



Korean STI Strategy for National Development

Presented at

Colombian Workshops

July & August, 2015

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- **Korean STI Strategy**
- **Growth of STI**
- **Policy Governance: Adaptation and Adjustments**
- **Triple Helix: Interactions among Actors**
- **Epilogue**



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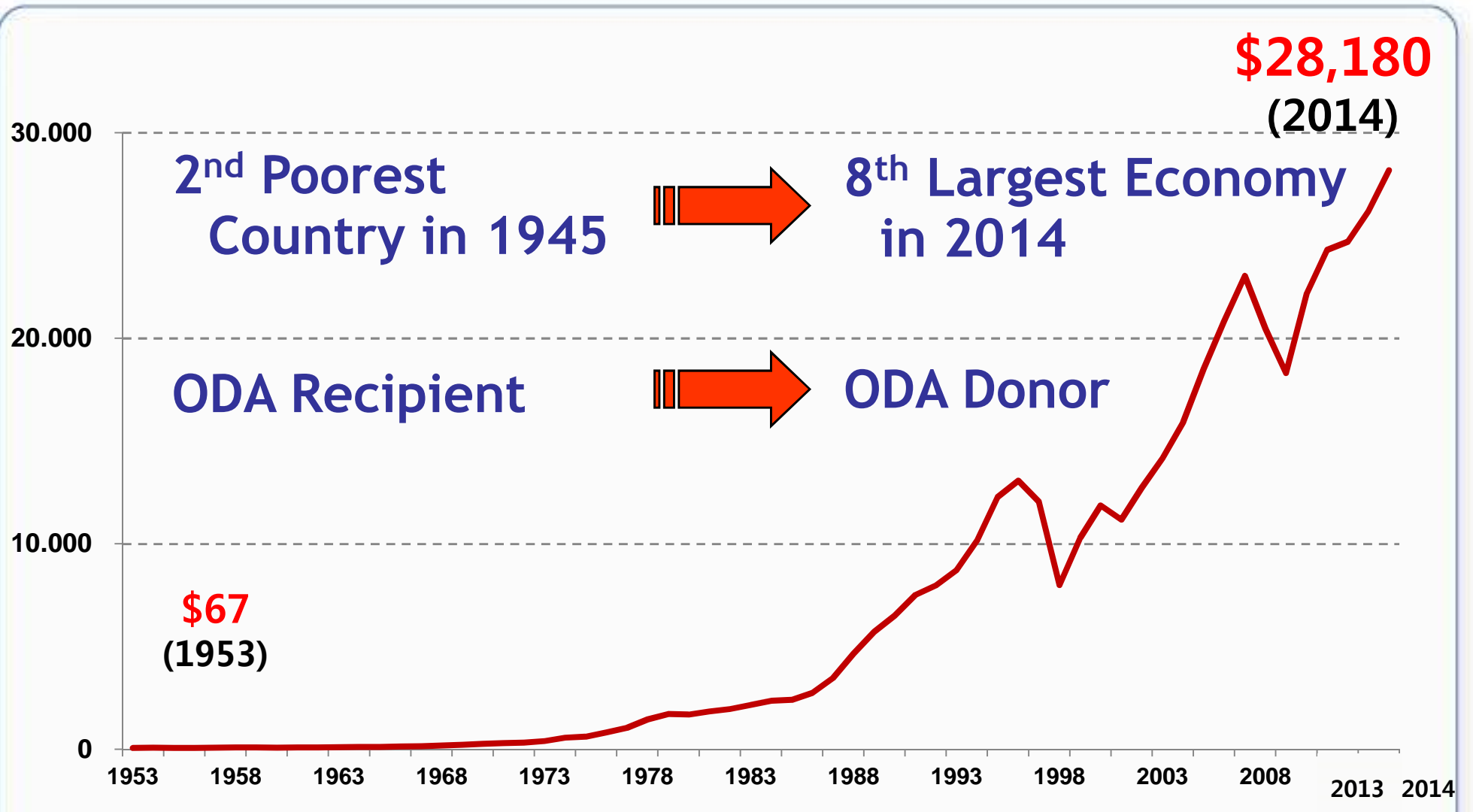
Republic of Korea (South)

Political Map of the World, April 2000



A Small Land with Scarce Resource

Korea's Economic Development, 1953-2013



Source: The Bank of Korea

- 1953-1970: Per Capita GNP (current US\$, 1975 base year)
- 1971-2010: Per Capita GNI (current US\$, 2005 base year)



Industrial Shifts

“Select and Focus” Strategy

1960s

Light Industries

- Import Protection
- Foster export-oriented light industry

1970s

Heavy Industries

- Introduce new technology, expand technological capability

1980s

Assembly & Processing Industries

- Promote import liberalization
- Expand investment in technological development, training of skilled manpower

1990s

IT Industry

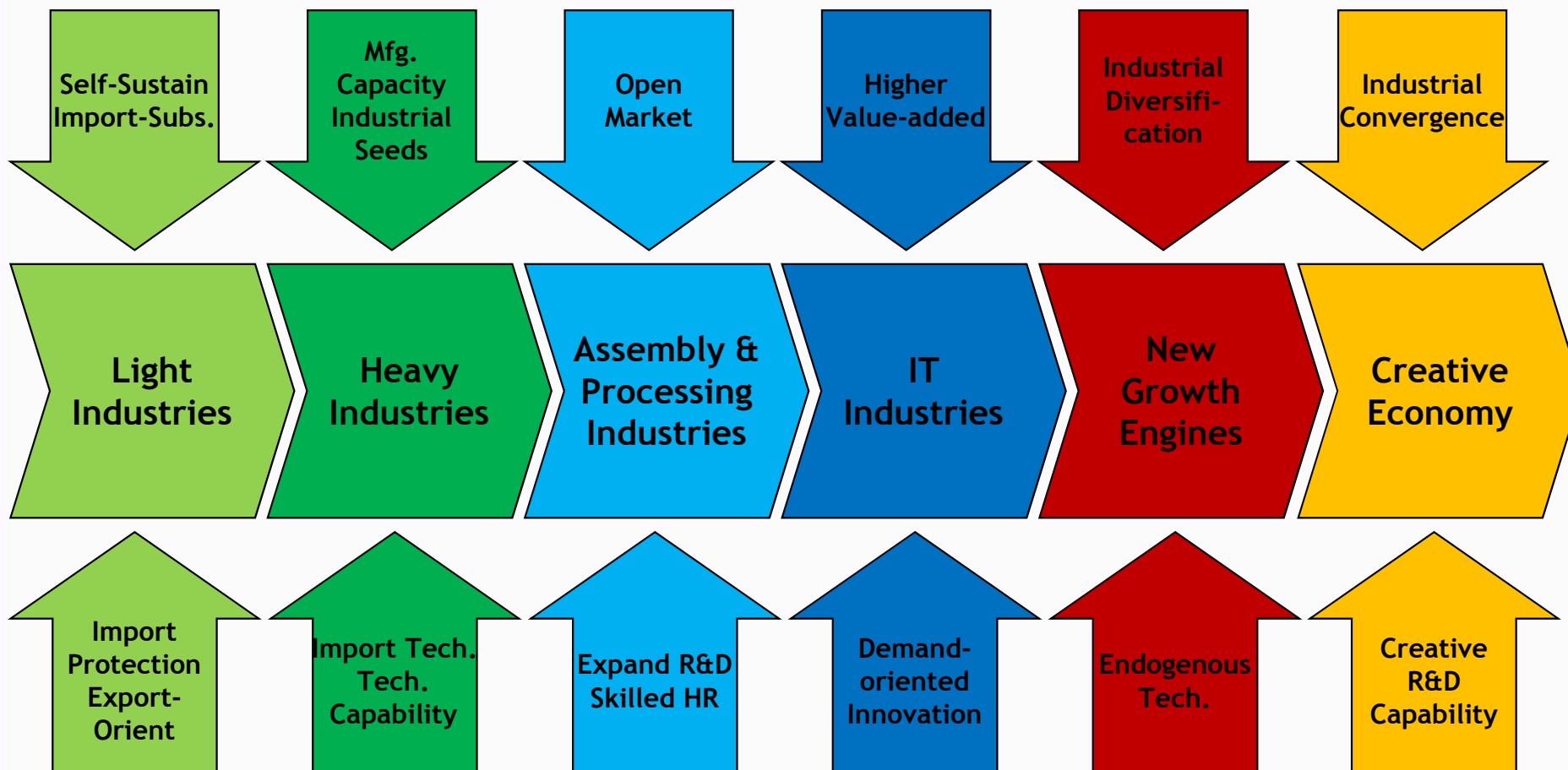
- Strengthen demand-driven technological innovation
- Establishment of nationwide IT infrastructure



