Overall Coordination of Government-Funded Research and Development Programs in Korea[+]

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Abstract

Given the increasing significance of government-sponsored research and development (R&D) programs in Korea, the importance of efficient and effective overall coordination of those programs based on the objective evaluation seems certain to increase. This paper introduces the overall coordination system of national R&D programs in Korea, and addresses current issues and problems encountered in the process of overall coordination. We finally propose a reform measure for the improvement of an overall coordination practice.

[+] The views expressed herein are solely those of the authors and do not represent the views of KISTEP. All remaining errors are our responsibility.

Introduction

As the importance of science and technology (S&T) for socioeconomic development increases, the government expenditures on research and development (R&D) programs in Korea have been enhanced substantially during the past 10 years. For instance, 4.8% of the total government budget is allocated to R&D activities in 2004, compared with 2.8% in 1995. With the growing amount of government-sponsored national R&D programs in terms of cost as well as total numbers of programs, efficient allocation of a limited government budget for those programs has been a matter of primary interest to the policy decision-makers in Korea. In May 1997, the Korean Government enacted a 'Special Law for S&T Innovation' and began to perform 'survey, analysis and evaluation' of national R&D programs according to this law. Later, in 1999, the Ministry of Science and Technology (MOST) of Korea introduced a 'pre-budget coordination' procedure and completed framing the 'overall coordination' system of national R&D programs. At the same time, the Korean government organized the National Science and Technology Council (NSTC) to support these activities. NSTC has been a leading organization in the field of S&T in Korea since then. This is especially the case with regards to its mission, which includes managing and supervising the overall coordination of R&D programs funded by the government at the national level. In addition, the Korean government set up a specialized agency, Korea Institute of Science and Technology Evaluation and planning (KISTEP), in 1999, with the responsibility for assisting NSTC in conducting surveys, evaluations, and pre-coordination of national R&D programs. While NSTC draws up a broad spectrum of S&T policies and general planning for the overall coordination of national R&D programs, the actual coordination practice

including impartial and objective evaluation and pre-budget coordination of those programs is carried out primarily by KISTEP.

The 'overall coordination' refers to the overall efforts to achieve a national optimum solution through proper coordination and mediation between local optimum solutions from all interested parties. In this respect, overall coordination of national R&D programs can be considered as involving coordinating all government-sponsored programs carried out by government ministries, agencies, and departments, and compromising conflicting matters of concern arising from each related party for the purpose of efficient and effective allocation of limited R&D funds, through synthesized analyses and objective evaluations of programs. In the context of contemporary environments featuring rapid science and technology change, the complicated nature of R&D programs, overlapping interests among government departments, and more diversified R&D programs, this overall coordination of government-sponsored R&D programs has been an essential system in strategically allocating limited R&D resources in Korea. For the successful overall coordination of national R&D programs, the Korean government and experts in the areas of science and technology forecast mid & long term technology development trends and draw a technology road map. They carefully assess positive and negative consequences that the technological development of R&D programs incur, and reflect them in forming future S&T policies and R&D projects. They also analyze and evaluate in-depth the performance of R&D programs and make use of them as criteria for setting up the order of priority in R&D spending.

This paper introduces the overall coordination system of national R&D programs in Korea. We also address current issues and problems raised by stakeholders in the

process of overall coordination and offer possible solutions for the improvement of future practice. We hope that this article on the overall coordination system of R&D Programs in Korea will convey some useful insights to policy makers and experts in this area from other countries as well.

