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FRAMEWORK FOR EX-ANTE EVALUATION ON NATIONAL R&D PROGRAMS

Abstract:

In order to enhance the efficiency of the fiscal management on research and development (R&D) programs, since 2008 the Korean government has applied the preliminary feasibility study (PFS) to newly proposed national R&D programs of which total budget exceeding about $50 million including about $30 million or more in government subsidy. For maintaining the consistency of evaluation, the PFS standard guideline on R&D program was published in 2011. Even after the publication of the first edition of the standard guideline, the development and application of new analytical methods on R&D program plans are being carried out on an ongoing basis. Recently it is studied to publish the revised edition of the standard guideline which contains new analysis methodologies and approaches.

In this paper, I will explain the standard guideline of which revision is being carried out. In the PFS on new national R&D program plans, 3 major criteria are applied to measure comprehensively effects in aspects of technology, policy, and economy induced by R&D program. In the revised edition of the standard guideline, the part that was improved mainly, is the analysis method for the technological feasibility analysis. In feasibility analysis on policy and economic feasibility analysis, small changes such as correction and reinforcement of contents were conducted. As an important tool to draw issues from the proposed R&D program plan, we developed the logic model for the PFS. Also, we modified the questionnaire for R&D logic analysis and it consists of 11 questions. The 2nd edition of the standard guideline is planned to be published at the end of 2014

Keywords:

Preliminary feasibility study, Ex-ante evaluation, National R&D program, Standard guideline, Logic model

JEL Classification: D81, E62, O32

1. Introduction

The Korea government has increased drastically the R&D budget from 4.2 trillion Korean won in 2000 to 17.7 trillion Korean won(equivalent to about 17.4 billion dollar) in 2014. From early 2000, the Korean government began to have an interest in the efficiency of the fiscal management on R&D than the quantitative increase of R&D expenditure. As a part of measures for the efficiency of the fiscal management, the Korean government introduced the Preliminary Feasibility Study (PFS) to new large-scaled construction projects like the social overhead capital (SOC) construction in 1999.

And in view of the increased proportion of the R&D investment in the government finance, since 2008 the PFS has been applied to newly proposed large- scaled, long-term R&D program of which total budget exceeding about $50 million including about $30 million or more in government subsidy. The preliminary feasibility studies have been performed to predict the potential results of implementations of planned R&D programs (Lee and Hwang, 2011) and to raise the effectiveness of government R&D investments by selecting R&D programs that has high viability. Only for the programs which get through the PFS acquire a qualification of a budget investment.

The fundamental purpose of the PFS is to provide important information to help the Ministry of Strategy and Finance decide whether or not to invest in R&D Programs proposed by government departments. The Ministry of Strategy and Finance can make an informed decision due to results of the PFS. In addition, the PFS is contributing the improvement of an R&D program plan by complementing its small drawbacks during the PFS process (Kang, 2012).

To apply the PFS to large R&D programs newly planned by government departments, the standard guideline was needed. The standard guideline is an official document which evaluation approaches and methods are systematized. Korea Institute of Science & Technology Evaluation and Planning (KISTEP) had studied and published the PFS standard guideline on R&D program in 2011 (Lee and Park, 2011; Ahn et al., 2013). Since 2012, this standard guideline has been applied to the PFS on new R&D program plans very well.

By publishing the PFS standard guideline in 2011, the integrity of analysis has been further improved. Even after the publication of the first edition of the standard guideline, the development and application of new analytical methods for R&D programs are being carried out on an ongoing basis. The study for the second edition of the standard guideline began from 2013 and it will be published at the end of 2014. In this paper, we will explain the standard guideline of which revision is being carried out.

2. Criteria of the PFS on R&D Program

In the PFS on new national R&D program plans, 3 major criteria are applied to measure comprehensively effects in aspects of technology, policy, and economy by R&D program (Yim et al., 2011) as shown in Figure 1. Technological analysis, policy analysis and economic analysis are performed independently and results of these analyses are combined to deliver the final result. AHP (Analytic Hierarchy Process) (Saaty et al., 2006) method has been utilized as a means of collecting the decision-making information for R&D programs in the PFS.

