

Technology Transfer In Singapore: SMEs And Publicly Funded Research

By Audrey Yap/Aileen Chua

Introduction

Whilst Singapore's economic recovery is beginning to gather pace in 2018 after the economic challenges thrown up in the last couple of years, Small Medium Enterprises (SMEs) are responding by pushing for top-line growth through investing in productivity and technology innovation as well as international expansion, aided by the national government's various policies, grants and initiatives.

The rationale behind the focus on SMEs is clear. The Department of Statistics reported that there are currently about 220,100 enterprises in Singapore, out of which, 99 percent are made of SMEs. These SMEs contribute S\$196.8 billion in gross value added (GVA) to the economy and in fact have been generating at least 50 percent GVA for the past 5 years. SMEs also employ 65 percent of all workers, ensuring that the unemployment rate of 2.1 percent and per capita GDP of S\$53,000 makes Singapore one of the strongest economies in the world, despite its size.

Yet if Singapore is to maintain its position, it has to continually push to position itself as a global Asian node of technology, innovation and enterprise, particularly within ASEAN.

In 2017, Singapore received a major boost of S\$1 Billion fund to allow commercialisation of globally competitive technologies. Apart from developing and monetisation of its own innovation and IP it generates, SMEs are also able to tap IP portfolios from publicly funded research to uncover innovation opportunities and fill gaps in the SMEs own technology or IP portfolio.

This paper sets out to analyse the contribution Singapore universities make to innovation in the country. It also examines the question of whether there is a specific IP status for inventions coming from the universities.

Other aspects considered includes understanding the links between the industrial companies of the country and the tertiary as well as public research centres. Finally, the paper seeks to assess whether active technology transfer offices are trying to improve the links between the university and industry and what is the state of play.

Issues:

1. Do the country universities contribute significantly to the innovation production of the country? Is there a specific IP status for the inventions coming from the universities?
2. Are there strong links between

1. <https://data.gov.sg/dataset/public-sector-research-and-development-expenditure>.

2. Information from <https://www.singstat.gov.sg/> (accessed 4 December 2018), source: A*STAR.

3. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2016.pdf.

4. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2016-chapter10.pdf.

the industrial companies of the country and the universities or the public research centres? What are the nature and content of these relationships?

3. Are there active Tech Transfer Offices which try to improve the links between the universities and industry?

1. Do the Country Universities Contribute Significantly to the Innovation Production of the Country? Is there a Specific IP Status for the Inventions Coming from the Universities?

In statistics gathered by A*STAR and provided on [Data.gov.sg](https://data.gov.sg), it is shown that expenditure on R&D in the private sector has consistently been higher than that in the public sector.¹ See Figure 1.

Other statistics also from A*STAR show that there are consistently more private organisations performing R&D then public sector organisation—though this could be attributed to there being more private sector organisations than public sector organisations in Singapore (generally). See Table 1.

According to an article by Mr. Lim Chuan Poh "From Research to Innovation to Enterprise: The Case of Singapore" in *The Global Innovation Index 2016*,³ it was explained that unlike the countries like Germany where R&D systems were cultivated organically from research-intensive universities or industries, Singapore's R&D journey was rooted in necessity, for economic competitiveness and growth.⁴

However, this does not mean that the country's institutes of higher learning did not or do not make a significant contribution to the innovation landscape of Singapore. In earlier days it would appear that R&D conducted in the public sector was largely contributed by institutes of higher education. In the following figure from the OECD, the data shows that a substantial proportion of

■ Audrey YAP/Aileen Chua,
Yusarn Audrey Lawyers.
Managing Partner/Associate,
Singapore, SINGAPORE
E-mail: audrey@yusarn.com

