Performance Evaluation of National R&D Programs in Korea

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Soon Cheon BYEON
sbyeon@kistep.re.kr

KISTEP
Korea Institute of Science and Technology Evaluation and Planning
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Introduction of National R&D in Korea
National R&D Expenditure in Korea (2006)

- GDP: $885bn
- Gross R&D Expenditure: $28.6bn (3.23% of GDP)

[R&D expenditure by the research entities]
- Public Research Institutes: 12.8%
- Universities: 10.0%
- Companies: 77.3%

[Source of fund for R&D expenditure]
- Government/Private: 24.3%
- Private: 75.4%
- Foreign: 0.3%

[R&D expenditure by the type of research]
- Basic Research: 15.2%
- Applied Research: 19.9%
- Product Development: 65.0%

[Tech. Employment Status]
- Total Tech. Employment: 365,794
  - Researcher/Engineer: 70.1%
  - Support Personnel: 29.9%
- Researcher per 1,000 labor force: 8.3

(Source: MOST, 2007)
Governmental R&D: $7.7bn ('05)

MOST: 19% for Scientific R&D
MOCIE: 19% for Industrial Technology Development
MOST (OSTI): 11% for GRIs
MIC: 9% for Information & Communication Technology

Rest of Ministries (Defense, Agriculture, Transportation, etc.)

MOST: Ministry of Science & Technology
MOCIE: Ministry of Commerce, Industry & Energy
MIC: Ministry of Information & Communication
GRIs: Government supported Research Institutes
Main Bodies of R&D
(Research Institutes under Research Councils, Private Companies, Universities, etc)

*NSTC: National Science & Technology Council
Necessity of Evaluation
Necessity of Evaluation at National Level

- Overall S&T Competitiveness: 35th
  - R&D Investment: 7th
  - Research Manpower: 7th
  - Oversea Intellectual Property Rights: 3rd
  - Scientific Infrastructure: 19th
  - Technological Infrastructure: 8th

- Increases and Diversity of R&D Investment
  - FY 2005: 7.7 Billion US$
  - More than 400 Programs by 20 Departments (2005)

Need a New System for Evaluation of National R&D Programs
*National Science and Technology Council established on March 1999 has carried out the first analysis, evaluation and budget review on national R&D in 1999.
R&D Program Evaluation of national R&D programs

Enhancement of Accountability / Better allocate limited public R&D resources

Necessity of Evaluation at National Level

Large scaled

Highly diversified

Multi-players
- 20 related agencies
Overview of R&D Program Evaluation in KOREA
Evolution of R&D Program Evaluation in Korea

1982: Beginning of National R&D Programs
1992: Project Evaluation
1999: NSTC Establishment (Program Evaluation By NSTC)
2004: Program Evaluation (Monitoring)
2005: OSTI Establishment (Strong Competence for Program Evaluation)
2006: Performance Evaluation

- Highly Advanced National Technology Program (G7 program) (Performance-oriented Program Planning)
- Establishment of the national R&D performance and results assessment act
Overview of National R&D Program Evaluation

- **Launched in 1999 by NSTC**
  - To improve R&D programs
  - For better allocation of public R&D resources
  - To examine the role of government in the area of R&D

- **Driving Forces of Evaluation**
  - Accountability to citizens
  - To improve transparency of national R&D expenditure
  - To enhance efficiency and effectiveness of R&D Programs

- **Main Players**
  - NSTC (OSTI in MOST)
  - KISTEP (supporting agency)
  - R&D related Government Agencies
Program Evaluation in National S&T Activities

National S&T Planning

- S&T Level & Trend Analysis
- Technology Level Assessment
- National Standard S&T Classification
- S&T Indicators & Statistical Analysis

S&T Foresight & Roadmap

National R&D Priority Setting

- National R&D Master Plan (5 years)
- Ministry Action Plan (every year)
- Ministry R&D Programs
- Performance Review (every year)

R&D Survey & Analysis

National R&D Budget Allocation

National R&D Program Evaluation

Overall Coordination for National R&D Programs
Objectives of National R&D Program Evaluation

- **To Improve R&D Programs**
  - To suggest the basic directions for program improvement
  - To enhance the efficiency and effectiveness of programs

- **To Increase Accountability**
  - Accountability to citizens
  - To improve transparency of national R&D expenditure

- **To Provide Useful Information for Decision-Making**
  - For better allocation of public R&D resources
  - To examine the role of each program in the area of R&D
Evaluation Criteria

