工業技術研究院
Industrial Technology
Research Institute

The 31st STAG Board Meeting

Theme I: S&T Policy Formation and Governance

Introduction:
Formation and Implementation of S&T Policy Beyond Government Restructuring

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Outline

I. Introduction

II. The Role of S&T Policy in Government and Society

III. Comparison of the Science & Technology Policies of Different Countries

IV. Analysis and Recommendations for the Formation and Implementation of S&T Policy

V. Conclusions

I. Introduction

- Government organic restructuring has been a lengthy process. The first draft was screened in 1988 and final revisions were made in 2010.
- The restructuring provides opportunities for new growth in S&T development.
- This topic focuses on visions and what it takes to form and govern new S&T policy.
- The goal is to pave a new road for Taiwan's technology development.

II. The Role of S&T Policy in Government and Society

Definition of Science & Technology Policy

Science & technology policy is the organization, system, and administration directions that a country establishes to strengthen its technology development potential, and as a result, to reach its development goal and to elevate its international status - defined in a report from United Nations Educational Scientific and Cultural Organization (UNESCO).

Technology and Lifestyle Trends in Connection with Social Changes

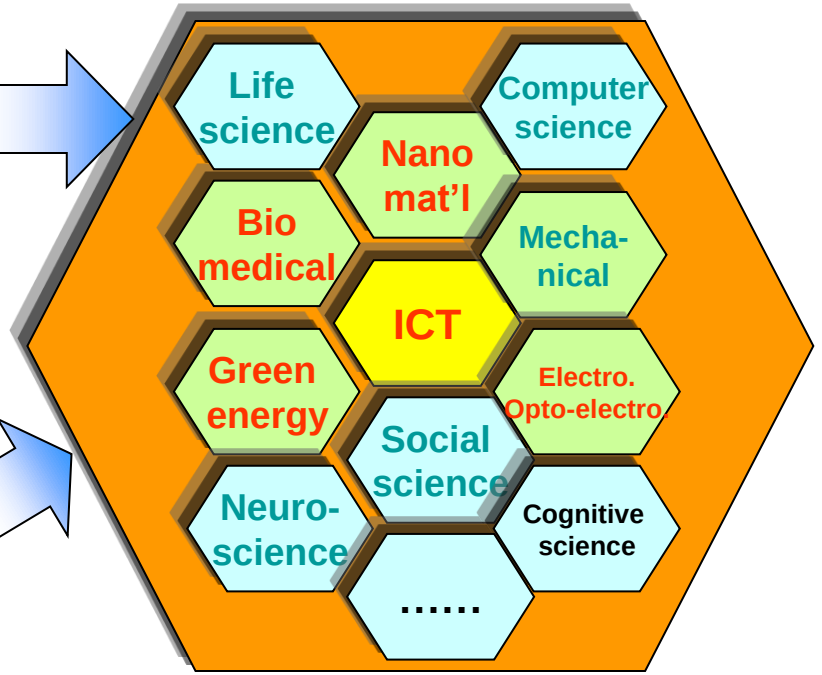
Lifestyle Trends

- Digital convergence
- Ubiquitous networking
- Reinforcement of human capabilities
- Preventive healthcare replaces treatment
- Global sustainability development (energy, ecology, security)

Social Changes

- From concentrated to distributed
- From physical to virtual
- From public to personalized
- From exclusive to collaborative

Merging Science & Technology across Different Fields



Challenges in Taiwan's Industry

- The establishment of Taiwan's high tech industries originated from the S&T policy in the 1970s & 1980s.
- Taiwan has had difficulty straying from the old model that generates meager profits and suffers from inadequate high value-added systems and services.

- Apple's profit on the iPhone 4 is about 60%. Manufacturing costs are about US$187, of which the assembly cost is less than US$13.13, a mere 7%. (Source: iSuppli)
- Apple's profit is equivalent to 60% of the total profit (NT$1.26 trillion) of Taiwan's top 1,000 manufacturers.
- Google acquires Motorola Mobility for US$12.5 billion.
- HP is reported to consider selling its personal system unit.

Challenges in Taiwan's Industry (Cont'd)

- **Our ICT industry will be seriously impacted if we miss opportunities associated with the growing market for cloud computing and services.**
- **The central of global economic activity is moving to Asia.**
- **What can our S&T policy provide to assist in industrial growth?**

The Government's Current Directions on Major Policy Administration

"Develop the Country through Technology Innovation & Generate a Golden Decade for Industry"

- Six Emerging Industries
  - –Green Energy
  - –Biotechnology
  - –Medicine and Health Care
  - –Culture and Creativity
  - –High-End Agriculture
  - –Tourism
- Four Major Smart Industries
  - –Cloud Computing
  - –Smart Electric Vehicles
  - –Smart Green Buildings
  - –Patent Commercialization
- Ten Major Service Industries

Restructuring government and forming good S&T policies are vital in assisting industry to move from focusing on manufacturing into systems and service industries.

III. Comparison of the Science & Technology Policies of Different Countries

USA, Japan, Korea, and China

Distinguishing Features: USA

- DARPA encourages risk-taking on challenging innovations for the future.
- R&D investment by the federal government is on the decline.
- "A Strategy for American Innovation" (2009, 2011) – S&T policies of the Obama administration
  - Government to strengthen innovation infrastructure, market-based innovation, and focus on technology breakthroughs in certain areas designated as national priorities.

Distinguishing Features: Japan

- **Has clearly defined rank and responsibility. The Council for Science and Technology Policy (CSTP) directs each agency to carry out S&T policies. MEXT and METI are in charge of about 80% of budget allocation.**

- **Formed a technology research system for close collaboration between the government, industry, and academia.**

Distinguishing Features: Korea

- **Economic development is based on the model focusing on large conglomerates.**
- **"577 Initiatives" in 2008**
  - **Encourages the enterprises to participate in R&D activities, a switch from "lead by the government" to "lead by the public."**
  - **The government's role has switched from "leading all aspects" to "leading by policies only."**
  - **The government also brushed up its R&D program administration system to improve efficiency and to avoid operation redundancy.**

Note: 577 Initiative – invest 5% of GDP by 2012, nurture 7 major technology areas, advance 7 S&T systems, become one of 7 major S&T powers in the world

Distinguishing Features: China

- The Ministry of Science and Technology is responsible for policy administration, while policy implementation is carried out by other agencies.
- The importance of S&T development is revealed in The Twelfth Five-Year Plan and other S&T polices:
  - Sponsorship for outstanding talent
  - Adapting policies to improve domestic competition and to encourage collaboration
  - Government funding is open to all research institutes
  - Incentives to encourage innovation

The Comparisons – Similarities

All these countries….

