

# R&D in Korea

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Ratsmitted in RETE

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# Korea

- ▶ Korea dynasty → Chosun (1392–1909)  
Republic (since 1945)
- ▶ Japan, 2<sup>nd</sup> World War, USA, UdSSR
- ▶ South & North Korea
- ▶ Korean war (1950–1953)
- ▶ Industries (ex. fertilizer), power plant, minerals & natural resources in North Korea
- ▶ Financial support → steel, chemical industries, logistic ; science & technology transfer ; education → stable economic growth
- ▶ Olympic, World cup, Winter olympic 2018



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Strategy & Basic Direction

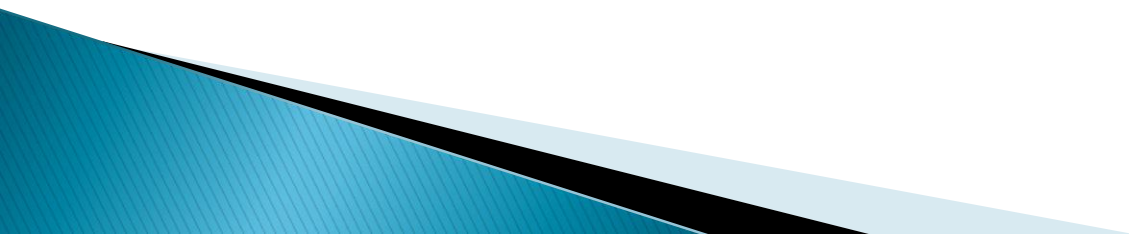
## II . Convergence Technology :

Importance, Usefulness & Marketability

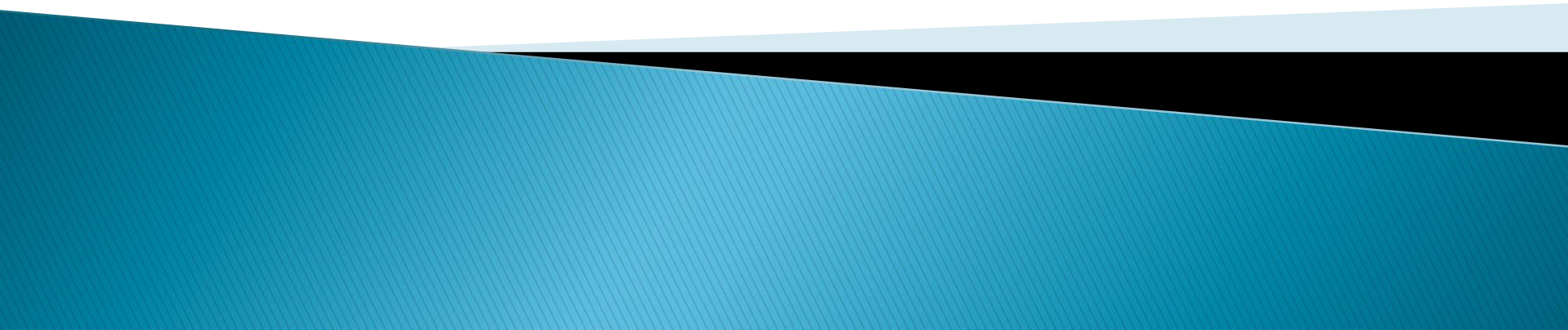
## III . Action Plan & etc. :

