

Opportunities and challenges for collaboration between government-industry-academia

Sharing by:

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Outline

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1. Background_The triple helix model of innovation

Evolution of Singapore's Research, Innovation and Enterprise (RIE) Ecosystem

Singapore's Research & Development (R&D) strategy (articulated through five-year plans) have evolved over three decades based on the evolving state of the global technology landscape and our local ecosystem

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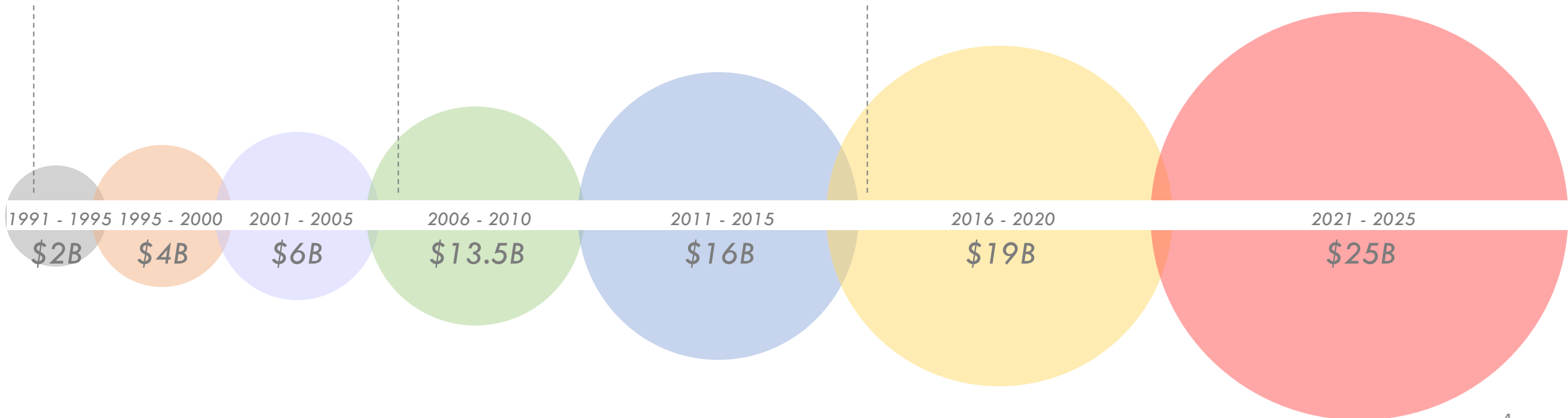
Development phase:
Launch of the first Science & Technology (S&T) plan in 1991

2

Growth phase: Establishment of NRF, significant increase in academic research funding to grow research intensive universities

3

Maturing phase: Vibrant innovation ecosystem – opportunities to leverage strong base of science for value creation