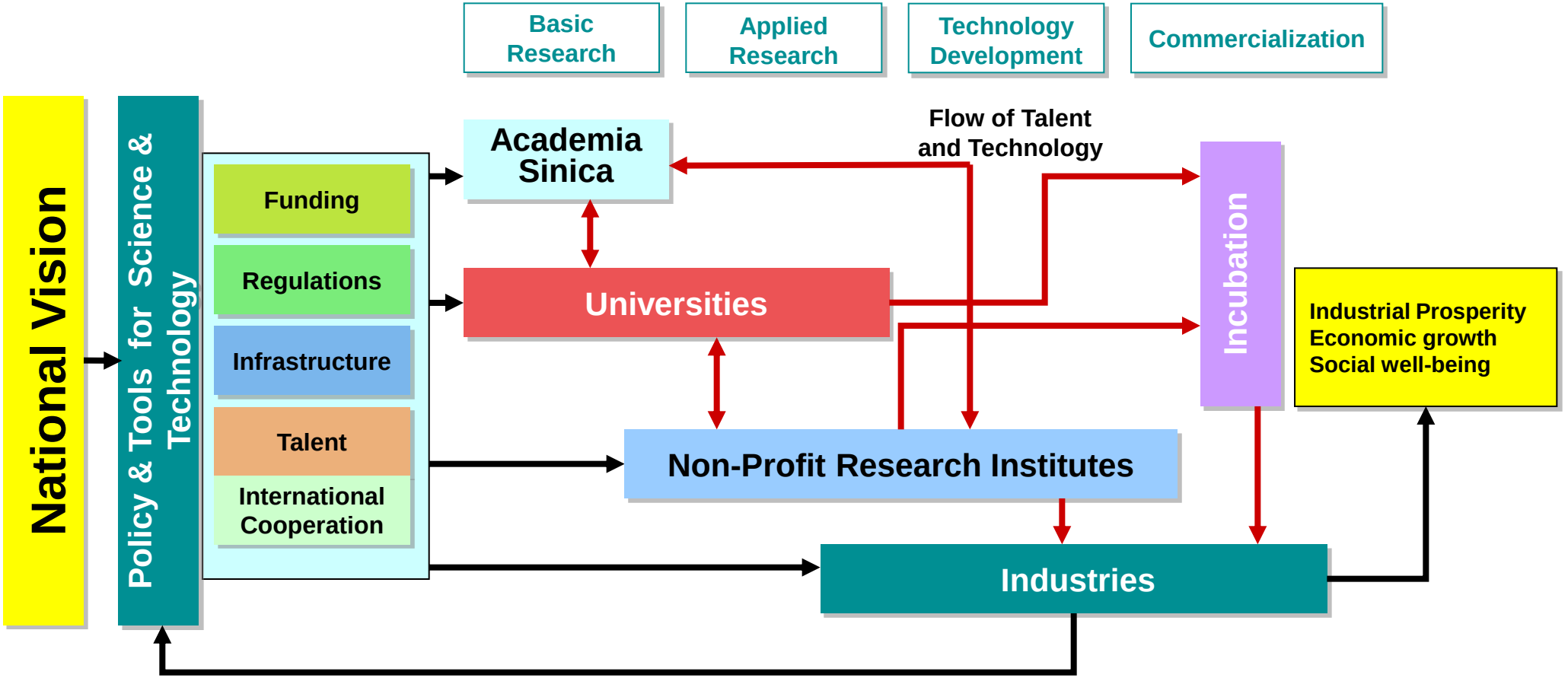
- **Pay high attention to the key elements of innovation, namely education, basic research and research infrastructure;**
- **Lead joint effort among enterprises, universities, and research institutes;**
- **Simplify administrative processes;**
- **Attract and employ domestic and worldwide talent;**
- **Encourage international collaboration;**
- **Involve think tanks in technology foresight and policy formation.**

The Comparisons – Differences

- The US government acts as a conductor and lets enterprises be the players. S&T policies are formulated individually by each department and coordinated by the president and Congress.
- Most of Asian governments act as authoritative leaders that oversee and enforce overall planning.

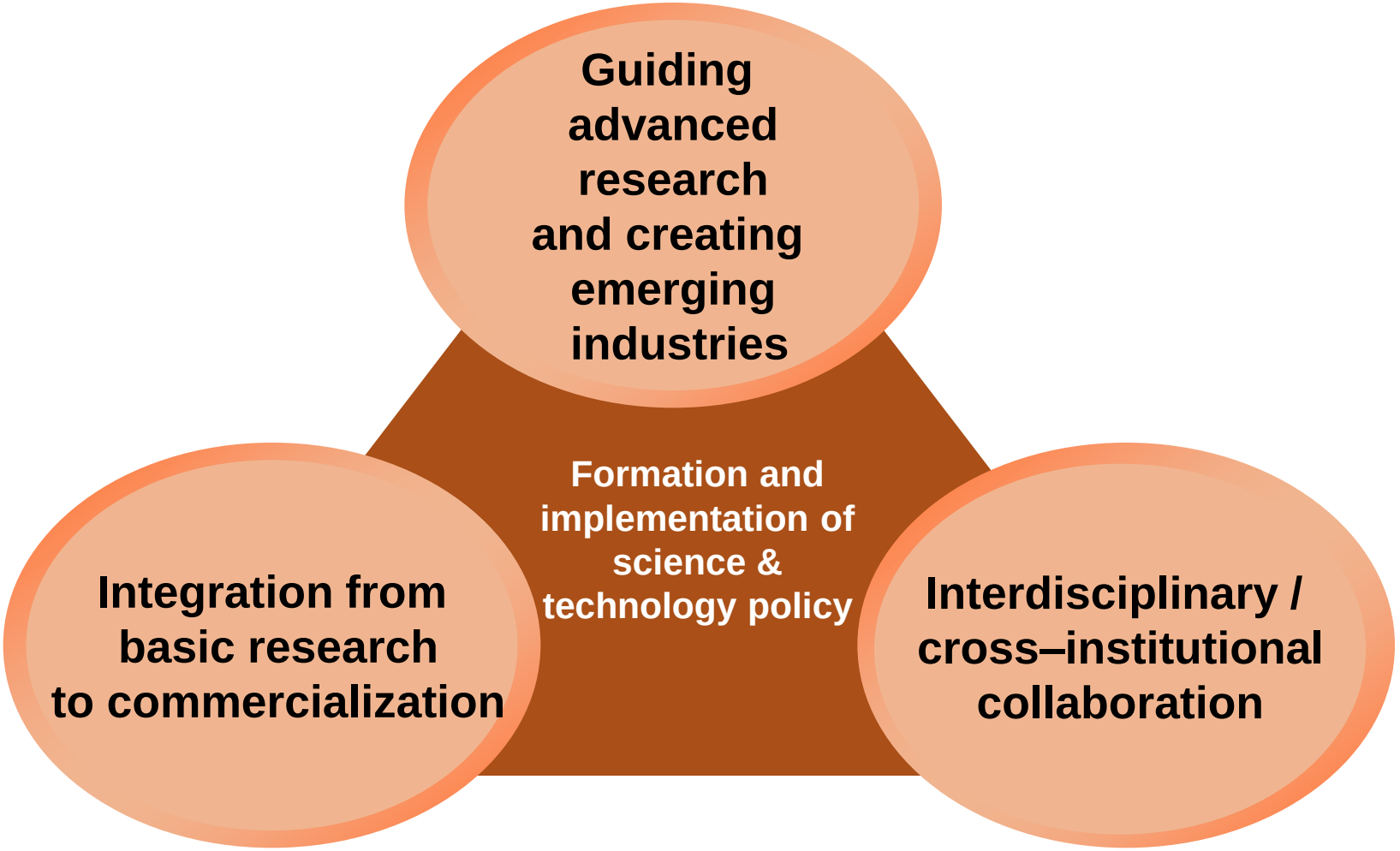
IV. Analysis and Recommendations for the Formation and Implementation of S&T Policy

