Transformation of Innovation Systems and Governance in Korea: Toward a Horizontal Policy Regime

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Yoo Soo Hong

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Contents

1. Introduction

- The Korean innovation policy system in the past and present is hardly regarded as one based on the concept of horizontal innovation policy.

- Rather, it is characterized by a strong hierarchical structure in decision-making. Although the system was relatively successful in mobilizing resources in the past, recently the system has been severely criticized to be inefficient for the new era of knowledge-based economy, where innovation is the most important factor.

- Korea is facing a serious challenge: Creating a new governance scheme for more efficient and democratic science, technology and innovation policy.

- The system needs substantial reforms **towards a horizontal innovation policy system** in which genuine cooperation and coordination among branches of the government and the general public's participation in the policy formulation are incorporated.

- The new administration, so-called "Participatory Government"has been formulating a grand strategy for reforming the Korean NIS in terms of structure, resource allocation, and balanced regional development.

- Although the strategy has not been formalized yet, the main framework has been formulated. This paper introduces the background, basic directions, measures and initiatives for the new NIS and management.

2. Historical development

Development of Industry and Technology Policy

	Industrial Development	Technology Development	Highlight
1960s	**- Develop import-substitution industries - Expand export-oriented light industries -Support producer goods industries**	**- Strengthen S&T education - Deepen scientific and technological infrastructure - Promote foreign technology imports**	**1960: $79/capita Labor**
1970s	**-Expand heavy and chemical industries - Shift emphasis from capital import to technology import - Strengthen export-oriented industrial competitivenes.**	**- Expand technical training - Improve institutional mechanism for adapting imported technology - Promote research applicable to industrial needs**	**1970: $253/capita Labor and Capital**

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	Industrial Development	Technology Development	Highlight
1980s	- Transform industrial structure to one of comparative advantage - Expand technology-intensive industry - Encourage manpower development and improve productivity of industries	- Develop and acquire top-level scientists and engineers - Perform national R&D projects efficiently - Promote industrial technology development	1980:$1,655/capita Capital and Technology
1990s	- Promote industrial restructuring and technical innovation - Promote efficient use of human and other resources - Improve information networks	- Reinforce national R&D projects - Strengthen demand-oriented technology development system - Institutional reforms	1990:$5,890/capita Technology and Innovation
2000-2003	- Move towards High tech and high value-added industries - Develop IT industry - Search the next generation	- Strengthen national and regional innovation systems - Internationalize R&D systems and information networks - R&D increase in IT, BT, NT,	2000: $9,823/capita Innovation and KBE

History of Government R&D Programs

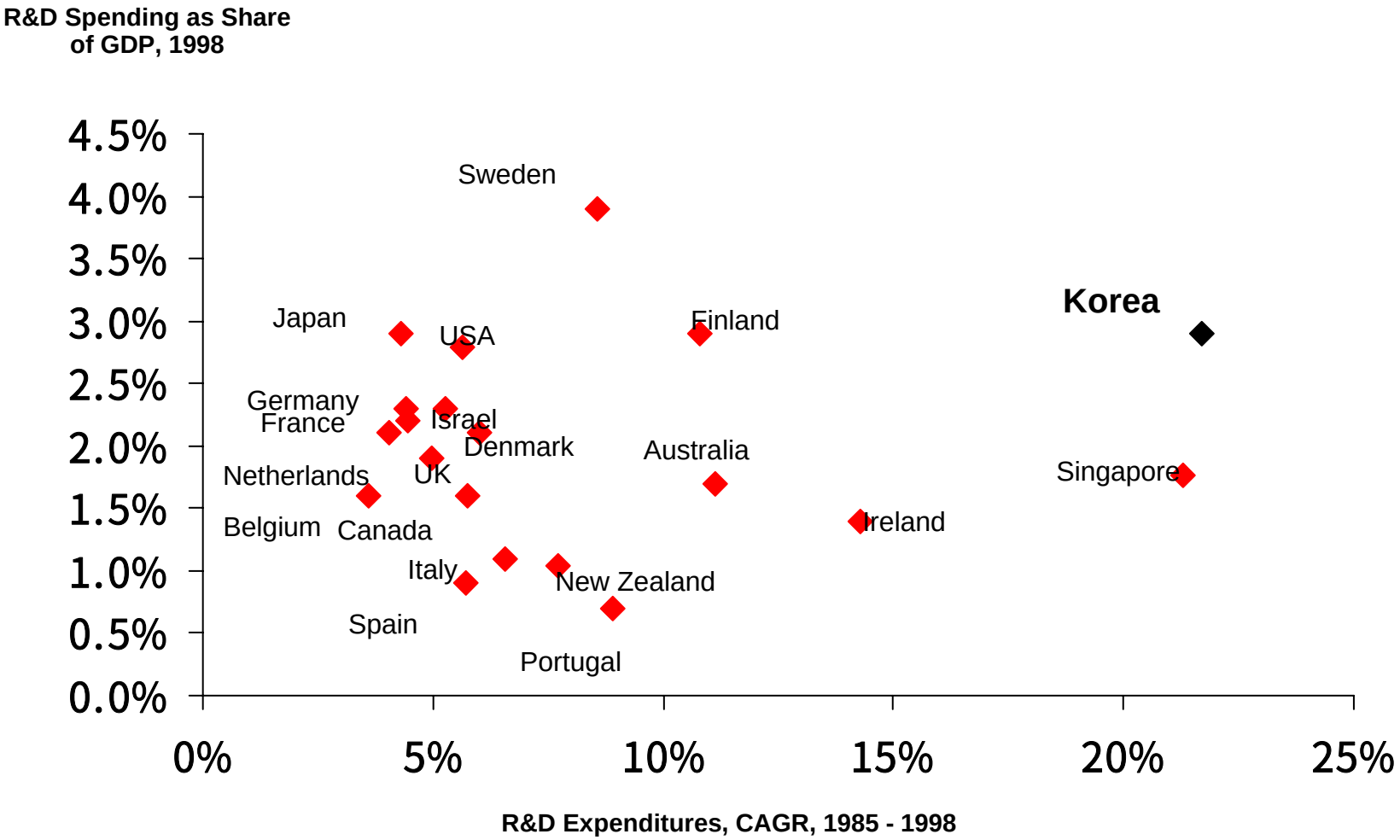
Decade	Emphasis and Initiatives	Remarks
1960 Infant Stage of ST Policy	- Imports of foreign technology - Laws for ST promotion - Established MOST, KIST, etc.	R&D/GDP = 0.3%
1970 Building Institutions	- Imitation and reverse engineering - Laws for R&D promotion - Established 16 GRIs	R&D/GDP = 0.4~0.8% Public : Private = 50 : 50
1980 National R&D Program	- Development of indigenous technology - Started National R&D program - Promotion of private sector's laboratories	R&D/GDP = 0.8~2% Public : Private = 20 : 80
1990 Diversification of Gov't R&D	- Development of high-tech - Promotion of university research - Started Highly Advanced National (HAN) Project	R&D/GDP = 2~3%
2000 Elaboration of Gov't R&D	- Development of knowledge-base economy - Started Creative Research program, National Research Laboratory Program, The 21st Century Frontier Program, etc.	R&D/GDP = 3~5%

Overall R&D Resources in Korea

		Unit	1998	2000	2002
Gross R&D Fund	GDP	$mil	317,079	461,519	496,819
	R&D Investment	$mil	8,089	12,245	14,433
	R&D Investment/GDP	%	2.55	2.65	2.91
R&D Source	Government & Public	$mil	2,178	3,052	3,787
	Private Funds	$mil	5,911	9,913	10,644
	Government: Private	%	27:73	25:75	26:74
R&D Allocation	Basic Research	$mil	1,131	1,544	1,977
	Applied Research	$mil	2,032	2,980	3,135
	Development Research	%	4,926	7,721	9,321
Resear-cher	Total Researchers	people	92,541	108,370	141,917
	Researchers/10,000 people (FTE)	people	20.0	23.1	29.8
R&D Fund/Researcher (FTE)		$	87,410	112,993	101,700

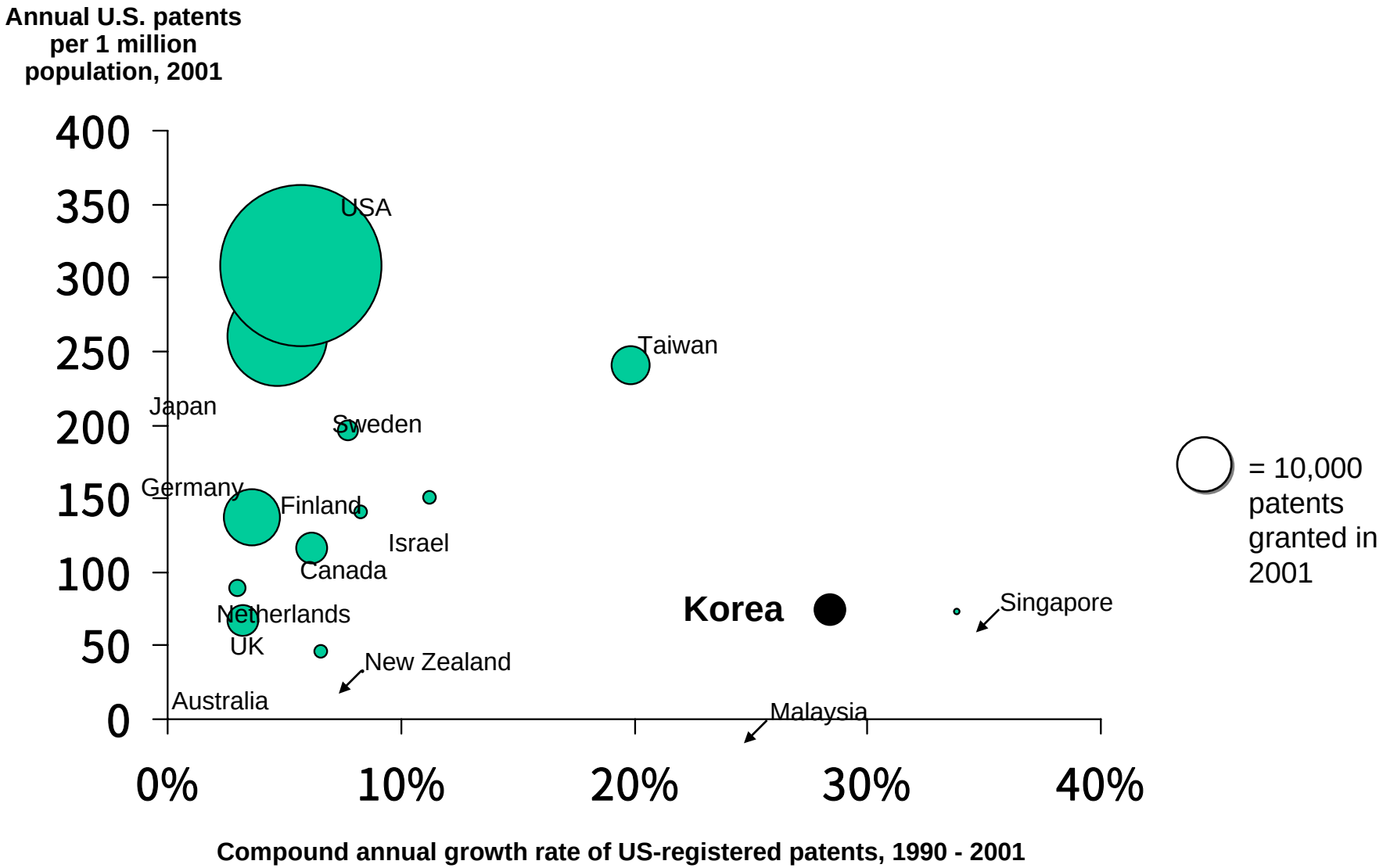
Source: Ministry of Science and Technology (MOST)

Korea's R&D Relative to Other Countries



Source: OECD Science, Technology and Industry Scoreboard 2001.