Overall Coordination Practice

Overview

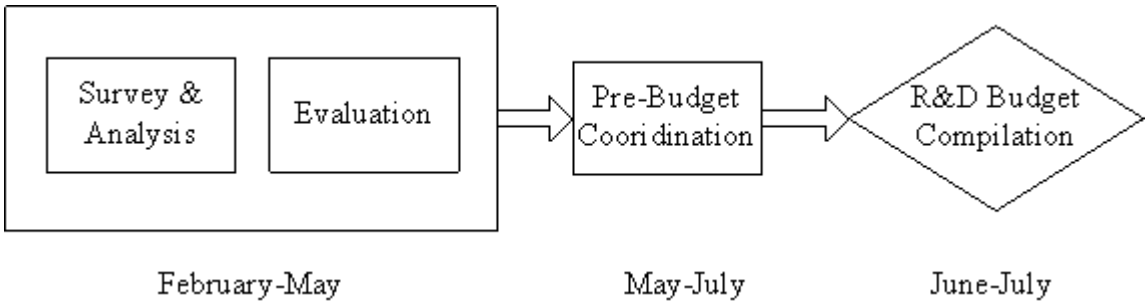
The 'overall coordination' of national R&D programs in Korea consists mainly of two procedures. The first is the 'survey, analysis, and evaluation' procedure (February-May of the year). This can be further divided into two sub-procedures: survey & analysis, and evaluation. The survey & analysis procedure conducts statistical surveys of national R&D activities every year, including R&D personnel and R&D spending, and analyzes national R&D spending areas. Future policy direction and strategies for achieving goals are also presented. Most importantly in evaluation procedure, the performance results and accountability of all government-sponsored R&D programs are carefully monitored, reviewed, and evaluated by expert groups in the relevant field. The consequences of this procedure are then reflected in setting up national R&D spending priorities.

The second 'pre-budget coordination' procedure is the planning stage (May-July of the year). The overall coordination committee reviews plans for R&D programs submitted by related government departments and sets the priority order of programs that the government should support in the following year, based on the significance of the programs and the results of the former procedure. The outcomes and suggestions for an efficient R&D spending from this procedure are used as a

basis for Ministry of Planning and Budgeting (MPB) of the Korean government to compile and to distribute an R&D budget for the following year. Figure 1 presents the framework of the overall coordination system of national R&D programs in Korea.

Figure 1.

Overall Coordination Framework



Classification of R&D Programs and the Subject of Overall Coordination

The R&D programs in Korea are generally divided into four broad groups based on economic and social perspectives, rather than technological perspectives. These are further classified as fifteen sub-groups for practical overall coordination procedures. Table 1 summarizes the classification of R&D programs.

Table 1.

Classification of R&D programs in Korea

Four Major Classifications	15 Sub-groups
R&D programs for basic, public and welfare technology	Generic and basic technology
	Public technology

R&D programs for industrial technology	Welfare technology
	Short-term industrial technology
	Mid and long-term industrial technology
	International cooperation
R&D infrastructure	Development of human resources
	Regional R&D centers of excellence
	R&D facilities and equipments
Supporting for public research institutes	National laboratories (3 sub groups)
	Government supported research institutes for basic technology
	Government supported research institutes for industrial technology
	Government supported research institutes for public technology

Above R&D programs, which are directly related to S&T, serve as the subjects of overall coordination. The following are, however, excluded from them: (i) personnel expenditures and utility and facility costs in government-sponsored institutes and national universities, (ii) military purpose R&D programs classified as high national confidential, and (iii) expenditures related to survey and research on policy, program planning and decision-making in R&D institutes.

Evaluation Committee

Given that the success of pre-budget coordination, and further, the entire overall coordination starts from impartial and professional evaluation of R&D programs, the importance of an objective and credible evaluation practice cannot be overstated. The objectivity and credibility of evaluation practice depend heavily on committee members who actually review and assess national R&D programs. Each sub-group of R&D programs in Table 1 has its own relevant committee, leading to

a total of fifteen evaluation committees. Each evaluation committee includes around twelve civilian expert members recommended by related government departments and carries out actual evaluation practice. To maintain objectivity, experts who are directly involved in particular programs evaluated are not allowed to be on evaluation panels. In addition, the fifteen program evaluation committees are supervised by a steering committee. The steering committee examines and confirms the final evaluation results originally submitted from each evaluation committee. This general committee consists of less than twenty committee members, and most of them are non-S&T background but with expertise in economics, business, accounting, public relations and policy, industrial policy and other areas. Researchers and analysts from KISTEP as well as specialists recommended by each relevant R&D program management organization play a very important role behind the curtain with the help of the Secretariat to the NSTC.