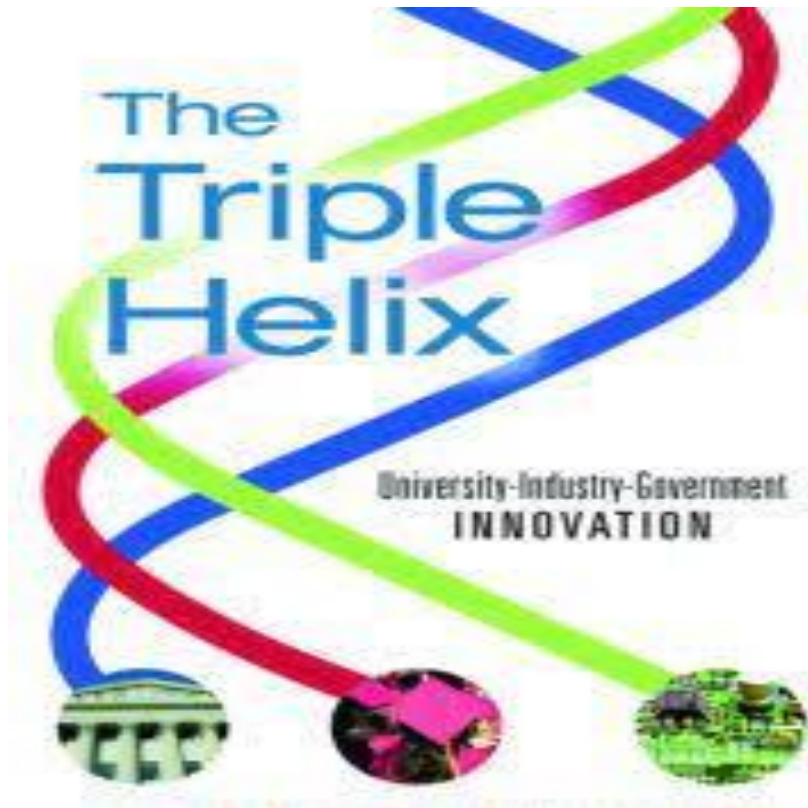


Evolving Roles of Government, Industry, Academia

	Development Phase	Growth Phase	Maturing Phase
Govt	<ul style="list-style-type: none"> Invest in key S&T-related infrastructure Anchor multinationals with strong base in manufacturing and technology 	<ul style="list-style-type: none"> Invest in R&D to build research-intensive universities Support the growth of new local enterprises 	<ul style="list-style-type: none"> Build translation platforms that bring together industry and academia to leverage emerging technology Government as lead demand driver or smart user of new technology
Industry	<ul style="list-style-type: none"> Provide knowledge transfer of tech capabilities 	<ul style="list-style-type: none"> MNCs provide lead demand for local enterprises, which serve as solution providers Establish R&D base in SG 	<ul style="list-style-type: none"> Deepen R&D activities, e.g. through setting up of corporate labs with universities
Academia	<ul style="list-style-type: none"> Equip local talent with technical skills to support high-tech activities of multinationals 	<ul style="list-style-type: none"> Build peaks of excellence in key research areas Develop technologies to supported key industry clusters 	<ul style="list-style-type: none"> Continue to sustain strong base of basic research Support translation of research outcomes through collaboration with industry or nurturing deep-tech spinoffs

Triple Helix Model

The Triple Helix Model studies how interactions between universities, government and industry can be forged to promote a country's economic and social development.



The Model was developed by 2 social scientists, Prof Henry Etzkowitz and Prof Loet Leydesdorff.