Korea's Patent Performance



Source: US Patent and Trademark Office (www.uspto.gov). Author's analysis.

National Innovative Capacity Rankings (2002)

Country	Innovative Capacity Rank	Innovative Capacity Index	S&E Rank	Inn. Policy Rank	Cluster Innovation Rank	Linkages Rank	Comp. Rank
United States	1	31.0	4	7	1	1	1
United Kingdom	2	29.7	15	10	2	2	2
Finland	3	29.1	8	4	5	3	9
Japan	5	28.3	2	13	6	17	7
Taiwan	8	27.8	16	5	4	15	14
Singapore	10	27.6	17	1	12	22	10
France	13	27.1	14	15	18	10	11
Australia	17	26.6	9	9	15	18	22
Italy	21	26.0	37	38	3	20	16
Korea	22	25.9	23	20	10	25	21
Spain	23	24.9	30	25	22	23	23
China	36	21.9	43	26	30	42	38

3. Current Innovation System

1) Main Characteristics of the NIS

– Korea is facing the challenge of transforming its current imitation and catch-up-oriented national innovation system to one that is innovation-oriented.

– The private sector in general is still concentrating on the rapid commercialization of outside technologies and imitating global front-runners. The private sector's R&D share of the national total was 74 percent in 2002, a proportion much higher than the OECD average.

– The Korean national innovation system has often been criticized for inefficiency. The output of the system, whether measured by patents, academic papers or otherwise, usually relatively low compared to inputs than the OECD average. Not only the private sector but also universities and public research institutes have problems and shortcomings due to a low level of knowledge creation or basic research.

– The share of the private business sector has steadily increased whereas that of research institutes has decreased.
This reflects more **active R&D role of the private sector.**

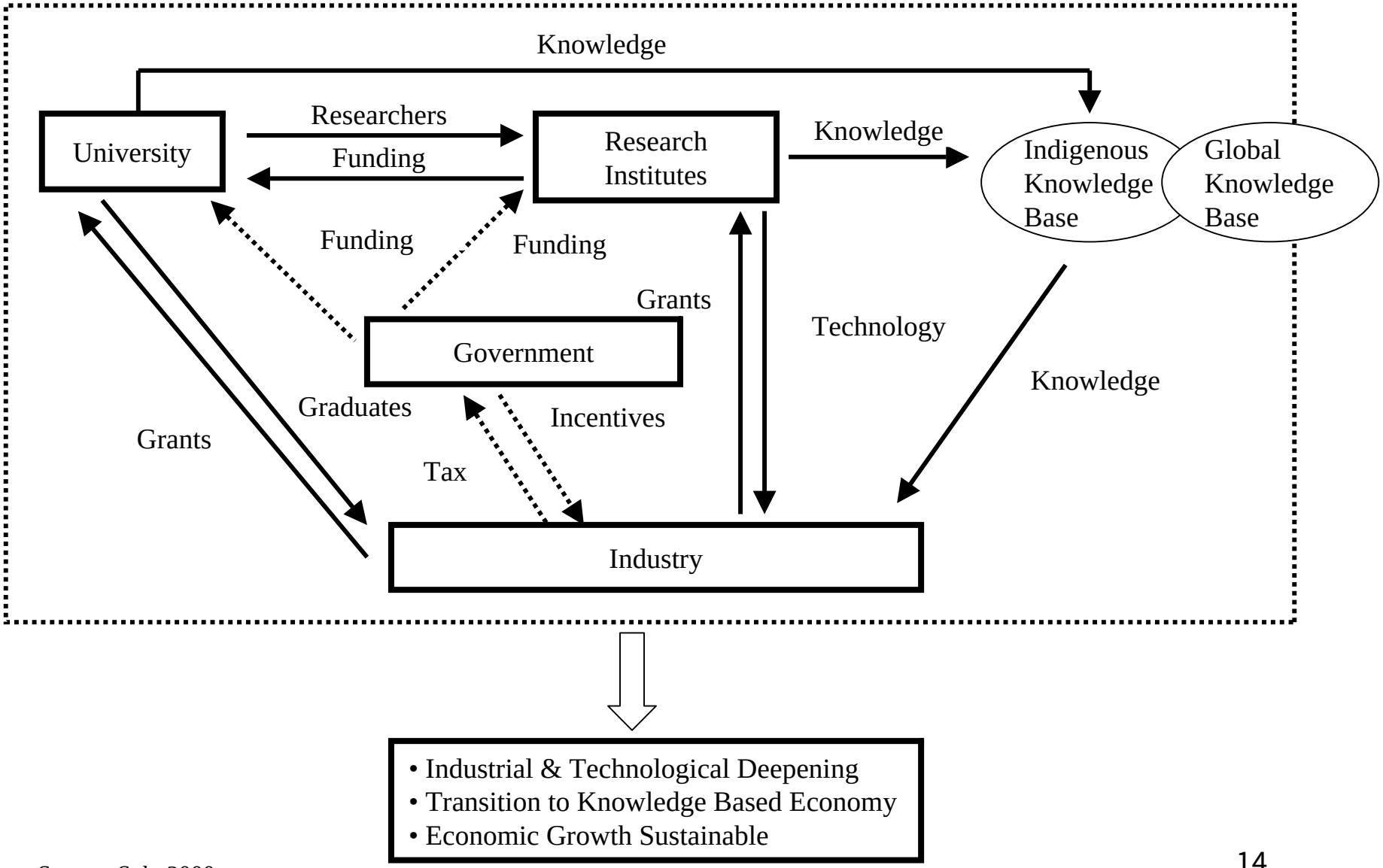
Overall R&D Expenditures by Organization in Korea in 2002

(Unit: $mil.)

	1998	1999	2000	2001	2002	Share (%)
Private Company	5,689	7,159	9,062	9,507	10,809	74.9
University	903	1,204	1,381	1,299	1,497	10.4
Research Institute	1,497	1,665	1,797	1,673	2,127	14.7
Total	8,089	10,028	12,245	12,479	14,433	100.0

Source: MOST

National Innovation System in Korea



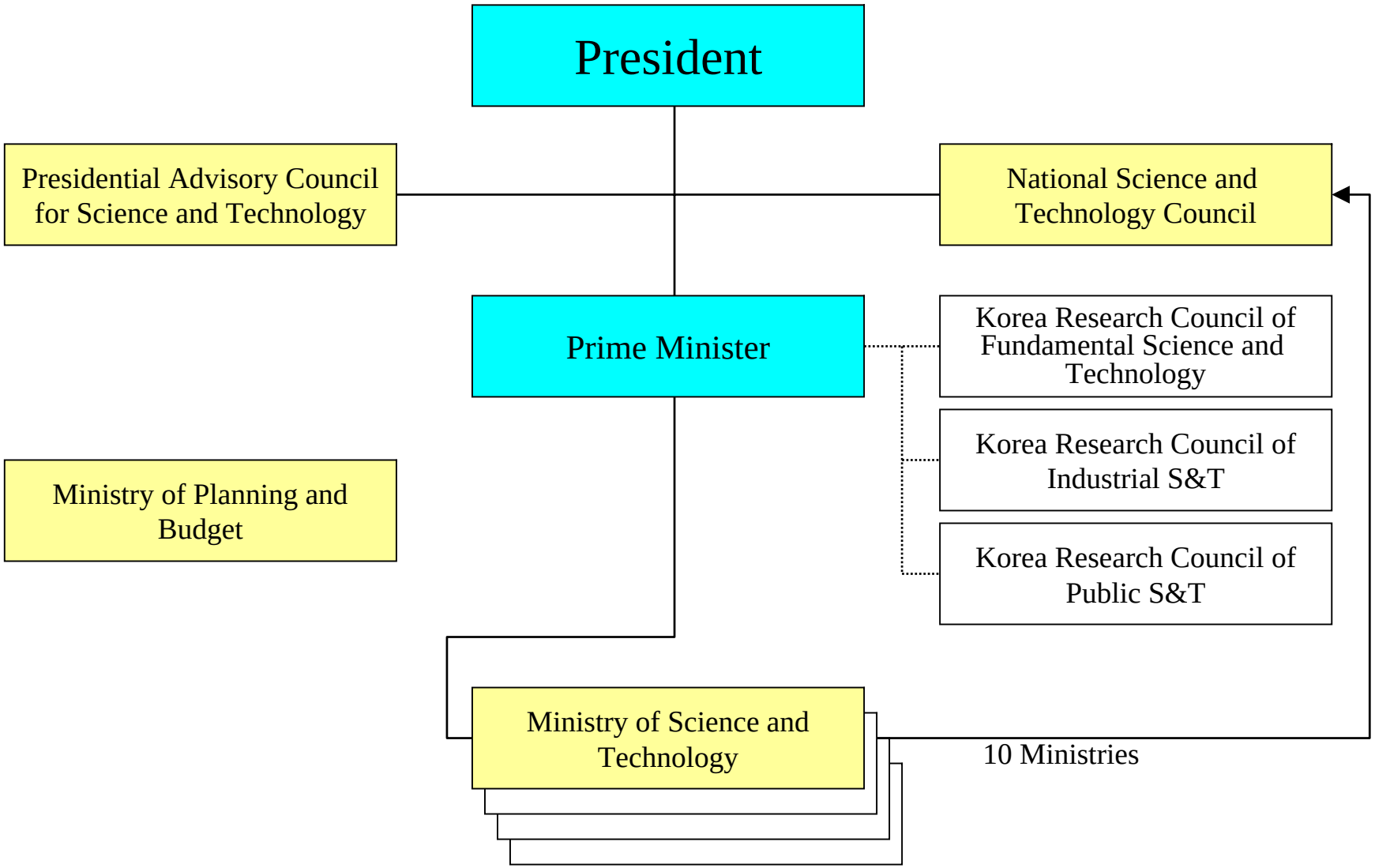
Source: Suh. 2000

2) STI Administration System in Korea

– There are three organizations undertaking ST coordinating function in different ways: the National Science and Technology Council (NSTC), the Presidential Advisory Council for Science and Technology(PACST) and the Ministry of Planning and Budget. The NSTC consists of 10 ministers and is chaired by the President. The Ministry of Science and Technology serves as the secretariat of the council. The main function of the council is short-term and long-term policy coordination, while its member ministries are in charge of implementation.