Criteria and Methods

Evaluation committees evaluate R&D programs based on six major criteria: validity of program contents, efficiency of program management, effectiveness of program results, necessity of program, impact and utility of program, and appropriateness of budget size. These criteria can be slightly modified by each committee, depending on the nature and characteristics of the program evaluated and pre-budget coordinated. Table 2 shows types of key questions most frequently considered by committee members for overall coordination.

Table 2.

Evaluation Criteria

Criteria	Key questions
Validity of program contents	▪ Are aim and scope of the program appropriate? ▪ Does the program feature contemporary economical and social environments? ▪ Are sub-projects in the program overlapping one another?
Efficiency of program management	▪ Is the detailed practice plan of the program set up systematically and strategically? ▪ Is the conduct of the program efficient? ▪ Does the program procedure concur with the practice plan? ▪ Is the program carried out in cooperation with other stakeholders? ▪ Is the budget for the program spent and distributed in an efficient way? ▪ Are suggestions and recommendations presented in the previous year considered effectively?
Effectiveness in getting program results (output and outcome)	▪ Does the program reach the main purpose (goal) for the appointed fiscal year? ▪ Will the program be able to attain the final goal of the program in the future? ▪ What are the scientific and technological achievements? ▪ How effective the program is in nurturing human resources in R&D? ▪ How effective is the program in building R&D infrastructure? ▪ Does the program contribute to the strengthening of industrial competitiveness of the country? ▪ Is the program conducive to the promotion of public welfare? ▪ Are the research activities in the R&D institute suitable for its given mission?
Necessity of program	▪ Is the program better carried out by a private sector or does the program need the government's support? ▪ Does the program concur with the government's strategic S&T policy?
Impact and utility of program	▪ What's the direct benefit from supporting the program? ▪ What are the consequences that the technological development of the program incurs?
Appropriateness of budget size	▪ Is the amount of a budget requested for the program reasonable? ▪ Is it necessary to reduce or raise a budget for the program?

Once the evaluation committees draw indicative evaluation scores of each program

according to the above criteria, they take these evaluation results as references for the pre-coordination of proposed R&D programs including optimal levels of program budgets. In addition, the committees draw up an opinion and prepare the written evaluation report for each program. Traditionally, final grading is classified as five or three groups. Table 3 shows the grading system.

Table 3.

Grading System

Number of classification	Grading
5 groups	A (highest ≥ A ≥ 90 %), B (90 % > B ≥ 70 %), C (70 % > C ≥ 30 %), D (30 % > D ≥ 10 %), E (10 % > E ≥ lowest)
3 groups	Excellent (highest ≥ Excellent ≥ 70 %), Ordinary (70 % > Ordinary ≥ 30 %), Poor (30 % > Poor ≥ lowest)

Note. The above grading system is under modification as of year 2006.

Procedures

Overall coordination of national R&D programs is undertaken over the following nine stages.

Stage 1: Survey & Analysis (starting around February)

KISTEP conducts full scale survey and analysis of the above R&D programs on an annual basis in order to provide specific and directly related information for relevant evaluation and pre-coordination. It includes overall reviews and previews of degrees of relevancy between national R&D policy directions and individual R&D program, and various aspects of technical and socio-economic impacts of R&D programs on the development of S&T.

Stage 2: Strategy Forum (around March)

Once NSTC finally confirms the master plan for overall coordination for the relevant year (for which the original plan was proposed and approved at the end of the previous year) the selection procedure for making up evaluation pre-budget coordination committee members is officially finalized. At the end of March, KISTEP offers the 'strategy forum' where a detailed evaluation and pre-budget plan including goal, scope, guidelines, and instructions is introduced to selected evaluation panels of the committees. For an efficient and time saving evaluation process and effective understanding of the programs, documented materials submitted by program management directors are provided to each evaluation committee member in advance at the forum.