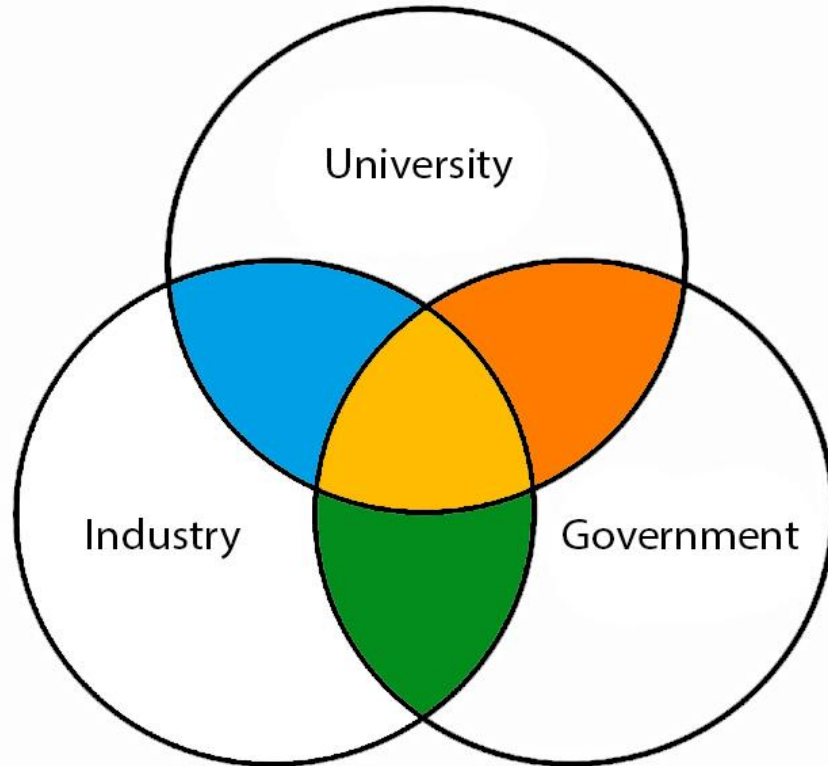
Prof Henry Etzkowitz



Prof Loet Leydesdorff

Key Interactions within Triple Helix Model

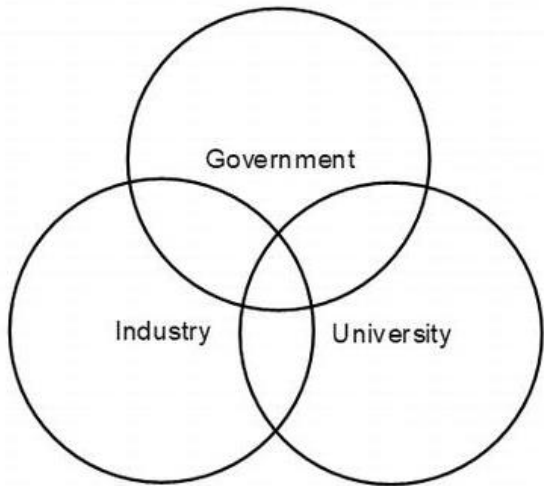
Beyond their individual roles, the Triple Helix Model can also be used to study interactions between the three stakeholders:



Government-University	<ul style="list-style-type: none">Government provides universities with research funding, and steers the direction of the research
Government-Industry	<ul style="list-style-type: none">Government helps to uplift innovation capacity of industryGovernment as a “smart regulator” of industry
Industry-University	<ul style="list-style-type: none">Universities provide industry with pipeline of technical talent and knowledge
Government-Industry-University	<ul style="list-style-type: none">Where there is a market gap (e.g. nascent technology), government develops platforms to facilitate interactions between university and industry to support pull through of technology

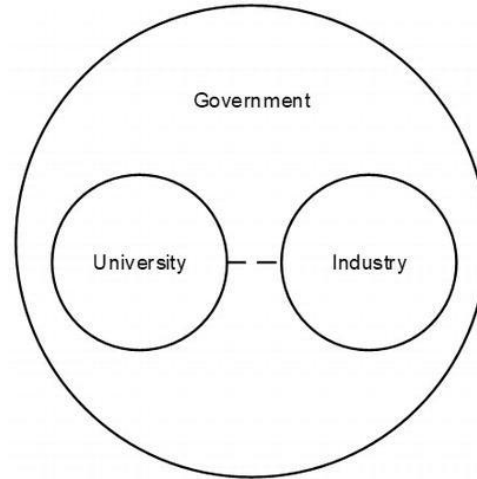
Different models for Government-Industry-Academia Interactions

Countries may place a different emphasis on the government, industry or academia, depending on their needs. There are generally 3 models for this:



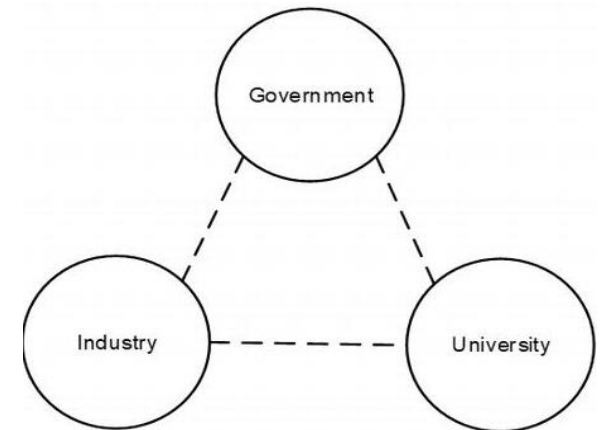
Balanced model:

University, industry and government partner as equals



State-led model:

Government leads, university and industry follow



Free-market model:

University and industry lead, government facilitates

2. Opportunities and Challenges_ Examples

Opportunities

- Corporate Labs are R&D partnerships established between companies and public R&D performers which lead to product innovation activities and economic returns e.g. creation of jobs and benefits to local enterprises

Case Study: Applied Materials & Institute of Microelectronics (IME) Applied Packaging Development Centre



- AMAT and IME co-develop new technologies in advanced semiconductor packaging
- Since 2011, AMAT has built R&D capability in SG through the Joint Lab with IME
- Outcomes: >75 RSEs employed, >460 patents, 5 new products launched
- In 2020, AMAT created S\$3 million business for ~20 SMEs in AMAT's advanced packaging R&D, through the joint lab.

Challenges Corporate Labs helped us overcome

- Corporate Labs helps to enhance the competitive advantage of companies by allowing them to tap on technological capabilities in our universities.
- University researchers who work alongside industry partners are also able to steer their research towards more impactful areas that are of relevance to industry



Opportunities

- Since 2006, 9 COIs have been launched to (1) offer tech consultancy and advice to SMEs by leveraging existing equipment and know-how, (2) Translate technology into products & services, and (3) meet sector-specific innovation needs
- Between 2016 – 2020, COIs completed approximately 980 projects, serving >700 different SMEs across 5 key industries

Case Study: Cheng Yew Heng (Rock sugar manufacturer), supported by Singapore Polytechnic's Food Innovation Resource Centre

FIRC developed a new method to infuse rock sugar with different colours/ flavours and crystallise it on sticks.