– The role of the Presidential Advisory Council for Science Technology is to recommend long-term science, technology and innovation strategies to the president. The ministry of Planning and Budget allocates the yearly budget for R&D and related activities in the public sector, as well as for supporting the private sector.

STI Administration System in Korea

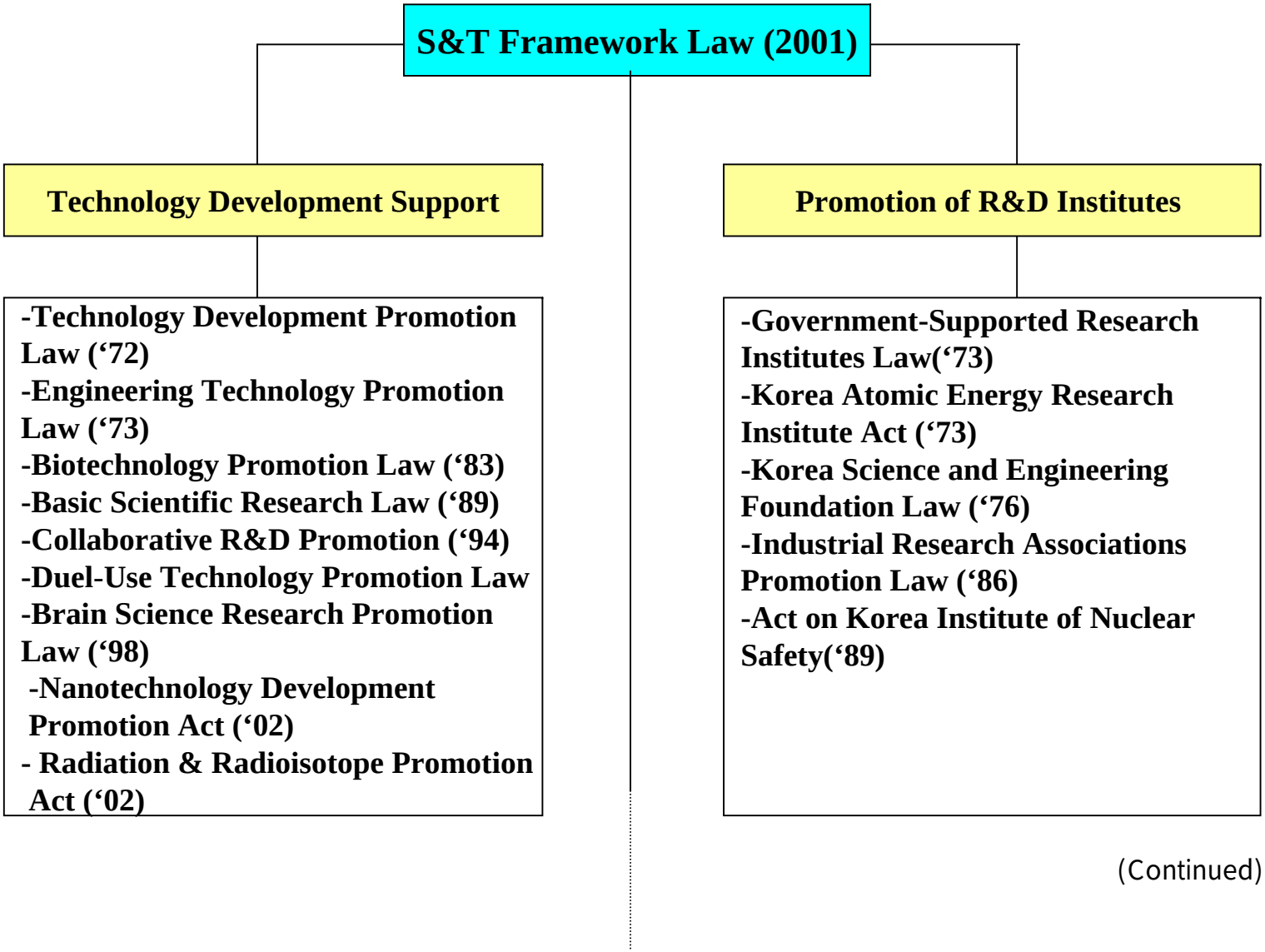


3) Laws and Institutions

- The Science and Technology Framework Law, enacted in 2001, is the most influential and comprehensive law, as indicated by its title. It provides an institutional framework to govern all the rules and regulations on science, technology and innovation. Other laws can be grouped into five areas: Technology development support; promotion of R&D institutes; nuclear and energy; improving manpower; and others.

- There is a complicated set of laws and regulations for science, technology and innovation. This fact may reflect the government's active role and leadership, but, at the same time, it may indicate duplications and authoritative intervention. Indeed, excessive regulations and duplications of R&D programs are problematic.

Laws for STI in Korea



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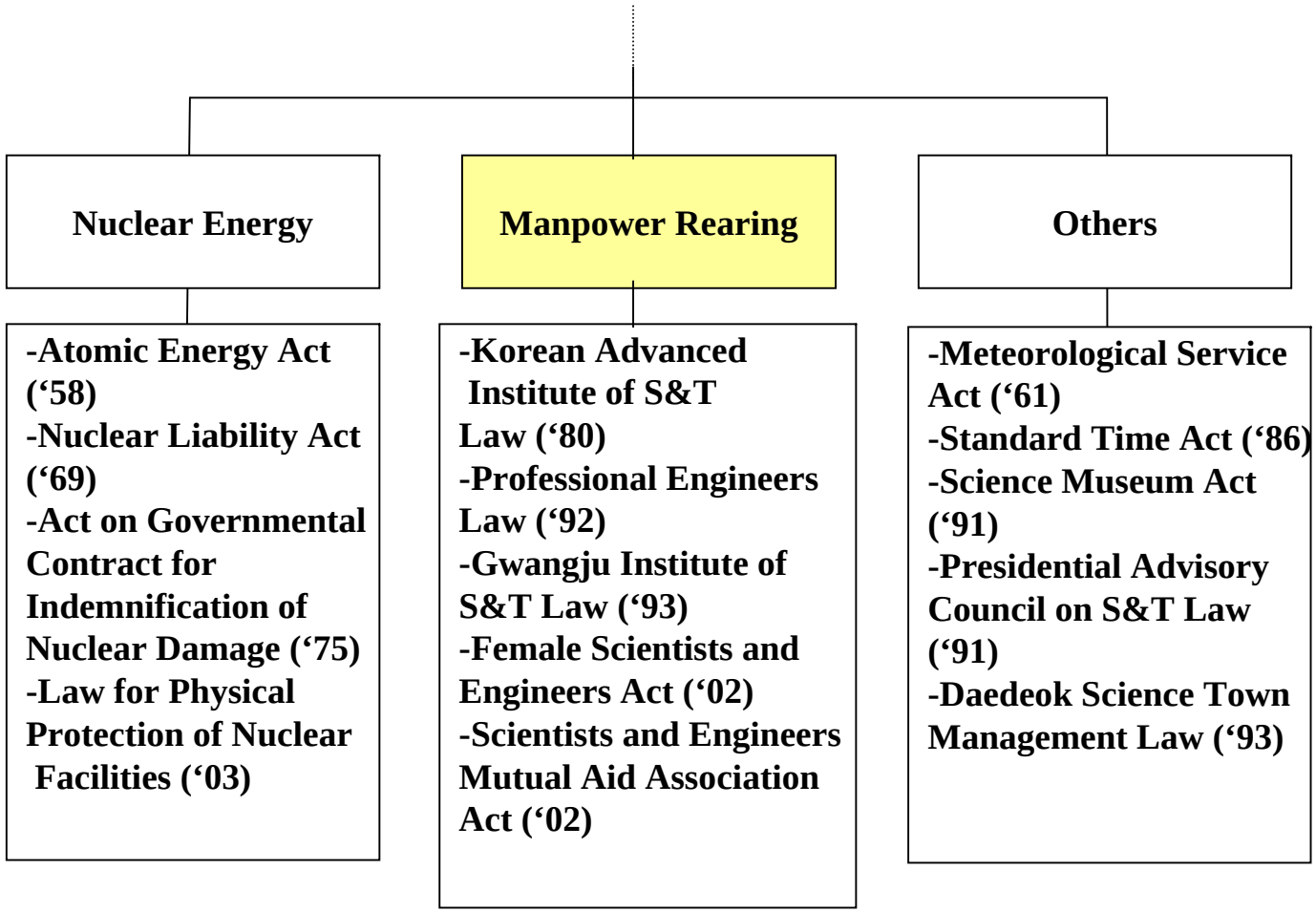


Note: Figures in parentheses are the years the listed law were enacted.

Source: MOST

4) Government R&D Budget

– Although the share of the national total taken by government R&D funding has not changed significantly, the share of R&D budget of the total government budget, in fact, has steady increased.
– R&D investment by the private sector has increased more rapidly even though the government has tried to allocate a larger portion of its budget to R&D activities.

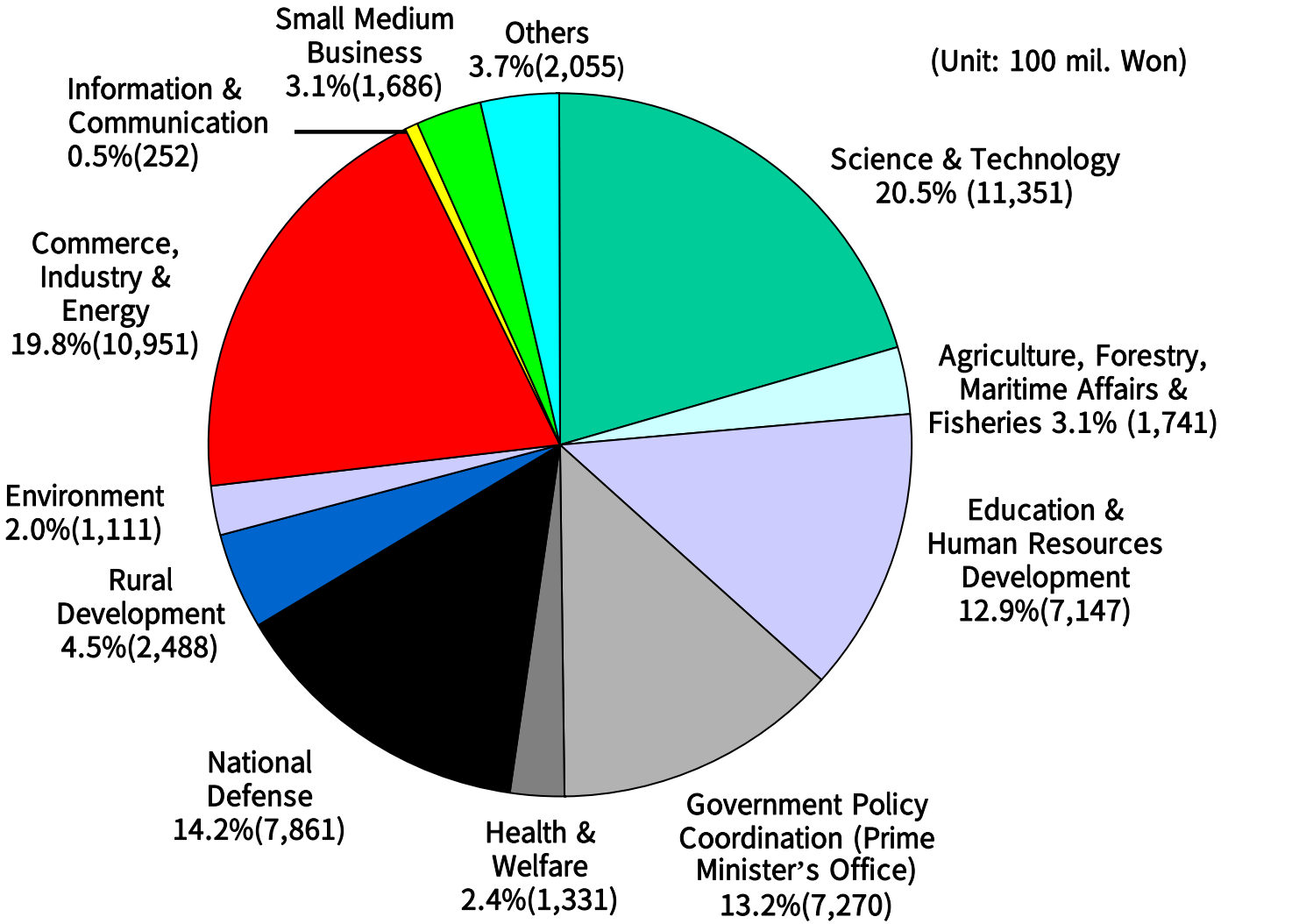
Government R&D Budget in Korea (Unit: $mil.)