Stage 3: Strategy Meetings on Program Evaluation (beginning of April)

During the month of April, various evaluation strategy meetings are held by each committee. In these meetings, evaluation panels discuss about the way they steer their committees and elect a chairman for each committee. In addition, they decide on appropriate evaluation indicators they will use for their evaluation, and other important evaluation methods like which indicators they should put more weight on in the course of evaluation.

Stage 4: First Panel Evaluation (beginning of May)

The fourth stage is the 'first panel evaluation'. In this stage, evaluation panels carefully review documented materials that they received at the forum in Stage 2

and draw up opinions for the first time. They also prepare for questions they may ask to program management directors at the next stage of meeting.

Stage 5: Presentation of Program Results and Plans (middle of May)

In the fifth stage, evaluation panels meet and interact directly with program management directors and listen to their presentations describing program achievements over the past year as well as discussing future plans. The meetings are held by the evaluation committees. In those meetings, panels also ask questions prepared in Stage 4 and often argue about certain topics with program management directors on the spot. Evaluation panels may require some additional materials for better and deeper assessment of the programs' performances.

Stage 6: Second Panel Evaluation (end of May)

In the 'second panel evaluation' stage, panels critically re-investigate and evaluate all materials and reach a conclusion on the evaluation of programs. Panels are asked to compare the final conclusion with the preliminary one which was drawn up in Stage 4, and modify and score the final grade on each program after full consultation. They then prepare the final written reports. Stage 6 was newly added in 2002 to increase the accuracy of the evaluation process.

Stage 7: Strategy Meetings on Pre-Budget Coordination (end of May)

Like evaluation stage 3, steering plans of the committees are formulated, chairmen of committees are elected, and proper evaluation indicators and weights are

determined in these strategy meetings. In particular, committees discuss how they can use the results of the previous evaluation stages in pre-budget coordination for this stage.

Stage 8: Presentation about New Programs for Next Year (mid of June)

In this stage, R&D programs that are to begin in the next year are presented. The meetings are held by the evaluation committees and the detailed format of presentation is similar to that of evaluation in Stage 5.

Stage 9: Expert Panel Pre-Budget Coordination Meeting (end of June or beginning of July)

Panels critically investigate and evaluate all materials to arrive at the final conclusion regarding the pre-coordinating of the R&D budget in this stage. They hold a consultation about the room for improvement of programs, and they increase or decrease the budget for each program reviewed. Finally, national R&D spending priorities are decided in the order of A, B, C (or A, B, C, D, E). The conclusions and opinions drawn here are then handed to MPB and become the basis of R&D budget compilation.

Challenges and Responses

Overall Coordination of national R&D programs in Korea has been continuously improved by seeking a more efficient and objective system over the past seven years since it was introduced in 1998. Improving program evaluation and pre-budget coordination practice is an abiding task that needs constant modification

and adjustment. This section discusses contemporary issues encountered in the process of overall coordination in Korea, as well as possible solutions suggested by a series of interviews with stakeholders including program officers, expert panelists, practitioners and executive staffs in KISTEP.

1. Appointing competent and credible outside panels of experts as evaluation committee members might be a first step toward improving the validity of evaluation. Currently, research and technology development related government departments in charge of managing programs are supposed to recommend appropriate experts of their related fields to NSTC, and NSTC makes the final selection procedure for relevant evaluation panels. Since many different government departments have networks of qualified experts of their own fields and have better information on them, this way of recommending expert groups certainly has many advantages. However, this way of recommending expert pool possesses its own problems. First, it is highly unlikely to guarantee objectivity of panels, which is one of the most important qualifications for evaluators. Panels entrusted by the related government departments tend to reflect their departments' own interests. Secondly, even though government departments make every effort to recommend capable specialists in their own areas, sometimes the quality of these people is not up to the standard NSTC wants to require. Even in such a case, NSTC has no specific ways to improve the situation under the current system. Lastly, government departments usually recommend new experts to NSTC every year, leading to lack of consistency because of high turn over-rate of the panels.

