AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH

ANNUAL REPORT
APR 2014 – MAR 2015

AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH

ANNUAL REPORT FOR THE YEAR ENDED 31 MARCH 2015

In the opinion of the directors, the annual report of the Agency for Science, Technology and Research (A*STAR) is drawn up so as to present fairly the state of affairs of A*STAR as at 31 March 2015.

On behalf of the Board of Directors,

Lim Chuan Poh	Raj Thampuran
Chairman	Managing Director
31 Jul 2015	31 Jul 2015

ORGANISATION DETAILS

Board Secretary	Ms Emily Liew Director Planning & Policy Department Agency for Science, Technology and Research
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Introduction to Agency for Science, Technology and Research (A*STAR)

A*STAR has crafted a new set of Mission and Vision statements against the backdrop of developments in the Research, Innovation and Enterprise landscape, and A*STAR's evolving role within it. A*STAR had taken reference from MTI's revised Mission and Vision in this exercise. They were approved by MTI on 31 Mar 2015.

Mission Statement

We advance science and develop innovative technology to further economic growth and improve lives

The Agency for Science, Technology and Research (A*STAR) drives mission-oriented research that advances scientific discovery and technological innovation. We play a key role in nurturing and developing talent and leaders for our Research Institutes, the wider research community, and industry.

Our research creates economic growth and jobs for Singapore. As a Science and Technology Organisation, we bridge the gap between academia and industry in terms of research and development. In these endeavours, we seek to integrate the relevant capabilities of our research institutes and collaborate with the wider research community as well as other public sector agencies towards meaningful and impactful outcomes. Together with the other public sector entities, we develop industry sectors by:

- integrating our capabilities to create impact with Multi-National Corporations and Globally Competitive Companies;
- partnering Local Enterprises for productivity and gearing them for growth; and
- nurturing R&D-driven Start-ups by seeding for surprises and shaping for success.

Our research, in addition, also contributes to societal benefits such as improving outcomes in healthcare, urban living, and sustainability. These serve to enhance lives in Singapore and beyond.

Vision Statement

A global leader in science, technology and open innovation

The Agency for Science, Technology and Research (A*STAR) is a catalyst, enabler and convenor of significant research initiatives among the research community in Singapore and beyond. Through open innovation, we collaborate with our partners in both the public and private sectors, and bring science and technology to benefit the economy and society.

We aspire to be a global leader in Science, Technology and Open Innovation.

Board Members

Chairman

Mr Lim Chuan Poh
Chairman, A*STAR

Deputy Chairman

Prof Tan Chorh Chuan
Deputy Chairman, A*STAR
President, National University of Singapore

Members

Prof Raj. Thampuran
Managing Director, A*STAR

Prof Sir George Radda
Chairman, Biomedical Research Council, A*STAR
Emeritus Professor of Molecular Cardiology, University of Oxford

Prof Sir John O'Reilly
Chairman, Science and Engineering Research Council, A*STAR
Chairman, NICC (Standards) Ltd.

Prof Bertil Andersson
President, Nanyang Technological University

Prof Isaac Ben-Israel
Chairman, Israel Space Agency
Chairman, Israel National Council for R&D

Mr Bruce Brown
Retired Chief Technology Officer, Procter & Gamble

Dr William W. Chin
Executive Vice President, Science and Regulatory Affairs
Pharmaceutical Research and Manufacturers of America (PhRMA)

Prof Jonathan Knowles
Distinguished Professor of Personalised Medicine Institute of Molecular Medicine Finland (FIMM), Helsinki, Finland

Mr Lam Yi Young
Deputy Secretary (Policy), Ministry of Education

Prof Sir Keith O'Nions
Chairman, Cambridge Enterprise

Mr Ong Boon Hwee
Chief Executive Officer, Stewardship Asia Centre Pte Ltd
Wef 1 December 2014

Prof Quek Tong Boon
Chief Defence Scientist, Ministry of Defence

Dr Sun Shih-Wei
Chairman, Sunterprise Ltd.