	1998	1999	2000	2001	2002
Government Budget (A)	70,393	78,461	76,825	91,328	94,477
R&D Budget (B)	2,581	3,187	3,307	4,128	4,490
Ratio (B/A)	3.7	4.1	4.3	4.5	4.8

Source: MOST.

National R&D Budget by Ministry (2003)

R&D budget in 2003 : 5.5 trillion won



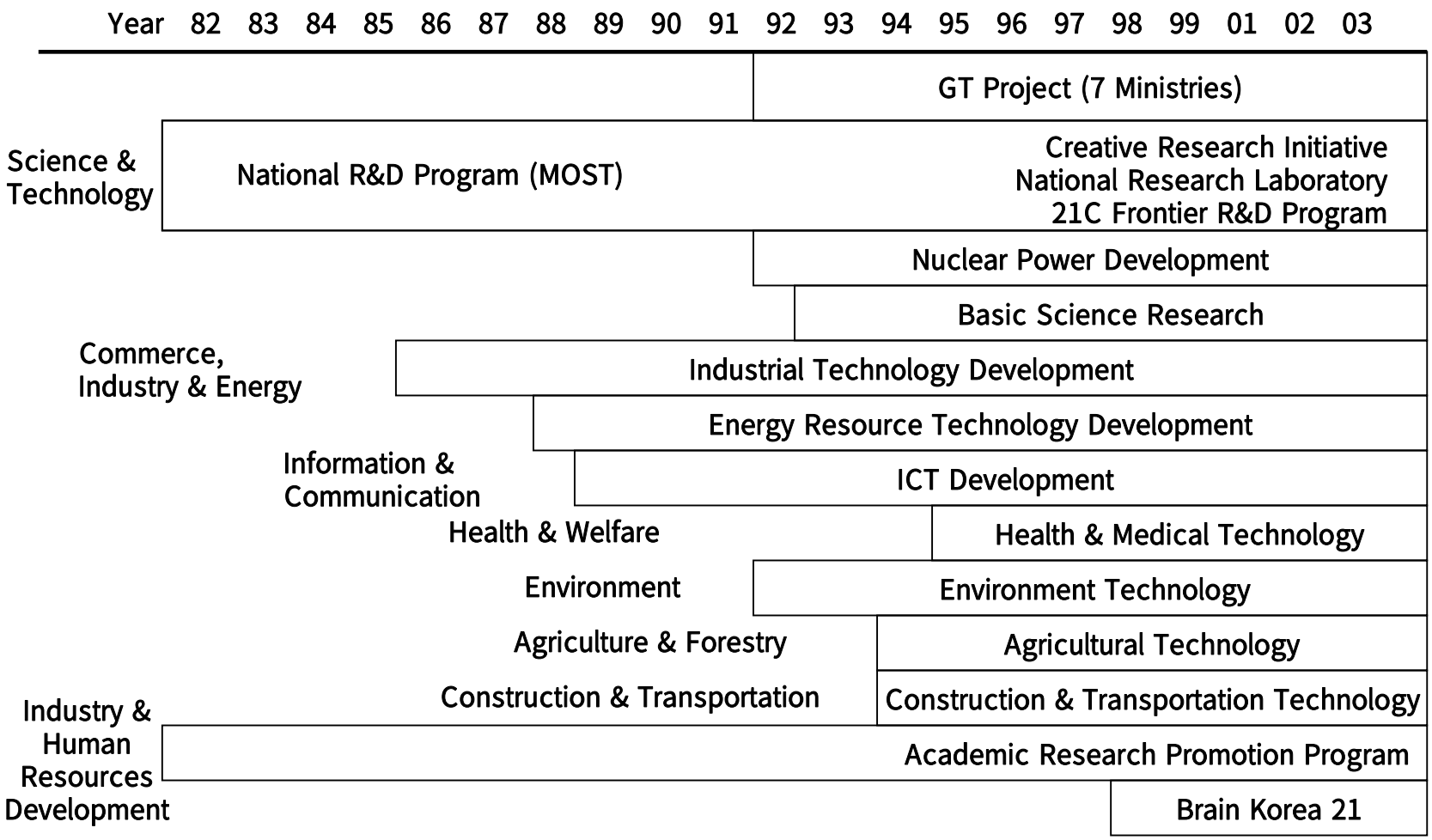
Trends in Government R&D Budget Allocation by Technology Area

(Unit: %)

	2000	2001	2002	Variation (2001-2002)
IT	15.7	14.3	15.0	17.1
BT	9.5	10.6	11.5	21.7
NT	1.2	1.3	3.2	164.0
ET	3.8	4.2	4.4	16.4
ST	2.8	3.8	3.8	12.0
Engineering	8.4	9.0	9.0	11.5
Energy	8.1	7.3	6.7	2.6
Basic Science	6.9	6.2	8.7	55.6
Material	10.3	12.6	10.3	- 9.4
Agriculture	12.3	8.9	8.7	9.8
Others	21.0	21.7	18.6	-4.5
Sum	100.0	100.0	100.0	11.5

Source: KISTEP. 2002.

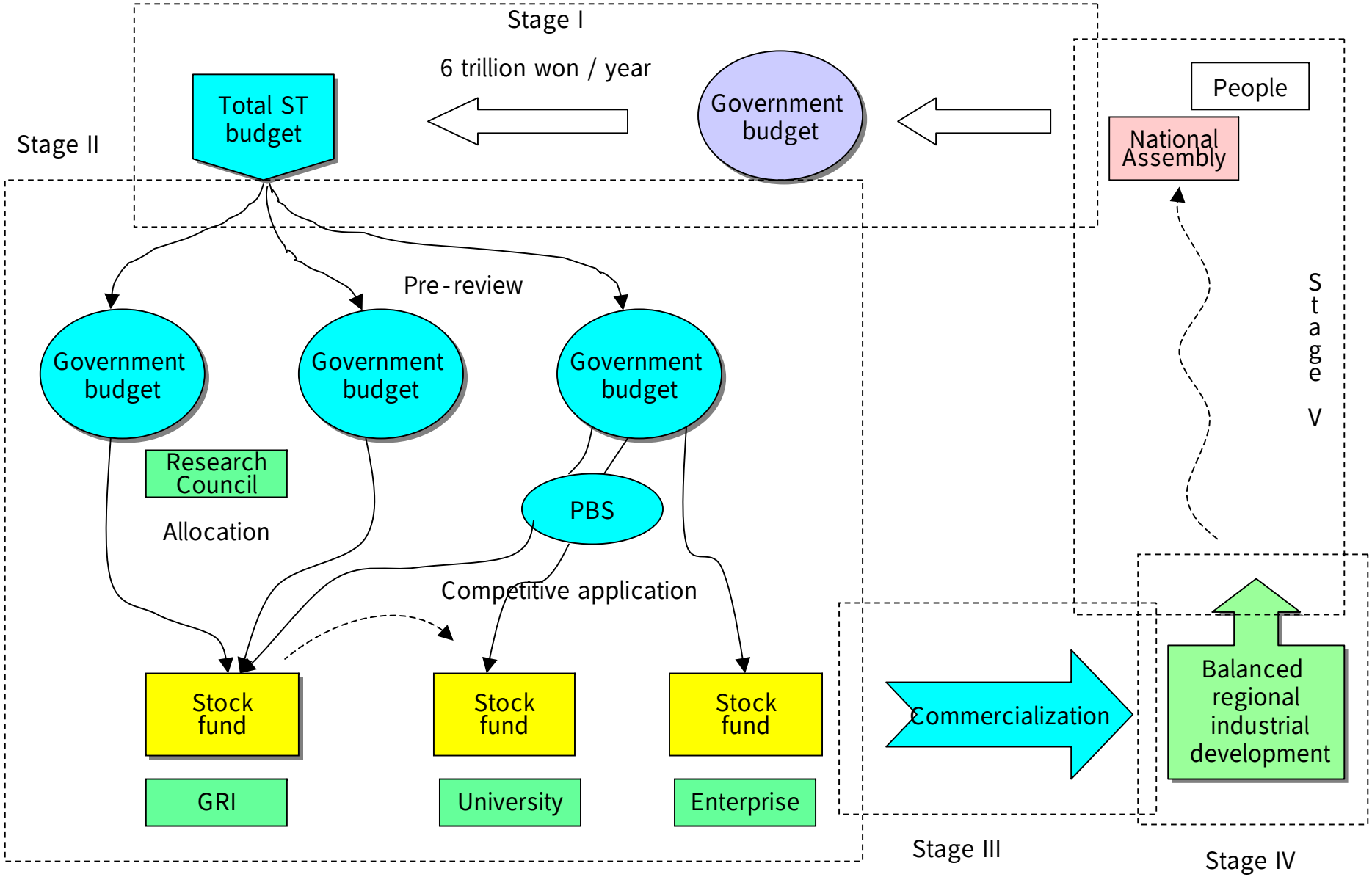
Government R&D Programs by Ministry



- Each ministry has operated own R&D programs independently. Only three R&D programs of the government are operated jointly. These are ① the G7 Project, ② the 21 Century Frontier R&D Program and ③ the Civilian and Military Dual-Purpose Technology Development Program.

- Recent drastic changes in the ST paradigm demand a fundamental change in the existing ST and R&D system. In addition, such changes as the rapid increase in the government R&D budget, increasing scale of R&D projects, increasing R&D time require further breakdown of program by area and function, differentiation of development content and nature, systemization of R&D implementation process, avoiding duplicative wastes of limited R&D resources and so on.