Figure 1. Expenditure On R&D In The Public And Private Sectors

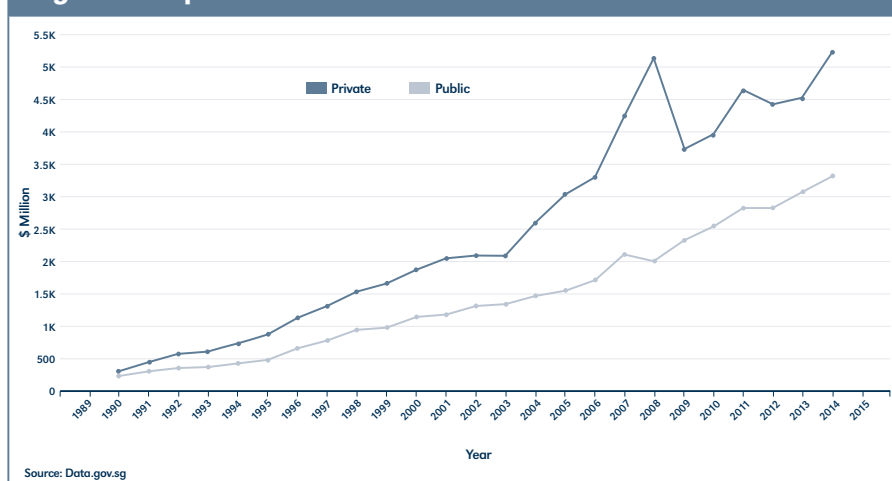


Table 1: Organisations Performing Research and Development By Sector, Annual²

Variables	2014	2015	2016
Government	31	34	31
Higher Education	12	13	13
Private	882	808	776
Public Research Institutes	25	25	25
Total	950	880	845

research performed in the public sector in 2007 stemmed from institutes of higher education rather than governmental agencies.⁵ See Figure 2.

Is There a Specific IP Status for the Inventions Coming from the Universities?

The United States has in place the Bayh-Dole Act of 1980 which established a system for universities in the country to license inventions, put in place due to issues with public funding of R&D where policies were such that organisations with public funding were prevented from patenting technologies, while agencies owned patents but did not commercialise them.⁶ While Singapore does not have a similar specific legislation, what was recently implemented is a National IP Protocol. Minister for Finance Mr. Heng Swee Keat announced that this National IP Protocol is “launched to encourage public agencies to work closely with enterprises, who can develop them into products and services that create economic and social value for Singapore. The IP Protocol will grant public agencies the flexibility to grant exclusive licences, non-exclusive licences, and even assign IP to industry—with the end-goal of facilitating commercialisation.”⁷

2. Are there strong links between the industrial companies of the country and the universities or the public research centres? What are the nature and content of these relationships?

Due to the efforts of the government, there are strong links between the public sector and private sector in R&D. This has been a result of the government recognising that to grow its knowledge capital, Singapore would need to develop both the public and private sectors in conjunction, and there has to be engagement between the public and private so as to drive innovation.

In the Economic Strategies Committee (ESC) recommendations published in February 2010,⁸ the ESC Subcommittee on Growing Knowledge Capital noted that the vision for Singapore was to become a

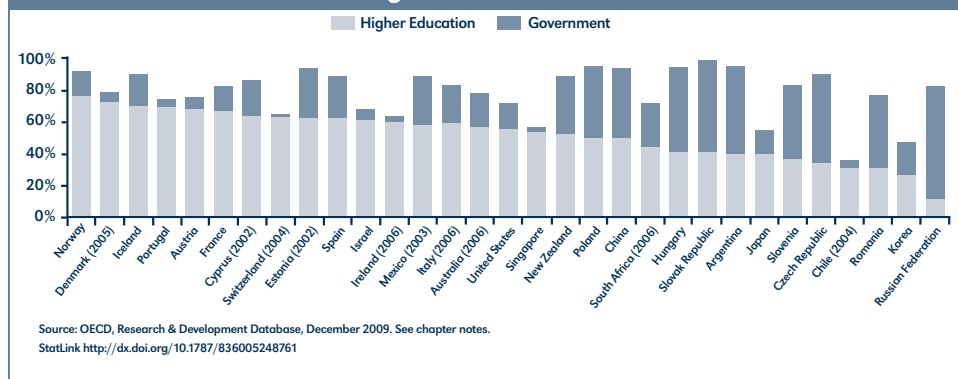
key global R&D hub and an innovation capital of Asia. According to the Subcommittee, the institutes of higher learning and the public agencies play a key role in developing Singapore’s R&D landscape.⁹ The Subcommittee also provided possible approaches for innovation platforms linking the private and public sector. These include:

Bilateral collaboration platforms, being direct research collaboration arrangements between the companies and the public sector research entities. An example is the Master Research Collaboration Agreement between FUJITSU, A*STAR and SMU to invest S\$54 million in an Urban Computing and Engineering Centre of Excellence in Singapore to address challenges faced by highly urbanised cities, announced in 2014.¹⁰

Consortiums, where Industry players/competitors who may otherwise not collaborate are brought together. An example is the Aerospace Consortium set up by A*STAR. Members of the consortium including SMEs are given full access to the R&D results developed under the programme and are also given the option of attaching their company staff to the programme to work on joint projects with researchers from the A*STAR research institutes. With respect to intellectual property generated from projects, the arrangement for all members is non-exclusive, royalty-free licenses on foreground intellectual property generated.¹¹

