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DEVELOPMENT OF GUIDELINE FOR PRELIMINARY FEASIBILITY STUDY ON GOVERNMENT R&D PROGRAMS IN KOREA

Abstract:

In order to enhance the efficiency of research and development (R&D) investment, since 2008 the Korean government has applied the preliminary feasibility study (PFS) to newly proposed government R&D programs of which total budget exceeding about $50 million including about $30 million or more in government expenditure. The PFS on R&D programs is an ex-ante evaluation that is performed in point of views of technology, policy and economy. Since 2008 the PFS was conducted to over 120 R&D programs.

For maintaining the consistency of evaluation, the first edition of 'the standard guideline of PFS for R&D program' was published in late 2011 by Korea Institute of Science & Technology Evaluation and Planning. By using the standard guideline, the integrity of analysis has been further improved. Even after the publication of the 1st edition of the standard guideline, the study for improving and developing analytical methods was carried out on an ongoing basis. As the result of the study, the 2nd edition of the standard guideline was published at the end of 2014. In this paper, the main contents of the 2nd edition of the standard guideline are explained.

Keywords:

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

JEL Classification: D81, O32, O38

1. Introduction

The Korea government increased drastically the R&D budget about three times during 10 years from 6.2 billion dollars in 2004 to 17 billion dollars in 2014. Consequently, the proportion of the R&D expenditure in the gross government expenditure rose from 3.6% in 2004 to 5.0% in 2014. From the middle of 2000, the Korean government began to have an interest in the efficiency of R&D investment 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. Also from 2008, the preliminary feasibility studies has been applied to newly proposed large-scaled, long-term R&D programs, of which total budget exceeding about $50 million including about $30 million or more in government expenditure.

The preliminary feasibility studies have been performed to predict the potential results of planned R&D programs and to raise the effectiveness of government R&D investments by selecting R&D programs that has high viability. In addition, the FPS could contribute to allocate more funds to better R&D programs by cutting poorly planned R&D program. Only the programs which get the credit for the feasibility through the PFS acquire a qualification of a budget investment. Since 2008 the PFS was conducted to 120 R&D programs.

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 to R&D Programs proposed by several 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).

The PFS on R&D programs is an ex-ante evaluation that is performed in point of views of technology, policy and economy. The ex-post evaluation focuses on measuring the final outcomes and performance of a government program, whereas the ex-ante evaluation is used to evaluate what the program aims to do. Because the ex-ante evaluation is applied to an R&D program plan written on papers, it is not easy to evaluate the uncertain performance in the future. We can find many cases of ex-post evaluation on R&D project, but there is few case of ex-ante evaluation. In previous work (Bulathsinhala, 2015), difficulties of ex-ante evaluation on R&D projects was explained.

In order to establish the ex-ante evaluation system, ‘the standard guideline of PFS for R&D program’ was published. The standard guideline is an official document which evaluation approaches and methods are systematized. Korea Institute of Science & Technology Evaluation and Planning (KISTEP) published the first edition of PFS standard guideline on

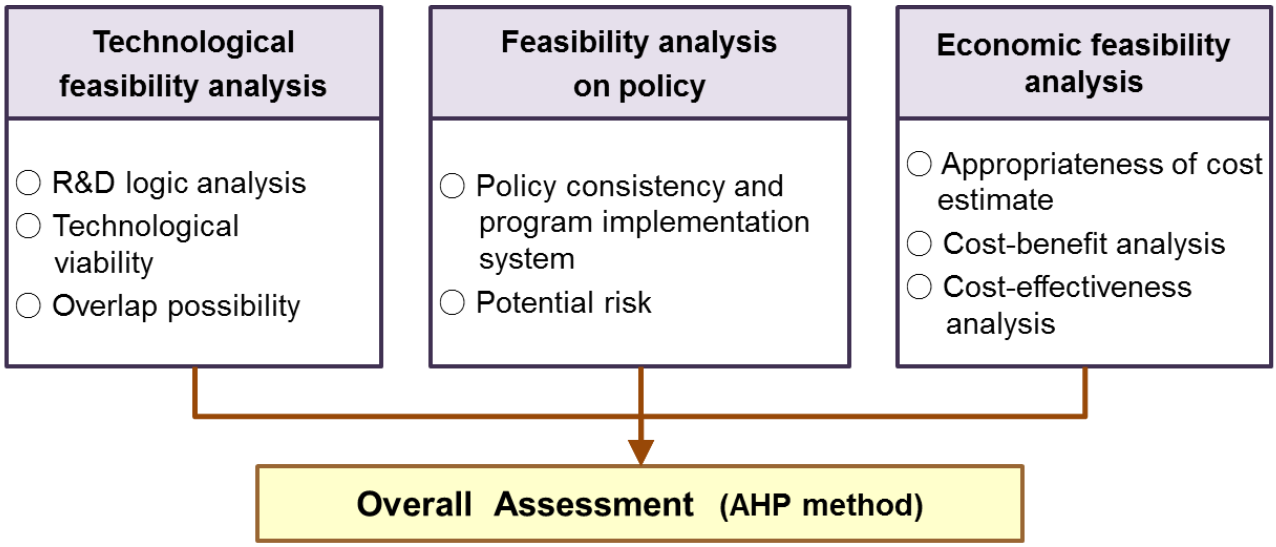
R&D program in 2011 (Lee and Park, 2011; Ahn et al., 2013). Since 2012, this standard guideline has been applied to the PFS on new R&D program plans very well.