Outcomes:

- New product offering
- Sales in China, Hong Kong, Singapore, US, Europe

Challenges COIs helped us overcome

- COIs have helped to improve the absorptive capacities of our SMEs and progress SMEs towards more sophisticated translation work.
- COIs filled this gap by helping our local SMEs to gain access to lab facilities, business consultancy and training courses, as well as assistance in developing and testing technology projects.
- By catering to particular sectors (e.g. food), the COIs filled a gap in providing customised support for product and process innovation in areas where there was strong industry demand and growth potential.



Opportunities

- Translation platforms, such as the Diagnostics Development (DxD) Hub, have brought together Singapore's universities, industry and public agencies around specific sectors or technology areas, to help capture value through translation of research to impact.

- This has helped to drive
 - enterprise innovation outcomes

34 Startups supported **>\$140M Follow-on Innovation Investment Spending**
(with Imputed Commercial Value equivalent to \$3.8B)

16 Products launched
(in clinical phase, from FY18–20)

- address global needs (e.g. **Fortitude Testkits for COVID-19**)
- Co-developed by Singapore's Experimental Drug Discovery Centre, Bioinformatics Institute and Tan Tock Seng Hospital.
- DxD Hub did the productisation and pilot manufacturing of the test kit, with successful tech transfer to MiRXES, a spinoff from A*STAR and the National University of Singapore.
- The kits have since been deployed in more than 20 countries.

Challenges Tech Translation Platforms helped us overcome

- To accelerate technology translation in key tech areas, we may require a sector specific platform that brings together the researchers, industry, government agencies and regulators to co-develop solutions and bring them to market.
- Talent is often a key gap in scaling up our translation efforts – such platforms would also deliberately train a core of talent who can support subsequent product development



Opportunities

- ESVF I and ESVF II co-invested into funds which invest in high tech startups;
- ESVF III co-invested into corporate venture funds of Large Local Enterprises;
- ESVF IV, where the National Research Foundation (NRF) co-invested with Temasek Holdings in a joint venture fund (Xora) which commercialises IP from publicly-funded research through venture building.

Case Study: Aslan Pharmaceuticals

Following receipt of ESVF support, Aslan then went on to close a US\$22M Series B funding round led by Cenova Ventures in 2013.

Outcomes:

- Aslan has collaborated with the Cancer Science Institute of Singapore to develop ASLAN003, a new drug which could potentially acute myeloid leukemia, a common and aggressive blood cancer with a low survival rate. The drug is now being trialled in hospitals in Singapore and Australia.
- Aslan was listed on the US NASDAQ in Jul 2020.

Challenges ESVF helped us overcome

- ESVF helped to fill the gap in terms of limited early-stage private financing for deep tech startups in Singapore and the region. Investing in deep tech startups is inherently riskier – with government coming in to de-risk part of the investments, we are able to incentivise private investors to invest in deep tech startups.
 - These investors not only bring in funding, but also provide access to networks and resources that can help deep tech startups succeed



Opportunities

- Challenge owners from the public / private sector leveraged this open innovation platform to gain access to SMEs, startups and research performers to develop solutions to overcome challenges in the post-COVID world.
- A total of 18 NIC challenge statements were launched since Jul 2020, with over 900 submissions received and 21 prototypes selected thus far.

Case Study: SACEOS x Viatick x Trakomatic: Integrated control crowd system



Singapore Association of Convention & Event Organisers & Suppliers (SACEOS) issued a challenge for an integrated control crowd system to improve events safety, traceability & contactability to rebuild a COVID-safe environment for events.

Status:

- **Local SME & Startup Viatick and Trakomatic will jointly develop the system**

Challenges NICs helped us overcome

- The NICs allowed public agencies to become smart buyers and regulators of innovation.
- The NICs allowed budding start-ups to find a platform to pitch their solutions to relevant social and economic challenges, and also allowed them to find business partners and funding to scale their solutions.
- The NICs allowed university researchers to find commercial partners they could work with to address economic and social challenges with the support of government regulators.



Thank You