Apart from facilitating relationships and co-operation with the industry in Singapore, the government has also announced a National IP Protocol. The purpose of this is to streamline guidelines to enable companies to gain better access to intellectual property generated from publicly-funded R&D and to provide a standardised approach for commercialisation of IP. Further, all public agencies will also be subject to a revised public sector Master Research Collaboration Agreement, which is meant to enhance

**Figure 2: Basic Research Performed In The Public Sector, 2007
As a Percentage Of National Basic Research**



5. <https://www.oecd.org/site/innovationstrategy/45188224.pdf>.

6. <https://www.warf.org/about-us/history/warf-bayh-dole-act/warf-bayh-dole.cmsx>.

7. [https://www.mof.gov.sg/Newsroom/Speeches/Opening-Address-By-Mr-Heng-Swee-Keat-Minister-For-Finance-At-Opening-of-Singapore-Week-of-Innovation-amp-Technology-\(SWITCH\)-Founding-A-New-World-At-M](https://www.mof.gov.sg/Newsroom/Speeches/Opening-Address-By-Mr-Heng-Swee-Keat-Minister-For-Finance-At-Opening-of-Singapore-Week-of-Innovation-amp-Technology-(SWITCH)-Founding-A-New-World-At-M) (published on 18 September 2017).

8. <https://www.mof.gov.sg/Resources/Economic-Strategies-Committee-ESC-Recommendations>.

9. <https://www.mof.gov.sg/Portals/0/MOF%20For/Businesses/ESC%20Recommendations/Subcommittee%20on%20Growing%20Knowledge%20Capital.pdf>.

10. <https://www.businesstimes.com.sg/technology/fujitsu-astar-smu-invest-s54m-in-singapore-centre-to-solve-urban-challenges>.

11. <https://www.a-star.edu.sg/aerospace/Consortium>.

the collaborations between the public and private sector and expedite the process of commercialisation of IP.¹²

In recent years Singapore's universities have also furthered engagement with industry players through deeper collaborations, such as the Rolls-Royce@ NTU Corporate Lab, Keppel-NUS Corporate Lab and the ST Engineering-NTU Corporate Laboratory. The aim of these collaborations is for industry partners to tap on scientific and technological capabilities built up in the universities to develop new products and services, while Singapore's universities obtain achievements through participation in development of cutting edge solutions the industry.¹³

The government has also focused on helping SMEs in Singapore which may have difficulties conducting their own R&D due to the resource constraints. This is apart from there being various grants offered to SMEs for development of their business. In particular, A*STAR provides assistance which includes but is not limited to:

- (a) Ability to license intellectual property from public agencies such as A*STAR for use and commercialisation. Senior Minister of State for Trade and Industry Mr Chee Hong Tat stated that under the Research, Innovation and Enterprise 2020 (RIE2020) programme, the number of licences taken up by SMEs grew from 129 licences in FY16 to 178 licences in FY17.¹⁴
- (b) Technology transfer to SMEs also takes place through the attachment of A*STAR researchers. Under the Technology for Enterprise Capability Upgrading (T-Up) scheme, A*STAR seconded its researchers to SMEs to help build in-house R&D and technical capabilities. Since the launch of the scheme in 2003, A*STAR has seconded 769 researchers to 678 SMEs.¹⁵

3. Are there active Tech Transfer Offices which try to Improve the Links Between the Universities and the Industry?

Yes, such Tech Transfer Offices consist not only of those belonging to the universities themselves, but also public agencies whose role is to facilitate R&D as well as commercialisation of inventions. One of the key priorities identified in the RIE2020 plan is to foster stronger collaboration and cohesion—where the role of Tech Transfer Offices is to be expanded to include facilitating technology transfer, providing innovation and enterprise education and incubation services to form integrated Innovation & Enterprise Offices (IEOs). The government will also establish a central fund that supports national collaborative initiatives amongst IEOs.¹⁶

The universities have their own individual offices for liaising with industry players to commercialise inventions:

(a) NUS Industry Liaison Office:¹⁷

The NUS Industry Liaison Office (“ILO”) is the university's technology transfer and commercialisation arm. According to the website of the NUS ILO, the office has “played a pivotal role in getting more than 580 patents granted and more than 60 technology-based companies being spun-off from NUS.”¹⁸

12. <https://www.ipos.gov.sg/media-events/speeches/ViewDetails/speech-by-ms-low-yen-ling-senior-parliamentary-secretary-ministry-of-education-ministry-of-trade-and-industry-at-world-ip-day-2018/>.