STI Meets Industrial Demands

Demand Side

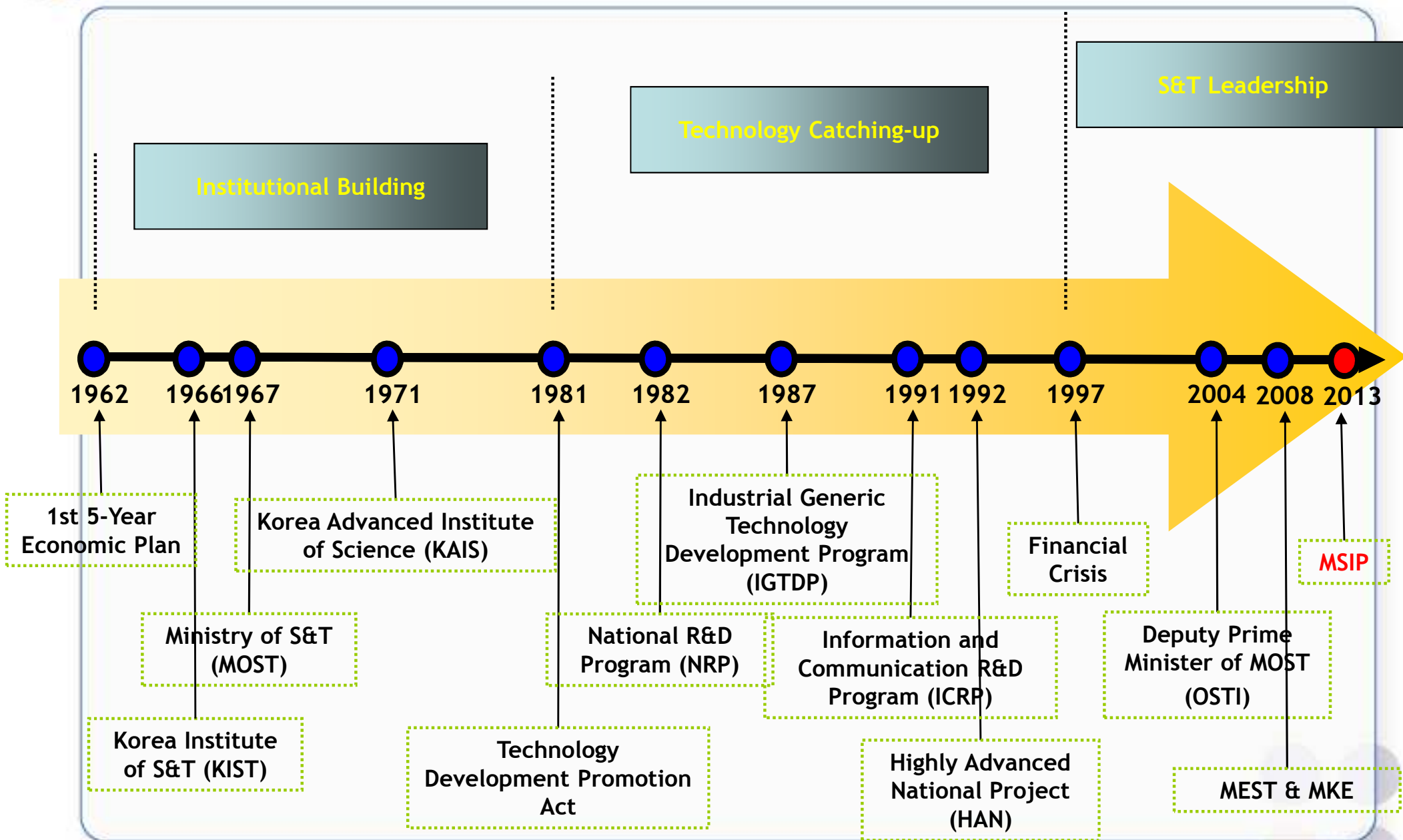
Industry-Oriented STI Strategy



Supply Side

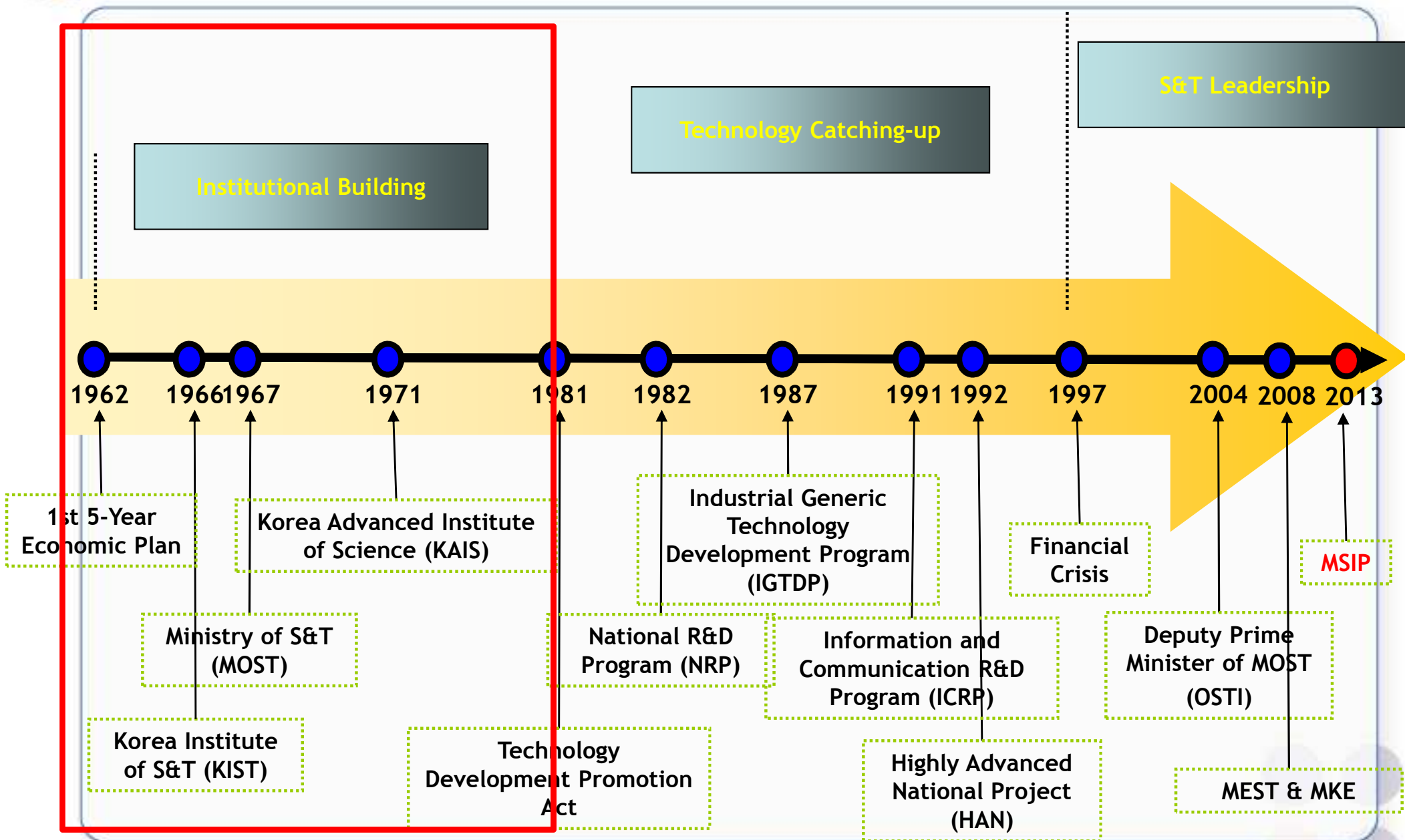


Evolution of Korean STI Policies





Evolution of Korean STI Policies I





1960s

• Industrial Policies

- Import-Substitution Industries (Textiles, Plywood, etc.)
- Expand Export-oriented Light Industries (export subsidy, preferential financing)
- Five-Year Economic Plans
- From Agriculture to **Labor-intensive Light Manufacturing Industries**

• STI Policies

- Establish Scientific and Technological Infrastructure (e.g., **KIST**)
- Initiate S&T Education (e.g., **KAIS**)
- Promote Foreign Technology Imports
- Strategically Adjust to the Need for Economic Dev.
- Establishment of Ministry of S&T (**MOST**)



1970s

• Industrial Policies

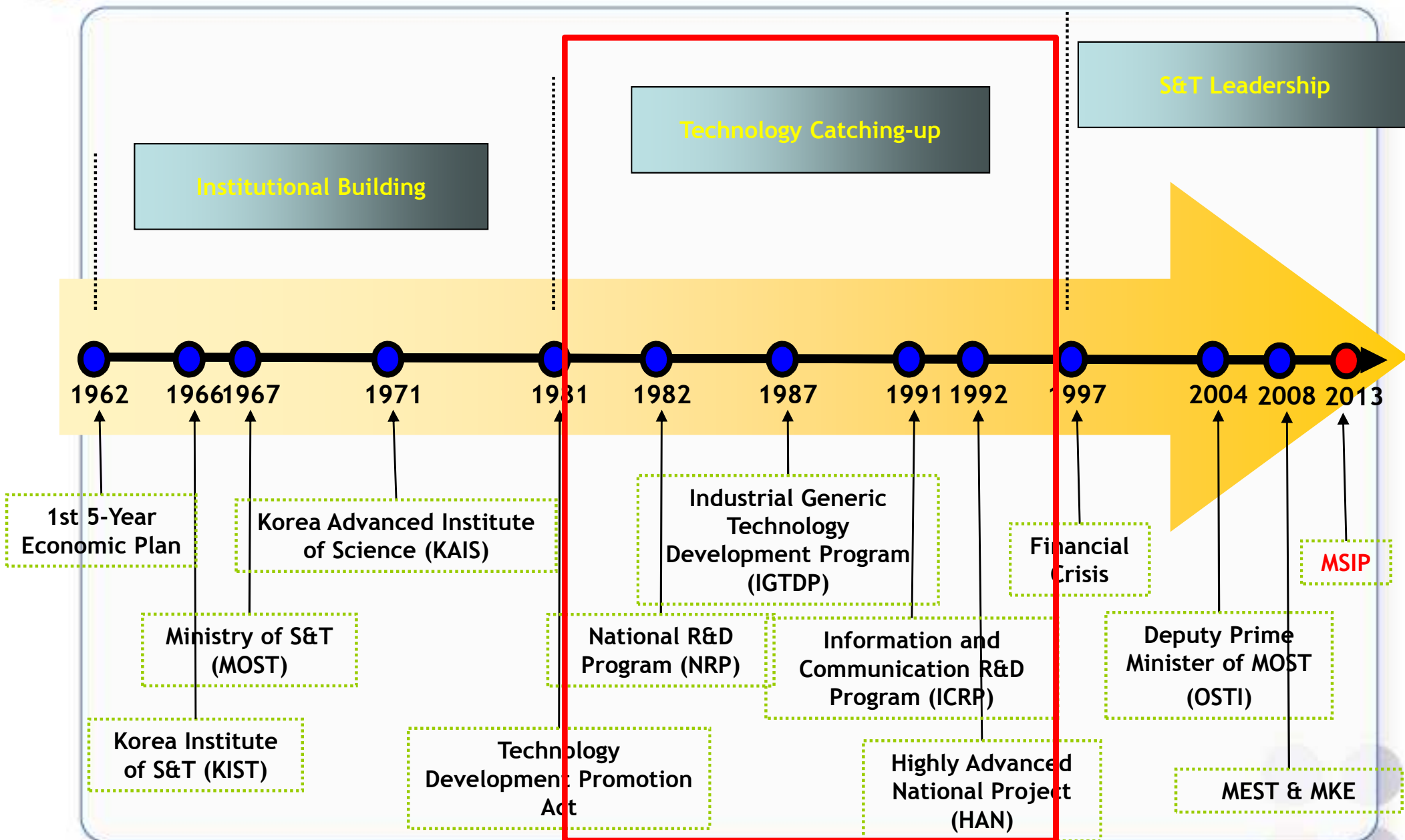
- Expand **Heavy & Chemical Industries** (e.g., machinery, shipbuilding, chemicals, marine science, electronics, electricity)
- Shift Emphasis from **Capital Imports** to Technology Imports
- Strengthen Export-oriented Industrial Competitiveness
- Foster **Chaebols** (e.g., Samsung, Hyundai, LG)

• STI Policies

- Expand Technical Training
- Improve Institutional Mechanism for Adapting Imported Tech. (**GRI**s)
- Invite eagerly Korean Scientists trained **overseas**
- Promote Research Applicable to Industrial Needs
- Promote **Imports of Foreign Tech.** (imitation, reverse engineering, imports of capital goods)



Evolution of Korean STI Policies II





1980s

• Industrial Policies

- **Economic Slowdown** / Trade Imbalance
- Declining Competitiveness in Labor-intensive Industries
- **Economic Liberalization**
- Transform Industrial Structure to Advanced and Balanced Form
- Expand **Technology-intensive Industries**
- Encourage Human Resource Development and Improve Productivity of Industries
- Promote **SMEs**

• STI Policies

- **Reluctant to TT** from Advanced Economies
- Pressure on Strong IPR
- Independent Innovation
- Develop and Acquire Top-level Scientists and Engineers
- Perform **National R&D Projects** Efficiently (e.g., NRP, IGTDP, AEECTP, ICRP)
- Promote Industrial Technology Development
- Promote Collaborative R&D (**San-Hak-Yun**)



1990s

• Industrial Policies

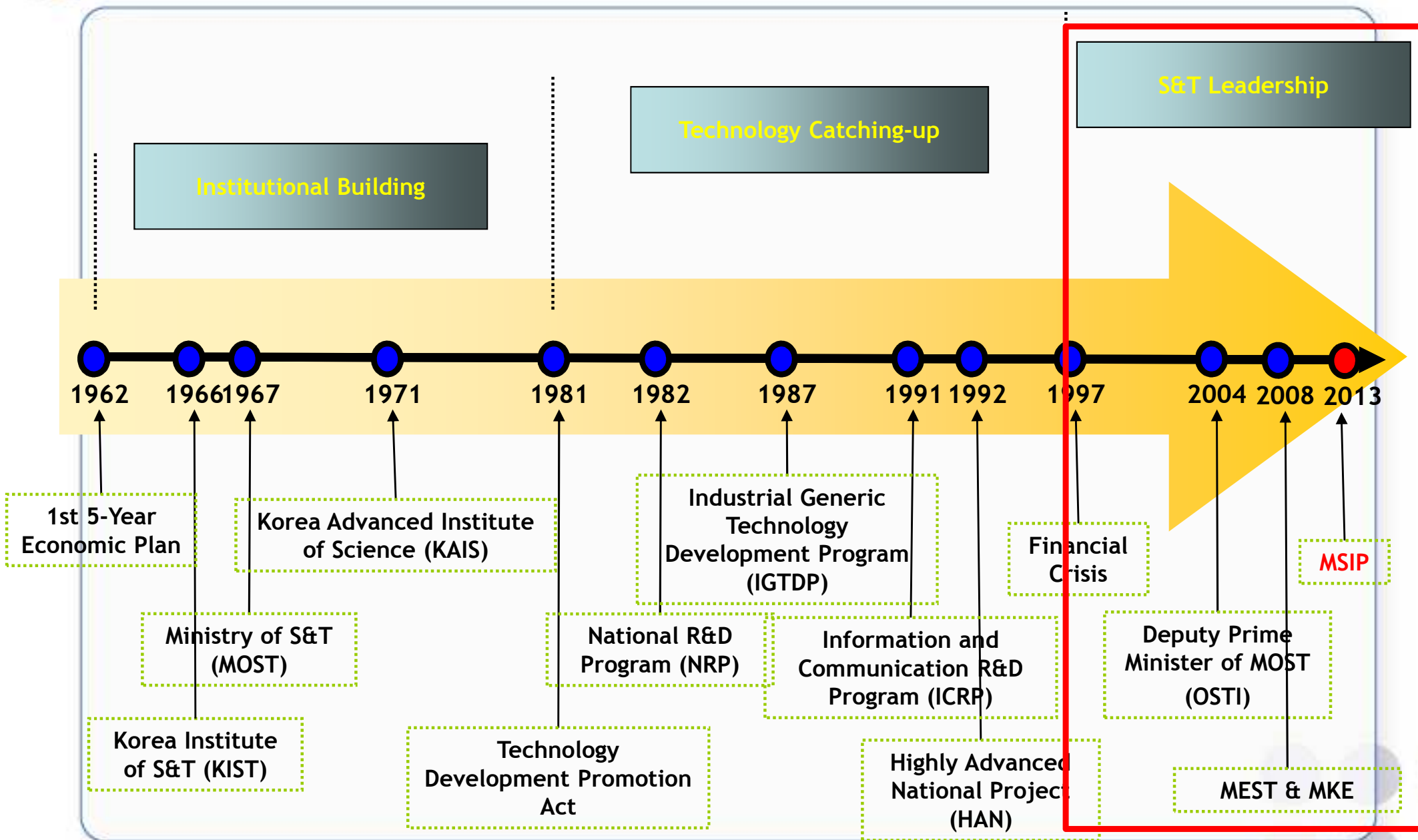
- Promote Adjustment of Industrial Structure and Technical Innovation
- From Imbalanced to **Balanced Growth Strategy**
- Promote Efficient Use of Human and Other Resources
- Improve Information Network
- **Information Tech.** (e.g., Computer, Semiconductor)