Visions, Goals & New Paradigm

## IV . Conclusion



# I . Green Growth : Strategy & Basic Direction



# I. Efforts for Successful Implementation of Green Growth

Harmonizing Every Sector of Society  
For Green Growth



# Establishment of Green Growth S&T Council

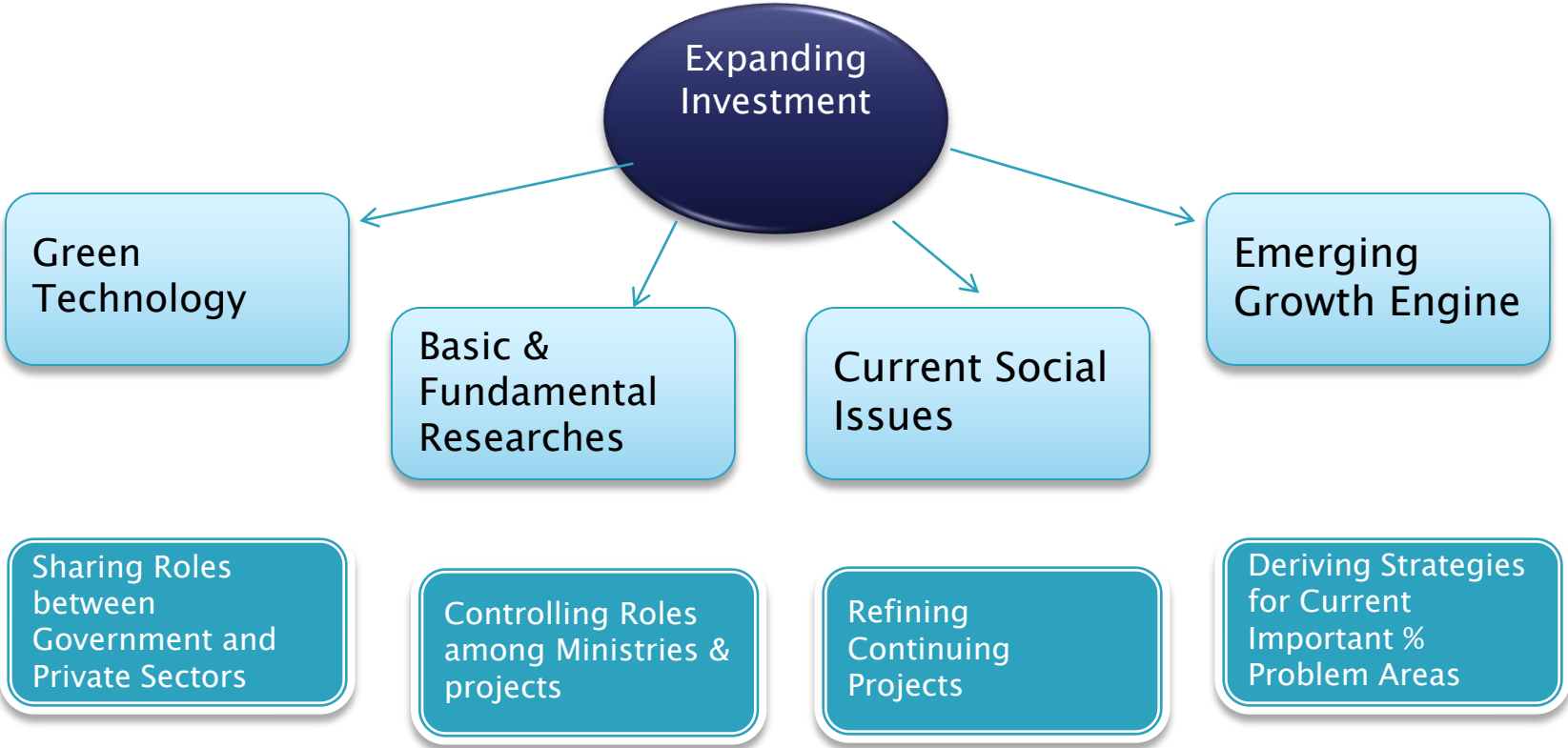
Green Growth S&T Council

S&T Societies, R&D Inst (priv, nat' l)  
Academic Circles, Gov Ministries

Office : KOFST

R&D	Technology Transfer	Education/Human	Bases for GreenTech	International
• Green Conv Tech	• Commercialization of Green Technology	• Green Campus	• Green Tech DB	• International Cooperative R&D
• Clean Tech	• Support for Industrialization with Tech Transfer	• Green Culture Expansion	• Infrastructure for Green Tech Industries	• R&D Institutes with World-wide Reputation
• Reduction of Greenhouse Gasses	• Tax Benefit & Financial Support	• Job Creation	• Certification / Standardization of Green Tech	• World-wide Invitation of high Quality human Resources
• Eco Tech		• High Quality Human Resources		

# Basic Direction on National Budget Distribution



Efficiency in Investment



# Budget Distribution on Major R&D Project



# R&D Budget on Green Technology

- Total of 27 Major technologies consisting of over 50 R&D projects
  - Total investment in 2008 – 1.04 trillion won  
(approx. \$.85 billion)
  - Budget for 2010– 1.41 trillion won (\$1.2 billion)
  - Major techs – new & renewable energy, energy resources, nuclear energy, intelligent transportation system, u-city, smart grid, ocean environment, advanced contents using convergence technology, etc.
  - Budget for 2012–under consideration

# R&D Budget on Emerging Growth Engine

- 17 Items in 3 Major Industrial Areas
  - Budget in 2009 – 1.72 trillion won (\$1.4 billion)
    - \* Green technology industry – 0.98 trillion won
    - \* Emerging convergence industry – 0.60 trillion won
    - \* Value-added service industry – 0.14 trillion won
  - R&D projects in convergence industry emphasized  
(‘10) u-Health, Robotics, Knowledge-service, USN technology, Future fundamental technology, Brain science, New materials, Mobile convergence technology, Industry technology convergence, Global u-R&ED platform, etc.
- 

# R&D Budget on Basic & Fundamental Researches

- R&D investment in 2008 – 1.84 trillion won (\$1.51 billion)
- R&D budget in 2009 – 2.49 trillion won (\$2.04 billion)
- Estimated increase in R&D budgets for basic and fundamental researches (% of government investment)
  - \* Basic research : 29.3%('09) → 31~32%('10) → 35%('12)
  - \* Fundamental : 9.6%('09) → 11~12%('10) → 15%('12)
- Emphasis since 2010 – supports for young researchers, experienced researchers, research leaders, basic research laboratories and leading research centers (e.g., SRC,ERC)
- High-risk, high-return projects & convergence technology

# II . Convergence Technology : Impotence, Usefulness & Marketability

## II. Convergence Technology

### Introduction – A Dream comes True !

– 1987, *Inner Space* (Steven Spielberg)

“ The miniaturized main characters enter into the blood stream of a patient boarding a tiny submarine-like capsule for a medical experiment. They completely eliminate the patient’s cancer cells with a laser beam and then exit from the patient’s body through tears.”

