From Discovery Research to Translational Innovation

Chi-Huey Wong

Academia Sinica

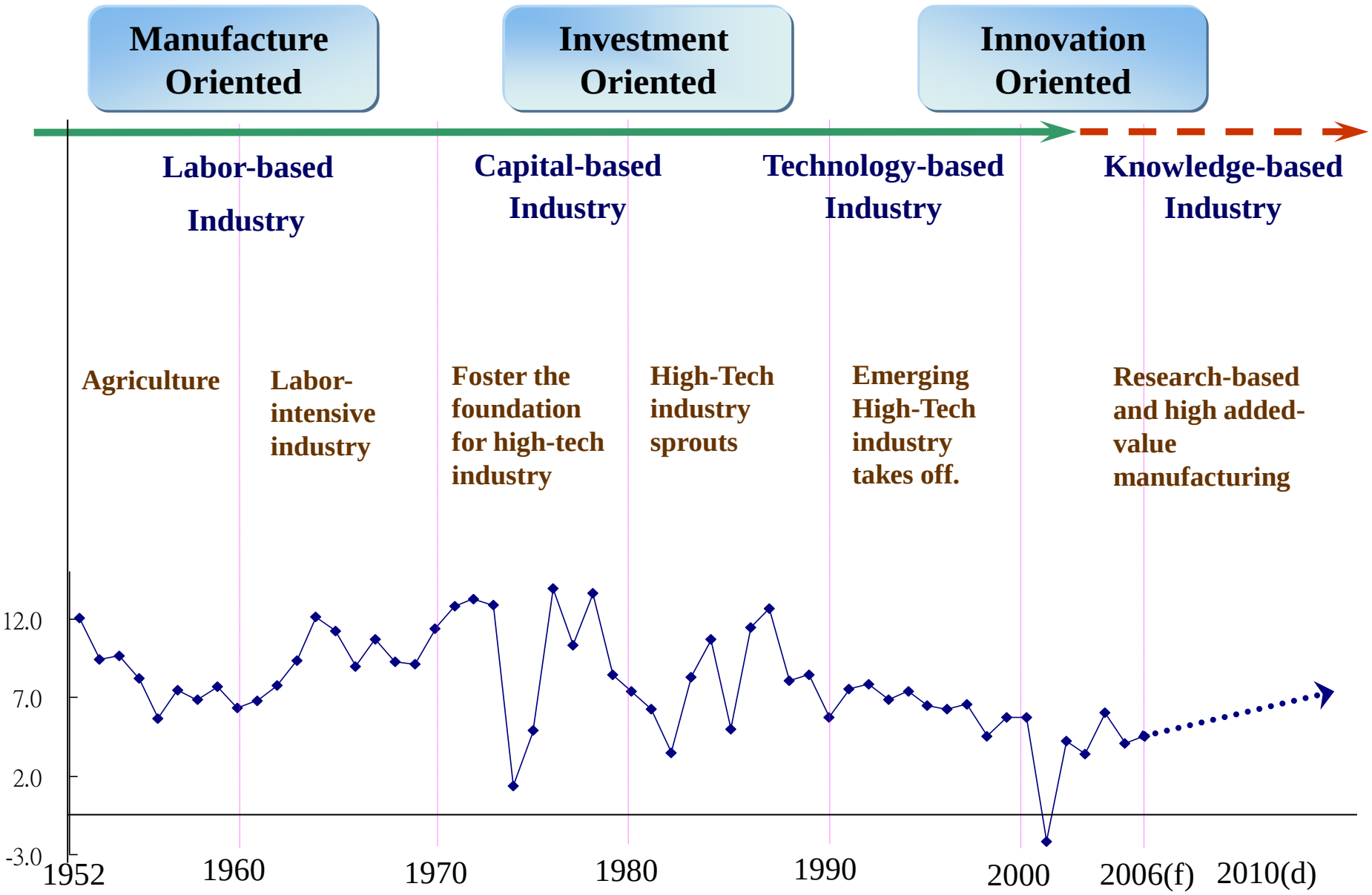
chwong@gate.sinica.edu.tw

Challenges and Opportunities

Challenges:

Global warming and climate change, energy and environment, population growth and food supply, aging and health care, preventive and personalized medicine.

50 Year Growth History of Taiwan/ MOEA



AS Report: Enhancing Technology Competitiveness

Report on Foresight Taiwan. October 2008

by Eugene Wong (Emeritus Professor, UC-Berkeley & Academician of AS)

- **Need for disruptive innovation – two sources:**
  - **New industries based on early stage technologies**
    - discovery driven, not improvement based
  - **High value exportable services**
    - technology based transformation of services

- **Goal of Foresight Taiwan**
  - Catalyze development of new innovative industries

2009 STAG: General Observations

Since the 1980's, Taiwan has successfully developed the semiconductor, information and communication technology (ICT) industry. However, to meet new challenges and improve the economy, Taiwan has recognized the need for diversification and development of new knowledge-based economy through investment in six emerging industries (SEI) to ensure the long-term sustainability and high quality of life.

Observation and Recommendation 1

- The ICT industries will provide a very strong foundation to launch the new emerging industries.
- The six emerging industries require multi-disciplinary and multi-sectoral cooperation and integration. Several ministries will need to work closely together to coordinate government role.

Observation and Recommendation 2

- Cross-straight cooperation will be essential to the success of some of the emerging industries, e.g. biotechnology and healthcare. Taiwan will need to meet international standards, e.g. clinical trials for drug development, if it is to be competitive in international markets
- Focusing and differentiating: Taiwan must focus on the high end of value chain, need to identify areas of competence for innovative product development.

