

Feasibility Analysis Studies on New National R&D Programs in Korea

Seongmin Yim, Hyun-Kyu Kang

Abstract—As a part of evaluation system for R&D program, the Korean government has applied feasibility analysis since 2008. Various professionals put forth a great effort in order to catch up the high degree of freedom of R&D programs, and make contributions to evolving the feasibility analysis. We analyze diverse R&D programs from various viewpoints, such as technology, policy, and Economics, integrate the separate analysis, and finally arrive at a definite result; whether a program is feasible or unfeasible. This paper describes the concept and method of the feasibility analysis as a decision making tool. The analysis unit and content of each criterion, which are key elements in a comprehensive decision making structure, are examined

Keywords—Decision Making of New Government R&D Program, Feasibility Analysis Study

I. INTRODUCTION

THE Korean government has increased the budget of R&D gradually. The government budget of R&D was \$4 billion with 197 R&D programs in 1999 and increased to \$10 billion with 473 R&D programs in 2009. R&D Budget and the number of program increased about 2.5 times in the decade. As the budget for government research and development programs has grown, the various aspects of the R&D programs should be taken into consideration. Private R&D programs led mainly by large conglomerates have been carried out for the purpose of developing new products and have resulted in an immense success in both the domestic and global markets, contributing to government wealth creation. Under the circumstances, there have been strong calls for the government to define the role of government R&D programs and to enhance the effectiveness of them. To meet the growing calls for improvement, various evaluation studies have been performed; including systematic evaluation for on-going national R&D programs conducted within the ministries, Periodical program evaluations like high-level assessment and in-depth assessment, and Performance evaluation at completion. In addition, feasibility studies have been performed to predict the potential results of implementation [1]. A variety of analysis methods, such as experimental design and statistical review, have been utilized to examine a causal relationship among the results, effects, outputs and inputs, for the purpose of obtaining a more systematic analysis of government R&D programs [2]. An attempt to measure the benefits and effects of government R&D programs is the part of such endeavors. R&D has its own unique features so that the various types of economic benefits should be taken

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into consideration; pure basic research, oriented basic research, strategic applied research, specific applied research, experimental development, infrastructure like equipment and human resources, and commercialization.

II. CONCEPT OF FEASIBILITY ANALYSIS

A. Object

Due to the huge budget size and complex characteristic of the R&D programs, the government has a burden of decision making for the investment of a new R&D program. Hence the purpose of the feasibility analysis is to demonstrate the feasibility of large-scale, long-term public investment R&D programs and also to enhance fiscal efficiency and productivity.

Feasibility analysis is positioned between a national science & technology plan and periodical evaluation in the lifecycle of R&D programs. Once a national plan for a specific science & technology area is set up, a government department makes a program proposal for carrying out the plan. Only for the programs which get through the feasibility analysis system acquire a qualification of a budget investment.

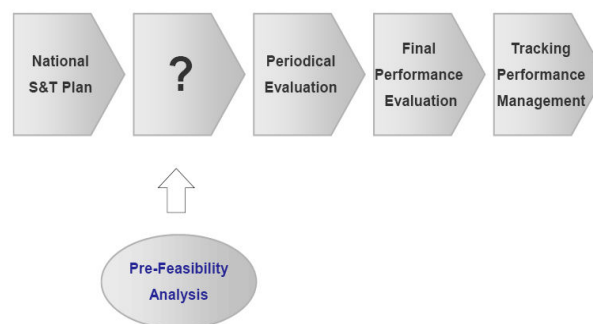


Fig. 1 The position of Feasibility Analysis in the lifecycle of R&D programs

The feasibility study, which was introduced in 1999, is the preliminary research conducted in advance of program implementation, for the purpose of improving the effectiveness of public finance programs. In 2008, under the President's executive order, it is carried out as feasibility analysis for the newly proposed government programs with concrete plans on technology development whose budget is over \$50 million and whose government subsidy is over \$30 Million. At the time of introduction, construction-related programs were the sole subject of study, but later on IT-related programs and R&D center, cluster, research equipment-related programs became the subjects of feasibility studies respectively. A total of about 60 feasibility analysis on government programs have been conducted since 2008.

B. Procedure

In case of a feasibility analysis on government R&D programs, 3 major criteria are applied to measure not only economic effects, which are measured in the form of the ratio of output against input, but also technological and policy effects.

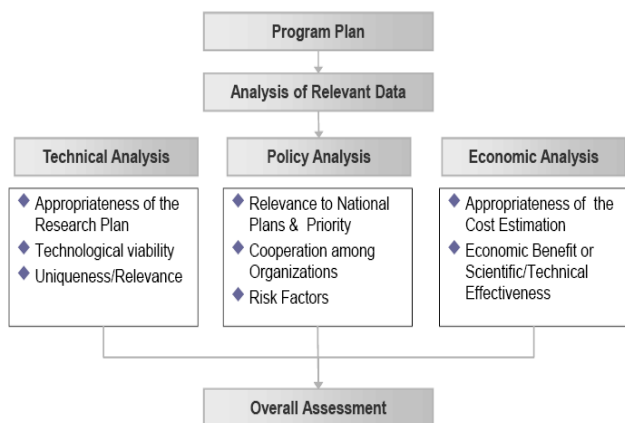


Fig. 2 A general procedure of feasibility analysis

Technological analysis consists of sub-criteria such as appropriateness of the research plan, technological viability, uniqueness & relevance. Appropriateness of the research plan is about planning process, program goal, specified sub-plan, organization System. Concrete and organized plans are highly evaluated. A method of program logic model which disassembles a program into input, activity, output, outcome, and impact is used to understand the concept of the program. Technological viability assessment is about national level in the technology field, technology level assessment, scientific literature or patent analysis, and quantitative or qualitative index. Viable plans are highly evaluated. Uniqueness and relevance assessment is to examine whether the program is overlapping with previously launched R&D program. The criteria to decide a similarity among programs are program's objectives, goals, implementation processes, and research area.

