writing section selects the road sign object to be improved, and inputs the improvement of the selected road sign. Then, if you select the standard unit price calculation sheet, the system calculates the budget by automatic calculation. It is possible to calculate the budget by a very simple process.

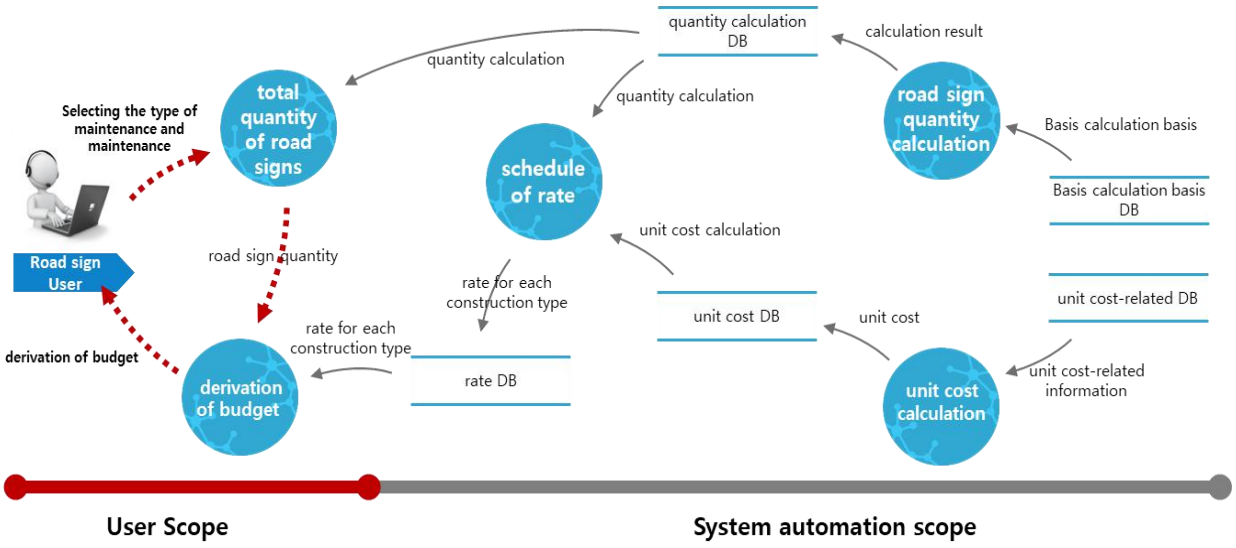

Figure3. Concept of maintenance budget plan

In case of the writing section, first, the target road signs for maintenance are selected, and items for maintenance or improvement are input for the target road signs. Next, a standard unit cost calculation is selected to easily derive a maintenance budget plan. If necessary, unit costs from estimates can be inserted. Compared to the existing tasks of

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document preparation and input of maintenance plans, which are complex, the workload can be significantly reduced to resolve the difficulties of users. Furthermore, understanding of the function isimproved so that users can prepare a budget plan only through simple manipulations. In case of the inquiry part as well, user convenience was improved by enabling inquiries on various forms including automated maintenance plans, production cost calculation, direct construction cost calculation, and quantity calculation table. The flow of user interface for the parts and functions that users can access is as follows.