Flow of Government R&D Budget



Note: PBS=Project Base System

5) The Governance in Science and Technology Policy in Korea

- Strong leadership or intervention from the government and a relatively weak private sector are the main feature of the ST governance.

- The government directly or indirectly affects the major decision process of leading government-sponsored research institutes (GRIs).

- The participation of scientists, engineers and researchers (the science and technology community) in the ST policy process has been passive.

- The participation of NGOs or the public in the science and technology policy process has been almost nonexistent.

- As Korea moves toward becoming a knowledge-based economy, a new paradigm of science and technology governance is needed.

6) Problems and Shortcomings of the Korean NIS

(1) Lack of comprehensive coordination

- The fundamental problem of the Korean national innovation system is the non-existence of the function to review and coordinate national R&D programs.
- Short-sighted projects are prevailing instead of long- term strategic projects.
- Duplications and uncoordinated priority setting result in inefficient resource allocation.

(2) Weak link between ST policy and government budget

- The Ministry of Planning & Budget and the Ministry of Finance & Economy do not have sufficient manpower with the expertise for the review and allocation of the budget to highly specialized ST projects.

- Both of the two ministries deal with ST budget for each individual ministry which also does not have sufficient expertise so that efficient budget allocation are not realized.

(3) Excessive competition among ministries

- Although the government has tried to establish cooperation among ministries through such institutions as the S&T Ministrial Meeting and NSTC, effective coordination has not been realized.

- Some ministries attempt to seize hegemonic power so that duplicative research institutes and programs have been introduced by them, which has resulted in inefficient R&D investments.

- Coordination of science technology function within the government is weak, as indicated by the scattered power and division of labor within the government.

Possible Source of Duplications in S&T Policy Measures in Korea

	MOST	MOCIE	MOIC
R&D Program	MOST National R&D Program (330.2 billion won)	Industrial Technology Program (253.1 billion won)	Information and Telecommunication Technology Program (405.6 billion won)
Research Center or R&D Consortium	SRC/ERC (45) RRC (45)	Technopark (6) TIC (6)	Software Center (6)
Information Service Agency	KORDIC	KINITI	-
R&D Management Agency	KISTEP	ITEP	ITA (Institute of Information Technology Assessment)

Source: Suh. 2000

Note : Figures in parentheses are the number of organizations, unless otherwise noted.

(4) Weak function of planning and evaluation of the National R&D Program

- Monitoring and evaluation of national R&D programs are not well developed.

- Superficial evaluations prevail and participation of the private sector in the evaluation process is minimal.

(5) Problems in management of GRIs

- The system of GRIs has been changed several times in the last several decades, reflecting economic development of changes in industrial structure and demand.

- However, autonomous management of GRIs has not been realized despite government promises.

(6) Weak regional innovation systems

- Government R&D budget has allocated mainly to institutes in Seoul metropolitan area so that provincial institutes have not grown much.

- About 50 percent of the national population live in the Seoul metropolitan area. Accordingly, R&D manpower, universities, ST infrastructure and financial organizations are centered in this area.

- Competitive regional plans for technologies, techno-parks, regional innovation centers, etc. resulted in duplicative programs and many infeasible projects.

4. STI Policy and Key Policy Strategies

1) Promotion of National R&D Projects for New Growth Technologies

- To prompt the early realization of national per capita income of 20,000 dollars, the government selected 10 new-growth industries in 2003, which will increase international competitiveness and lead job creation for the next 5~10years.

- New growth industries will be promoted through developing some 80 key technologies under the coordination of National Science & Technology Council.

The Next-Generation Growth-Engine Technologies

	Product/Technology (Non-Exhaustive)
Digital TV/Broadcasting	Broadcasting system, DTV, DMB, set top box, multi-equipment
Display	LCH, LED, PDP, glass EL, electronic paper, related material
Intelligent robot	Home service robot, IT-based service robot, micro work robot, metal robot
Future automobiles	Intelligent automobile, environment-friendly automobiles
Next-generation semiconductors	Next-generation memory, SoC, nanoelectronic chips, related material
Next-generation mobile communications	4G terminal equipment/system, telematix
Intelligent home network	Home server/home gateway, home networking, intelligent information home electronics, Ubiquity computing
Digital content/software	Digital content provision use distribution system, cultural content, embedded software, Intelligent total logistics system.
Next-generation batteries	2nd batteries, fuel batteries, related material
Biomedical products	New medicine, bio-internal organs, biochips

Source: MOST

2) Development and Provision of Creative and Qualified Researchers

- Korea plans to cope actively with future demand for the development of new technologies by establishing master plans for rearing and utilizing 10,000 researchers in promising high-tech areas.

- Korea will encourage university manpower supply system more toward demand-oriented one through establishing innovative education models for colleges of science and engineering.

- More attention will be paid to strengthening science education at school curricula, training science laboratory teachers, and securing up-to-date laboratory and teaching materials. More scientists and engineers will be appointed to government offices.

3) Expansion of National R&D Investment to Strengthen potential for Growth

- R&D budget has gradually increased from 4.8% ($4.49 billion) of the total government budget in 2003 to 7% ($8.35 billion) in 2007.

4) Promotion of Basic Science and Enhancement for Creative Innovation Capabilities

- In Korea, the portion of basic research among total R&D investment is relatively low compared to that of other advanced countries.

- The portion of basic research has been continuously increasing in the government's R&D budget. The portion of basic research in government's R&D budget of $4,490 million in 2003 was 19.5%($877 million). The portion will be increased up to 25% by 2007 in basic research in order to join a group of world's top 10countries in basic science capabilities.

- Activating creative basic research projects and support joint research with the areas of human and social sciences

○ Enhancing regional science and technology research capacities through supporting researchers at local universities

○ Supporting small-sized research groups in pure science such as mathematics, physics and chemistry

○ Developing centers of excellence for basic research in universities (currently there are 30 Science Research Centers (SRC) and 36 Engineering Research Center (ERC).

Goals for Expanding Government's R&D Budget

(Unit: $billion)

	2003	2004	2005	2006	2007
Share of R&D budget in total government budget	4.8%	5.2%	5.7%	6.3%	7.0%
Total government budget (estimate)	94.48	100.15	106.16	112.52	119.27
R&D budget (estimate) (Growth rate from the previous year)	4.49 (6.9%)	5.21 (16.0%)	6.05 (16.2%)	7.09 (17.2%)	8.35 (17.8%)

Note: The figures were attained using the assumption that the government budget would increase 6 percent annually (the 2003 figures were attained using actual figures).

Source: MOST

5) Reformation of National Innovation System

- The government plans to strengthening the role and authority of the National Science & Technology Council by:

○ Monitoring and coordinating strategies for new growth technology development

○ Ensuring the results of NSTC's evaluation and coordination be reflected in budget-allocation

○ Enhancing fairness and objectivity of coordination through active participation of experts from the private sector

- Improve the system for planning, management, evaluation, and outcome diffusion of R&D projects

○ Standardizing inconsistent research management systems across ministries for the sake of researcher’s convenience

○ Enhancing the utilization of research outcomes through establishing research outcome management system, disseminating research outcome, and building consumer-oriented technology transfer system

- The government will support GRIs so that they improve their basic abilities and educate excellent research manpower and perform mid-and long-term projects in order to produce world-class research results.

6) Promotion of Regional Science and Technology

- The government is promoting following policies to improve local capabilities of innovation S&T:

○ Allocates a portion of the national R&D budget to local governments and induces local governments to invest a certain portion of their budget in S&T

○ Designates major high-tech science complexes as “National R&D Special District”.

○ Executes regional R&D cluster projects aiming to support local governments

7) Support of R&D in the Private Sector

-The Technology Development Promotion Law established in 1972 supports various kinds of private industrial research organizations, such as, industrial R&D centers, industrial technology research associations, industrial research clusters, etc.

○ As of 2002, there are 9,705 industrial R&D centers, and 65 industrial technology research associations to activate mutual cooperation in R&D.

- “Industrial Research Cluster Support Program” was initiated by the MOST in 2002. It supports small and medium scale enterprises research institutes, grouped to about 10 research clusters to identify and develop common key technologies together.

5. Agenda Setting, Prioritization and Implementation

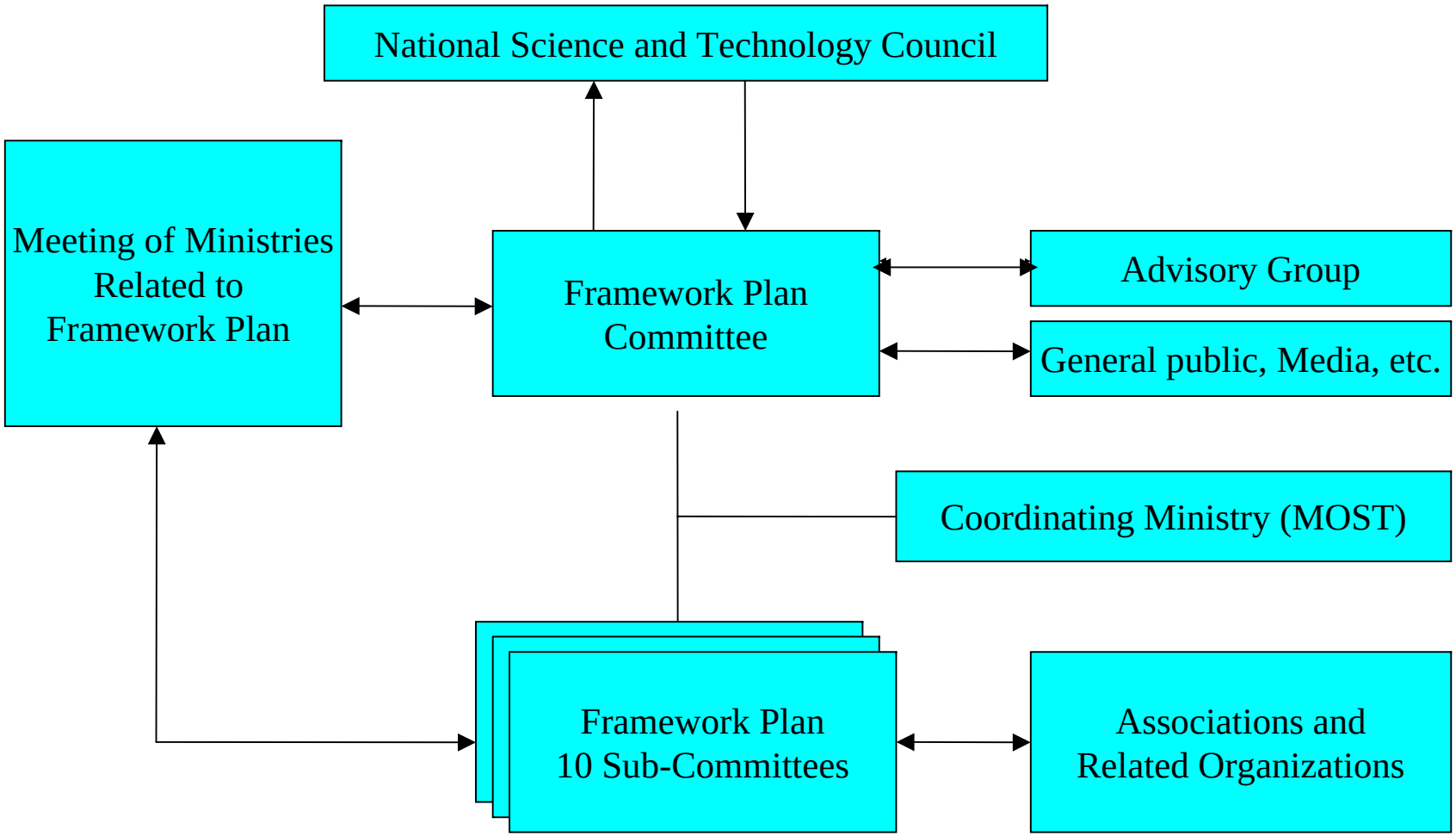
1) ST Framework Planning

- Since the introduction of the “Law of S&T Framework,” the basic direction and framework of the STI Policy in Korea have been formulated by the “Five Year ST Framework Plan”.