To overcome the above difficulties, NSTC should formulate each evaluation

committee directly out of all experts available, in industries, academia, and research institutes, etc. NSTC may select relevant and objective experts on its own by building a large pool of evaluators with excellent reputations, outstanding achievements and ample experience. Also, instead of temporary involvement, panels' tenure for a certain period of time such as two or three years needs to be guaranteed for their consistent and responsible activities.

2. The question about whether it is necessary to evaluate all R&D programs in each and every year has been another issue of debate. It can be ineffective to carry out evaluation practices every year on all programs, since the nature and the context of the programs may vary. Besides, anticipated results will easily fail to be realized within a year given that a large number of national R&D programs are planned and performed from a long-term perspective. Sometimes, panels also need additional time beyond a year to evaluate more thoroughly and carefully on particular programs.

In order to solve these problems, the government tries to introduce 'in-depth' and 'periodical' program evaluation methods. That is, rather than evaluating all programs every year with the same intensity, the government tries to pick a few targeted programs for the specific year and rigorously analyzes and investigates them, completely beyond the level of simple monitoring. The program evaluated in such a way may skip evaluation in the following several years so that the government can concentrate on other target programs instead. Note, however, that pre-budget coordination procedure should be carried out every year in any case, because new budgets are supposed to be prepared each and every fiscal year.

3. While 'relative evaluation' is currently employed in grading R&D programs,

programs management directors have started to question the appropriateness of this grading system. They argue that it may be ineffective and unfair to compare the performance and grade programs based on the same measurement without considering the various nature and unique characteristics that each R&D program has. Moreover, numbering other's performance in rank order can even be considered as impertinent in oriental culture.

As a solution, an 'absolute evaluation' approach has begun to be used in rating programs. Incorporating a wide variety of qualitative as well as quantitative performance indicators is also suggested. In pursuit of performance-based management and performance-based budgeting of R&D, policy makers have a plan for the methodology of 'self-evaluation' followed by 'meta-evaluation' (i.e. evaluation of self-evaluation by NSTC). Program applicants then have a chance to self-assess their outputs and performance according to government-issued guidelines before they are officially confirmed by the government, which can raise accuracy and objectivity of evaluation practice. Finally, the Korean government is considering introducing a new system similar to the Government Performance and Result Act (GPRA) and Program Assessment Rating Tool (PART) of the United States, in order to build a more accurate system of performance measurement of R&D programs.

4. The evaluation procedure serves as one of the better channels of gathering information for future important decision-making to government policy makers. They may anticipate prospective areas to invest and shape a R&D policy on the basis of materials provided by program management directors at the time of evaluation. Thus, not only the required information for

evaluation, but the more detailed performance reports and analyses on particular R&D programs formulated by program management directors in charge should be requested every year.

Conclusion

Technology and innovations are becoming the driving forces in strengthening industrial competitiveness, improving quality of life, developing a healthy society and fortifying national security. Korea's technology and innovations have developed remarkably over the past decades thanks to government's support of R&D programs. Along with its efforts to facilitate strategic policy by seeking a new growth engine for S&T by sponsoring R&D programs, the Korean government operates an overall coordination system on R&D programs it supports at a national level, to avoid a typical government failure. This paper briefly described the Korean overall coordination system of R&D programs including evaluation and pre-budget coordination procedures. It also looked at issues that have been revealed from past experience, and studied future alternatives in terms of shaping a reform measure for improvement of overall coordination practice.

Efficient and effective overall coordination of national R&D programs is very much of a challenge due to the inherent uncertainty and complexity of R&D programs and S&T. Moreover, the findings and results of evaluation and pre-budget coordination practice are largely bounded by a number of factors such as political, economical, social and cultural environments, and characteristics of administration and government departments. Thus, the best overall coordination methodology should be different by countries. Nevertheless, the structure and experience of overall coordination in Korea could be a good reference to other

countries, especially developing countries that plan and begin to introduce similar systems to that of Korea in the future.

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