Taiwan's Innovation System

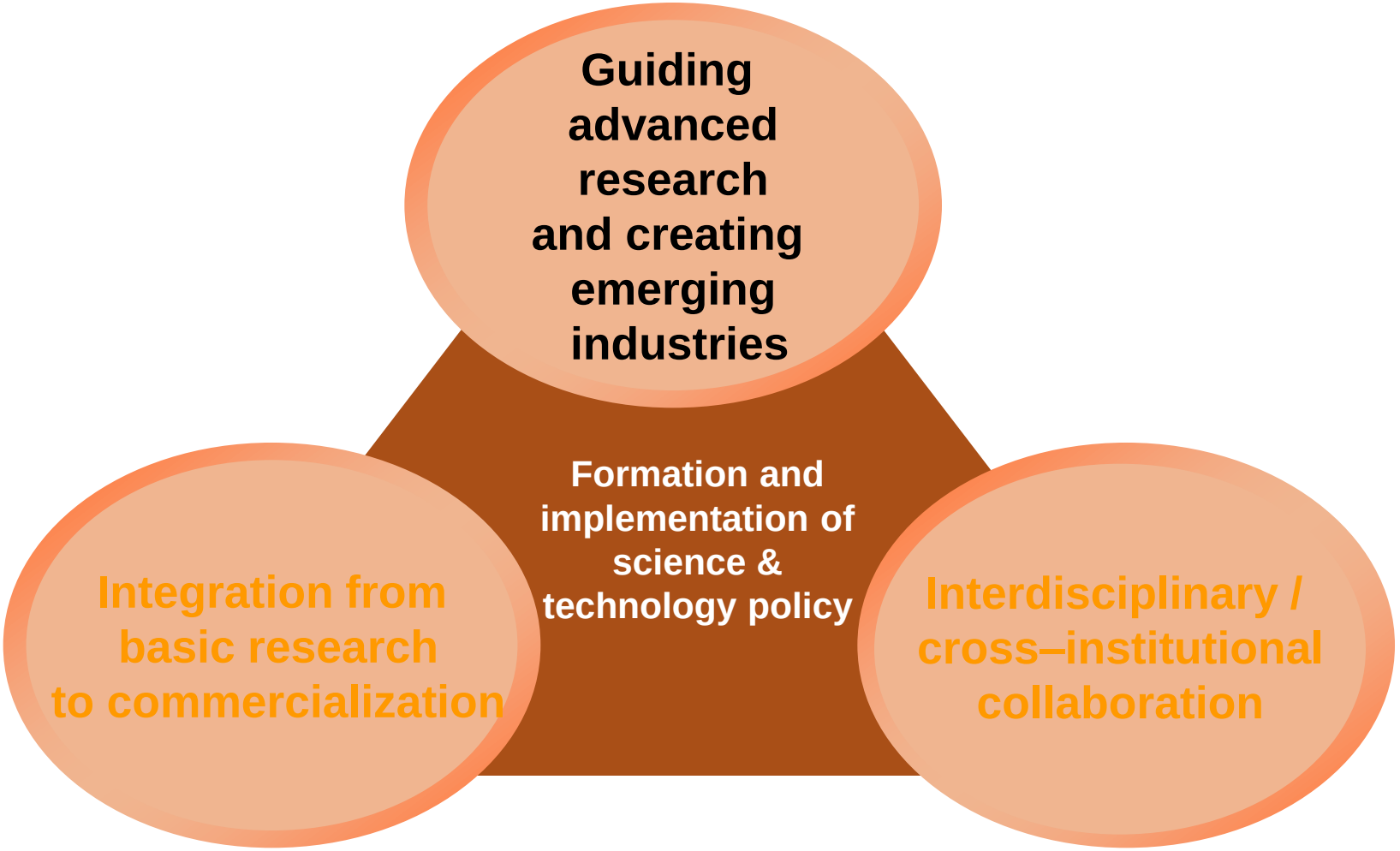


Government has the responsibility to use policy as tools to build infrastructure and guide talent and knowledge utilization and sharing to achieve the goals of driving industrial development, creating economic value and social well being.