• STI Policies

- **From Imitation to Indigenous Innovation**
- Realign **National R&D Projects**
- HAN Project (Long-term, Large-scale)
- Strengthen Demand-oriented Technology Development System (industry-neutral & Tech.-oriented)
- Internationalize R&D Systems and Information Networks
- Construct S&T Infrastructure
- **Basic Research at Universities**



Evolution of Korean STI Policies III





2000s

• Industrial Policies

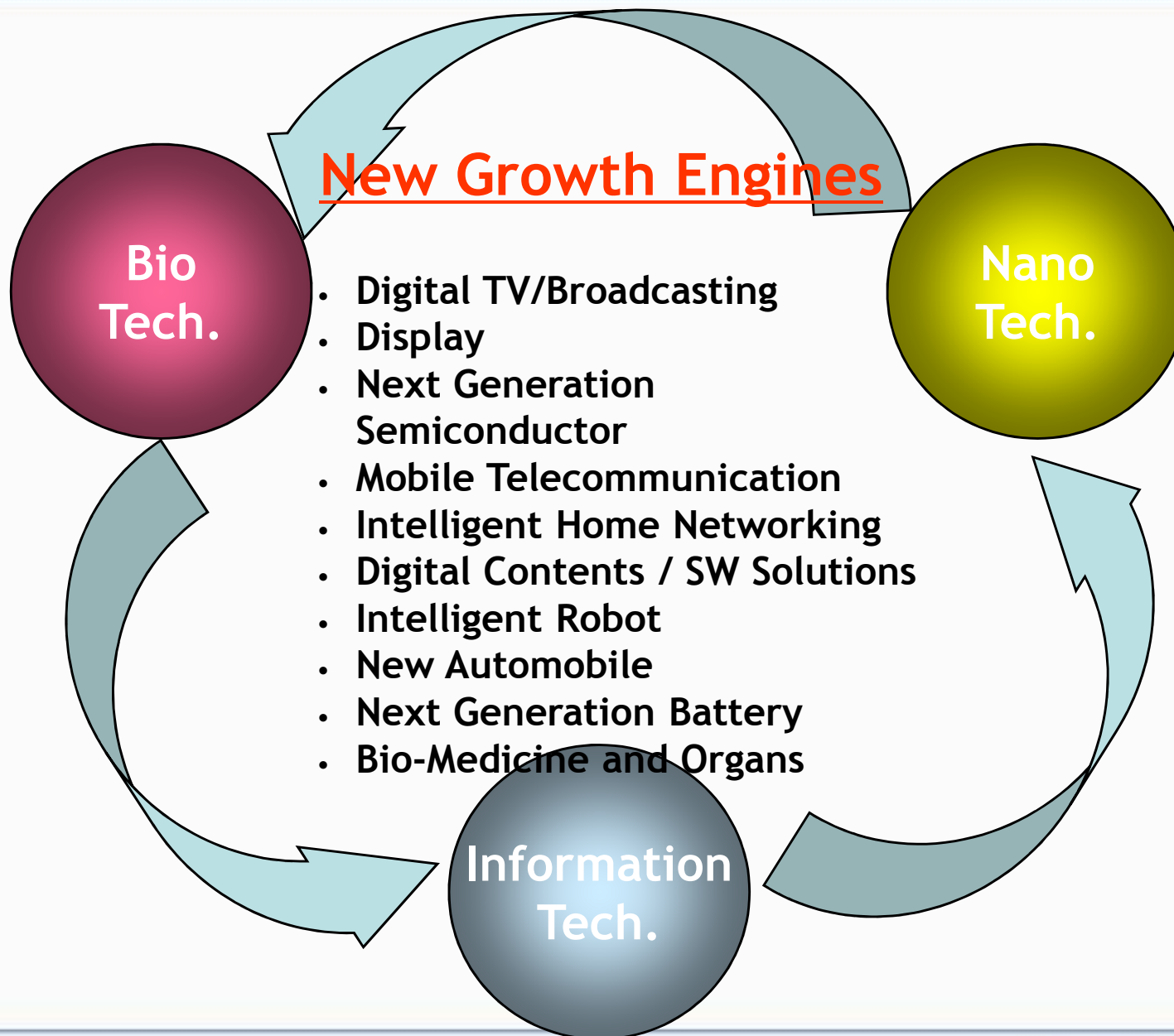
- Searching Sustainable Growth based on Tech. Innovation
- Select and Concentrate
- Differentiated Strategies for Major Industries, **Future Strategic Industries**, and Manufacturing-related Service Industries
- **Regional Development**
- **Entrepreneurships** (Venture Capital, NASDAQ)
- **Globalization** (FTAs with Chile, U.S., EU, China)

• STI Policies

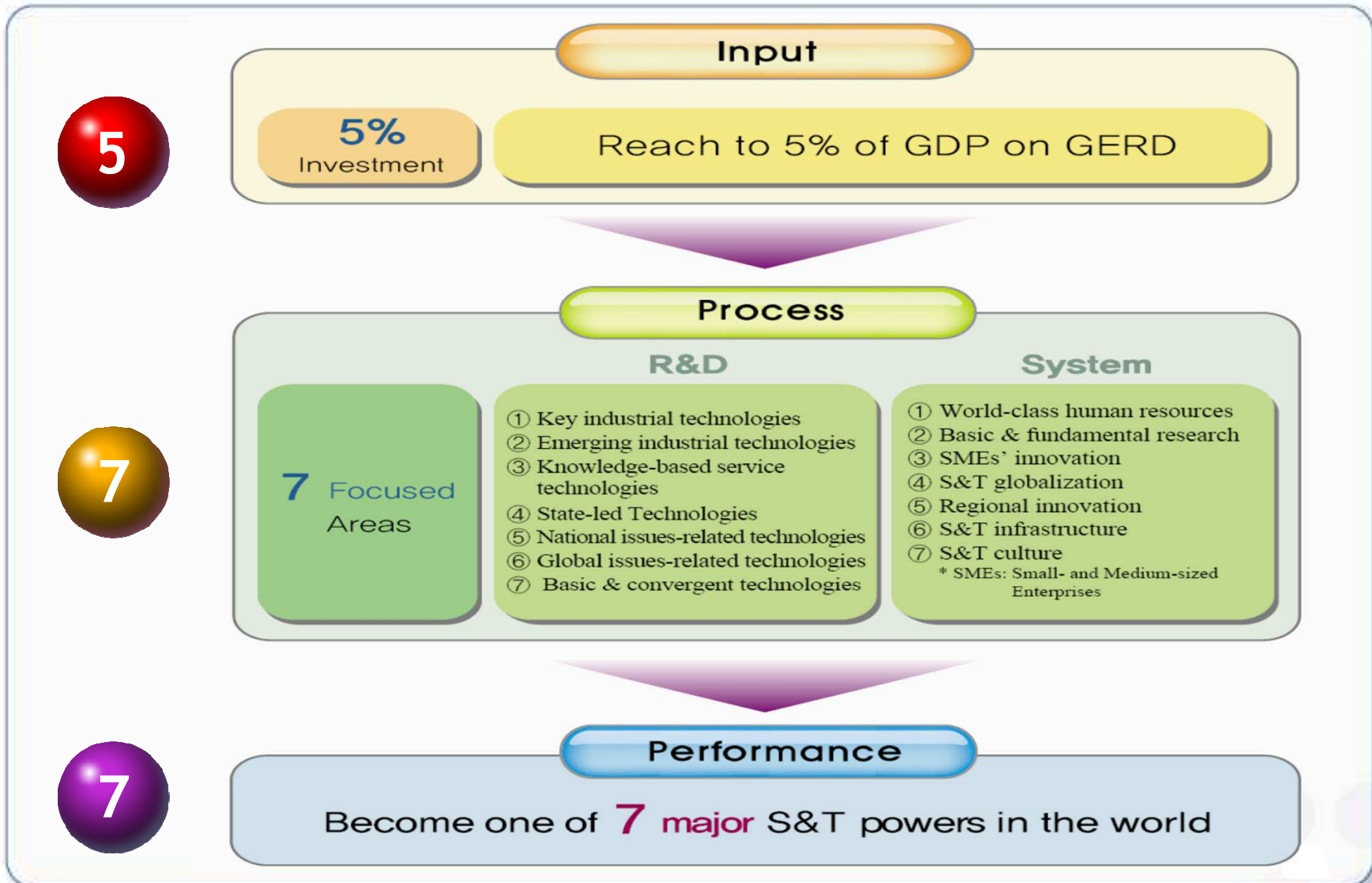
- **New Growth Engines** (Bio, Nano, IT)
- Develop **Regional Innovation Clusters**
- Decentralization of R&D Authorities but Emphasis on **Coordination**
- Long-term Vision for S&T Development (Vision 2025)
- Five-Year S&T Principal Plan
- Efficiency of Gov. R&D Investments (**Evaluation** Emphasis)
- National Technology Road Map (NTRM)
- **Private Sector-led NIS**



Seeking New Growth Engines



577 Initiative (2008)





Creative Economy (2013~)

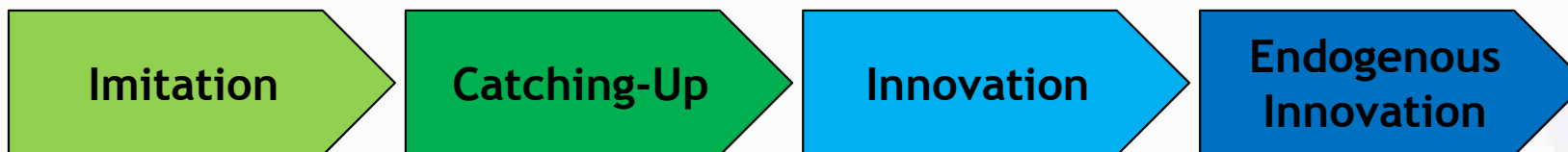
- **Creation of ecosystem that facilitates startups**
 - Break down the obstacles hindering startups and foray into the market, refurbish the intellectual property right system to ensure safe distribution of ideas and knowledge, and create the chance to take on the challenge even after a failure.
- **Support and cultivation of venture and SMEs**
 - Provide financial support and tax relief to help venture and SMBs evolve into global companies, and ensure large companies and SMBs to share the benefits of economic growth.
- **New industry & creation of market**
 - Create new products and services based on the convergence of knowledge and technology - the creative assets - with conventional industries, such as culture, health, agricultural and marine industries, and fully leverage S&T and IT to create future growth engines.
- **Development of global creative talents**
 - Develop creative talents who have challenging and entrepreneurial spirit, provide active support to ensure that those talents fully unfold their capabilities abroad, and deploy the professional manpower in the global arena with open-mindedness.
- **Expanding the capability of S&T and ICT**
 - Increase the investment to expand the ICT and S&T of Korea to an unmatched level in the world, and build the world's best internet and network environment to promote the exchange of idea and knowledge.
- **Creation of the inclusive creative economic culture**
 - Create a social environment that allows the public to express their imagination and ideas without restriction, provide opportunities for creating new value by using the public information, and achieve innovation in the operation of government in order to lay the groundwork for the public and the government to work together.