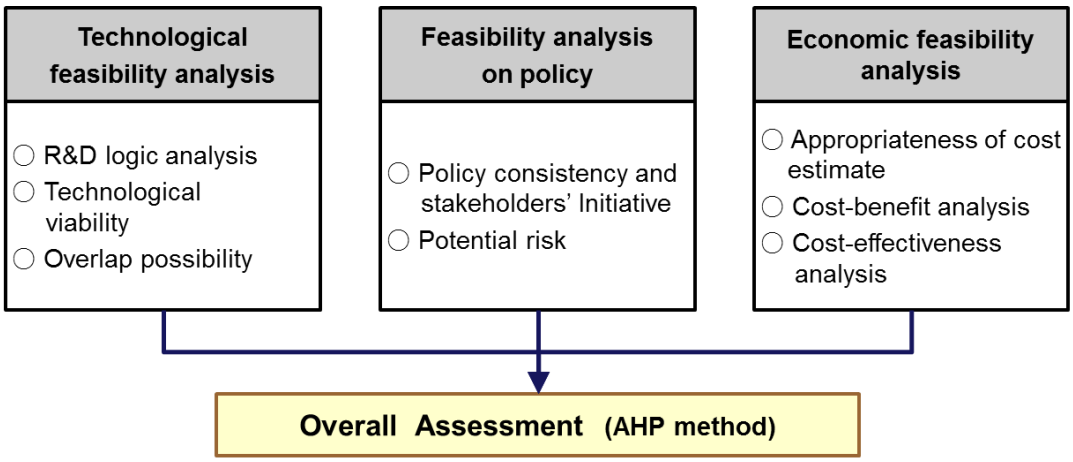

Figure 1. Criteria of the PFS on R&D program

In the technological feasibility analysis, the completeness and appropriateness of a R&D program plan are analyzed. For this purpose, this part is consisting of 3 sub-criteria such as R&D logic analysis, technological viability, and overlap possibility. 'R&D logic analysis' includes the whole framework for logical linkages and rationales of the examined R&D program. It can explain what proposed program is, why proposed program is valid, how investment results in desired outcome, and who private or public beneficiaries are. 'Technological viability' is to analyze the technology to be developed the R&D program in the aspect of technological characteristics. This factor consists of two elements: technology trend analysis and technology competitiveness analysis. Technology trend analysis measures a technology maturity for investment, and technology competitiveness analysis evaluates the competitive position of principal research agents. 'Overlap possibility' can be useful for identifying delivery systems similar to the examined program to prevent the overlapped investment into same research topic.

The feasibility analysis on policy deals with policy issues and other issues that could not be analyzed in technological feasibility analysis and economic feasibility analysis. The

analysis of consistency and initiative of R&D program helps to understand the position of examined R&D program in the whole governmental science and technology policy, and potential risk analysis can help to identify risks included in an examined R&D program plan.

The economic feasibility analysis is to analyze outcomes and spillover effects caused by an R&D program in the aspect of the efficiency of the fiscal management. Firstly, the appropriateness of the budget of proposed R&D program plan is reviewed and we analyze whether there are hidden costs. By doing these, total cost related to the R&D program could be estimated appropriately. If the expected outcome or spillover effect of the R&D program could be quantified as the monetary value, the cost-benefit analysis is used for economic feasibility analysis. However, the outcome or spillover effect of the R&D program could not be quantified as the monetary value, the cost-effectiveness analysis is used.

3. Main changes in technological feasibility analysis

A. Change of analysis structure

Compared to the 1st edition of the standard guideline, the change of analysis structure is that three level 3 criteria were added under ‘R&D logic analysis’ in technological feasibility analysis; proper planning process, proper objectives, proper logistics. Figure 2 shows the basic analysis structure of the PFS on R&D program that will be included in the 2nd edition of the standard guideline.