The Impacts of and Challenge Facing Science & Technology Policy



The Impact of and Challenges Facing Science & Technology Policy



Science & Technology Policy and the Course of Development Pursued by ITRI

	1970s	1990s	2010s
Industrial Environment	• Main industries: Textile & petrochemical • The growth of basic industry	• Growth of ICT industry • IC Industry is developed	• The flight of industries, financial crisis • ECFA, international coopetition
S&T Policy (ex.)	The transfer and commercialization of RCA semiconductor technology →	R&D Program from DoIT/ MOEA: Advanced technology in 5~10 years →	Advanced research program in next decade: System research and service innovation, cross-field integration
	Draft Plan of IC Program (MOEA; 1974)	19th STAG (1998)	30th STAG (2010)

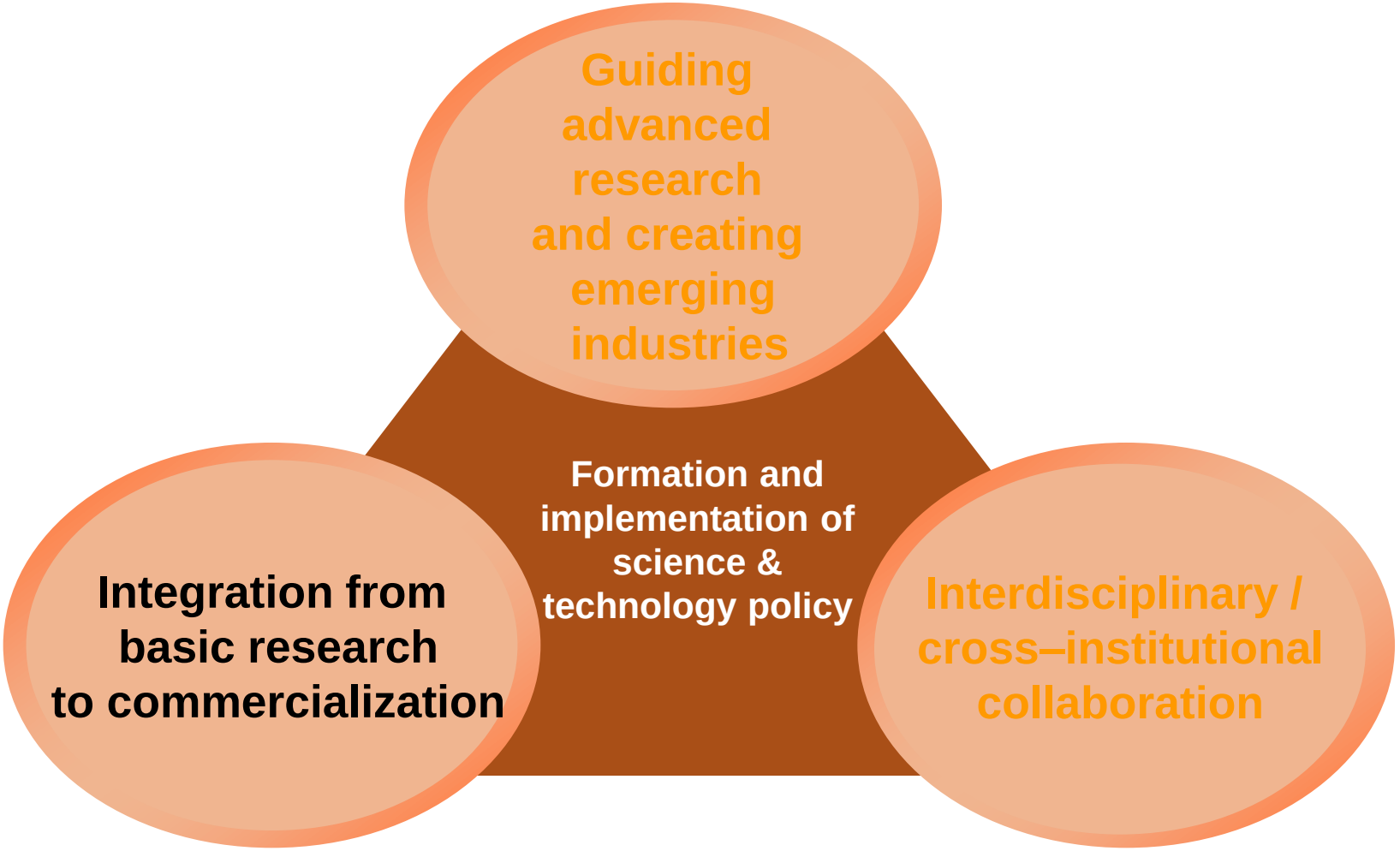
ITRI's R&D Strategy

- Licensing of key technologies
- Independent innovation
- Open innovation
- Leverage global capabilities
- System, software, and service

Guiding Advanced Research and Emerging Industries

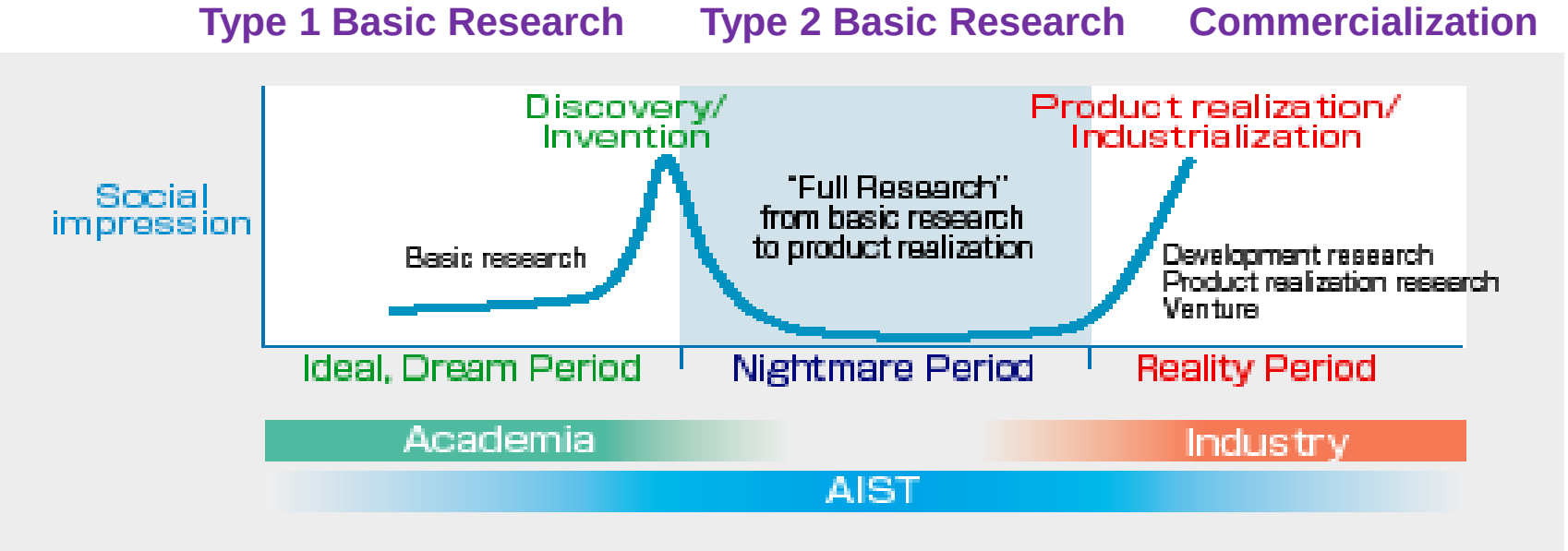
- **Implementing S&T Policy to drive major innovations and their commercialization**
  - **Development path of Taiwan's semiconductor industry**
    - **S&T policy (Draft Plan of IC Program in 1974)**
    - **International collaboration (acquisition of RCA technology in 1976)**
    - **Research and development (VLSI Program in 1984)**
    - **Start-ups (UMC spun off in 1980; TSMC in 1987)**
    - **Blooming industries (total revenue was NT$1.6 trillion in 2010)**
  - **S&T policy should facilitate advances in innovation research and the development of emerging industries.**