- Validity of Program Contents
- Efficiency of Program Management
- Achievement during the Target Year
- Effectiveness of Program Results
## R&D Evaluation System in Korea

<table>
<thead>
<tr>
<th>Evaluator</th>
<th>Evaluation system</th>
<th>Evaluation methods</th>
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</table>
| Research Program | NSTC | •Program evaluation | •Monitoring of annual results (ex-post)  
•Peer, qualitative, comparative evaluation |
| | | •Budget coordination | •Ex-ante assessment of annual plans  
•Peer, qualitative, comparative evaluation |
| Each ministry | Internal evaluation of R&D programs | •Internal performance evaluation of R&D programs  
•Implemented every year/when necessary |
| Government Research Institute (GRI) | Research council & each ministry | •Institute evaluation | •Annual evaluation of management results and research activities  
•Peer and site evaluation |
| Research project | Each ministry & R&D management organizations | •Research project evaluation | •Peer evaluation of responsible projects  
•Evaluation of planning, progress, and results  
•Any time throughout the year |
| R&D Policy (issue) | NSTC | •Policy and issue evaluation | •Performance evaluation  
* in-depth BT evaluation (2003)  
•Implemented when necessary |
R&D Evaluation Unit

- Related Departments
- Large Classifications
- Research Programs
- Research Projects
- Detailed Projects

- MOST
- Specific R&D Program
- 21C Frontier R&D Program
- Tera-Level Nano Device Technology Development
- Standardization of S/W for Engineering

- Evaluation and Budget Allocation Unit
- Survey and Analysis Unit

Related Departments

Large Classifications

Research Programs

Research Projects

Detailed Projects

MOST

Specific R&D Program

21C Frontier R&D Program

Tera-Level Nano Device Technology Development

Standardization of S/W for Engineering

Evaluation and Budget Allocation Unit

Survey and Analysis Unit
Objects of National R&D Program Evaluation

R&D Budget → Survey/Analysis → Evaluation

- General Account
- Special Account

- (+) Information Promotion Fund
- (+) Nuclear R&D Fund
- (-) R&D Funding for Humanities and Social Sciences
- (-) Classified Defense R&D Funding

- (-) Salaries and Operation Expenses of National Employees and GRI
- (-) R&D Planning and Operating Expenses and Policy Studies Spending
- (-) Regular Operating Expenses of R&D Funding Agencies
- (-) Funding for Classified Defense R&D Facilities
Establishing National Evaluation System of Public R&D Programs
**Background**

- Demand for better performance and more effectiveness of R&D investment

- Recent trend of performance evaluation and performance management systems both domestically and internationally
  - U.S.: GPRA and PART → the performance evaluation on government programs (1993)

* MPB: Ministry of Planning and Budget
The current R&D evaluation mostly focuses on the appropriateness of the budget input and execution process, thus lacking of objective monitoring and evaluation on the performance.

R&D programs: Since NSTC evaluates all the programs for a short period, substantial evaluation has been difficult, usually focusing on rating programs for budget allocation for the next year.

- Complementing the evaluation results through a feedback is necessary, and more proactive monitoring and evaluation by a ministry in charge should be encouraged.

R&D projects: Significance has been placed only for the selection and monitoring, thus lacking of objective criteria for evaluation in terms of performance.

GRIs (Government Research Institutes): Evaluation by the related ministries in the form of monitoring, thus performance has been low compared with input resources.

Therefore, "the National R&D Performance and Results Assessment Act" was enacted transforming to the performance-based R&D Evaluation System.

- Suggesting basic directions and future priorities to have consistency.
Framework of National Evaluation System

Before

- Direct evaluation of every program by NSTC
- Appropriateness on input and implementation process

Evaluation System

Evaluation point

Role sharing between NSTC and ministry

After

- Specific evaluation (NSTC)
  - In-depth analysis and evaluation
  - Provide detail improvement plan
- Meta evaluation (NSTC)
- Self evaluation (R&D ministry)
- GRI evaluation (Research council)
  Performance evaluation based on the mission

Performance evaluation based on the pre-set goal and indicators

2005.12
R&D Performance Evaluation Act
Framework of National Evaluation System

**NSTC**
- Basic Plan for Performance Evaluation (every 5 yr)
- Implementation Plan for R&D Performance Evaluation (every yr)
- Developing and providing R&D Standard performance indicator