- The plan is formulated by a plan committee in close cooperation and feedback with ministries, advisors and experts. Thus the basic strategies, policy priorities, agenda and responsibilities are all set by the plan.

- However, since each ministry can initiate own plans which may not necessarily follow the Framework, the coherence is not guaranteed.

ST Framework Planning System

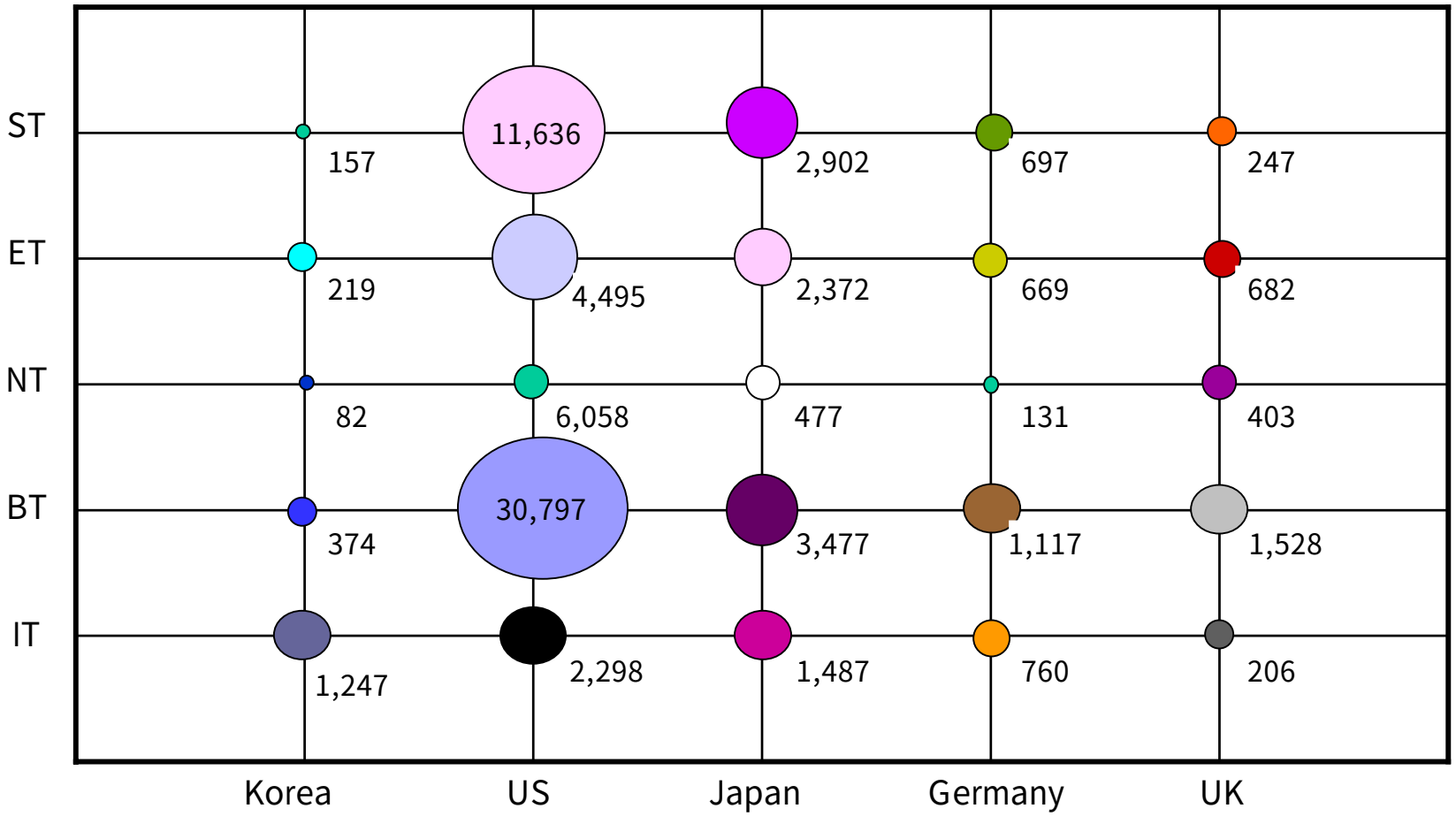


ST Policy Priorities

Tasks	Policy Objectives
Future growth engine creation	1. Selective and focused development of national strategic science and technologies
Strengthening bases	2. Promotion of basic science research for creative innovation capacity 3. Rearing ST manpower for knowledge-based society
Internationalization and localization	4. Internationalization of ST and establishing Northeast Asia R&D Hub 5. Regional STI for balanced national development
Advancement of the innovation system	6. Increasing ST investment and efficiency 7. Promotion of the private sector's technology development for industrial technology capacity 8. Strengthening infrastructure for higher ST productivity
Participation of the people in the ST process	9. Increase the role of ST in response to social demand 10. Dissemination of ST culture among the general public

Comparison of R&D Investment in 6T Areas (2001)

(Unit: bill. won)



2) Reformation of the National Innovation System

- The government plans to strengthen the role and authority of the NSTC through monitoring and coordinating strategies for developing growth-engine technology. It aims at ensuring the results of NSTC's resolution and coordination be reflected in budget-allocation and enhancing the fairness and objectivity of coordination through active participation of private sector experts.

- Other policies for the improvement of the national innovation system are:

○ Improving the efficiency of planning, technology transfer and the commercialization of national R&D projects through whole process management;

- Establishing proper planning system in which experts plan, consumers decide the direction of research projects, and the final goals are clear;

- Reducing the number of evaluations, improving the depth of evaluation and utilizing evaluation;

- Introducing a transparent evaluation system and abolishing yearly evaluation of long-term projects;

- Supporting government-sponsored research institutes to improve their basic abilities, educate excellent research manpower, and perform mid and long-term projects.

3) Restructuring

(1) Transforming the major function

- Transfer most of existing programs for applied R&D or R&D commercialization to relevant ministries

○ Machinery, Electronics, aero-technology to the ministry of Commerce, Trade and Energy (MOCIE)

- Strengthening pan-national function of planning, coordination, and evaluation by the MOST

- Big science and fusion technology programs will be continuously under the jurisdiction of the MOST

○ Basic programs such as basic science and research, strengthening science and engineering education, enhancing the people's understanding of science and technology culture

○ Big and fusion technology programs such as space, atomic power, etc.

(2) Operational improvement

- MOST will support objectively and systematically the activities of the National S&T committee and will recruit capable civilian experts to its offices as many as possible.

(3) Governance restructuring

- Elevate the authority of the Minister of Science and Technology to be a Deputy Prime Minister and the Vice Chairman of the National S&T Committee

○ Legal power is given to the MOST to coordinate other ministries.

○ The position and power of the Minister are practically strengthened through the new Government Organization Law.

- MOST will have the review and adjusting power of the government S&T budget.

- Transfer of policy coordination and infrastructure business of other ministries to the MOST improvement of Comprehensive Coordination system of the National R&D program

  ○ Efficient allocation and use of the government R&D budget in line with national development goals
  ○ Pre-coordination scheme preventing duplications

○ Strengthening strategic allocation and coordination of the government R&D budget

-New methods:

○ Reflect MOST's review opinion on the total of the of R&D budget to the Ministry of Planning and Budget in the process of budget planning

○ MOST will be endorsed the allocation of the budget to individual projects after reviewing of the total ST budget by the Ministry of Planning and Budget.

(4) Improvement of government-sponsored research institutes (GRIs)

- Purpose:
  - ○ New role as the core institution of national science and technology innovation
  - ○ Stability in GRI operation and improvement of welfare of researchers
  - ○ Linking national science and technology policy and promotion of GRI
- Autonomy of GRI
  - ○ Each Research Group will have autonomous budget allocation.
  - ○ Open research system with flexible mobility of researchers between GRIs

-Development of the Next Generation Growth Engine Core Technologies

- ○ Instead of vertical implementation, horizontal implementation scheme is being developed under the leadership and new role of the MOST.
- ○ Linking existing major national R&D projects and the Next Generation Growth Engine projects

-Joint Implementation System

- ○ Under the National S&T Committee, “ the Next Generation Growth Engine Implementation Special Committee” is established to coordinate all the involved ministries.
- ○ Civilian participation in the decision making will be encouraged.

6. Coordination of Policy Formulation and Implementation

1) Enhanced Role of the MOST as the Coordinator of the STI policies

- In 2004 the administration announced the MOST will be endorsed the function of coordination of major STI policies of the government and the Minister will be a deputy prime minister.

- Accordingly, the jurisdictions and missions of the Ministry of Commerce, Industry and Energy, and the Ministry of Information and Communication will be changed, too.

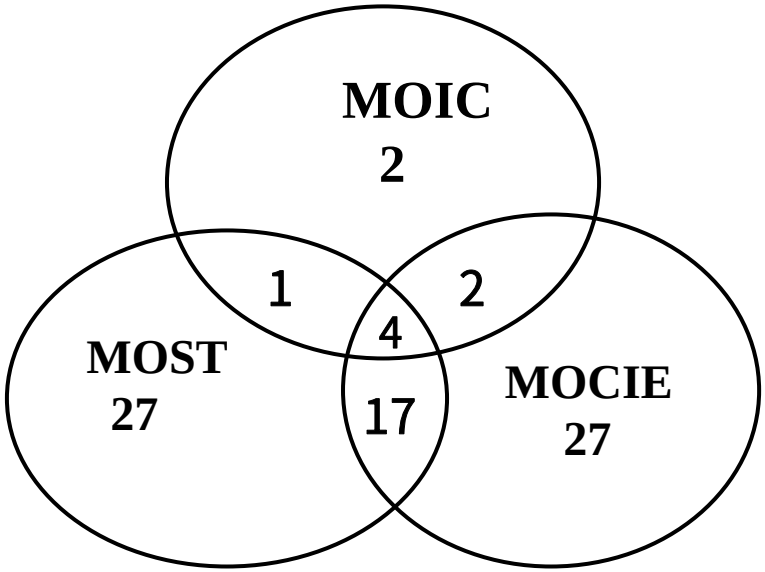
2) Example of the coordination problem: Problems of the Next Growth Engines

- It is not necessary to follow the decision made by incomplete negotiations among ministries due to unclear definitions in technology areas, there is ample room for each ministry to interpret the result of the selection according to their own justification and interests.