The Impact of and Challenges Facing Science & Technology Policy



Japan's AIST - Filling in the Big Gap between Basic Research and Commercialization

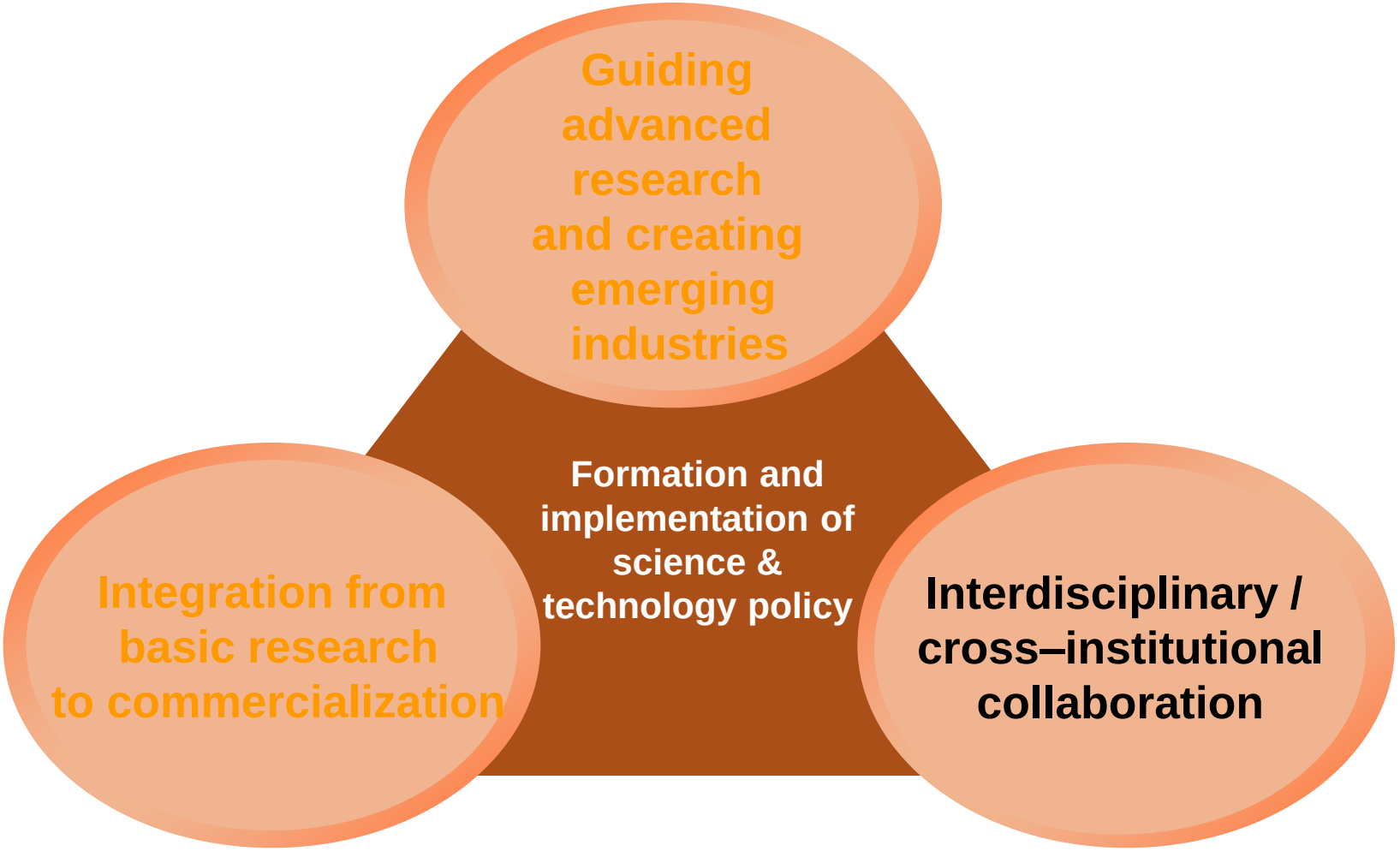
- **Comprehensive (Full) Research: To fulfill the targeted scenario based on Type 2 Basic Research to drive series of studies from discovery/invention to product commercialization.**
- **Type 1 Basic Research: To explore or discover the nature of an unknown phenomenon.**
- **Type 2 Basic Research: To choose, integrate, and apply multi-disciplinary knowledge to solve social or economical issues.**



Encourage Multidisciplinary Collaboration and Integration

- Strengthen the integration of basic research, applied research, technology development, and commercialization:
  - —Create mechanisms to encourage collaboration, such as
    - ➢ Expanding the NSC's funding to research institutes
    - ➢ Fostering collaboration on IP pooling and incubation among universities and research institutes
  - —Balanced resource allocation
  - —Incentives to attract excellent R&D talent
  - —A platform for international and cross-strait collaboration

