Ex Ante Portfolio Analysis of Public R&D Programs for Industrial Technologies in Korea: Practices at the ITEP

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Share of Total World R&D (2004)

- US: 35%
- Japan: 14%
- Germany: 7%
- France: 4%
- U.K.: 4%
- Other EU: 9%
- All other OECD: 7%
- China: 11%
- Other non-OECD members: 6%

Total World* R&D = U.S. $874 billion**

* World = OECD members plus Argentina, China, Romania, Israel, Russia, Singapore, Slovenia, South Africa, Taiwan

Source: AAAS (2006)
Trend of Total R&D Exp. and GERD/GDP

Source: MOST (www.most.go.kr)

$26 Billion
Trend of Public vs. Private R&D Funding

Private Share, %

Gov. Share, %

Source: MOST (www.most.go.kr)
Public R&D Exp. : $8.9 Billion (2006)

Other Agencies (Defense, Agriculture, Transportation, etc.)

MOST : Ministry of Science & Technology
OSTI : Office of Science & Technology Innovation
MOCIE : Ministry of Commerce, Industry & Energy
MIC : Ministry of Information & Communication
GRIs : Government supported Research Institutes

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

Source: Nam (2005)
Organizational Structure for Public R&D in Korea

R&D Performers
(GRIs, Firms, Universities)

Source: Nam (2005)
• Korea Institute of Industrial Technology Evaluation and Planning
  - Government-Funded Agency for R&D funding
  - Under Ministry of Commerce, Industry, and Energy (MOCIE)
  - Established in 1989
  - 5 Depts and 2 Centers
  - Approx. 160 Staffs
  - www.itep.re.kr

• Industrial Technology R&D Programs
  - Plan/ Design Program Structures
  - Implement R&D funding
  - Monitor / Follow-Up R&D Projects
  - Evaluate Program Performance
  - Also, Manage SMEs’ Innovation Technology Program
Industrial Technology R&D Programs

- Provide Funding for Generic Industrial Technology R&D
- Collects ‘Payback’ (20% - 40% of Gov’t Funding) only if Succeed

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<th>Mid &amp; Long Term</th>
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<td>• Mid Term Strategic Tech.</td>
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<td>• Next Generation New Tech.</td>
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<td>• International Joint R&amp;D</td>
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Source: Park (2006)
Types of Industrial Technology R&D Programs

- Mid & Long-term, 35.6%
- Strategic Industries, 31.2%
- Strategic Technologies, 3.2%
- Regional Balance, 15.1%
- Short-term, 14.9%

Total: $1.1 B in FY 2006
Mid & Long-term R&D Programs

• Mid-term Strategic Tech. Program
  - Develop Complex System and/or Core Techs for Generic Use
  - Focus on Competitiveness of the Current Core Industries
  - Maximum 5 years in two stages
  - $2 million / year

• Growth Engine Tech. Program
  - Focus on 10 Strategic Areas that can Further Technological Frontiers
  - Multiagency Initiative
  - Maximum 5 years in two stages
  - $2 million / year

• Next Generation New Tech. Program
  - Develop New Tech. in New Industrial Fields
  - Large Potential Technological & Economical Impacts
  - Maximum 7 years in three stages
  - $2 million / year
“Research Planning”

• Ex Ante Portfolio Analysis at Program Level
  - A Review Process to Identify Proper Techs for R&D
  - Focus on All Mid & Long-term R&D Programs
  - Relatively Large Scale R&D ($2 million / year for 5 ~ 7 years)
  - Purports to Reduce Selection Errors & Research Risks
  - Criteria : Industrial Demands & Strategic Concerns

• Tech. Demand Survey
  - Solicit Tech. Demands Proposals
  - Identifies High Demand Industrial Techs for Further Analyses

• ‘Research Planning’ Analyses
  - Industrial Trend Analysis
  - Technology Analysis
  - Patent Analysis
  - Economic Impact Analysis

• Review of ‘Research Planning’ Results
  - A Comprehensive Committee Review at ITEP
“Research Planning” Processes

1. Tech. Demand Survey
   - Relevance
   - Appropriateness
   - Tech Impacts
   - Economic Impacts

2. ‘Research Planning’ Analyses
   - Tech Analysis
   - Industrial Analysis
   - Patent Analysis
   - Economic Impact Analysis

3. Review of 'Research Planning' Results
   - Appropriateness of ‘Research Planning’
   - Technological Excellence
   - Business Excellence

4. Selection of R&D Consortia
   - R&D Consortia
   - Committee Review
   - R&D Excellence
   - Performers’ Capability

Source: Nam (2005)
Technology Demand Survey

- **Solicitation**
  - Prepare Background Data on Tech. Demands, Trends, & Roadmaps
  - Solicit Proposals widely from Univ., GRIs, Industrial Firms
  - 2 ~ 3 pages of Proposals