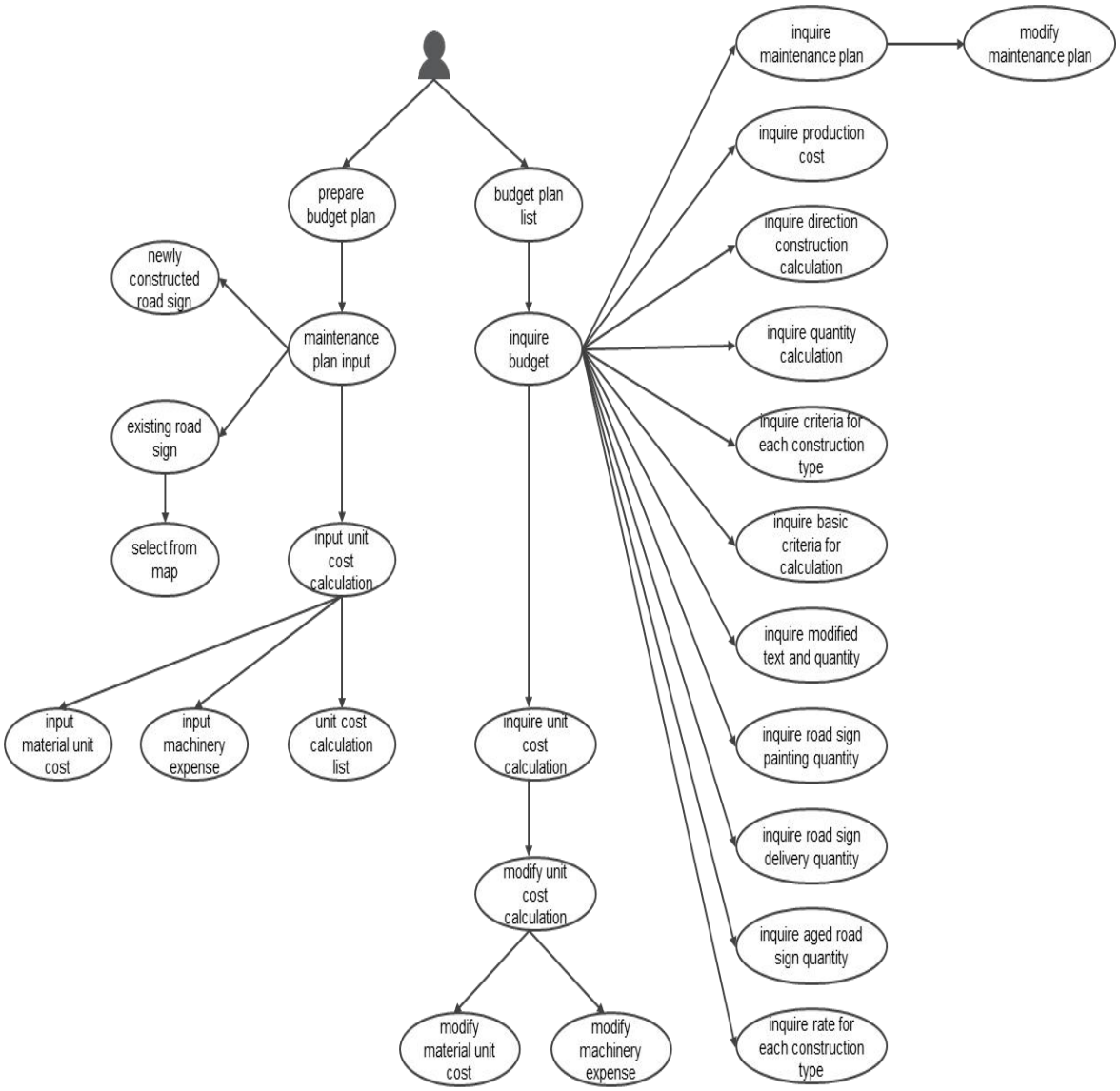

Figure4. Maintenance Budget Plan User Interface Flowchart

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Figure5. Screen Showing a List of Maintenance Plans (Target Road Signs for Maintenance)

Figure6.Screen Showing an Automatically Calculated Budget

III. CONCLUSION

The land management offices and local governments perform budget planning for new construction and maintenance of road signs once or twice a year. In this process, the working-level staff complained about various difficulties such as repetitive tasks, excessive number of forms, poor job handover, and intensive document management. To resolve these difficulties, face-to-face interviews with the personnel in charge were conducted. Requirements were received directly from the users, and a support function for the preparation of road sign maintenance budget plans was developed to automate the task and facilitate the preservation and management of documents. In the future, it will be necessary to continuously upgrade the road sign system to increase the practical value of the system by making it more user-oriented. This will be done by gradually expanding functions that reflect

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the opinions of the working-level staff,such as the support function for the preparation of road sign maintenance budget plans.

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1. *Ministry of Land, Infrastructure, and Transport, “Operation of Road Sign Center,” 2017*