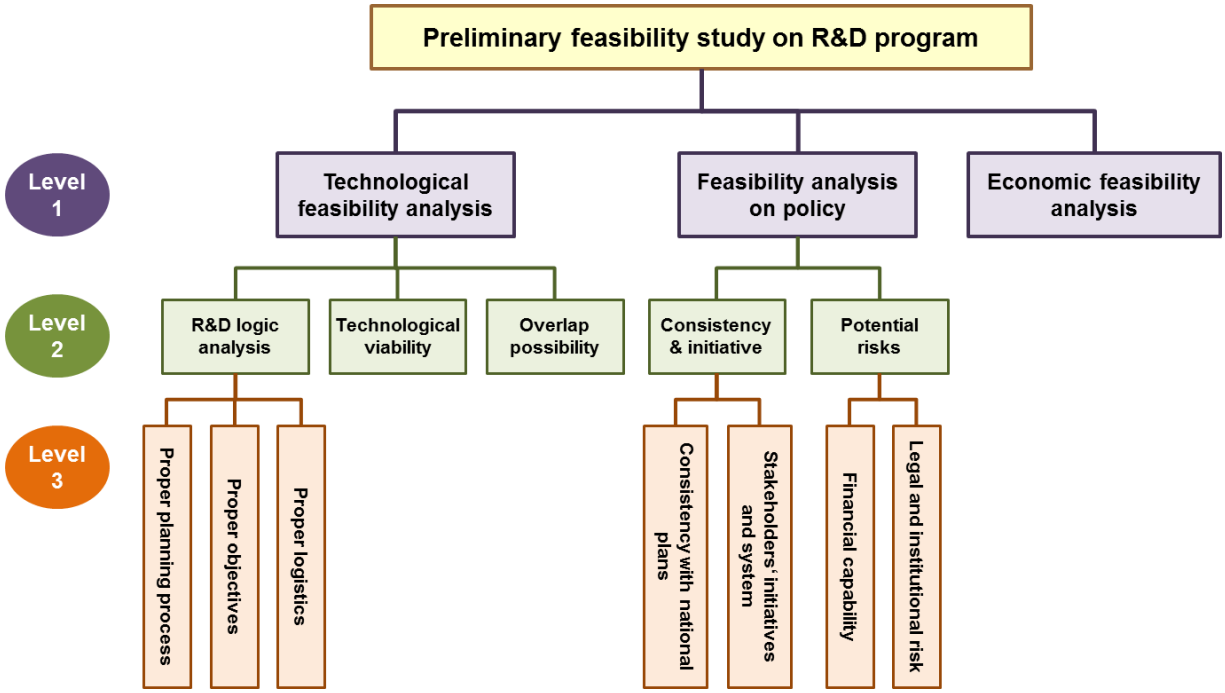

Figure 2. Basic analysis structure of the PFS on R&D program

In the 2nd edition of the standard guideline, what was improved mainly is analysis methods for the technological feasibility analysis in structure shown in Figure 2. In feasibility analysis on policy and economic feasibility analysis, small changes such as correction and reinforcement of contents were conducted. So, in this paper, we will explain important changes in technological feasibility analysis.

B. Development of Logic model

As an important tool to draw issues from the proposed R&D program plan, we developed the logic model for the PFS, based on literatures (W.K. Kellogg Foundation, 2004; McLaughlin et al., 1999, McLaughlin, 2010) and past PFS cases. The program logic model is defined as a picture of how organizations do their work and links outputs/outcomes with relevant issues/problems, program objectives, and activities/processes. A logic model is a systematic and visual way to present and share the understanding of the relationships among the resources to operate a program, the activities, and changes or results to be achieved.

The logic model is a core tool utilized for 'R&D logic analysis' which is the level 2 criterion of the technological feasibility analysis. Meanings of components of the logic model are shown in figures 3. Arrows in the logic model illustrate the relationship and the direction of an effect between components. The developed logic model has a form that combines the

theory approach model and outcome approach model. We tried to form the simple logic model to apply it easily in practice. However, the logic model presented is a general form and it could be modified, depending on the characteristics of the program (Kang, 2013).