– 21<sup>st</sup> Century

“ An attempt to cure cancer patients by designing a cancer-cell-specific nanoscale medicine injection system, a micro-robot made of a hard disk the size of a nail, and motors assembled with gears that are the half-thickness of hair.”

# Advantages of Convergence Technology 1

- Futuristic technology-intensive value-added industry possible.
- Requires competitiveness of individual technology  
(Stronger competitiveness against countries)
- Development of new technology /  
Creation of new market potential
- *In the next 10~20years, the convergence technology is expected to be the most essential elements in human society. Conversion of new technologies require **long-term investment**. However, considering its enormous spreading effect and the consequential industrial revolution, the experts are predicting that it will become the main indicator of a nation's competitive power in the world.*

# Advantages of Convergence Technology 2

- Marketability

*Prospect of the National Science Foundation(NSF)*

*NT-IT: basic technology applied to all future high-performance components of IT*

*Nano-applied semiconductor market (approximately US \$350B in 2014)*

*BT-IT : creation of high value-added markets in the medical, agricultural, and environmental fields (approximately US \$60B in 2010)*

- Smaller gap between the technologically developed and developing countries due to its short history

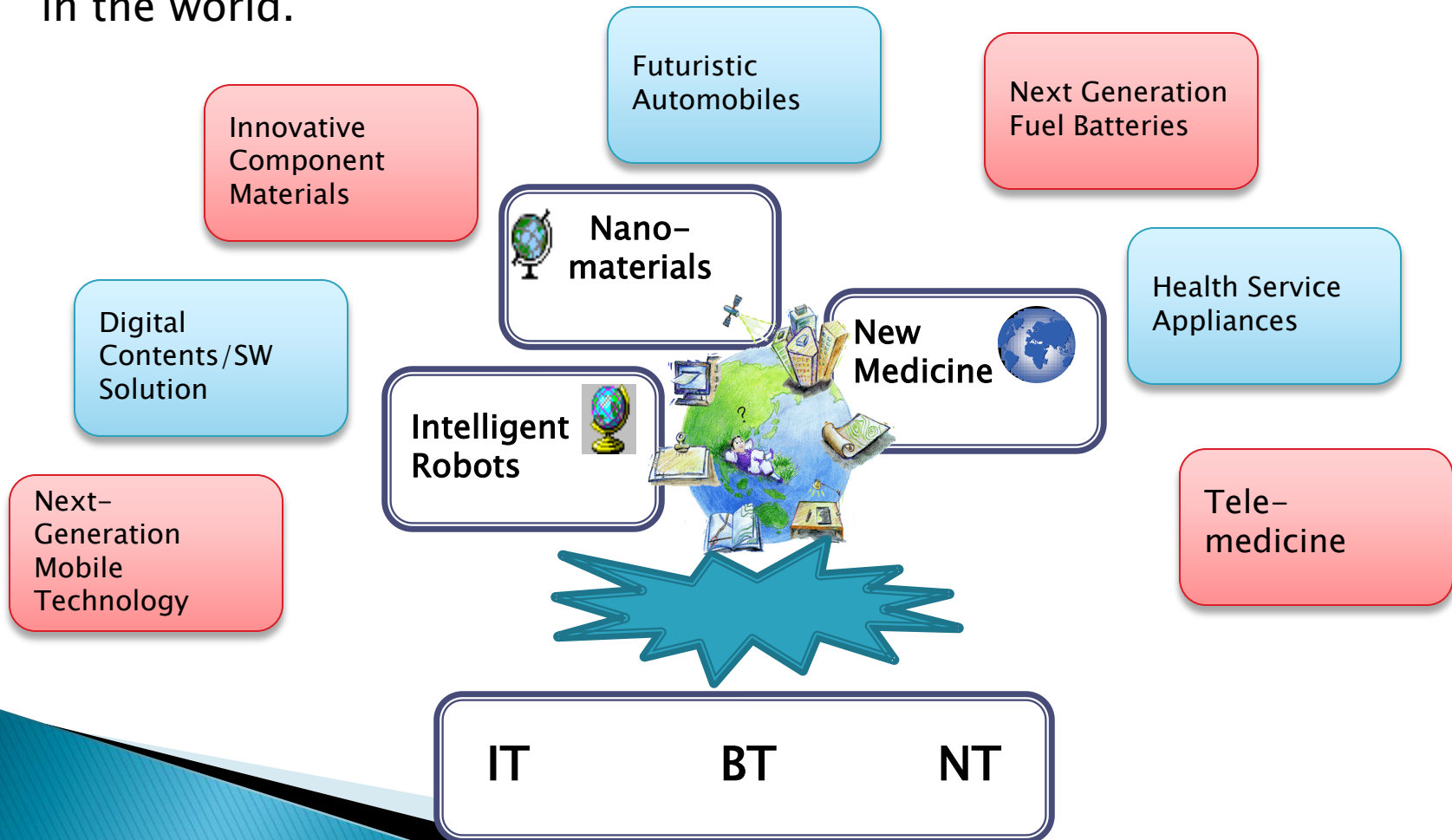
- Immense spreading effect on a variety of high-tech industries