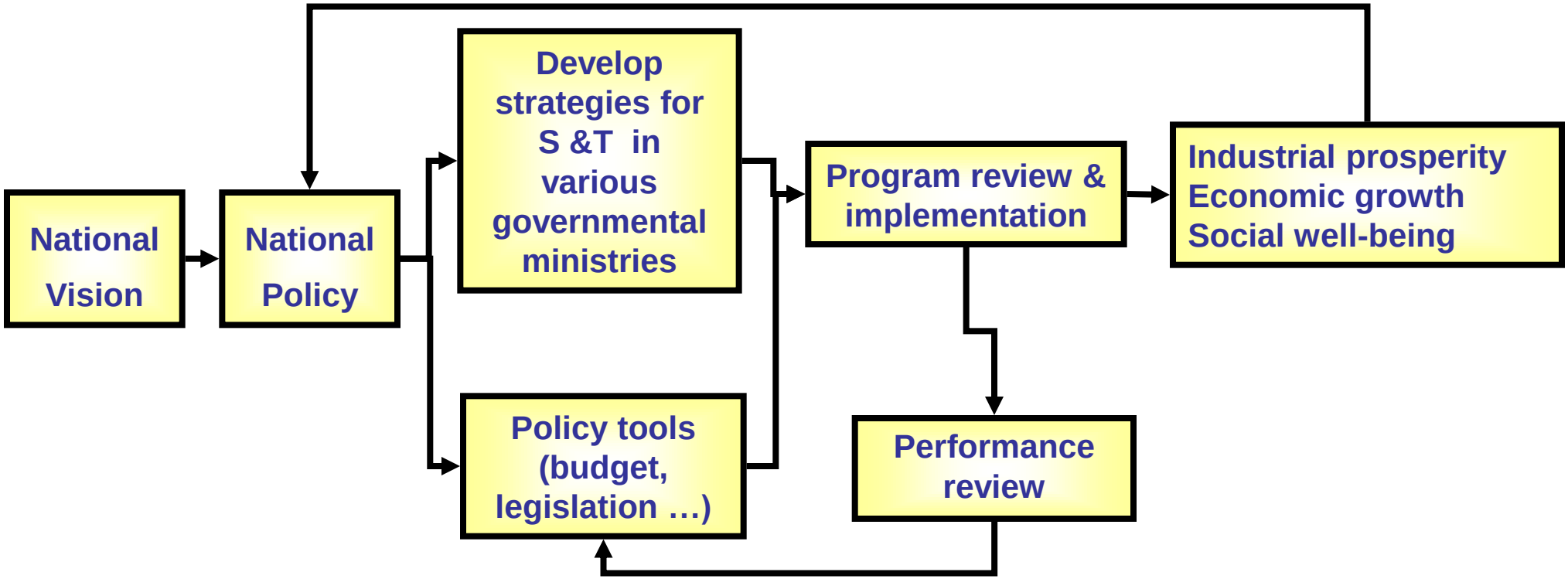
The Impact of and Challenges Facing Science & Technology Policy



Interdisciplinary / Cross–institutional Collaboration - Problems and Solutions -

- **Common psychological barriers – Concerns**
  - Leaking technical information
  - Increased job complexity
  - Difficulty in management and administration
  - Not properly credited for research results
- **Keys to success**
  - Identifying meaningful subject for collaboration
  - Eliminating psychological barriers
  - Collaboration is more than delegating tasks and responsibilities
  - Value the importance of interflow and interaction among people
- **Eliminate barriers by setting new S&T policy to encourage interdisciplinary / cross–institutional collaboration**
  - Mutual trust (beginning), collaboration (process), sharing (results)

The Process for Implementing Science & Technology Policy



- The linkage in planning, resource allocation, implementation, and performance assessment of S&T policy should be coherent and substantial.
- All projects must have exit strategies.

V. Conclusion

- **The purpose of forming S&T policy is to bring policy closer to lifestyle trends and the needs of society and industry.**

- **Implementation of S&T policy is to guide advanced innovation research and to facilitate the emerging industry.**

  - **Understand trends in technology and industrial development (strengthen the role of think tanks)**
  - **Focus on primary subjects that have the potential to increase competitiveness**

- **Strengthen the integration of basic research, applied research, technology development and commercialization.**

  - **Invest sufficient and stable resources**
  - **Strengthen the innovation infrastructure**

V. Conclusion (Cont'd)

- **Encourage interdisciplinary / cross-organization collaboration to achieve effective integration.**
  - **The spirit of mutual trust, collaboration and sharing**
  - **Building strong administration mechanisms and linkage**
- **We look forward to the opportunity provided by government restructuring to re-evaluate the effectiveness of policy formation and implementation.**
- **We hope to establish a new advanced innovation system that can meet social expectations and achieve President Ma's vision of "Creating a golden decade, building a strong country by innovation."**

Agenda for Discussion

Theme 1: S&T Policy Formation and Governance

- **Presentations**
  - Topic 1: Implementation of S&T Policy and Budget Allocation, National Science Council
  - Topic 2: Implementation of S&T Policy and Budget Allocation, Ministry of Economic Affairs

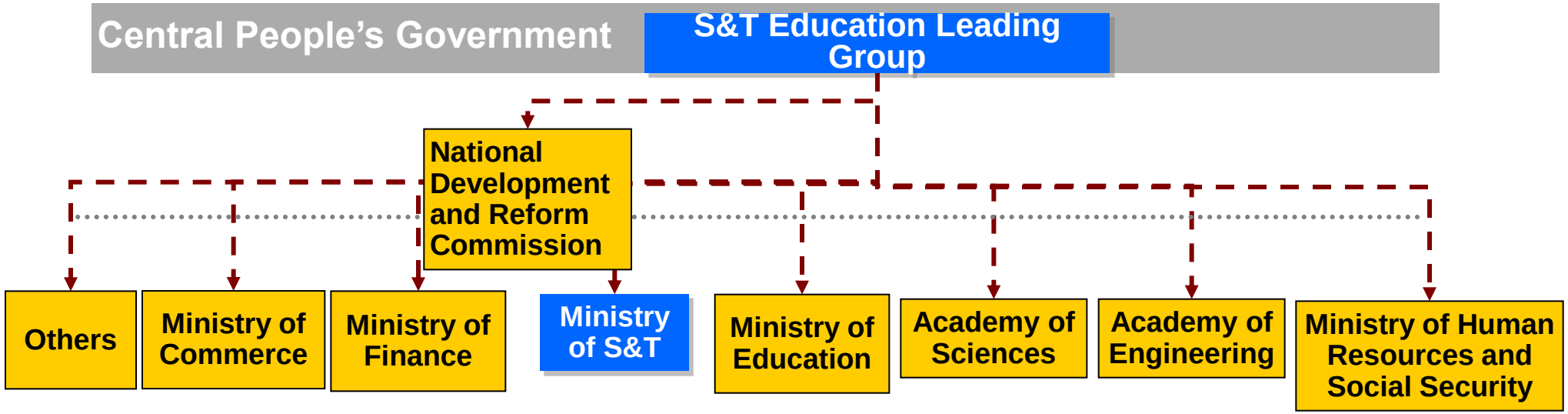
- **Discussion**
  - Opening Remarks: Toward a New Mechanism for S&T Policy Formation and Governance