**OSTI**
- Developing action plans for the evaluation
- Supporting NSTC in execution (working office of NSTC)

**Associated Ministry**
- Setting performance goals and indicators
- Performing self evaluation

**Meta Evaluation**
- Appropriateness of performance goals and indicators applied during self evaluation
- Objectivity/credibility of evaluation procedure and methods

**Self Evaluation**
- Annual performance
- Phase/interim/final performance
- Following up the performance management and application for 5 yrs after program completion

**Specific Evaluation**
- In-depth evaluation by NSTC on major national R&D programs
- Long-term/large-scale programs, programs necessary for the overlap-coordination or linkage, inter-ministerial programs, national programs of pending issue

Establishment and notification of plans → Results report

Evaluation
**R&D Program Evaluation System**

- **Specific Evaluation**
  - Long-term/large-scale program
  - Overlapped/correlated program
  - Multi-department related program

- **National pending issue related program**

* Specific evaluation every 3 years (other programs are subject to self evaluation every year)

**Self/Meta Evaluation**

- **Self evaluation** (each ministry)
  - Meta evaluation (NSTC)

**Re-evaluation**

- (if necessary)

*(Self evaluation)*
# Utilization of Evaluation Results

## Specific Evaluation

| Long term/Large Scale Program | · Program improvement (re-planning etc.)  
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<th>· Resource Coordination (if necessary)</th>
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| Overlapped /Correlated Program| · Inter-program coordination  
|                               | · Transfer/Unification/Termination of program |
| Multi-departments Related Program| · Coordinating related programs  
|                               | · Improvement of program management system |

## Self-Evaluation

- Program improvement, utilizing on budget allocation next year

## Meta-Evaluation

- review on the appropriateness of Self-Evaluation (if necessary, re-evaluation)
Framework of Evaluation Implementation

- NSTC: Discussing and finalizing plans and results
- Office of Science & Technology Innovation: Setting up the plans, Forming the evaluation committees
- KISTEP: Analyzing R&D Program, Give administrative service, Draw up the evaluation guidelines
- Associated Ministries: Conducting the self evaluations, Feedback the evaluation results on programs
- Program management organizations and others: Provide experts’ supports and data
- Program Evaluation Committee: Operation supports
- Program Evaluation Support Group (KISTEP experts): Make a notification of plans
- Plans & evaluation guidelines
- Internal evaluation results & related data
- Analysis of evaluation report
- Plans
- Finalize and make a notification of plans
- Report evaluation results
- Mutual cooperation
- Draw up the evaluation guidelines
Specific Evaluation

In-depth performance evaluation on major R&D programs which NSTC conducts for program improvement and coordination

- Selection criteria for specific evaluation
  - Long-term / large scale program
  - Overlapped / correlated program
  - Multi-department related program
  - National socio-economic pending issue related program (if necessary)

- Sufficient analysis of the national R&D programs
  - Conducting comprehensive evaluation on the performance during the past 3-5 years
  - Future plans for the next 3-5 years
  - Identifying parts necessary for coordination or improvement through in-depth and intensive evaluation, and suggesting concrete and proactive alternatives
Annual Schedule of Specific Evaluation

- **Pre-Analysis**
  - Long-term/ large-scale program, Program necessary for overlap -coordination and linkage, Inter-ministerial program
    - (Regular evaluation)
  - R&D programs with national and social pending issues
    - (Evaluation at anytime if necessary)
  - Committee

- **Interim evaluation result**
  - Alteration/ coordination of program plans based on evaluation results
    - Committee, Office of S&T Innovation, Ministries

- **Final evaluation result**
  - Evaluation result review
  - Pre-analysis for the next year’s evaluation

NSTC
Implementation System of Specific Evaluation

NSTC
- Finalizing results of survey & analysis, evaluation

Office of S&T Innovation
- Establishing implementation plan
- Feedback the evaluation results
- Developing policy alternatives at the national level

KISTEP
- Performance analysis and evaluation
- Writing evaluation report
- Forming a relevant committee if necessary

Related Ministries
- Feedback the evaluation results

Private sector experts (academy, industry, research)
- Program management org
- Experts’ support
- Supplementing data
- Providing advice in related areas

Evaluation committee
- Reviewing evaluation result [draft]
  - Formed if necessary

Evaluation Plan review and determination
- Notification of evaluation plan & cooperation request
- Data submission for evaluation