*"Its spreading effect is too wide to measure the economic, medical & technological potential"*

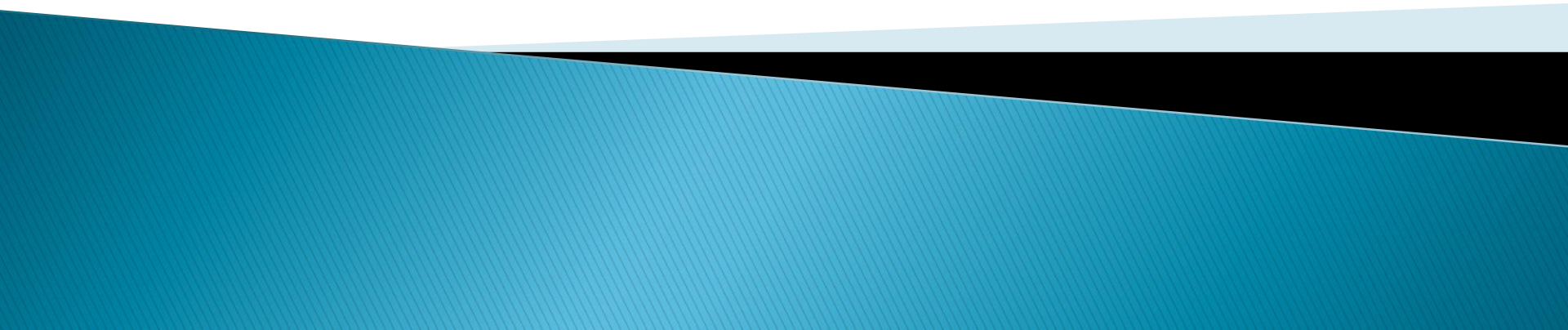


# Usefulness of Convergence Technology

An achievement that will surpass the limits of IT/BT and embrace the latest technology through Synergistic Combination for the Well-Being of mankind in the world.



# III. Action Plan & etc. : Visions, Goals & New Paradigm



# Example of Large & Venture Companies

## IT-NT

Enterprise

- Samsung Electronics : 16Gb Flash Memory based on 50nm Process (2005.09.)
- LG Electronics: Storage based on Nano Photonics (2005.10.)

Venture

- IL-Jin Nano Tech : Commercialization of Carbon Nano Tube (2001, 1 million dollar sale/year)

## IT-BT

Enterprise

- LG Electronics: Merging Blood-sugar testing device into a cellular phone (2004)