Roles of STI Policy in Korean Development

Period	1960s	1970s	1980s	1990s	2000s	2010~
Era	Export-Oriented	Export-led	Economic Liberalization	Democrat.	Advancement	Global Leading
Focused Industries	Light Industries	Heavy Industries	Assembly & Processing Industries	ICT	Knowledge Intensive Industries	Knowl. Service/New Converging/Green Ind.
Compet. Factor	Cheap Labor	Skilled Labor	Capital Investment	Technologies	S&T Innovation	Advanced S&T Innovation
Demanding S&T HR	Skilled HR	Technical HR	Higher S&E	High Calibre S&E	Creative S&E	Creative & Converging S&E
Demanding Tech.	Plant Mgt.	Facility M&O	Mfg.	Core Tech.	Endogenous Tech.	Source Tech.
S&T Policy	Turn-key Capital Import/ Tech. Learning	Internalizing Imported Tech./ Reverse Eng.	Modify Imported Tech./ Develop Domestic Tech.	Advancing Tech. Catch-up/ Large Gov. R&D Prog.	Focus on endogenous tech./ Systemize S&T Prog.	Globalize S&T/ Focus on Convergence

Paradigm Change



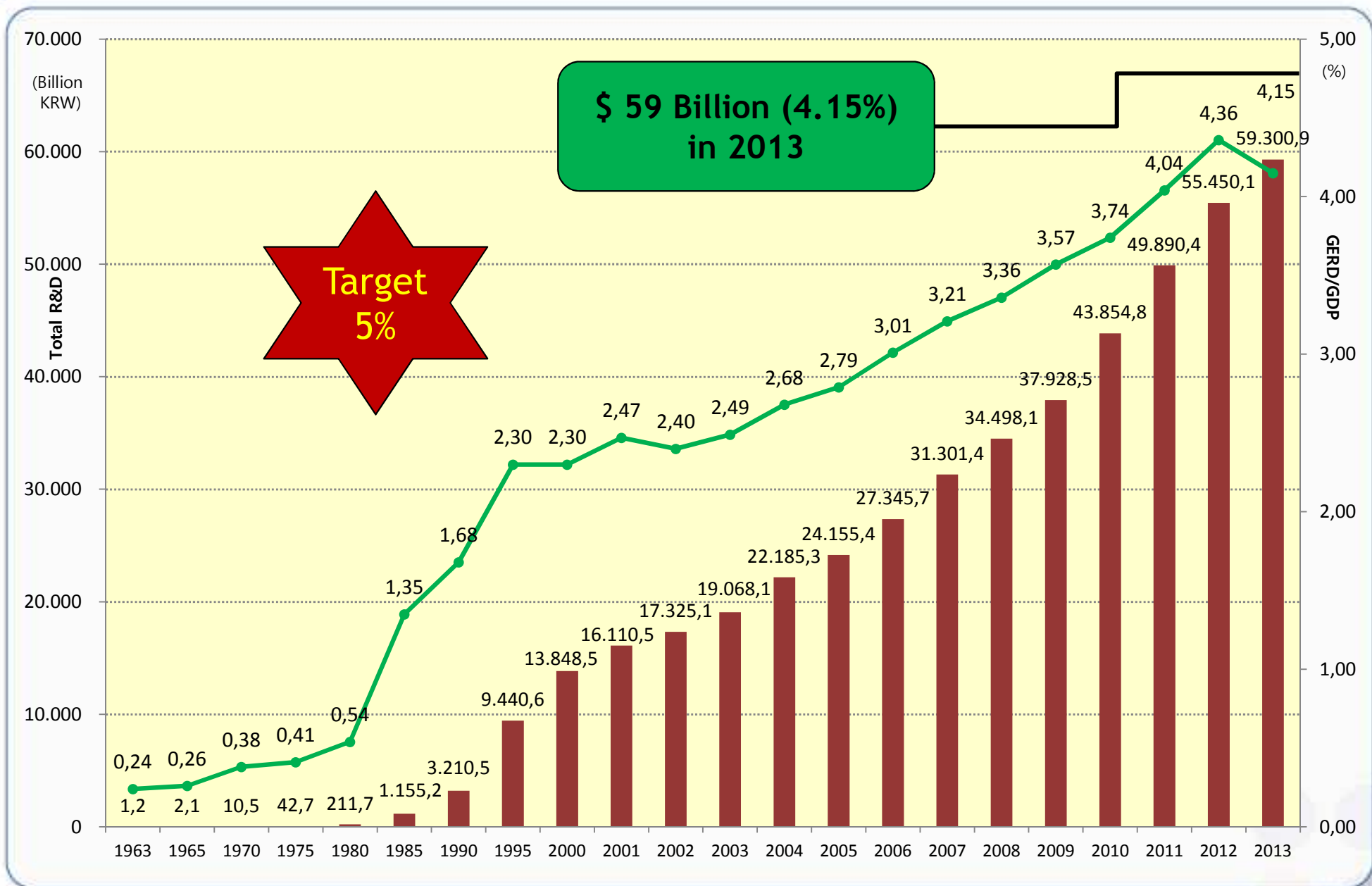


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Trends of Total R&D Exp. and R&D/GDP in Korea



Public R&D Investment Growth

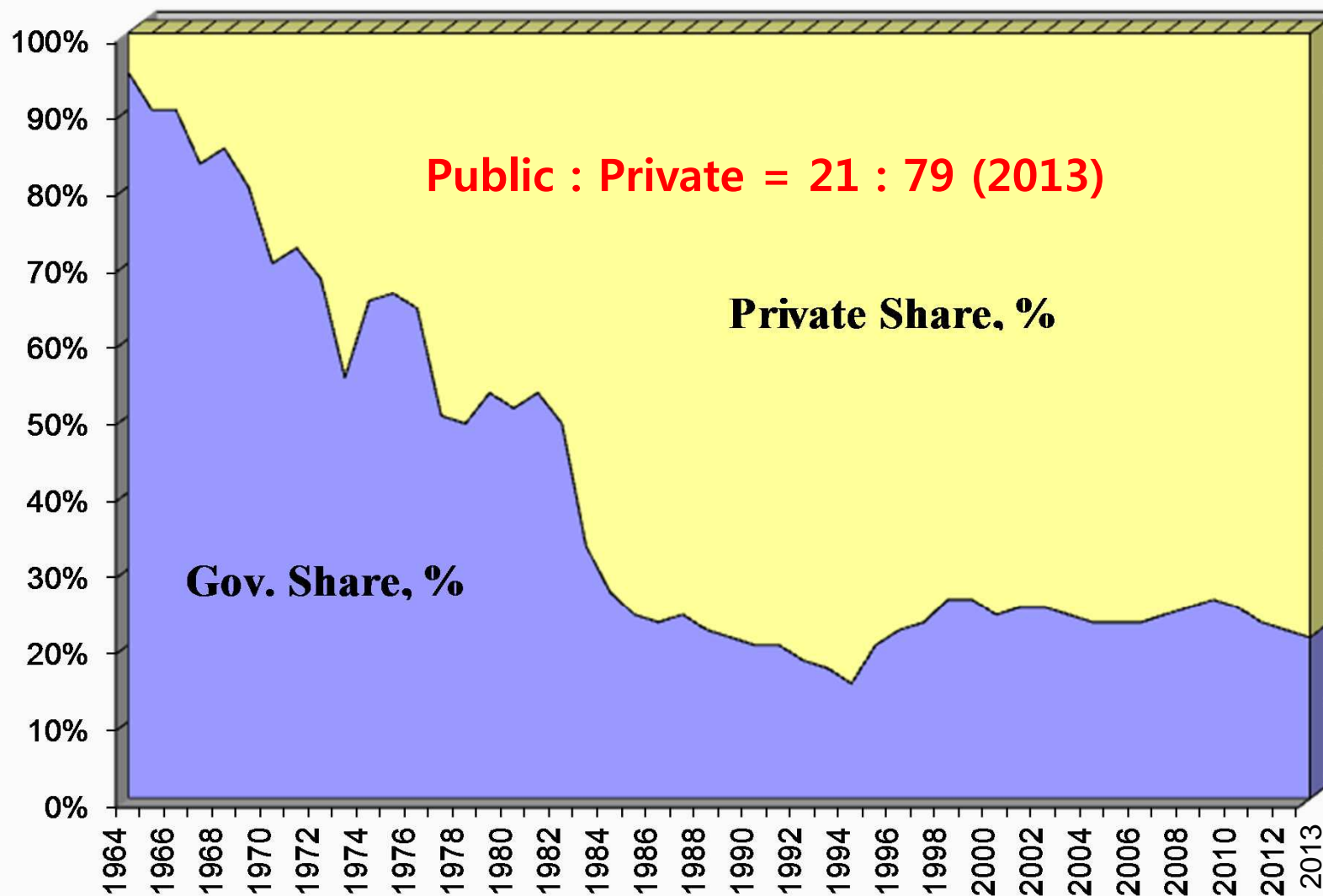
Public R&D Investment



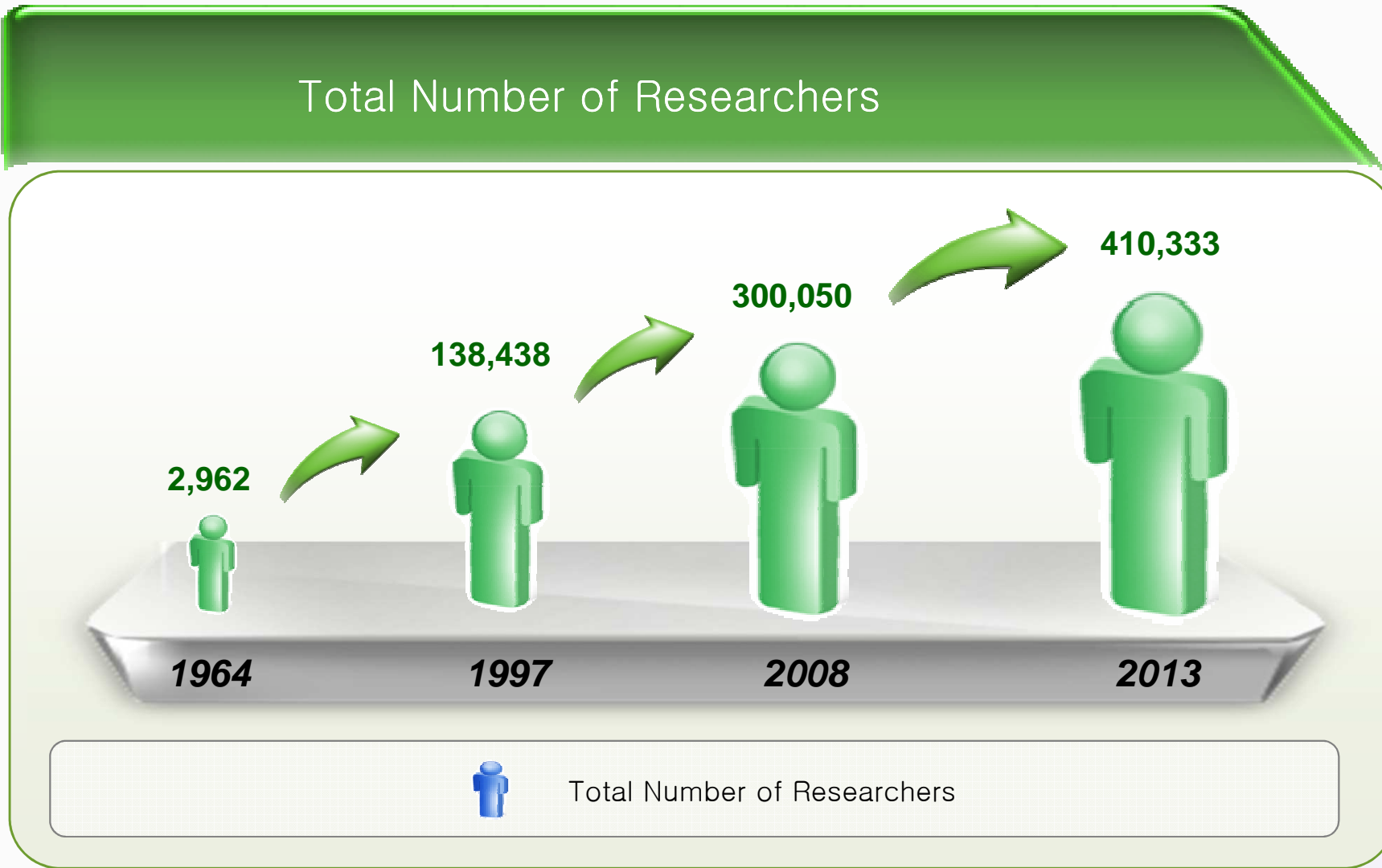
Government's R&D Budget (Trillion KRW)