Commission of Evaluation
- Evaluation result report

Notification of evaluation plan & cooperation request
- Evaluation result report

Data submission for evaluation
### Specific Evaluation Procedure

| Step 1  | Data Collection                                      | · Departments submit evaluation materials  
|         |                                                   | · collected through KORDI system          |
| Step 2  | Data Analysis                                       | · Program analysis: Positioning, Portfolio, Performance  
|         |                                                   | · performed by KISTEP experts              |
| Step 3  | Strategy Meeting                                    | · Evaluation Guideline is distributed  
|         |                                                   | · held by each committee                   |
| Step 4  | First Panel Review                                  | · Review documented materials             
|         |                                                   | · Prepare questionnaire for the program details |
| Step 5  | Program Explanation                                 | · Program manager present the details of program  
|         |                                                   | · O&A between panel and PM                 |
| Step 6  | Second Panel Review                                 | · Panels re-investigate and evaluate all materials  
|         |                                                   | · Draw final conclusion                    |
| Step 7  | Request for Reappraisal                             | · Department is informed with the evaluation results  
|         |                                                   | · Departments may request for reappraisal    |
| Step 8  | Reporting                                           | · KISTEP members write the final report  
|         |                                                   | · Report the evaluation result to NSTC(OSTI) |
Self Evaluation and Meta Evaluation

< Self Evaluation >

A performance evaluation by each ministry which measures the achievement of strategic goals and performance goals set by themselves.

- In the past, substantial evaluation was difficult and the evaluation has been focused on the rating since NSTC evaluated all the programs for a short period of time.
- NSTC provides the guidelines for self evaluation and standard performance indicators.
- Each ministry’s setting strategic goals and performance goals by year and by phase and developing performance indicators reflecting program characteristics.
- Ministries report self evaluation result to NSTC.

< Meta Evaluation >

Evaluation by NSTC on processes and results of ministries’ self evaluation.

- NSTC conducts meta evaluation on the validity of self evaluation results.
- Appropriateness of performance goals and indicators set in self evaluation.
- Objectivity and credibility of procedures and methods of self evaluation.
Annual Schedule of Self and Meta Evaluation


- Each ministry
- NSTC
- Pre-analysis
- Self-evaluation
- Meta-evaluation
- Re-evaluation (If necessary)
- Review of this year’s Evaluation result
- Pre-analysis for the next year’s evaluation

Interim Evaluation Result  Final Evaluation Result
Self Evaluation and Meta Evaluation Implementation System

Related ministries
- self evaluation
  - Feedback the performance results on program
- implementation plan
  - Data provision

Program Management Organization
- Experts’ support
- Data provision

Office of S&T Innovation
- Establishing implementation plan
- Forming evaluation committee
- Forming a program evaluation support group

NSTC
- Finalizing self/meta evaluation results
- Review & determination of implementation plans

KISTEP
- Program analysis
- Support for administration and professionalism
- Developing evaluation guide

Meta-evaluation committee
- Support group for program evaluation
- Supporting committee operation

Supporting operation
Challenges and Responses

: Evaluation in Change
Challenges

- Limits in In-depth Evaluation
- Insufficient in Self-Evaluation Capabilities of the Ministries/Program Managers
- Not good in Performance-based Program Evaluation
- Insufficient in Evaluation Methodologies
Responses

- To Build-up “National Evaluation System”
- To Enhance the Nexus of Evaluation Systems
- To Promote Self-Evaluation Capabilities of the Ministries/Program Managers
- From Monitoring to In-depth Program Evaluation
- From Output-oriented to Performance-based Evaluation
- “R&D Performance Evaluation and Management Act” (2005)
Concluding Remarks
Very successful, until now

- strong control tower

- strong link with R&D budget

- competent supporting organization
Some Issues in R&D Program Evaluation

- **Issue 1.** Scope of target programs
  - Every program? Optimal program level?

- **Issue 2.** Selection of evaluators
  - Experts from industry, university, research institute?
  - Basic/engineering/social science?

- **Issue 3.** Selection of Methodology
  - No perfect (or complete) evaluation methods
  - Each method has its advantages and drawbacks
  - Most of methods to be used complementarily
Concluding remarks

Efficient and objective evaluation of national R&D programs must be a quite challenge

National Evaluation System and experience of program evaluation at the national level in Korea will be good references

But several points should be considered to enhance the effectiveness and efficiency of the R&D Programs

- When to evaluate and how to utilize the evaluation results
- Credibility of Self evaluation results
- Feedback of the evaluation result on the next year’s budget, etc
Thank you very much!