Venture

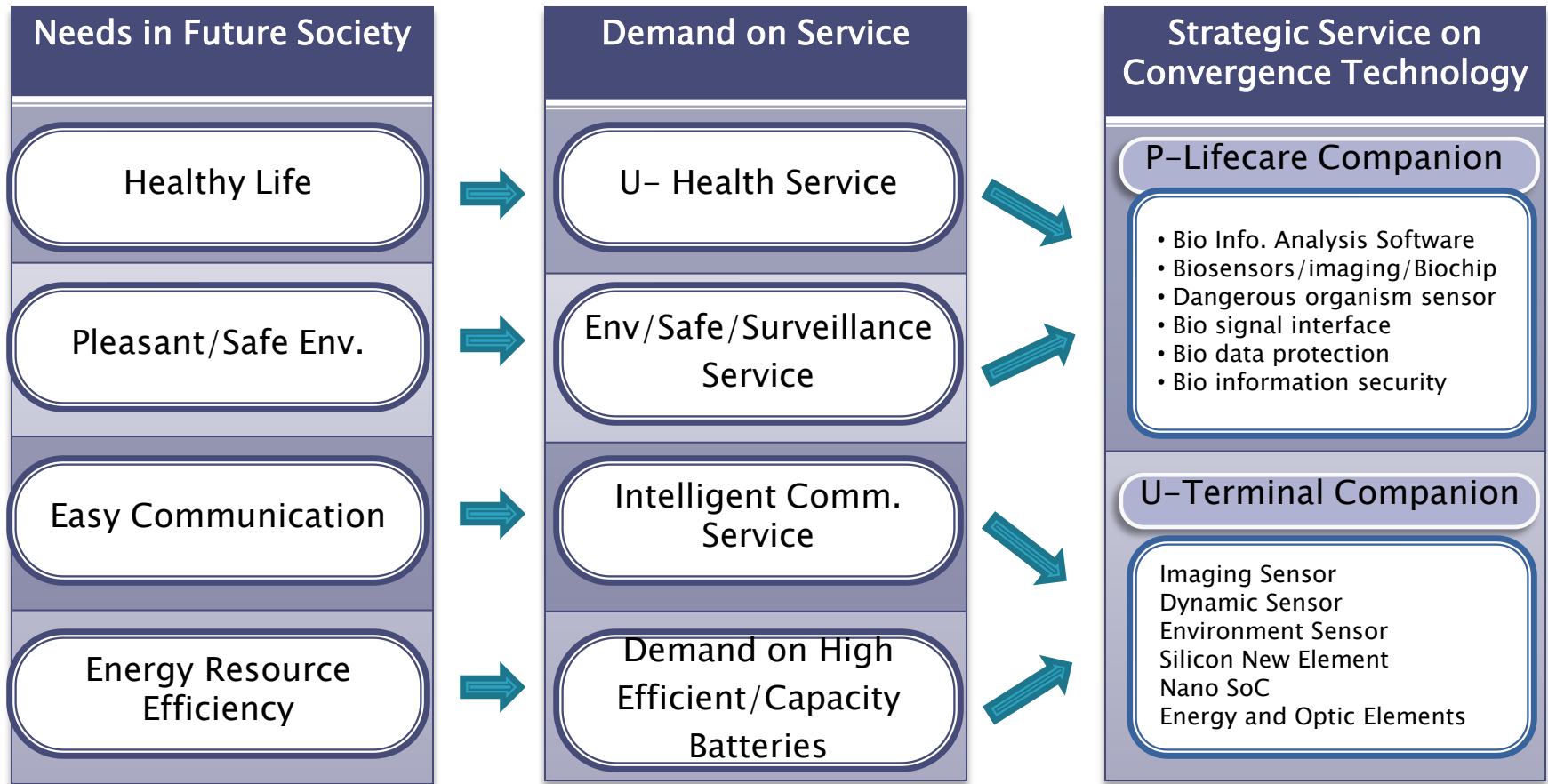
- MicroGen: DNA Chip for testing hereditary disease (2003, 11 million dollar sale/year)
- LabFrontier: Protein Chip (2004, 10.7 million dollar sale/year)

- ◆ University: Education for convergence technology/Basic research (partial list)
  - *KAIST: Dept. of Biosystems*
  - *POSTECH: School of systems Biosciences & Bioengineering  
School of Environmental & Engineering*
  - *Soongsil University: Dept. of Bioinformatics*
  
- ◆ Corporations / Research Institutes:  
Commercialization utilizing conversion technology
  - *Artificial heart/electronic anatomy (e-baby)*
  - *Tele-medicine*
  - *Molecular design technology (Pohang Accelerator Laboratory)*
  - *DNA-, protein-, bio-Chip (POSTECH Biotechnology Center, Samsung Research Institute, etc.)*
  - *MEMS & NEMS(POSTECH Department of Mechanical Engineering)*