Trends of Public vs. Private R&D Investment in Korea

Public R&D: Promoter & Facilitator



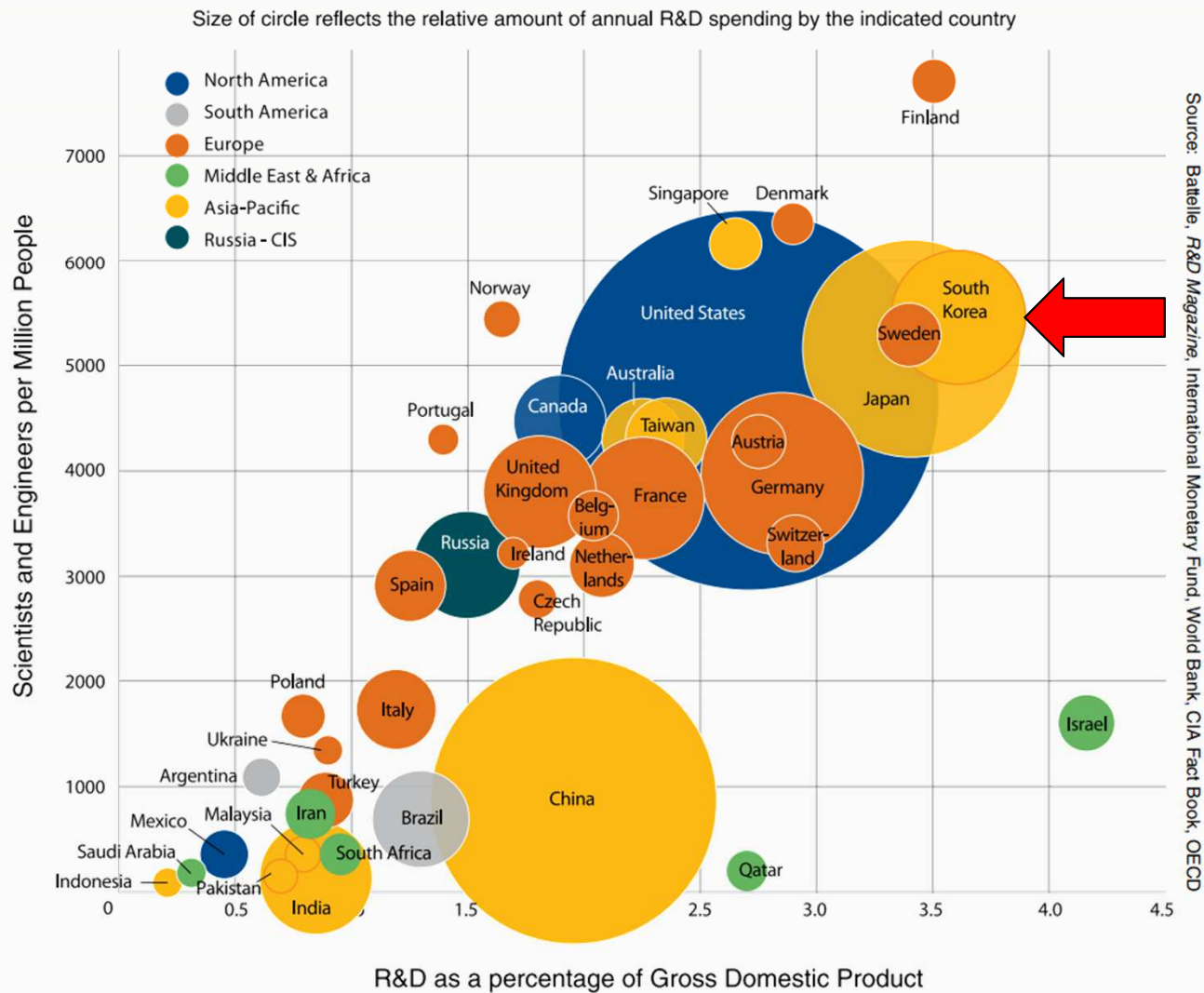
Total Number of Researchers Growth





Korea in Global R&D (2013)

WORLD OF R&D 2013

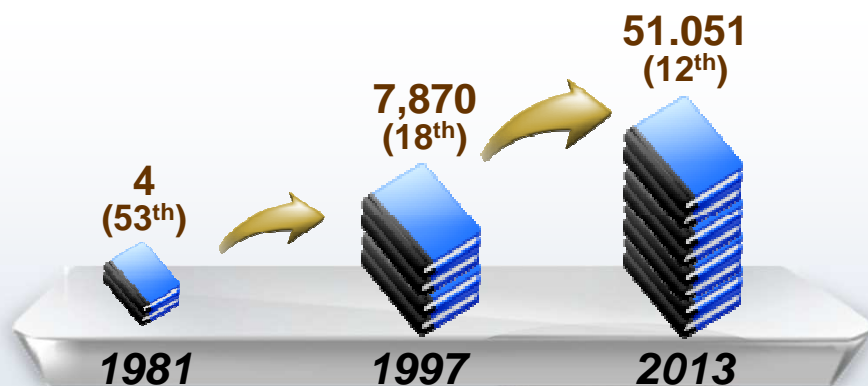



Source: 2014 Global R&D Funding Forecast, Battelle (2013)



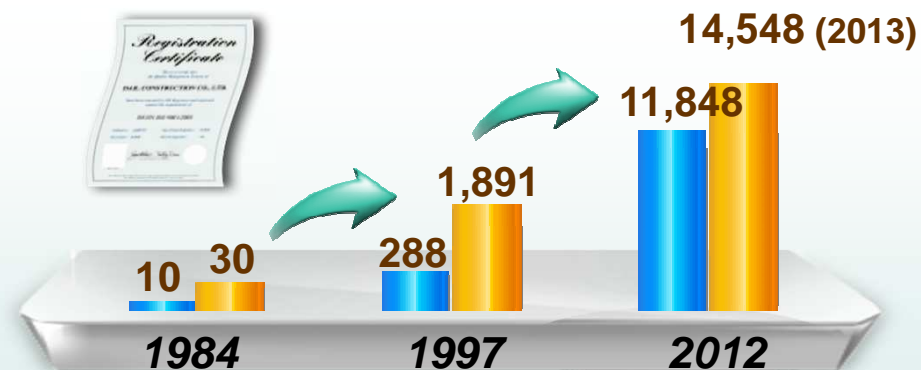
Major S&T Achievements

Science & Technology Articles



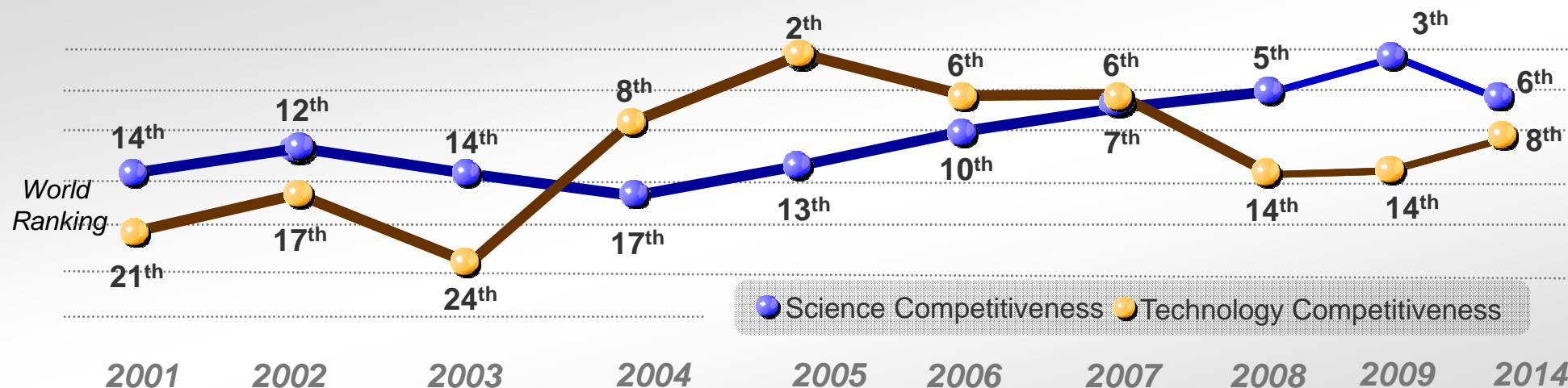
 Number of Articles (Ranking)

International Patents



 No. of PCT Applications  No. of US Granted Patents

Science & Technology Competitiveness (IMD)



 Science Competitiveness  Technology Competitiveness



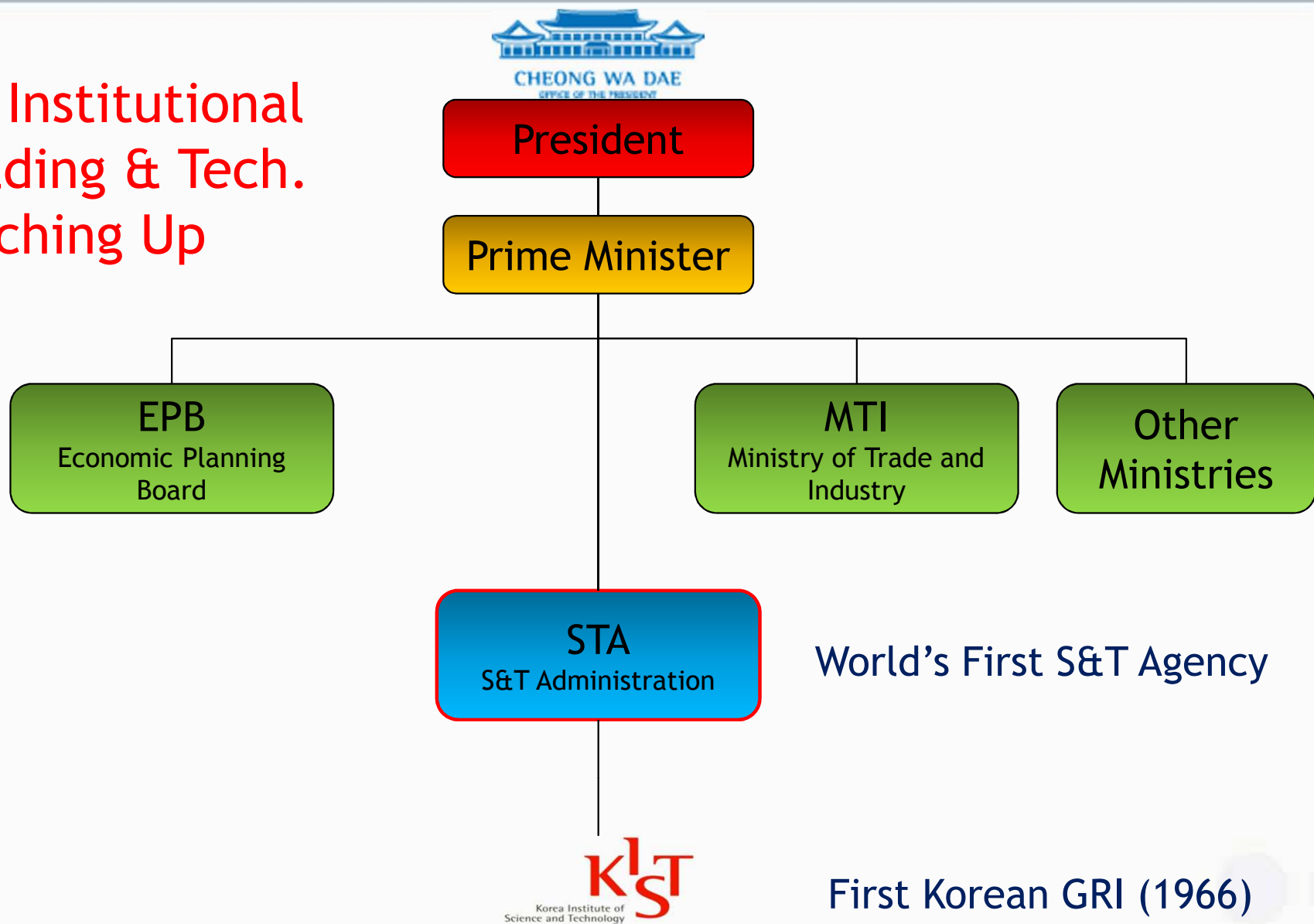
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Birth of MOST in 1967