13. <https://www.nrf.gov.sg/programmes/corporate-laboratories-in-universities>.

14. <https://www.mti.gov.sg/en/Newsroom/Parliamentary-Replies/2018/09/Oral-reply-to-PQ-on-tech-commercialisation-10-sep-2018>.

15. <https://www.mti.gov.sg/en/Newsroom/Parliamentary-Replies/2018/09/Oral-reply-to-PQ-on-tech-commercialisation-10-sep-2018>.

16. <https://www.nrf.gov.sg/rie2020/growing-a-vibrant-national-innovation-system>.

17. <https://enterprise.nus.edu.sg/technology-commercialisation/for-industry>.

18. <http://technology.nus.edu.sg/>.

(b) SMU Office of Research & Tech Transfer:¹⁹

The SMU Office of Research & Tech Transfer (ORTT) works the schools in SMU as well as the other offices of the university (e.g. finance, legal) to provide support to researchers. The office also plays a role in identifying and managing various forms of intellectual property created across the university, filing for intellectual property protection, and facilitating technology transfer where appropriate.

(c) NTU's NTUitive Pte Ltd (NTUitive):²⁰

Similar to the other universities' Tech Transfer Offices, NTUitive manages the intellectual property of NTU and also assists with protection and commercialisation of intellectual property belonging to the university, including licensing opportunities as well as collaborations with external parties, including industry.

Apart from universities, the polytechnics also have Tech Transfer Offices, including Nanyang Polytechnic's (NYP) Research & Technology Transfer Office²¹ and Temasek Polytechnic's Research and Technology Development Department.²²

There are also public agencies assisting the tech transfer between private and public sector, including the following:

(a) Intellectual Property Intermediary (IPI):²³

The IPI was established under the MTI and connects Singapore-based businesses with partners to enhance innovation capability. The IPI organises various events for the industry on a regular basis, with its largest event being the annual TechInnovation event, the purpose of which is to link-up and connect technology providers and seekers in order to encourage organic collaborations. One example of a collaborative effort which has sprung from TechInnovation is a licensing agreement between med-tech start-up Invivo Medical Pte Ltd, ITE, NUH and NUS for the commercialisation of an innovative device for kidney stone removal surgery.²⁴

(b) A*STAR's A*ccelerate:²⁵

The commercialisation arm of A*STAR, A*ccelerate works towards bringing innovations from A*STAR researchers to industry. The role of A*ccelerate is (i) to support A*Star researchers in taking innovations from laboratory to market; (ii) to support local businesses in innovation; and (iii) to connect A*STAR and the industry for R&D.²⁶ It has been reported that in the last five years, more than 1,000 A*STAR licences have been taken up by companies. Further, the licences taken up by local companies is also on the rise, growing from 130 in FY2013 to 197 in FY2017 such that 74 percent of A*STAR licenses now go to local enterprises.²⁷

A*ccelerate also works with educational institutions. In August 2006, ETPL (as it was then) had signed agreements with five local polytechnics—the first time where the five polytechnics had come together under an umbrella agreement to with an agency to utilise research output for prototype development.²⁸ ■

Available at Social Science Research Network (SSRN): <https://ssrn.com/abstract=3380531>

19. <https://research.smu.edu.sg/about/introduction-office-research>.

20. <http://www.ntuitive.sg/what-we-do>.

21. <https://www.nyp.edu.sg/industry-partners/research-and-technology-transfer-office.html>.

22. <https://www.tp.edu.sg/centres/research-and-technology-development>.

23. <https://www.ipi-singapore.org/about-ipi>.

24. <https://www.ipi-singapore.org/news/techinnovation-2017-sees-record-high-3900-attendance-over-two-days-conference-sessions-and>.

25. <https://www.accelerate.tech/welcome-about-accelerate>.

26. <https://www.businesstimes.com.sg/government-economy/astars-accelerate-investors-raise-over-s85m-to-co-create-deep-tech-startups>.

27. <https://www.mti.gov.sg/en/Newsroom/Speeches/2018/11/Speech-by-SMS-Koh-Poh-Koon-at-Accelerate-at-Fusionopolis-One>.

28. <https://www.a-star.edu.sg/language/en-SG/News-and-Events/News/Press-Releases/ID/100>.