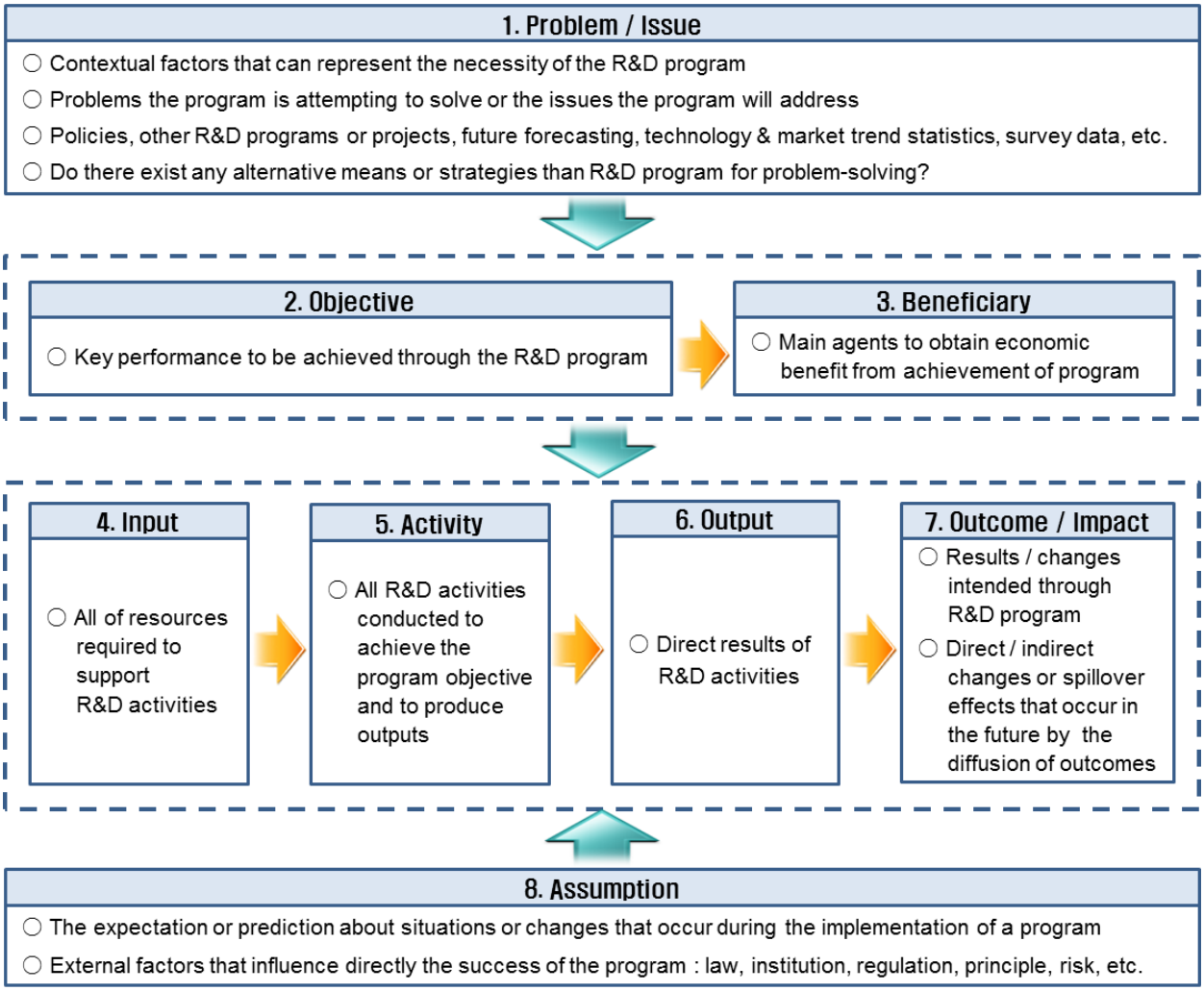

Figure 3. Logic model of the PFS on R&D program

Actually, logic models have not used widely in the planning process of a new government R&D program in Korea. However, we expect that the application of the logic model in PFS will contribute to the improvement of R&D program planning capabilities by promoting the use of the logic model on the planning of national R&D programs.

C. Modification of technological analysis questionnaire

Because of the PFS is an official process for government budgeting, a standard guideline to maintain the consistency and promote the efficiency should be prepared. As a part of an effort, R&D logic analysis, one of the key criteria(level 2) in technological feasibility analysis part, is consist of 3 sub-criteria: proper planning process, proper objectives, and proper logistics (Yim, 2013). Each sub-criterion has some prescribed evaluation questions to maintain the consistency of analysis.

For R&D logic analysis, 20 evaluation questions were included in the 1st edition of the standard guideline (Ahn et al., 2013). But some questions among those questions are not suitable. So, we modified the questionnaire and the number of questions in the questionnaire was reduced to 11 as shown in Table 1.

Table 1. Questionnaire of R&D logic analysis

Level 3 Criteria	Evaluation questions
Proper planning process	1. Participation of unbiased and diverse professionals 2. Technological demands investigation 3. Priority for selecting technology
Proper objectives	4. Appropriate definition of existing problems and issues 5. Relation between existing problems and program objectives 6. Design of intended beneficiaries 7. Specific, measurable and realistic objectives
Proper logistics	8. Specified and appropriate activities 9. Activities' alignment with program objectives 10. Appropriate performance of activities 11. Logical time sequence among activities and proper periods of activities

4. Conclusion

The preliminary feasibility study is one of the important budgeting processes. Because the PFS, itself, is an evolutionary national system, the analysis methodologies and approaches will be improved consistently. Even before carrying out R&D program, it is very difficult to evaluate precisely its result and performance that will occur in the future. In this paper, we explained the major changes through the revision of the PFS standard guideline on R&D programs. Even after the publication of the 2nd edition of the standard guideline, further studies will be conducted steadily for the more credible ex-ante evaluation of R&D programs.

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