Appendix

Government Organizations Responsible for Science & Technology Policies in the PRC, US, Japan, and South Korea

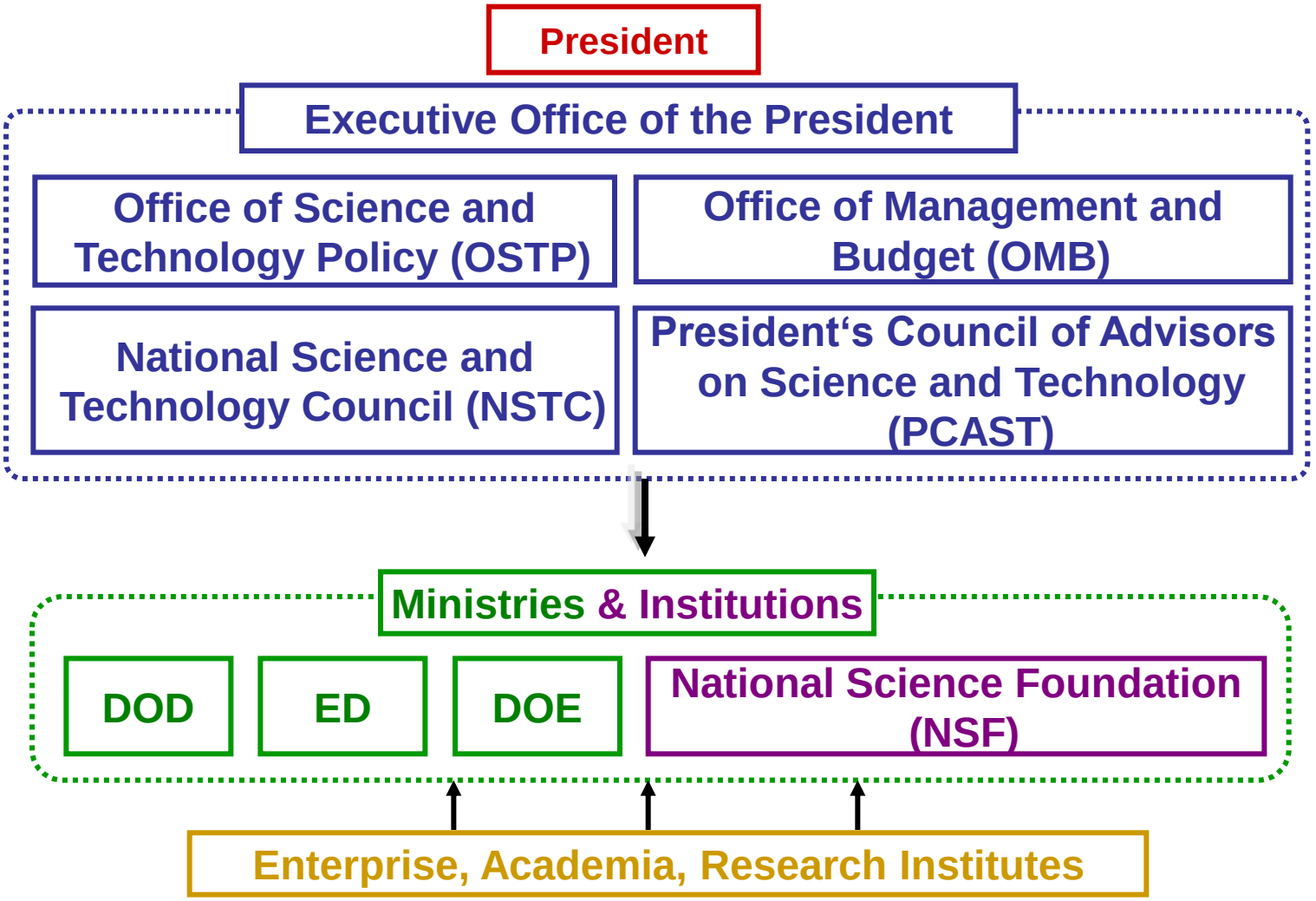
PRC

- **S&T Education Leading Group: Study and evaluate the national science education development strategy and policy; coordinate science education affairs among the departments of central and local governments.**



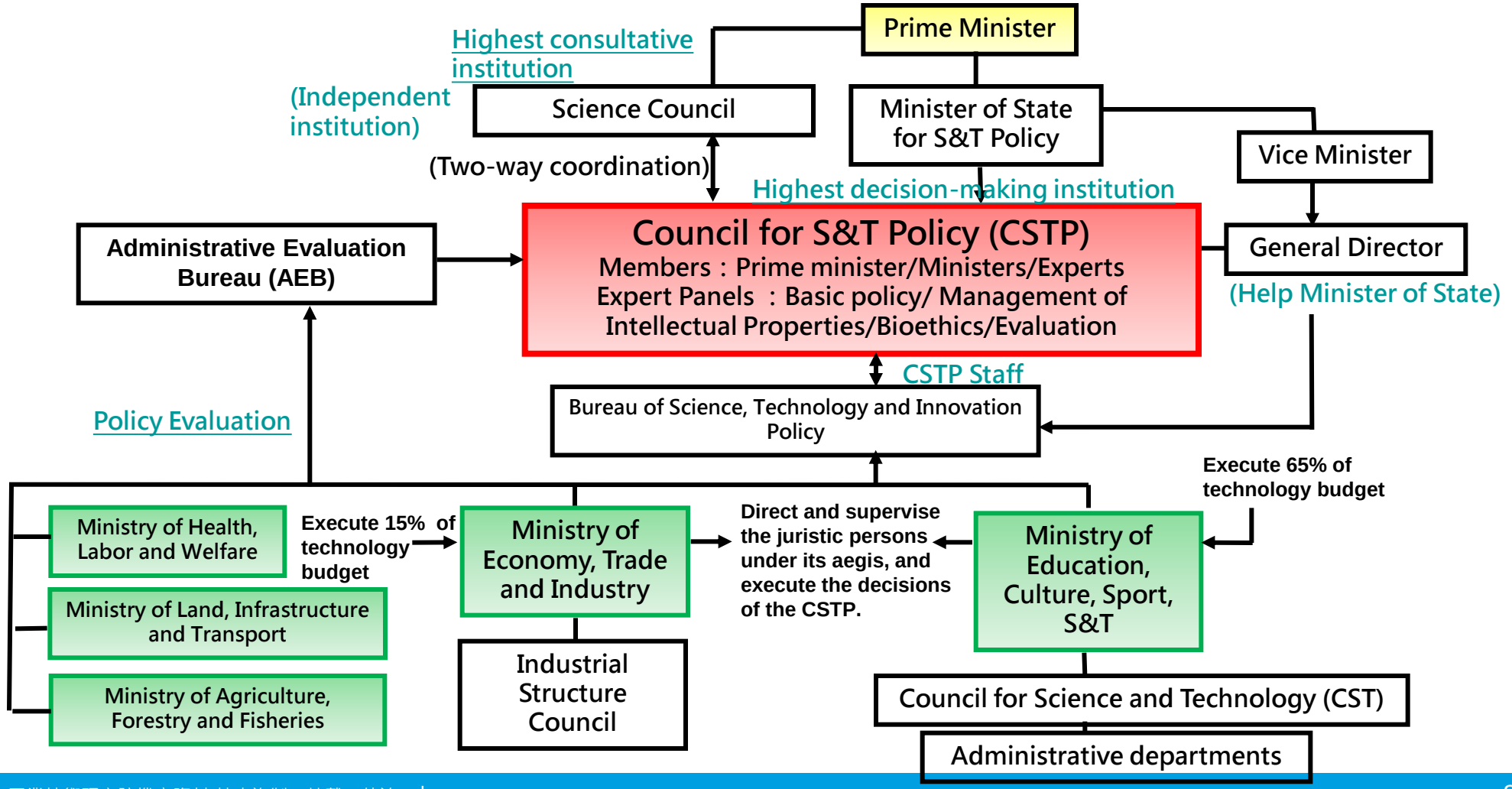
- **Ministry of Science and Technology: Plan the budget of key technologies related to the national economy and social development; undertake the missions decided by the State Council, but leave execution to other ministries.**