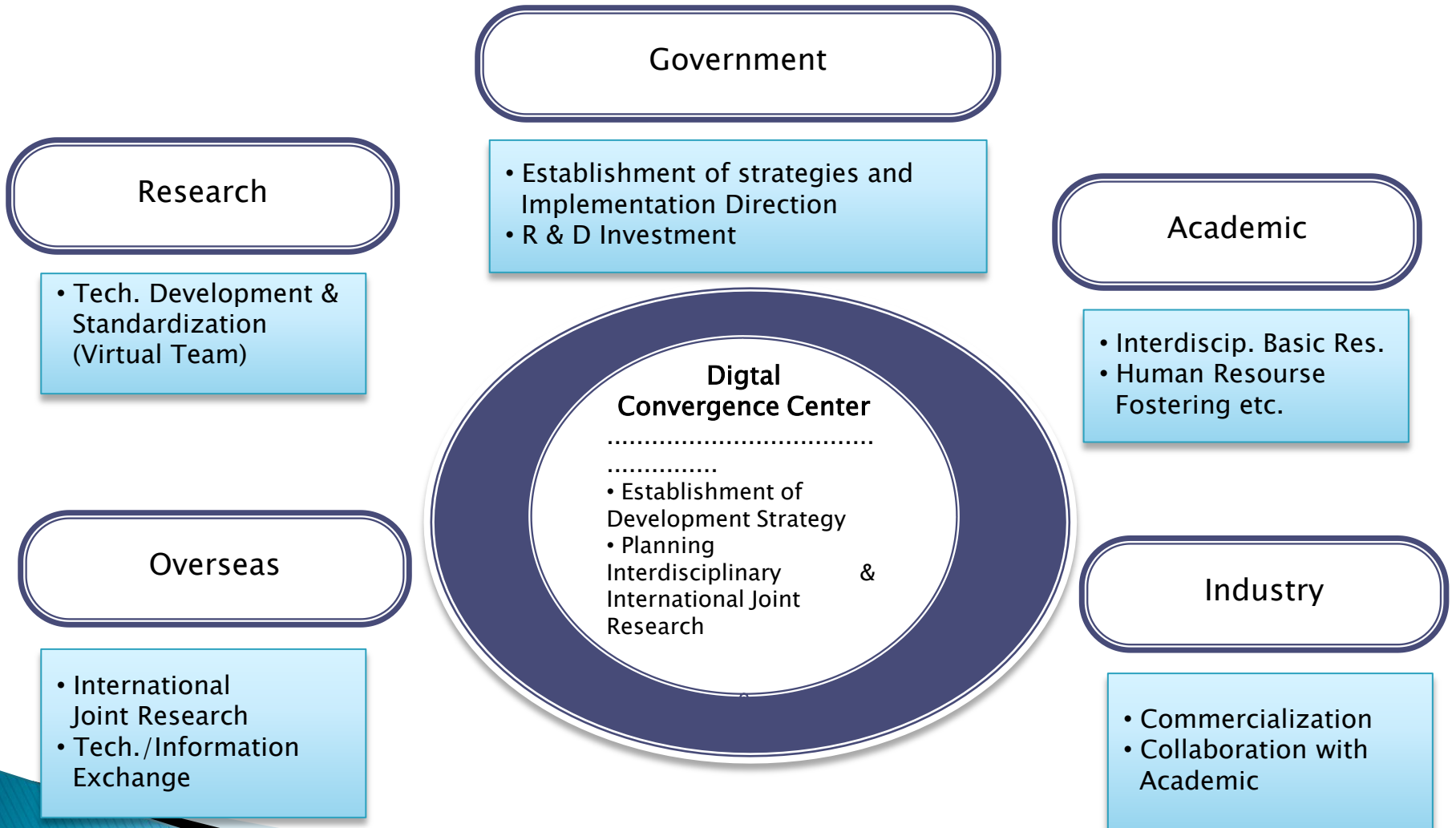
# Prediction of Needs & Service Demand

Needs in Future Society			Services
Healthy/ Pleasant Life	Healthy Life	<ul style="list-style-type: none"> <li>▪ Health monitoring and distance medical examination for the aged</li> <li>▪ Constant monitoring for chronic disease</li> <li>▪ Individualized health management program</li> <li>▪ Monitoring and warning of exposure to dangerous materials</li> </ul>	U-Health Service
	Pleasant And Safe Life	<ul style="list-style-type: none"> <li>▪ Monitoring/prevention of Environ. Pollution</li> <li>▪ Monitoring/tracking of pollution source</li> <li>▪ Prevention system for calamity &amp; disaster</li> </ul>	Environment Communication Service
Society with Easy Commu nication	Easy Info. Exchange	<ul style="list-style-type: none"> <li>▪ Environ. Sensor-based intelligent network</li> <li>▪ Ubiquitous information exchange</li> <li>▪ Safe communication e.g. indiv. Info. Secur.</li> </ul>	Intelligent Communication Service
	Energy Resources Efficiency	<ul style="list-style-type: none"> <li>▪ Development of sustainable energy sources such as solar energy</li> <li>▪ Increased needs on high-efficient battery</li> </ul>	Demand on High-Efficient/ High-capacity Batteries