- There has been criticism on the intervention of the Presidential Advisory Council for S&T in this case, since it is the role of the National Science and Technology Council to coordinate such a case.

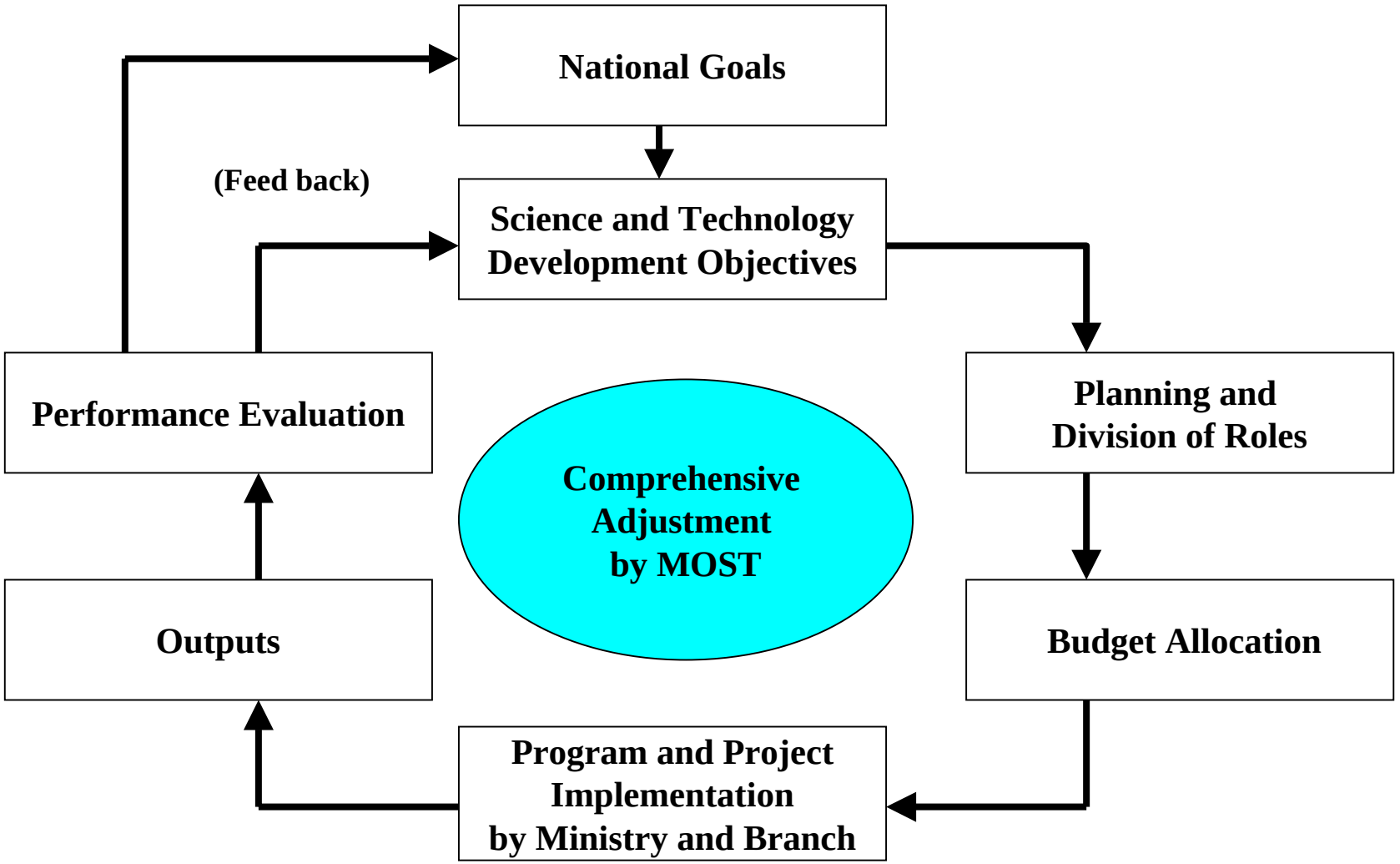
- Too many ‘engines’ for growth will limit the outcomes of research.

Distribution of 80 Items for the Next-Generation Growth Project among Ministries



Note: Figures indicate the number of projects.
MOIC = Ministry of Information and Communication
MOST = Ministry of Science and Technology
MOCIE = Ministry of Commerce, Industry and Energy

Basic Scheme for the New NIS



3) Innovating the NIS and governance

(1) Basic Direction

- For realizing the Science- and Technology- Driven Society

○ A system for successful new growth engine, based on science and technology

○ Integration of science, technology and innovation, HRD and industrial technology policy

(2) Basic Plan of the MOST for the new NIS

- Emphases of the Plan

○ Efficient implementation of the national science and technology agenda

○ Science and technology back up of best performance to fulfill national goals

(3) New Evaluation Model

- In order to enhance R&D efficiency, various methods for evaluation of R&D performance and results are in discussion.

- Of these, the “Law on R&D Performance Evaluation” is studied by the Ministry of Science Technology aims at providing a common method to evaluate all the R&D results of 19 ministries.

- Ministries of Commerce, Industry and Energy introduced a new model for evaluation to invite NGOs in the process of R&D performance evaluation under its own jurisdiction.

(4) Civilian Participation

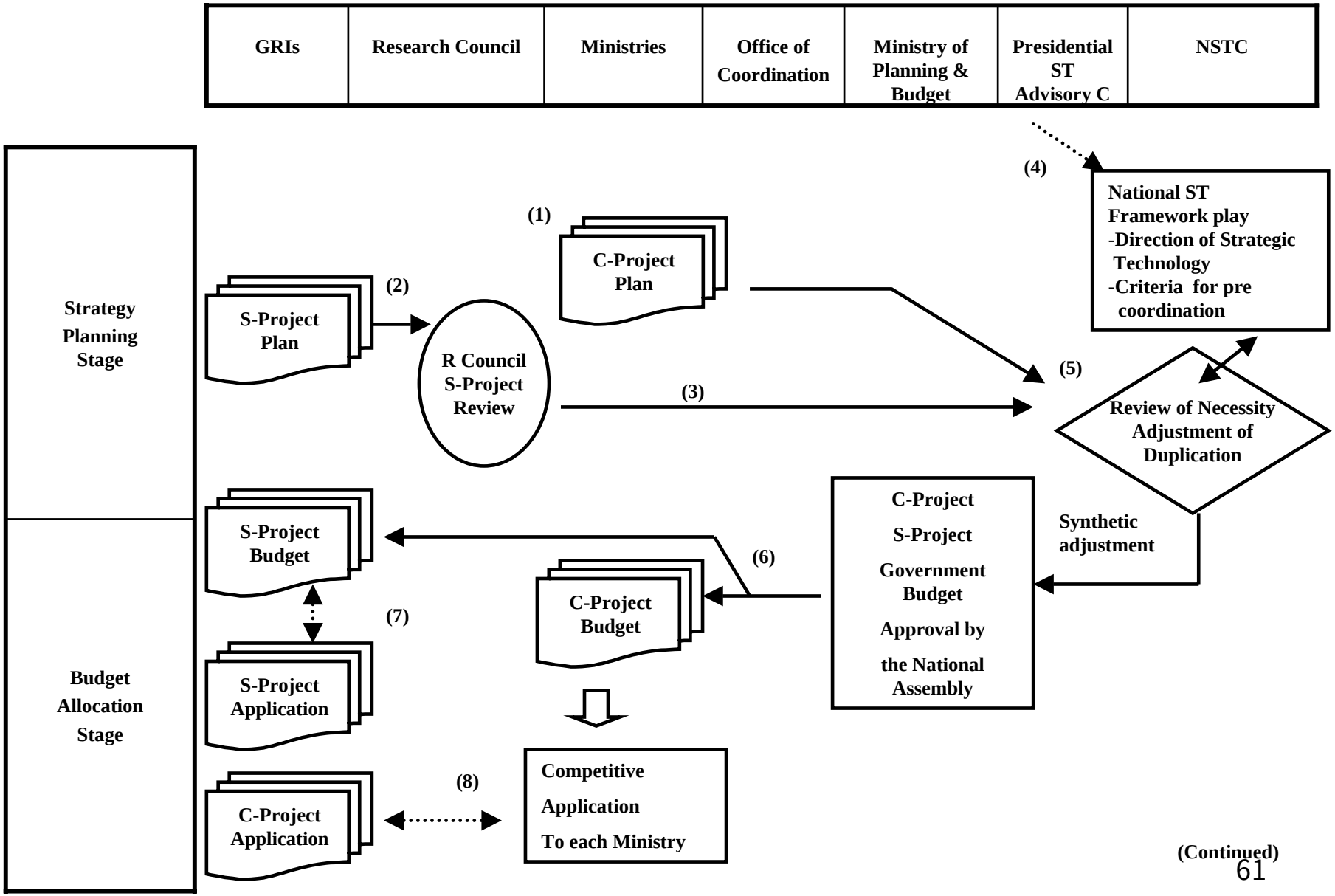
- Participation of civilians in the process of policy making and evaluation has been limited.