By using the standard guideline, the integrity of analysis has been further improved. Even after the publication of the 1st edition of the standard guideline, the study for improving and developing analytical methods was carried out on an ongoing basis. The study for the 2nd edition of the standard guideline began from 2013 (Kang, 2014) and it was published at the end of 2014 (KISTEP, 2014). In this paper, the main contents of the 2nd edition of the standard guideline will be explained.

2. Main Criteria of the PFS on R&D Program

As a project manager of a PFS on new R&D program plan, a researcher of KISTEP is in charge of the evaluation group for the R&D program plan. The project manager composes expert panels which experts in technology, policy, economy field are participated. It is believed that expert panels are the most effective mechanism for evaluating R&D projects (Brezis, 2007). Experts in technology, policy, economy field analyze the program plan at each point of view. Then the evaluation group discusses together several times about their opinions and evaluates the program plan.

Figure 1: Main criteria of the PFS on R&D program

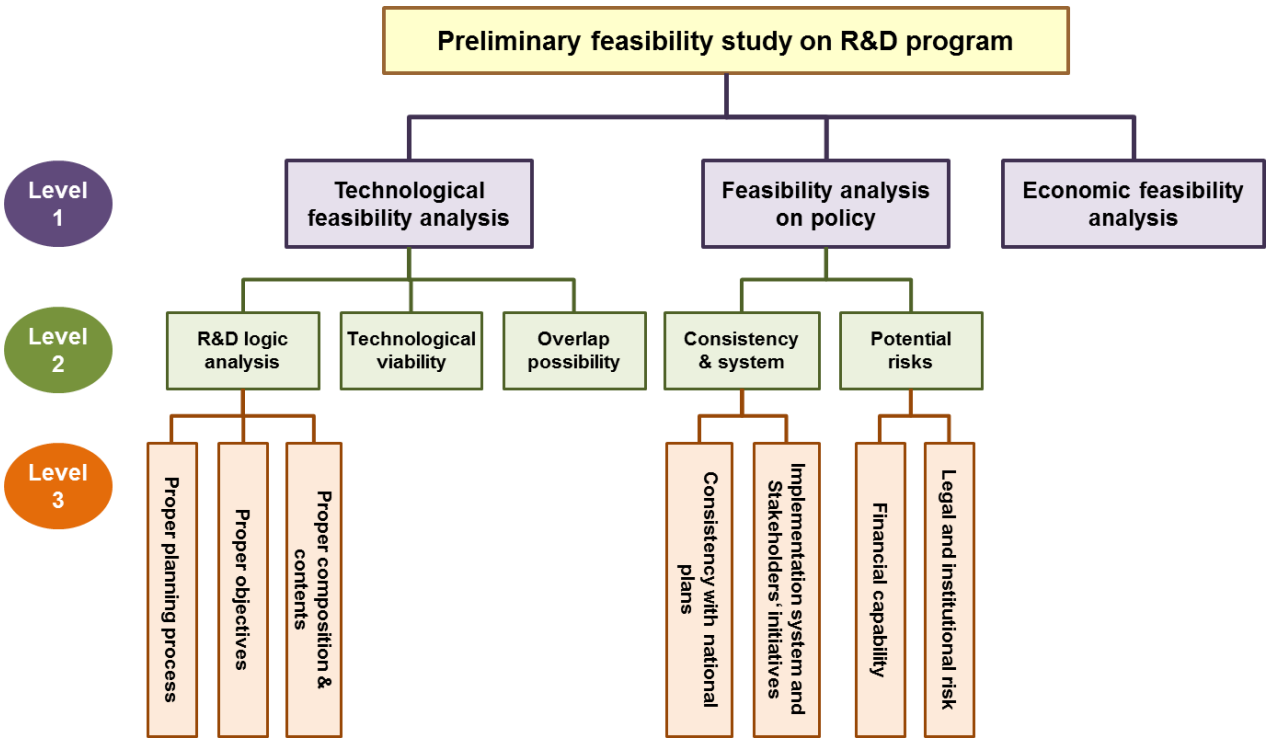


In the PFS, 3 major criteria are applied to measure comprehensively effects in aspects of technology, policy, and economy by R&D as shown in Figure 1. Technological analysis, policy analysis and economic analysis are performed independently and results of these

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 examined R&D programs in the PFS.

Figure 2 shows the basic analysis structure of the PFS on R&D program. This analysis structure has a hierarchy of 3 levels, and every R&D program plan should be analyzed according to it. AHP method is performed for all of criteria in the analysis structure.

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



3. Technological feasibility analysis

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'.