# Strategic Service Areas on IT-NT Convergence Technology



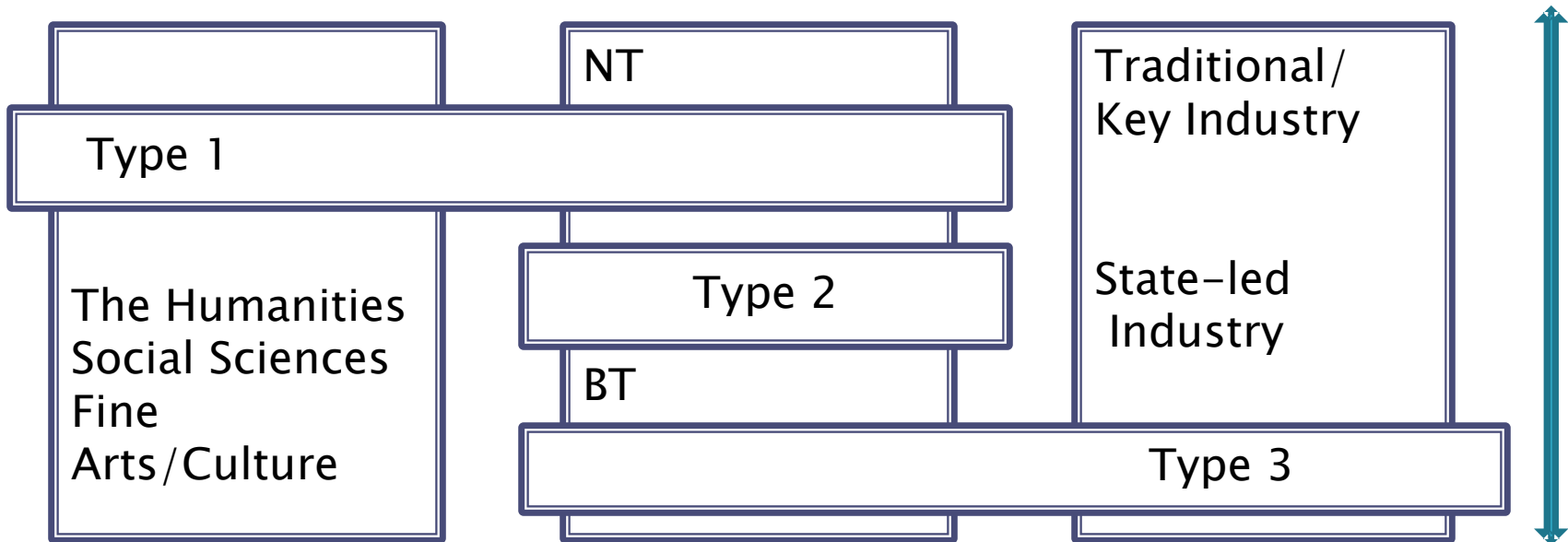
# Roles of Organization Involved





# Types of Technical Convergence

Academic Sub.



Type 1	Converging New Technology with Established subjects e.g. Converging Content & Knowledge-based service with Brain & Cognitive Science Research
Type 2	Convergence among New Technologies e.g. Nano-Bio Materials, IT-Nano Element Technology
Type 3	Converging New Technology with Existing Industry e.g. Intelligent Car Technology, U-City Construction

# Importance of SW

## Bases for Convergence Technology

- Convergence Industry such as Automobile, Medical Instruments, Aviation – SW takes up 30~50% of development cost keep going up