Policy Analysis consists of sub-criteria such as relevance to national plans & priority, cooperation among organizations, risk factors. Relevance to national plans & priority is to analyze consistency with higher-level plans like national policy and priorities. It also considers importance in national strategy like national defense, energy security, market failure, and urgency etc. Cooperation among organizations is to analyze official or non-official systems for cooperation in the program. It also considers cooperation with other ministries, institutions, and expert groups. Risk factor is to analyze preparation for the risk expected in the process of R&D program including political, fiscal, and institutional risk. Political risk such as conflict between ministries, institutions, fiscal risks such as medium- and long-term plans of government, contingency plans are common risk factors.

Economic Analysis consists of sub-criteria such as appropriateness of the cost estimation and economic benefit or scientific/technical effectiveness. Appropriateness of the cost

estimation is to examine the way to estimate the total cost of the program and the sub-programs. Sometimes the appropriate cost of the program is analyzed using a comparison with similar case ones. Economic benefit or scientific/technical effectiveness is measured by net present value, benefit cost ratio, or benefit cost of cost effectiveness analysis.

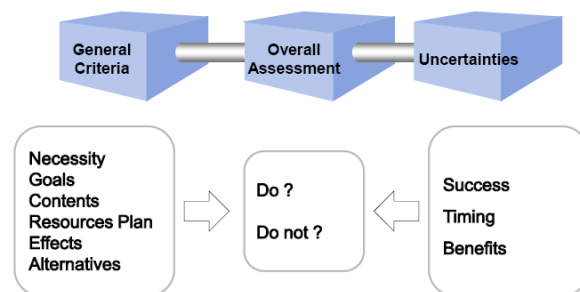


Fig. 3 The concept of feasibility analysis

The analysis results are reviewed and combined to deliver the final results. In order to integrate analyses properly, we built a decision hierarchy based on the assumption that those multiple elements are independent. A series of factors to be considered for decision making process include multiple alternatives, criteria for choosing alternative solutions, weights of criteria, scores of the criteria, and the integration of results, and then multi-criteria analysis methods are applied [3]. AHP (Analytic Hierarchy Process) method has been utilized as a means to collect decision-making information for R&D programs in feasibility analysis [4]. A participant in AHP must have complete understanding on the national R&D program and transparency and objectivity of the evaluation.

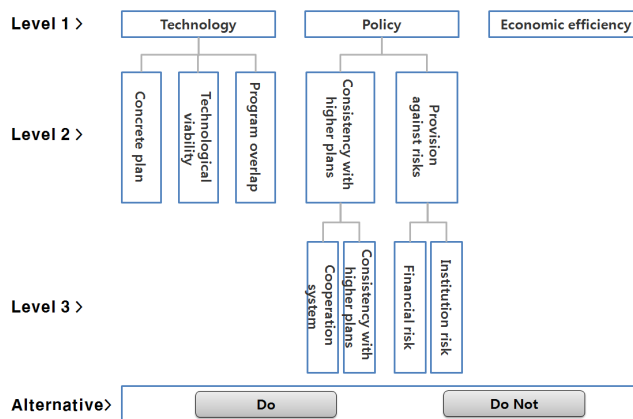


Fig. 4 The hierarchy of AHP

III. CONCLUSION

In Korea, feasibility analysis is applied to demonstrate the feasibility of large-scale, long-term public investment R&D programs and also to enhance fiscal efficiency and productivity since 2008. 3 major criteria are applied to measure not only economic effects but also technological and policy effects. The analysis results are reviewed and combined to deliver the final results using AHP method.

As feasibility analysis study on government R&D program is still in the initial stage, we have to develop standard guidelines for feasibility analysis considering the features of basic research, R&D for public health & welfare, and industrial technology R&D. In addition, we need to establish new valuation methods and improve guidelines.

REFERENCES

- [1] Y. B. Lee, J. Hwang, "A Study on Correlation Between Elements of AHP for Government R&D Programs," Proceedings of the International Symposium on the Analytic Hierarchy Process, 2011.
- [2] E. Triantaphyllou, *Multi-Criteria Decision Making Methods: A Comparative Study*, Kluwer Academic Publishers, 2000.
- [3] William N. Dunn, *Public Policy Analysis; An introduction*, 4th edition, Prentice-Hall, 2000
- [4] Thomas L. Saaty, Luis G. Vargas, *Decision Making with The Analytic Networking Process; Economic, Political, Social and Technological Applications with Benefits, Opportunities, Costs and Risks*, Springer. 2006.