For Institutional Building & Tech. Catching Up





Upgrade of MOST in 1998

For Promoting
Innovation



President

NSTC

Prime Minister

Introducing Research
Councils & NSTC

MOCIE
Ministry of Commerce,
Industry and Energy

MOST
Ministry of S&T

MIC
Ministry of Info. and
Communication

Others

KRCF

NRES

NRHS

KOCI

GRIs

GRIs

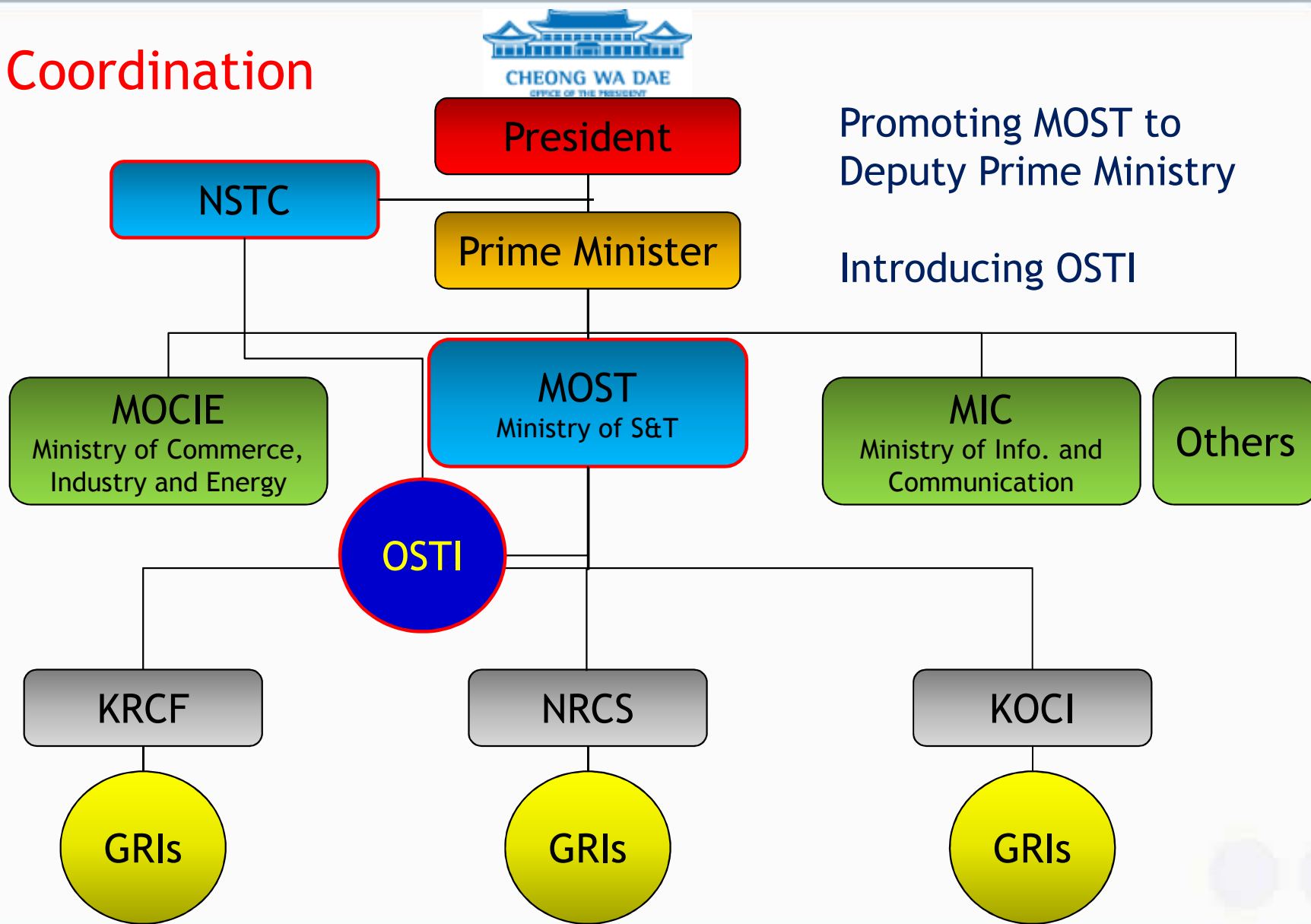
GRIs

GRIs



Promotion of MOST in 2004

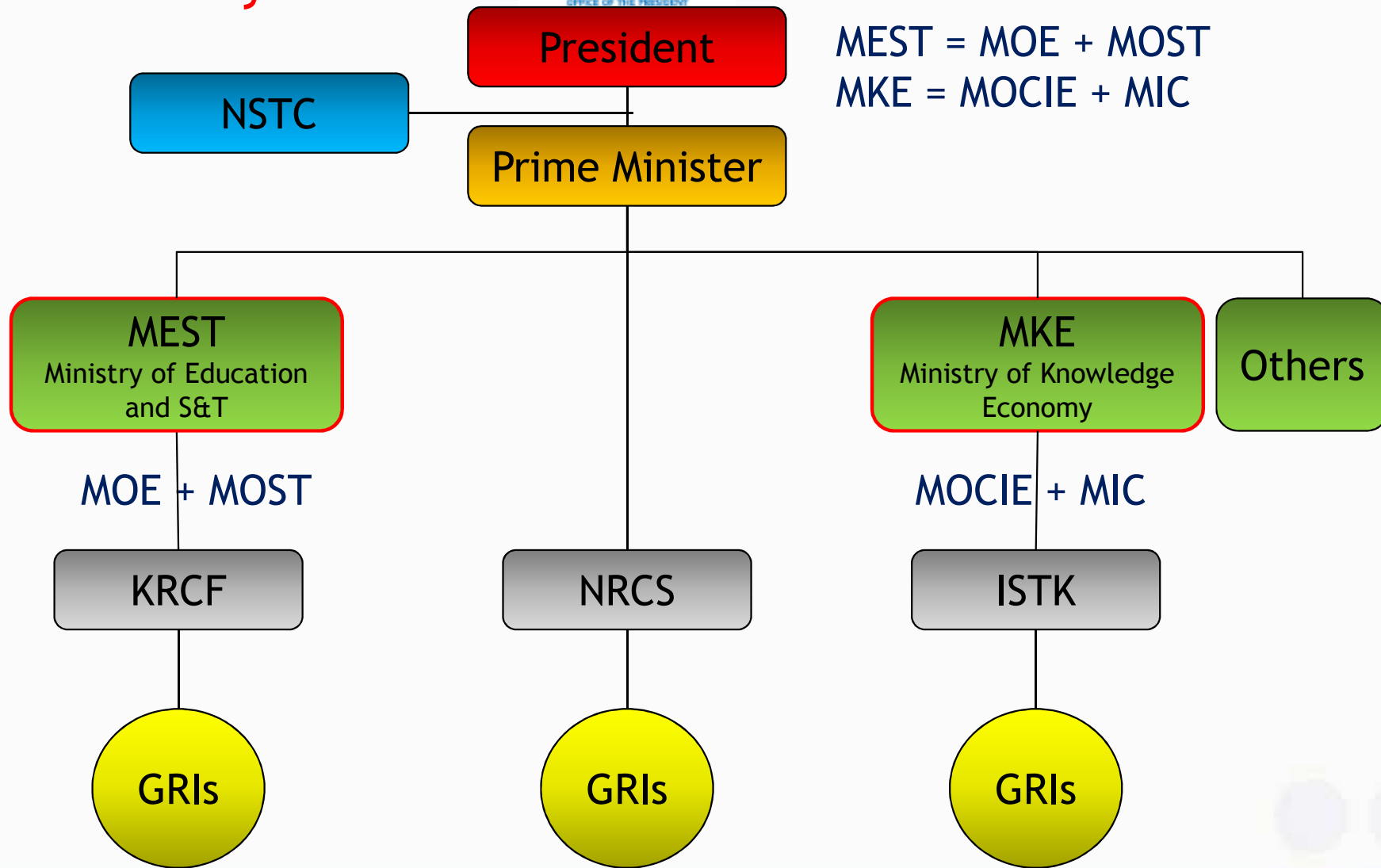
For Coordination





Two Top System in 2008

For Efficiency



MEST = MOE + MOST
MKE = MOCIE + MIC



Standing NSTC in 2011

For Effective
Coordination



President

Prime Minister

Standing NSTC as a Control
Tower with STI Policy
Coordination and R&D Budget
Allocation Power

MEST

NSTC

MKE

Others

KRCF

NRCS

ISTK

13
GRIs

26
Policy
Inst.

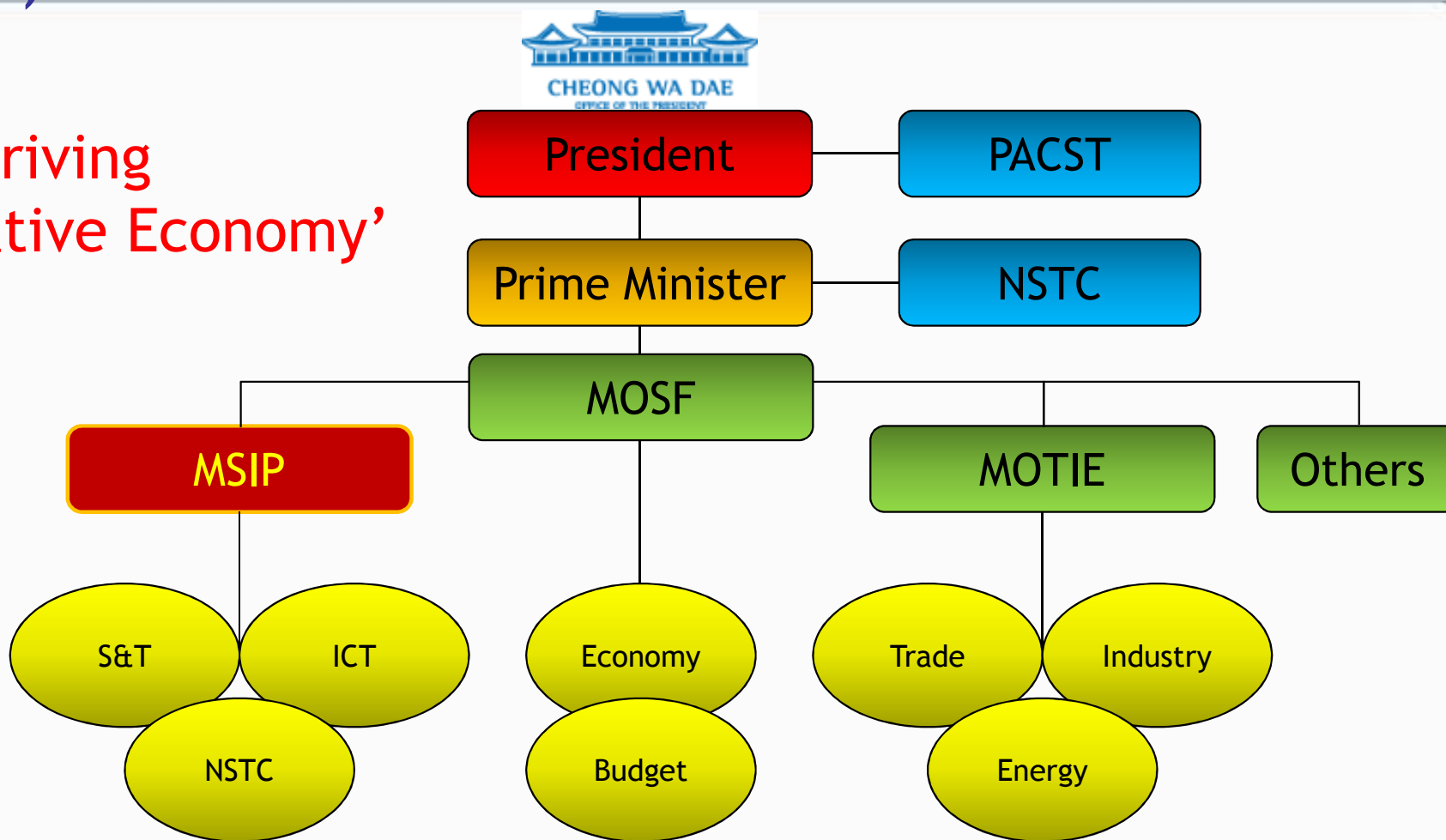
14
GRIs





New Governance for Creative Economy (2013)

For Driving
'Creative Economy'



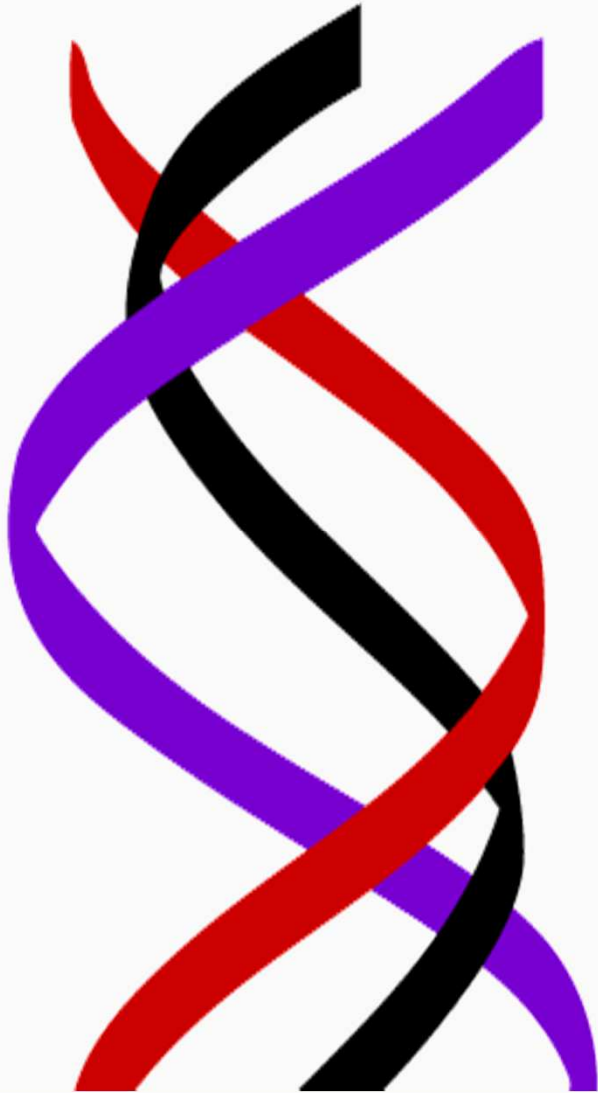
- * MOSF: Deputy Prime Minister and Ministry of Strategy and Finance
- * MSIP: Ministry of Science, ICT and Future Planning
- * MOTIE: Ministry of Trade, Industry and Energy