### World Market Outlook

3.6 times of semiconductors  
7.7 times of cell phones

\$915 bill  
\$249 bill  
\$120 billion

Cell Phone   Semicon   SW

### Employment capacity

6.2      For 1 million dollar sales

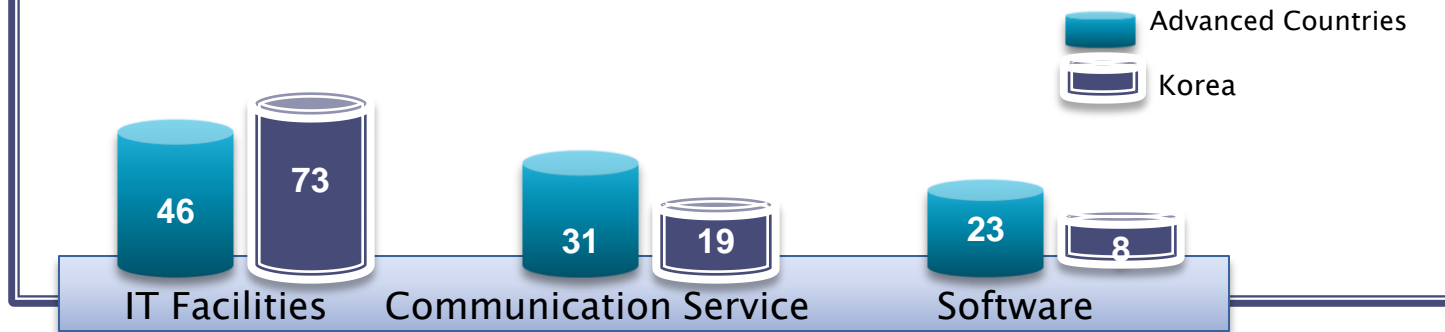


SW      communication      manufacturing

# Current Status of Technology In Korea

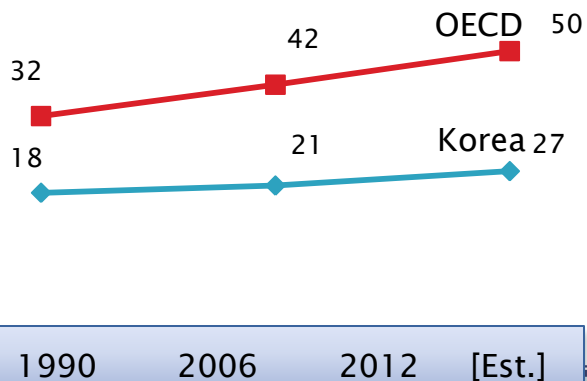
## Ratio of SW Productivity

### Comparison with Advanced Countries



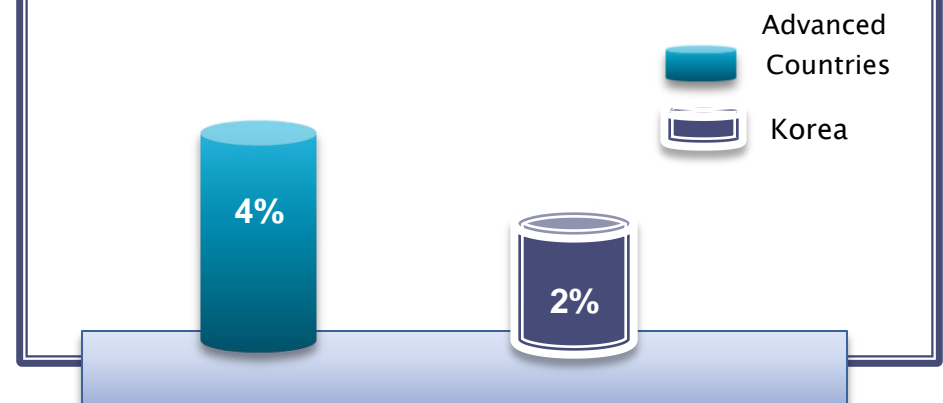
## Knowledge-Service Industry

### Ratio over GDP



## Ratio of SW Manpower

### Half of Advanced Countries



# Vision, Goal, Strategy & Paradigm

Vision

Creation of New Growth Engine and Increase in Global Competitiveness by Early Development of Creative Convergence Technology

Goal

Raise Convergence Technology Level  
[50~80%('07)→70~90%('13)]

Creation of New Convergence Technology of Future  
[Rank of Adv. Tech. Prod. Among Total Export Amount  
7<sup>th</sup>('08) )→5<sup>th</sup>('13)]

Strategy

1. Early Securing of Core Convergence Technology
3. Excavating New Conv. Tech. and Strengthening Support
5. Strengthening Open-type Joint Research

2. Cultivation of Experts for creative Conv. Tech.
4. Innovation of Conversion Tech. based Industry
6. Networking and Collaboration among related Ministries

Paradigm Shift in Tech. Level.

- Development of Conversion Technology that will overcome problems of Existing Individual Technology
- Increase in Productivity and Overall Economy/Market by Introducing Conversion Technology
- Solving National & Social Problems through Interdisciplinary Convergence Research and Convergence Technology

# Implementation Strategy

## Creativity

### St.1: Early Securing of Convergence Tech.

- Strengthening Basic / Core Convergence Technology
- Supporting Researcher's Creative Ideas
- Leading Global Standardization and Strengthening Intellectual Property Rights

### St.2: Fostering Experts for Creative Conv. T.

- Expanding Education and R&D Programs
- Nurturing Demand-centered Conv. Tech. Experts
- Long/Mid Term Survey and Prediction on
- Convergence Technology Manpower

## Practically

### St.3: Excavating/Supporting New Conv. Tech.

- Excavating Strategic Areas and Supporting Feasibility Study for New Convergence Technology
- Fostering Inter-cluster for New Convergence Tech. and utilizing International Science-Business Belt

### St.4: Advancing Industry with Conv. Tech.

- Development of New Conv. Tech. to advance existing Industries
- Excavating and Fostering Promising Convergence
- Knowledge Industry

## Infra

### St.5: Strengthening Open Type Joint Research

- Strengthening Support on Conv. Research of S&T with Humanities, Culture and Fine Arts, etc.
- Experts Networking & Community building
- Participating actively in Conv. Tech. Res. Programs

### St.6: Network./Collaboration among Minist.

- Action Plan covering all Related Ministries
- Revise Related Laws/Rules/Infra for Fostering Conv. Core Tech. and Creating New Industry
- Strengthening Utilization/Commercialization of Convergence Technology Research

# IV. Conclusion

# IV. Conclusion

Developed Countries' Success Keywords	Strategy
<ul style="list-style-type: none"><li>• Fostering manpower centered on basic scientific research</li></ul>	<ul style="list-style-type: none"><li>• Recognize conversion technology not as another trend in the midst of digital–nano–bio revolution but as an inevitable developing stage following sound basic science &amp; technology</li></ul>
<ul style="list-style-type: none"><li>• Break away from a closed research system</li></ul>	<ul style="list-style-type: none"><li>• Educate the core sciences such as physics, mathematics, chemistry, biology, medicine, computer science, and materials science in order to improve basic strength on science &amp; technology</li></ul>
<ul style="list-style-type: none"><li>• Provide and environment for creative ideas</li></ul>	<ul style="list-style-type: none"><li>• Foster creative and well–rounded conv. technology scientists through a flexible interdisciplinary conv. technology curriculum</li></ul>
<ul style="list-style-type: none"><li>• Ceaseless challenge toward innovation</li></ul>	<ul style="list-style-type: none"><li>• Set specific visions and determinations based on accurate technology analysis</li></ul>
<ul style="list-style-type: none"><li>• Industrialization of new ideas</li></ul>	<ul style="list-style-type: none"><li>• Plan product–specific objectives and market–specific research development</li><li>• Select and support proper research programs by the government</li><li>• Develop a long–term realistic objective and establish a stable research driving system</li><li>• Seek for international collaboration</li></ul>