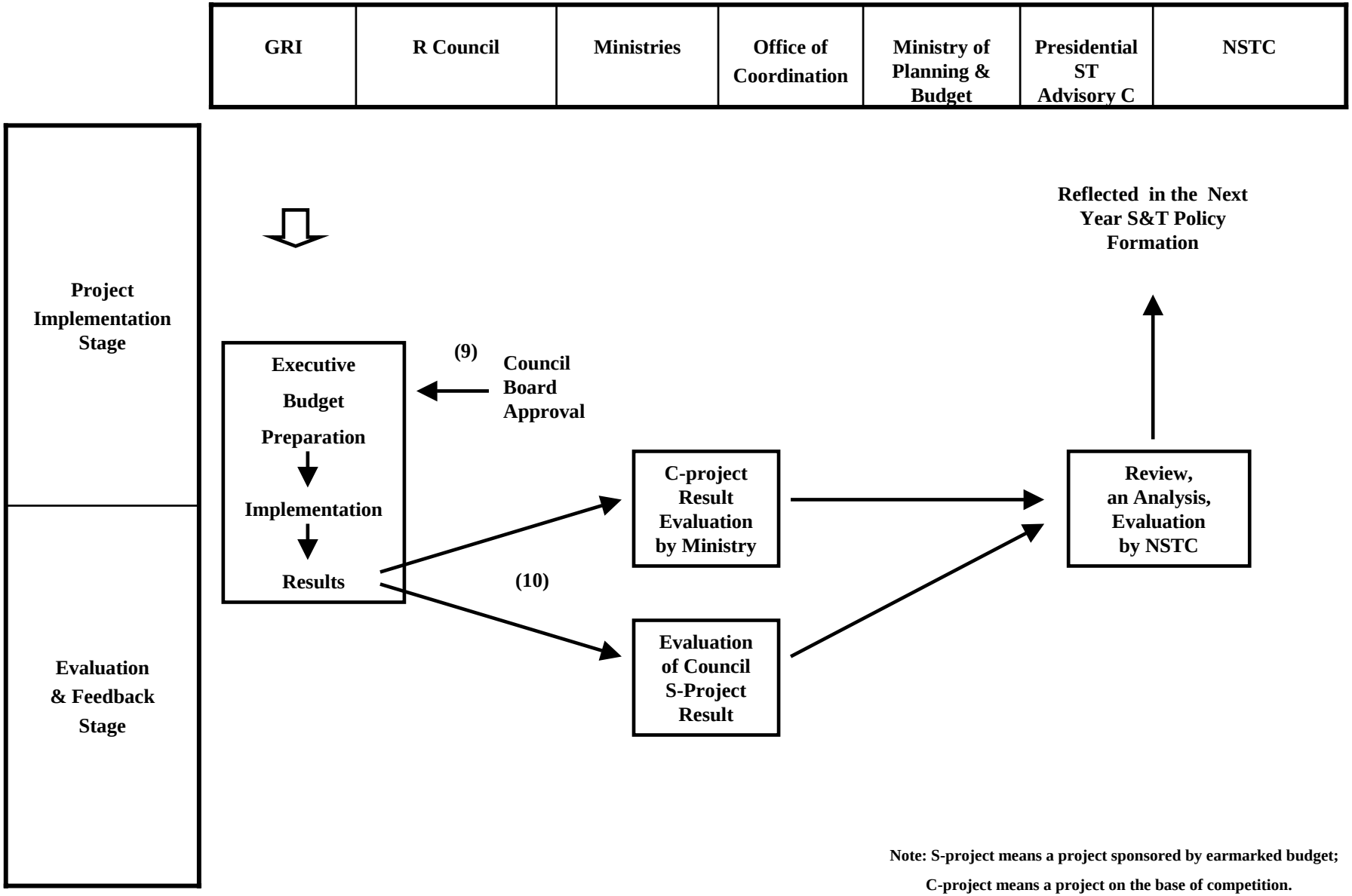
- The usual pattern is that some experts and leaders in S&T related NGOs are recruited by politicians as staff members or aids.

- Especially the new government, “Participatory Government” has followed this pattern and actively recruited NGO leaders.

- Although the participation of civilians has been emphasized time and again, the actual institutionalization for that has been still slow. The most effective way is the civilian experts’ participation in policy process as committee members or advisors.

A New model for National R&D Process





Note: S-project means a project sponsored by earmarked budget;
C-project means a project on the base of competition.

Source: STEPI. 2003.

7. Policy Learning

1) Slow Learning

- The compartmental and vertical STI policy structure in Korea made mutual policy learning very slow. Major STI ministries competitively formulated and implemented various policies, often ignoring duplications and wastes of resources. Instead of learning from each other and sharing information and knowledge, in many times and cases, they tried to expand own jurisdictions and power in terms of budget and regulations.
- As a result, many of the policy cycles of the ministries were similar without much change or improvement.

- Only recently ministries and branches of the government, central or provincial, came to share knowledge under the task force system for national strategic policy. In fact, these task forces (in the form of committee) have been criticized to study and discuss so long.

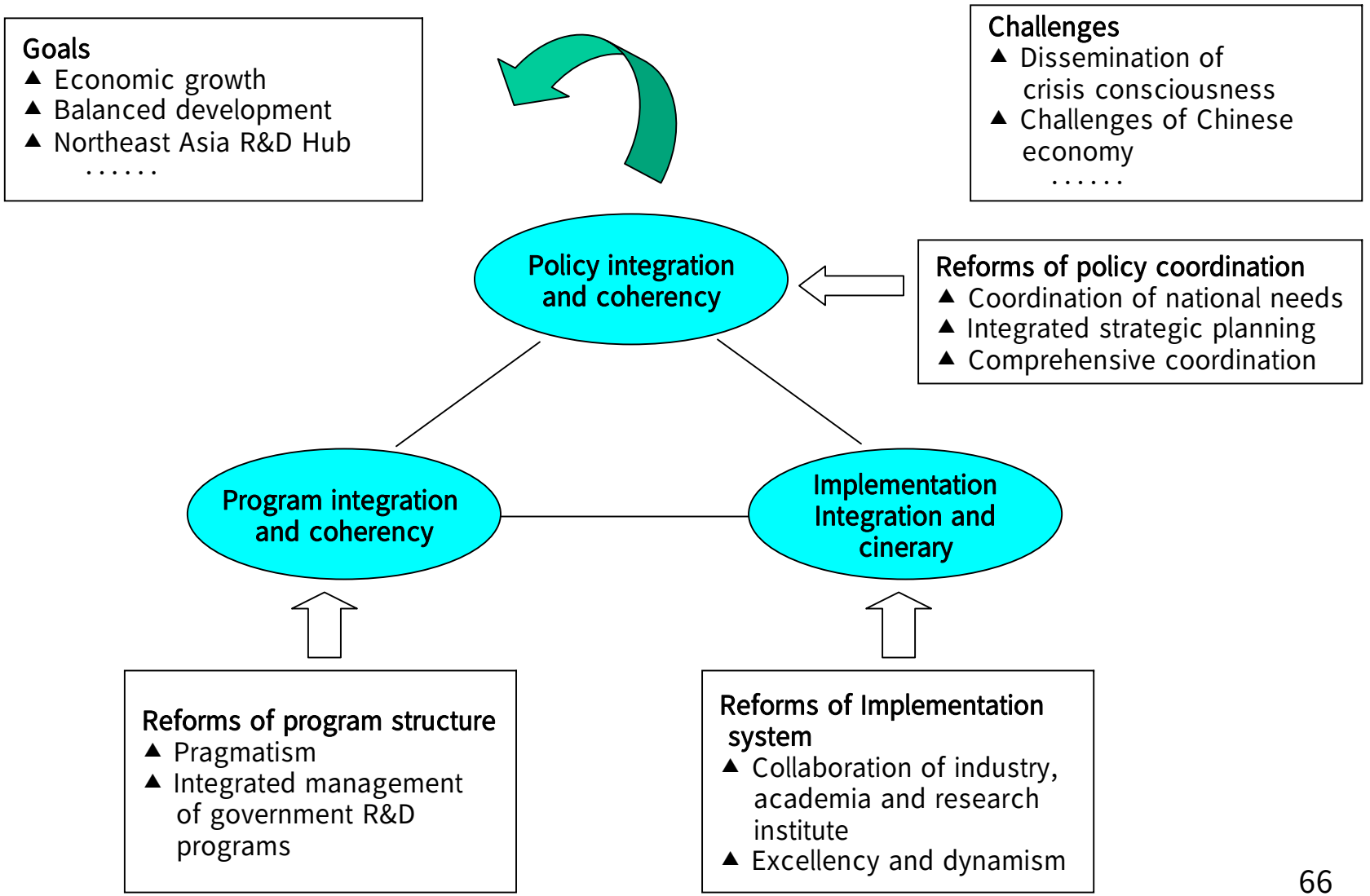
2) Rigidity in the Auditory System and Evaluation System of Government Policies

- Rules and criteria for auditing and evaluation of policies are not coherent and different among government organizations.
- Furthermore, Auditory Administration's auditing system is in general a negative one in the sense that detecting misconducts is the main faction. Under the system, government officers tend to behave to fulfill the minimum responsibilities only and to be less creative.

3) New Movement

- Although the concept of the horizontal innovation policy has not been officially and publicly introduced in Korea, the recent movement initiated by the new administration is obviously in line with the concept.
- The new direction is characterized by “integration and coherency”, which implies that STI policy is coordinated by the leadership and coordination function of restructured MOST and that projects and programs are trimmed and guided by the grand strategy of the “Science- and Technology-Based Society Building.”
- Korea is in a transitional period to redesign its NIS and STI policy governance. Many experts and government officers actively participate in the process. Civilian participation is also peculiar although their influence is still limited.

Direction of Reformation of National R&D System



8. Lessons

1) Needs for Change

- Korea's governance of its science and technology policy is characterized by the strong leadership or intervention of the government and the relative weak position of the private sector. In the time of extensive growth, this kind of governance was effective. However, as the economy moves toward becoming a knowledge-based economy that is dependent more on knowledge, technology and innovation than labor and capital, a new paradigm of science and technology governance is needed.

- Although the need for reforming the NIS and governance structure has been pointed out by many experts and the media, it is the new administration which promised broad and deep reforms of the whole social system that actually materialize the required reforms.

2) Recognition of Problems and Needs of Reforms

- It takes much long time to recognize problems of an NIS and even longer to reach a consensus on the direction and measures for reform. The recognition is a result of combined and accumulated efforts of various actors in the system. A kind of crisis consciousness is a crucial factor. In the case of Korea, the challenge of the rapidly rising Chinese economy contributed a lot to this.

3) Managing Conflicts and Vested Interests and Consensus Building

- This is the most difficult part in the process of reforms. Korea is still in the process. Although the management of conflicts is an endless job, pressures for reform and capable political entrepreneurship can achieve it.

4) Importance of Political Entrepreneurship and Change Agents

- The new administration started from 2003. The catchphrase of the new administration and its supporting political group is a creative destruction of the “ancient regime”. Many political entrepreneurs and change agents were recruited and involved in the reform process. A political power shift like this can render a critical momentum.

5) Benchmarking and Creative Approach

- The fundamental problem of the Korean NIS and ST governance is that the system was designed for the imitation era, which is inefficient and a bottleneck for the innovation era. Benchmarking of many leading countries contributed to the discussion on the problem and new designing.

-Obviously, in-depth studies of OECD economies and policies have been much helpful. However, it cannot be denied that Korea should find its own creative way to solve the serious problem since the country’s situation is more complicated than other advanced countries.

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Appendix: Governance of R&D Projects (Example)

1. New Drugs and New Agro-chemicals (to develop new antibiotics and germicidal agents)

   Principal ministry: MOST
   Assistant ministry: MOHW
   R&D management agent: Science and Technology Policy Institute
   Cost Sharing : 3 firms

2. B-ISDN Project (to develop core technologies of B-ISDN)

   Principal ministry: MOIC
   Assistant ministry: MOST
   R&D management agent: Korea Telecom
   Cost Sharing : 4 firms

3. HDTV (to develop prototype products of high density television)

   Principal ministry: MOCIE
   Assistant ministry: MOST and MOIC
   R&D management agent: Korea Electronics Technology Institute
   Cost Sharing : 5 firms

(**Continued**)

4. Next Generation Vehicle Technology (to develop an electric vehicle as well as core technologies for vehicles with high safety and low pollution)

   Principal ministry: MOCIE
   Assistant ministry: MOST
   R&D management agent: Korea Automobile Technology Institute
   Cost Sharing : 3 firms

5. Application Specific Integrated Circuit (to develop ASIC for HDTV)

   Principal ministry: MOCIE
   Assistant ministry: MOST and MOIC
   R&D management agent: KETI
   Cost Sharing : 4 firms

6. Next-generation TFT-LCD and PDP (to develop 25-29 TFT-LCD and 55 full color PDP)

   Principal ministry: MOCIE
   Assistant ministry: MOST
   R&D management agent: Korea Display Research Union
   Cost Sharing : 5 firms