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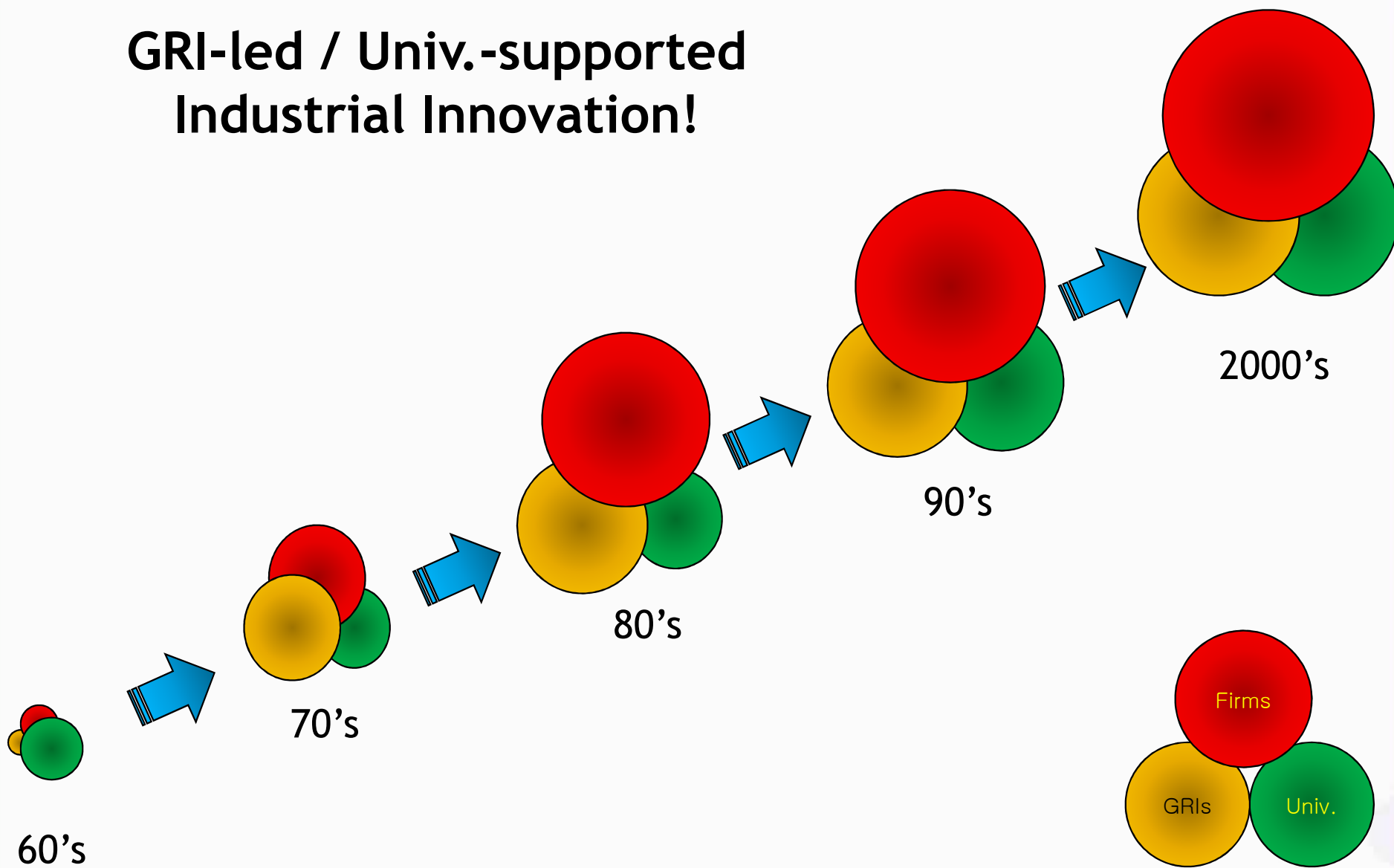
Triple Helix for Innovation



- **Government (GRIs)**
 - Government-sponsored Research Institutes (GRIs)
 - Public Research Institutes (PRIs)
 - Research for Public Purposes
 - Applied Research
- **Universities**
 - Supply S&Es
 - Curiosity-driven
 - Basic Research
- **Firms**
 - Commercialization
 - Produce Innovations
 - Development Research

Evolution of Korean Triple Helix

**GRI-led / Univ.-supported
Industrial Innovation!**



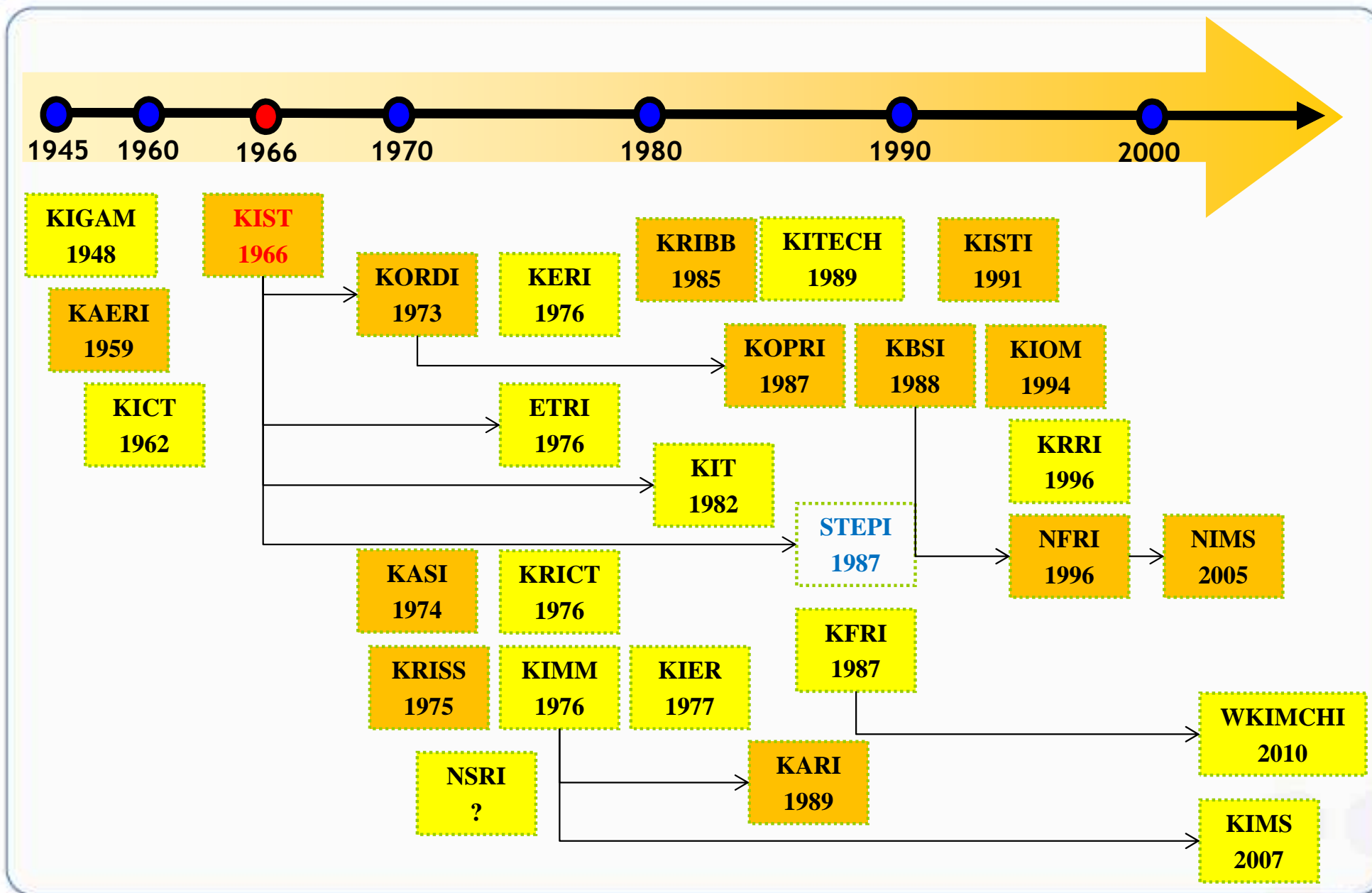


Roles of GRIs

- **Leading Player for Korean Innovation**
 - Independent non-government organizations with government's financial supports
 - Operating under the GRI Laws and civil laws
 - Conduct about Half of Public R&D Investments
 - KIST, the First GRI, was established in 1966 with help of USAID
 - 27 (13 under KRCF & 14 under ISTK) S&T GRIs (as of 2011)
- **Role Shifting**
 - Absorbing & Internalizing imported foreign tech. (1970s)
 - Modifying imported tech./Developing domestic tech. (1980s)
 - Advancing catching-up tech. (1990s)
 - Focusing on Endogenous Tech. (2000s~)
 - Major Function: Providing Needed Tech. to Industries
- **Challenges**
 - As Private R&D Labs and University Researches Grow,
 - Need to Redefine its Role



Evolution of Korean GRIs





KIST: The First Korean GRI

- **Korea-US Summit in 1965**
 - Between then Presidents, Park Chung Hee and Lindon B. Johnson
 - ‘Foundation of a research institute for Korea’s Growth in industrial technology and applied science’
 - Under USAID Program
- **Models** <  Bell Laboratories **vs.**  Battelle >
 - Bell Lab: Research for Basic Science
 - **Battelle**: Industry-oriented Tech. Dev. for Catching-up
- **Growth**
 - 1966: 50 FTE & 200 M.KRW
 - 2010: 700 FTE & 250 B.KRW



• Principles

- Close to Industries
- Operational Autonomy
- Stable Funding
- Transparency



Roles of Universities

- **Reservoir of High-Caliber S&E Human Resources**
 - Korea High Fever on Education (College Enrollment Rate: 87%)
 - More than 400 Higher Education Institutes
 - Holds about 70% of S&E Ph.D.s
 - Excessive Teaching Orientation
 - Conduct Only 10% of Gross R&D Expenditure
- **Enforcing its Research Function**
 - KAIST, the first S&T Research Univ., was established in 1971
 - Allocating More Public R&D Investment to Universities
 - Promoting Basic Researches
 - Various Programs such as BK21, WCU, WCI, etc.
- **Challenges**
 - Shrinking S&E Enrollment
 - Weak Univ.-Industry Partnership
 - Promoting into the World Class Level



S&T-specialized Research-oriented Universities

- **Education + Research**
 - Supply High-Caliber S&Es to GRIs & Industries
 - Conduct Mid- & Long-term Researches
 - Under Different Governance
- **Under Ministry of S&T (MOST)**
 - Most Universities were under auspices of Ministry of Education (MOE)
 - S&T-specialized Universities were under auspices of Ministry of S&T (MOST)
 - Operational Autonomy
 - Stable & Growing Funding
- **Expansion**
 - POSTECH (Private Univ. sponsored by POSCO)
 - GIST, DGIST, UNIST (Public Univ. funded by Government)



KAIST: The First Research-oriented Graduate School

- **Korea Advanced Inst. of S&T**

- Established in 1971
- Under Special Law on KAIS
- With Government Funding
- Provided High-Caliber S&Es

- **Evolution**

- Staffed with Oversea-trained Korean S&Es
- Merged with KIST in 1981
- Undergraduates in 1986
- Split out from KIST and Moved to Daejeon in 1989

- **Current**

- Faculty: 700+ (Int'l: 100+)
- Student: 8,000+ (Int'l: 300+)