- **Selection Criteria**
  - Relevance to Program Purposes (30%)
  - Appropriateness of Research Planning (30%)
  - Technological Impacts (20%)
  - Economic Impacts (20%)

- **Review Committee**
  - Identify High Demand Techs for ‘Research Planning’ Analyses
  - Based on Review Results and Budget Limits
  - Selection Rate : less than 10%
‘Research Planning’ Analyses I

• Solicit ‘Research Planning’ Analyses
  - Any type of Entity (Univ., GRIs, Firms) can Apply
  - Acting Committee comprised of 10 experts from Univ., GRIs, and Firms (at least 5 Industrial Experts)
  - Duration: Two Months
  - Cost: approx. $15 K

• Technology Analysis
  - Define Technological Characteristics
  - Estimate Current Technological Status
  - World Technological Environments
  - Technological Impacts of Proposed R&D

• Industrial Analysis
  - Define Industrial Characteristics
  - Estimate Current Industrial Status in World Market
  - World Industrial Environments
  - Industrial Impacts of Proposed R&D
‘Research Planning’ Analyses II

• **Patent Analysis**
  - KIPRIS (Korea Industrial Property Rights Information Service)
  - Acting Committee provides Keywords
  - Search Worldwide Patents as well as Korean Patents
  - Tech Trends and Competitiveness Analysis
  - Create Patent Map
  - Suggest specific R&D foci

• **Economic Impact Analysis**
  - KTTC (Korea Technology Transfer Center)
  - Acting Committee Defines Proposed Tech. & Industrial Characteristics
  - Review & Forecast of Market Trends
  - Review of Commercialization Plan
  - Analyze Tech. Values (NPV, BC Ratio, Export, Import, Cost Saving, Job Creation, etc.)
Review of ‘Research Planning’ Analyses

- **A Comprehensive Review of ‘Research Planning’ Results**
  - In-House Review at ITEP
  - 12 Committees across 12 Tech Areas
  - Committee Members from Academy, GRIs, and Industries
  - Encourage Industrial Participation: Over 50% from Industrial Firms
  - Tech Experts: Business Experts = 7 : 3

- **Committee Review on Technological and Economical Aspects**
  - Tech Experts focus on Technological aspect of ‘Research Planning’ Results
  - Business Experts focus on Economical aspect of ‘Research Planning’ Results

- **Review Criteria**
  - ‘Research Planning’ Results (20% or 30%)
  - Technological Excellence (50%)
  - Business Excellence (20% or 30%)
Selection of R&D Consortium

• Solicitation of R&D Projects
  - Solicit Joint R&D Projects based on ‘Research Planning’ Results
  - Encourage Research Collaboration – All R&D Projects are conducted by Consortia
  - One Coordinating Body + Multiple R&D Performer + Multiple Subcontractors

• ITEP Screening
  - Preview of Administrative Requirements (e.g., Relevance, Eligibility, Funding Overlap, Background Credit Investigation, Restrictions, etc.)
  - Favorable to SMEs, Int’l Collaboration, & New Participation
  - Form A Selection Committee for each R&D Project
  - 7 Experts (at least 1 Business Expert, Over 50% Experts from Industrial Firms) at each Selection Committee

• Selection Criteria & Grading Ratio
  - R&D Excellence (60%)
  - Performers’ Capability (40%)
  - Overall Project Scheme (30%) + Individual Tasks (70%)

• Select R&D Consortium
  - Final Selection done by Coordinating Committee at MOCIE
  - One Time Appeal is Allowed
Contributions

**Transparency (Objectivity)**
- Improve Transparency (Objectivity) in Project Selection Process to a Greater Extent
- Three-layers of Committee Reviews
- Quantitative Analyses (KIPRIS & KTTC)

**Demand Pull R&D Programs**
- Strategic Selection based on Industrial Demands
- Tech. Demand Survey
- Active Industrial Participation (Over 50% from Industrial Firms)

**Outreach to Industry**
- Wide Open Access Channels to/from Industrial Firms
- Effective Delivery of Government Policy (Strategy)
- Policy Development based on Industrial Demands
Challenges

• Excessive Committee Review but Small Pool of Experts
  - Committee Review at Each Stage
  - After Excluding Experts in Conflict-of-Interests, the Remaining Pool is too Small
  - May Systematically Exclude Innovative R&D Ideas

• Time and Budget for ‘Research Planning’ Analyses
  - Two Months are Sufficient or Not?
  - $15 K is Enough or Not?

• No Systematic Portfolio Analysis on Technical Areas
  - “Research Planning” focuses on Specific Techs for R&D within each Technical Area
  - Allocation among Technical Areas is remained under Policy Decision

• Effectiveness of “Research Planning”
  - Not Yet Sure How Effective the “Research Planning” is for Better R&D Performance
  - Proposed Policy Evaluation on “Research Planning”
  - Need More Years to Evaluate – Only 5 Years of Operation
  - With What Evaluation Methodologies?