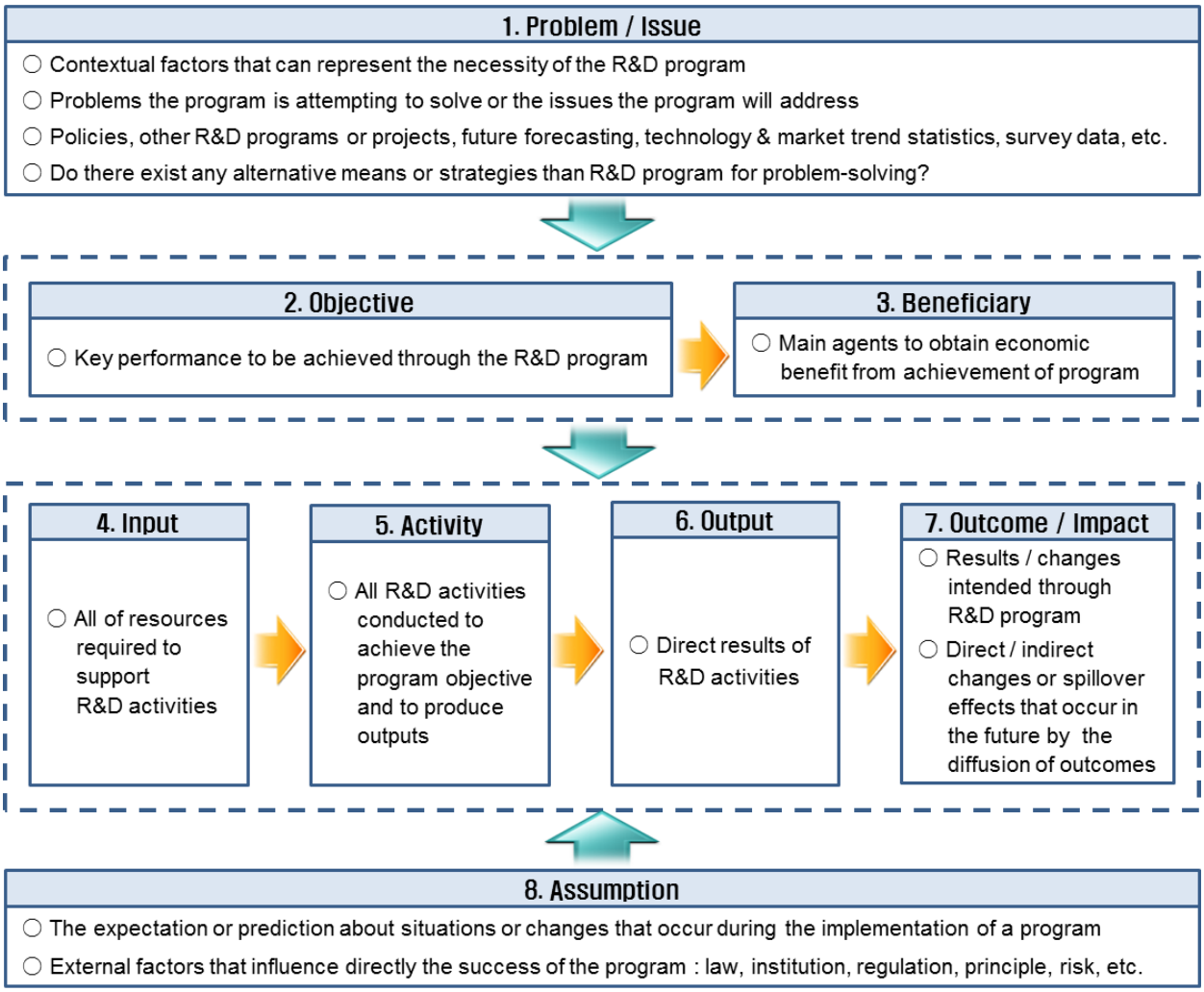
A. R&D logic analysis

'R&D logic analysis' includes the whole framework for logical linkages and rationales of the R&D program plan. 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. Because this 2nd level criterion is most important criterion in the PFS on R&D program, I would like to explain the analysis methodology of this criterion in detail.

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, as shown in Figure 3. The program logic model is defined as a picture of how organizations do their work and how 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, the activities, and changes or results to be achieved. This logic model is used to grasp the thought of the planning entity of the program.

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



The logic model is a core tool utilized for 'R&D logic 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. We tried to form the simple logic model to apply it easily in practice. However, the logic model presented in the standard guideline like figure 3 is a general form and it could be modified, depending on the characteristics of the R&D program be assessed (Kang, 2013).

Logic model is a very useful tool to plan and evaluate a program. However logic models have not used widely in the planning process of a new government R&D program in Korea yet. 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 government R&D programs.

Because the PFS is an official process for government budgeting, a standard guideline for maintaining the consistency and efficiency should be prepared. As a part of an effort, R&D logic analysis consists of 3 sub-criteria (level 3): proper planning process, proper objectives, and proper composition & contents (Yim, 2013). Each sub-criterion has some prescribed evaluation questions to maintain the consistency of analysis as shown in Table 1.

Questionnaire consists of essential questions and optional questions. Whereas essential questions should be applied to all R&D programs, optional questions could be applied, depending on characteristics of R&D programs be examined.

Table 1: Questionnaire of R&D logic analysis

Level 3 Criteria	Evaluation questions
Proper planning process	1. Was the expert group that participated in the planning suitably organized? 2. Was the demand for R&D of the related field suitably understood? 3. Was the priority setting process rationally carried out?
Proper objectives	1. Is the problem or issue to be solved suitably deduced? ※ (Optional) Is there any other efficient alternative plan aside from R&D? 2. Does the program objective specifically present the effect that is intended to be accomplished? 3. Is there a correlation between the objective and the problem to be solved? (System development program) Is the mission and concept design suitably organized? 4. Is the targeting of the beneficiaries for the program outcome suitably carried out? ※ (Optional) Is the promotion strategy to accomplish the objective suitable?