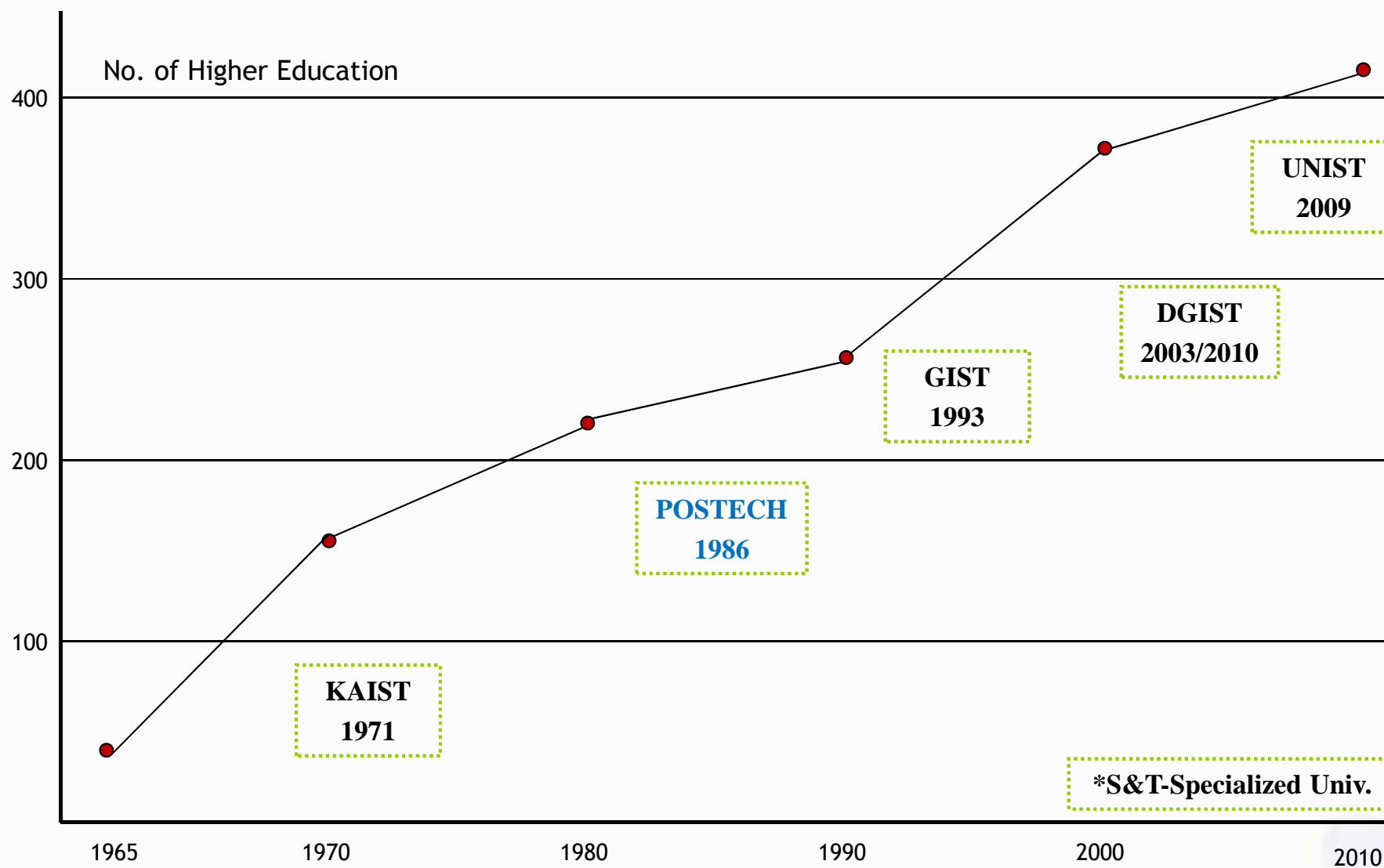
↑ The whole view of KAIS in 1970s

- **Functions**

- Education & Research
- Theoretical & Applied Researches
- Mid- & Long-term R&D
- Incubate Entrepreneurs

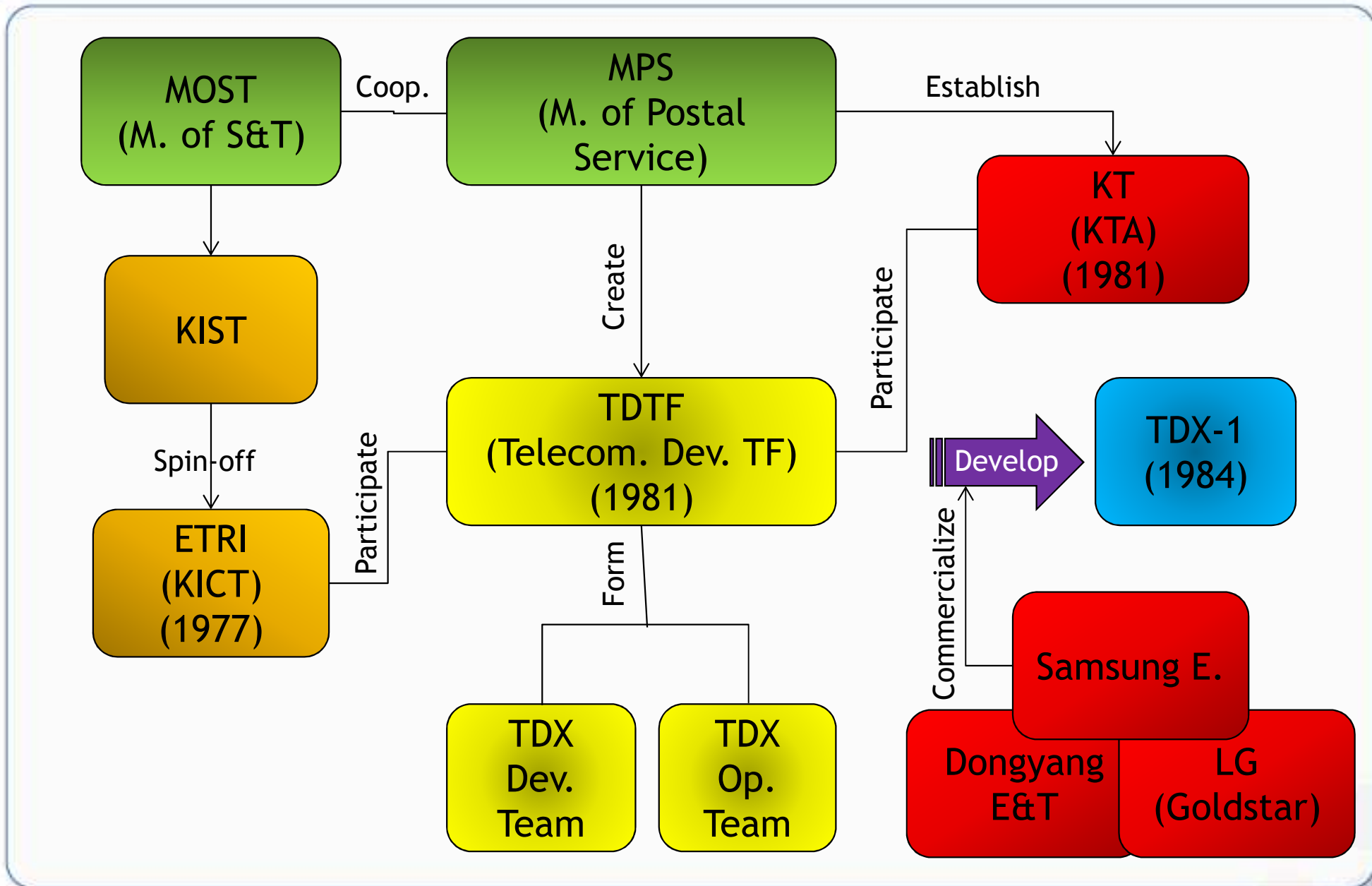


Evolution of Korean Universities



Source: MEST (2010)

A Typical Case: TDX Development Project (1977-1984)



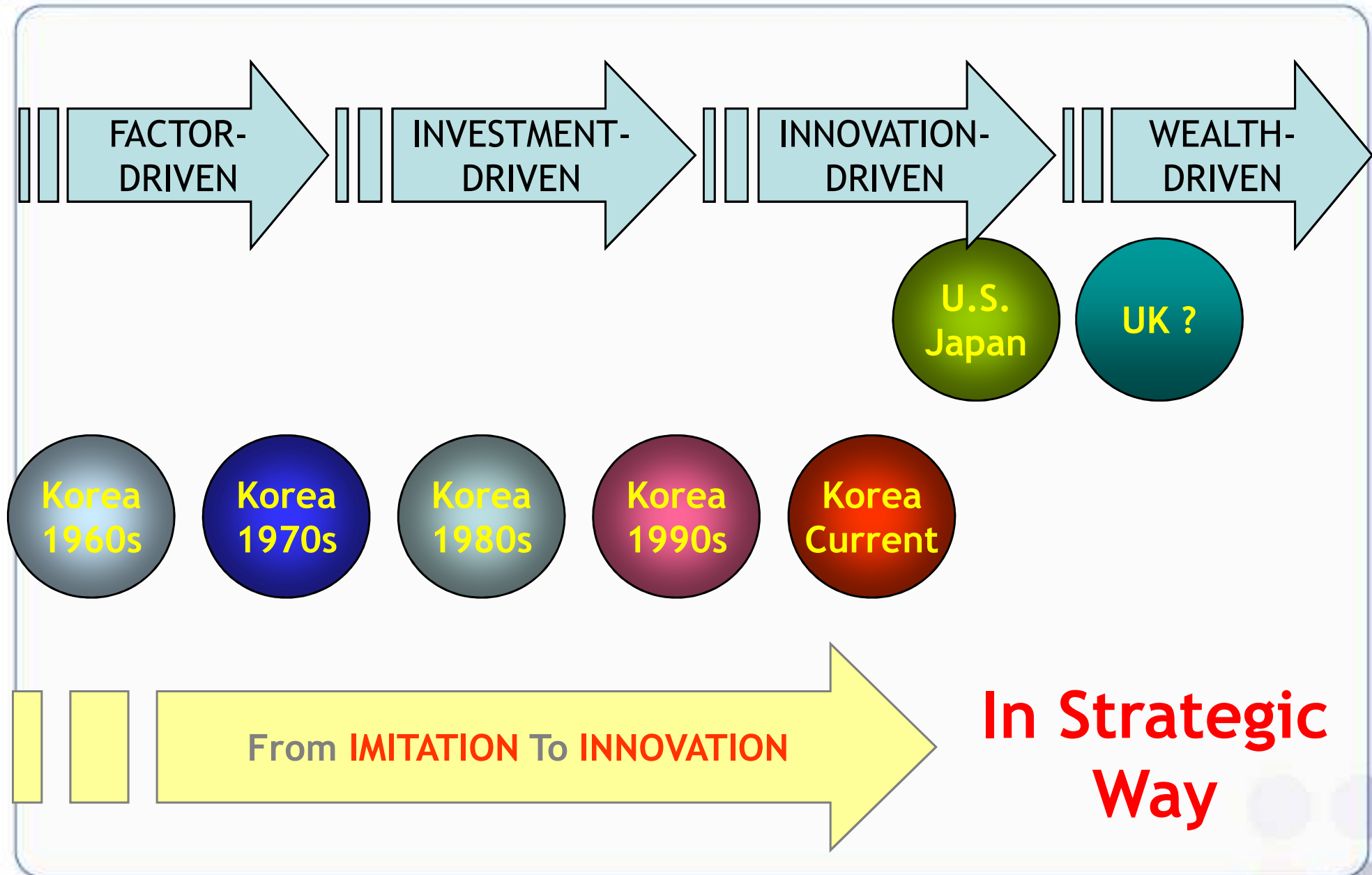


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How Has Korea Evolved?





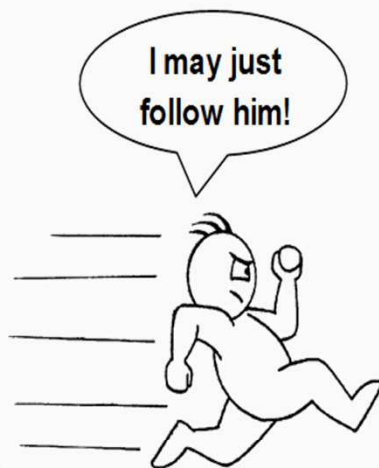
Innovation Strategies at Different Development Stages

STI Leadership

Institution Building



Catching-Up





Policy Implications

- **Triple Helix**
 - Major Players for Modern Innovation
 - Each has its own designated Role
 - Collaboration among Triple Helix is Essential
 - For Development, Which Player should go First?
- **Western Model (Balanced Strategy)**
 - All Players should be developed in Balance
 - Based on Traditional Simple-Linear Innovation Model
 - Basic R -> Applied R -> Development -> Innovation
 - Assume Automatic Spillovers
- **Korean Model (Unbalanced Strategy)**
 - Under very limited framework conditions
 - University vs. GRIs
 - Korea chose GRIs to take a lead for Catching-up
 - Later, promote Research in University
 - Essence is Education!



Thank You!

For Further Comments & Questions;

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