

The 31st STAG Board Meeting

Theme II: From S&T Research to Industrial Applications

Panel Discussion:

2.6 Drivers for Connecting S&T Research with Industrial Applications

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Outline

**I. SWOT Analysis on S&T
Research and Its Industrial**

II. Core Issues

III. Discussion

SWOT ANALYSIS ON S&T RESEARCH AND ITS INDUSTRIAL APPLICATIONS

Strengths

- R&D expenditures as a share of GDP stood at 2.94% in 2009.
- Higher education sector shares more than 62% of researchers who hold Ph.D. degree.
- Taiwan ranked 16th in the number of scientific papers published in SCI journals in 2009.
- Taiwan ranked fifth in the number of patents granted by the US 2009.
- Many government programs involve industry-academic joint research to construct a comprehensive innovation system.
- Taiwan's outstanding OEM capabilities makes it a global leader in many ICT hardware manufacturing sectors.
- Many technology products manufactured by Taiwan have a majority market share in the world.

Weaknesses

- Incentive schemes for industry-academic cooperation are needed:
 - University R&D expenditures financed by industry were only 6.3% in 2009, which was lower than that of Korea and China.
 - Industry-academic cooperation is mostly conducted by public universities on a small scale and with limited impact.
 - The ratio of university IP income to R&D expenditures is only 1/6 that of the US.
 - Start-ups in campus incubators seldom involved technology transfer.
- Most SMEs are incapable of undertaking advanced academic technology transfers due to their limited R&D capabilities.
- Integrated management of IP is difficult to achieve as public IP rights are owned by different institutes.

Opportunities

- The regional innovation system coupled with industrial clusters around science parts may facilitate innovation among industry.
- The economic rise of China and Southeast Asia has generated a reorientation of international trade. Taiwan's favorable geographic position makes it a more competitive and attractive place for investment.
- Government organic restructuring will be launched in 2012.

Threats

- Taiwan's overall industrial value-added rate decreased from 46.31% in 2001 to 39.95% in 2008.
- The value-added rate in manufacturing industry was 20.12% in 2008, while that of the US was 32.9% and of Japan was 35.77%.
- Korea has announced a plan to increase GERD (Gross Expenditure on R&D) / GDP to 5% by 2012, while China will increase it to 2.20% in 2015.

CORE ISSUES

From University Research to

Commercialization and Value Creation

- An Overview of the Commercialization of Research Results
 - Innovative research makes only point-breakthroughs for technology and lacks systematic or integrated development.
 - Difficulties in generating a profound impact on industrial development
 - Performance assessment on both academic excellence and value creation has not been formulated.
 - The entrepreneurial culture on campus needs to be stimulated by several success stories.

Policy Packages for Commercialization of S&T Research and Innovations

- Implementation of Government Technology Policy
- Social pressure dictates that government programs have to accommodate existing domestic industrial development tracks.
 - Public research funds can not efficiently lead to innovative early-stage R&D
- Taiwan's industrial composition is dominated by SMEs.
 - Difficulties in creating unique value chains shared by Taiwan industry
- Taiwan lacks powerful measures to integrate existing industrial capacity (*i.e.* DRAM, LCD) or to lead to the development of strategic emerging industries (*i.e.* Green Energy).

Commercialization of Research Outcomes from National S&T Programs

- Collaboration among Different Parts of the R&D Chain
- Program objectives are too diversified, inhibiting focus on industrial development.
- Many programs are conducted at the same time, causing dilution of public research resources.
- Systematic issues cannot be completely resolved due to insufficient authorization.

Innovation Strategies of Taiwan's Science Parks

- Industrial Clusters and Regional Innovation System
- The niche competitiveness of enterprises is on cost-down, mass production and process management, while most key technologies are licensed from overseas companies.
 - The industrial profit margin ratio has gradually decreased
- Science parks should be gradually transformed into a place to develop and cultivate start-ups. This may generate higher risks, but result in higher rewards.
 - Land availability is limited

Commercialization of Agricultural S&T Research

- An Example of Industrial Applications for S&T Research
- The value-added rate of Taiwan's agricultural industry needs to be raised.
- Business-related research needs to be conducted to broaden understanding of market trends, product prospects and commercial models.
- Taiwan will find it difficult to compete in the global market before it has its own world-class agricultural enterprises.

DISCUSSION

How to Increase the Incentives for Industrialization of Research Findings?

- Campus entrepreneurial spirit should better flourish by enhancing curricula for innovative creation and business planning, and nurturing innovative human resources.
- Establishing professional organizations on campus would help to implant market and consumer research, and enhance a culture of entrepreneurship.
- Universities can play a major role in launching industrial advanced research and transforming their scientific findings into industrial applications.
- The value created from research findings should be taken into account in the course of performance assessment of research institutes.

How to Strengthen the Circulation and Utilization of Intellectual Property

- University IP should be managed by a profit-oriented organization to strengthen business availability.
- Strengthening the IP-based valuation mechanism, releasing both applicable research findings and its associated teams to the public, and providing consultative services for technology matching and licensing will help to achieve this objective.
- An IP cross-licensing platform for government-funded research should be set up to promote R&D industrialization.

How to Create a Complete Eco-System for Commercialization of R&D Results?

- Universities should create a truly multidisciplinary entrepreneurial educational environment.
- Existing on-campus institutions that related to IP management and incubator should be integrated.
- Science parks may play a role in the regional innovation system and the development of start-ups.
- Taiwan regulatory system needs to be amended to encourage venture capital and financial intermediation.

How to Strengthen Cooperation among Ministries?

- Strengthening the link from basic research to industrial development will help to enhance cooperation among relevant ministries carrying out government programs.
- “Pre-commercial procurement by the government” could be utilized to drive R&D and create initial markets.