USA

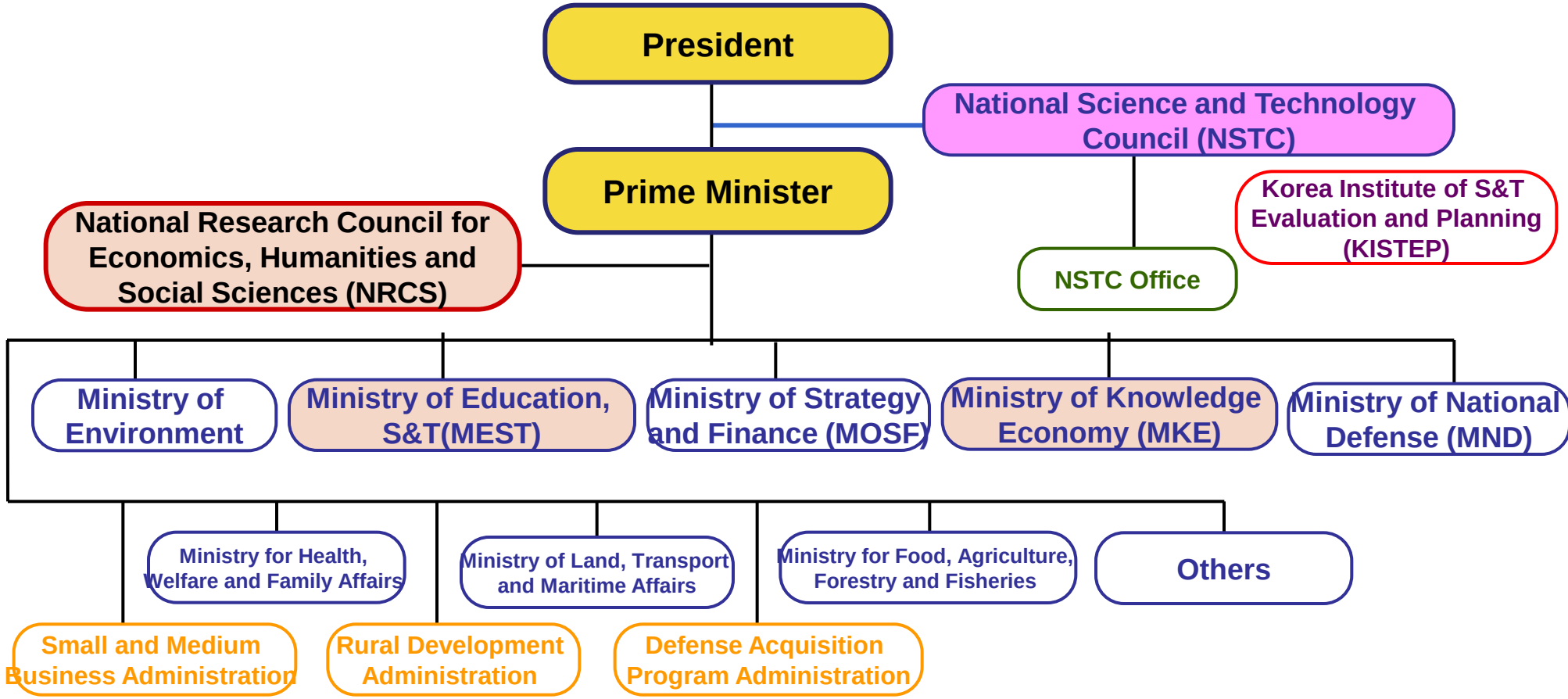

President
Executive Office of the President
Office of Science and Technology Policy (OSTP)
Office of Management and Budget (OMB)
National Science and Technology Council (NSTC)
President's Council of Advisors on Science and Technology (PCAST)
Ministries & Institutions
DOD
ED
DOE
National Science Foundation (NSF)
Enterprise, Academia, Research Institutes

Japan

- **In the execution of the technology budget, the Ministry of Education, Culture, Sport, S&T (MEXT) accounts for 65% and the Ministry of Economy, Trade and Industry (METI) for 15%.**
- **MEXT primarily takes charge of affairs related to education, academics, culture and science, and pushes forward closer links between academics and S&T administration.**



South Korea



- To integrate science and education affairs, the Ministry of Science and the Ministry of Education were merged to become the Ministry of Education, S&T.
- The NSTC was restructured to become a standing administration directly reporting to the president. It has independent control over personnel matters, administration, and budget. The NSTC has become the “control tower” of S&T affairs in Korea.