Observation and Recommendation 3

- Some emerging industries, e.g. green energy and biotechnology, require development of key technologies while others require adequate business models. The government should provide incentives and infrastructure to facilitate their development.
- Some emerging industries, e.g. green energy, are being aggressively pursued by other countries, Taiwan must make choices and focus on the areas which can become a world leader.

Green Energy

- Core industries: photovoltaics and light emitting diodes (LED)
- Growth industries: Batteries (energy storage, R&D beyond lithium-ion) and smart grid.
- Energy conservation R&D: more efficient use of fossil fuels, air conditioning, refrigerators, heaters, lighting, and construction materials.

Biotechnology

- Strengthen the preclinical and early-stage clinical development (the Diamond Action Plan).
- Nurture quality biotech companies: more talents with well trained professionals in management, promote industry-academia interactions, improve bylaws to facilitate tech transfer and provide incentives for scientists.

Pharmaceutical Investment, Successful Rate, and Global Licensing Prices

The Average Values are in US$ (unless specified as %)

Stage	Preclinical	Phase I	Phase II	Phase III
Investment#	2.0m	1.0-2.0m	10.0-20.0m	>100m, variable
Success rate(%) (2004)	2-10%	80%	60%	70-80%
Licensing out				
Upfront	7.0m	7.0m	26.0m	63.0m
Milestone	132m	132m	180m	206m
Total Value	139m	139m	206m	269m
8-Year royalty	10-15%	10-15%	15-20%	30%

Healthcare

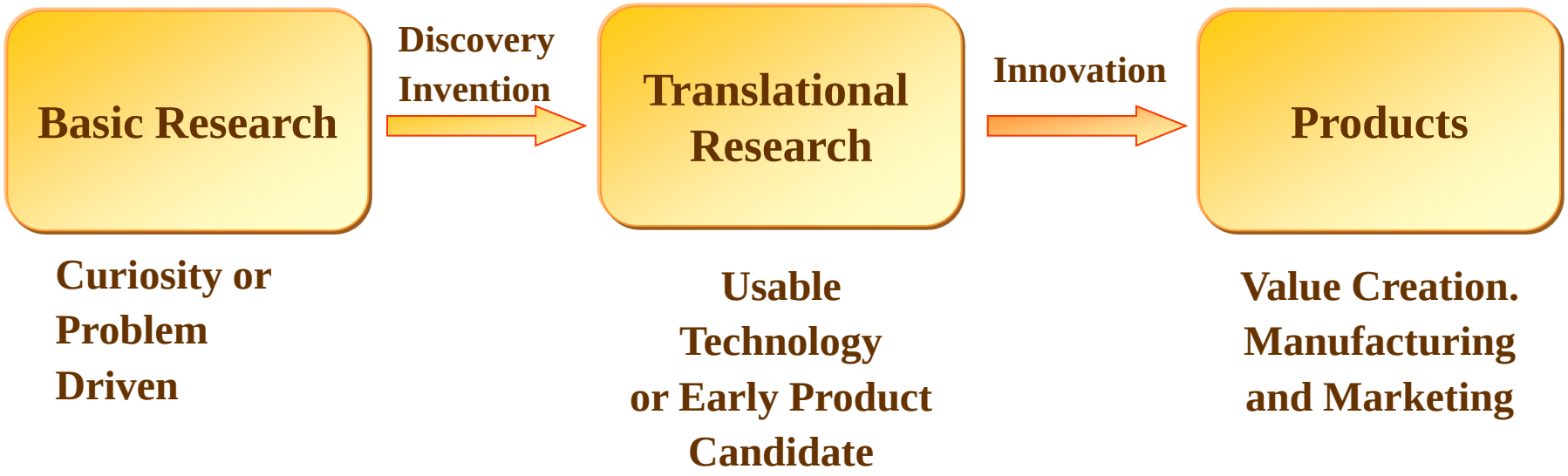
- Use Taiwan's strength in ICT to facilitate long-term care, and develop personalized medicine as well as high-end devices.
- Increase the healthcare expenditure to 8-10% of national GDP to improve the quality of healthcare and bio-pharmaceutical industry.
- Ensure a clear national vaccine-development policy.

Agriculture

- Develop efficient, high quality and sustainable agriculture.
- Establish effective GMO regulation and IP protection.
- Secure the national food supply and invest research in increasingly uncertain climate.
- The National Agriculture Research Institute should focus on new technologies, crop variety and innovative agriculture business models.

Discovery and Innovation

Bridging the Gap between Academia and Industry



Academic Institutions in Taiwan

Innovations in research continue to accelerate in Taiwan and have built a strong foundation of knowledge for applications, but academic institutions need to have more flexibility to modify their programs to insure their graduates to have the knowledge and skills required for emerging industries and new challenges.

Closing the Innovation Gap

- **From Discovery to Translational Research -- Germination**
- **From Germination to Startup -- Tech Transfer & Incubation**
- **From Incubator to Manufacture -- Innovative Products**

Germination Strategy

- **Institutionalize the Process: Germination Center**
- **Funding -- Government and Industry**
- **Encouragement and Recognition (Award with matching fund from industry)**

eg Presidential Early Career Award

- Focus on the new generation

National Medal of Innovation

- Encourage and motivate innovation

Fundamental Science and Technology Act

Needs amendment and action guidelines to facilitate tech transfer and encourage collaboration between academia and industry

1. **Regulation of IP generated from government funded research:** owned by the government or the institution creating the IP?
2. **Procurement of government funded research and tech transfer.** by S&T Act or by Government Procurement Law?
3. **Issue of conflict of interest: relation between academia and industry** when tech transfer involved?
4. **How to facilitate the tech transfer process: incentives for the** inventors, the investors and the management team?