	※ (Optional) Is the role of government support considering the attributes of technology suitable?
Proper composition and contents	1. Are detailed activities deduced and presented at a suitable level? 2. Are detailed activities logically related to the objective? (R&D Infra establishment) Are facilities/equipment established in consonance with R&D activities? (System development program) Is a suitable work breakdown structure (WBS) organized around the core component technology? 3. Are the outcome indicators of detailed activities suitably presented? 4. Are the period estimation of detailed activities and temporal order logical?

B. Technological viability

'Technological viability' is to analyze the technology to be developed in 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.

C. Overlap possibility

'Overlap possibility' can be useful for identifying delivery systems similar to the examined R&D program to prevent the overlapped investment into same research topic.

4. Feasibility analysis on policy

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.

A. Consistency of policy and system of R&D program

In the criterion of the consistency of policy, it is analyzed the position of the R&D program in the whole governmental science and technology policy by investigating related national R&D strategies.

In the criterion of the implementation system, the governance in the R&D program and the initiatives of stakeholders are analyzed to understand the viability of successful operation of the program.

B. Potential risk

In the criterion of the financial capability, it is identified potential issues on the fund investment of both government and private sectors for the R&D program.

In the criterion of the legal and institutional risk, it is investigated potential issues related to the violation of domestic laws or international trade law during implementing the program or deploying its results.

5. Economic feasibility analysis

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 it is analyzed 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.

4. Conclusion

The preliminary feasibility study, which is an ex-ante evaluation on R&D program, is one of the important budgeting processes in Korea. Because the PFS is an evolutionary national system, the analysis methodologies and approaches should be improved consistently. In this paper, I explained the main contents of 2nd edition of the standard guideline of preliminary feasibility study for 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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