Dr Tadataka Yamada
Chief Medical & Scientific Officer (CMSO),
Executive Vice President & Board Member,
Takeda Pharmaceuticals

Mr Yeoh Keat Chuan
Managing Director, Economic Development Board

Prof Chong Tow Chong
Provost, Singapore University of Technology and Design
Wef 1 February 2015

Ms Tan Li San
Deputy Secretary (Industry & Information), Ministry of Communications and Information
Wef 1 April 2015

Mr Yee Ping Yi
Deputy Secretary (Policy), Ministry of Finance
Wef 1 April 2015

Four board members stepped down upon completion of their terms or relinquished their ex-officio appointments on 31 January 2015. They were:

Prof Tan Eng Chye
Deputy President (Academic Affairs) and Provost, National University of Singapore

Mr Tan Kok Kiong Andrew
Chief Executive, Maritime and Port Authority of Singapore

Dr Patrick Vallance
President, Pharmaceuticals R&D, GlaxoSmithKline

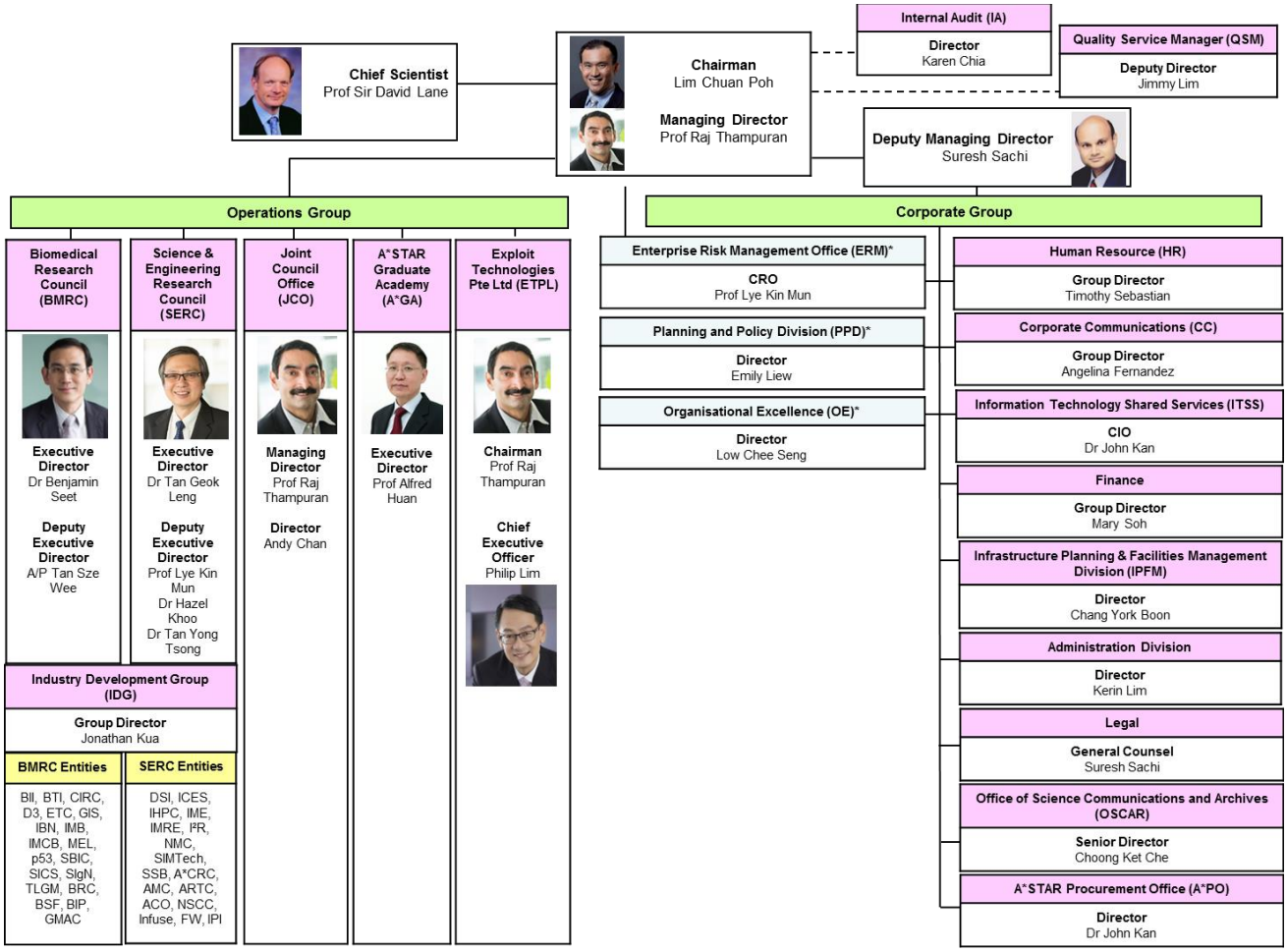
Mr Ng Wai Choong
Deputy Secretary (Policy), Ministry of Finance (till 31 March 2015)
Chief Executive, Energy Market Authority (from 1 April 2015)

We thank the board members for their service to the A*STAR Board.

Key Management Personnel

Chairman, A*STAR	Mr Lim Chuan Poh
Managing Director, A*STAR	Prof Raj. Thampuran
Scientific Advisor to A*STAR Chairman	Dr Sydney Brenner
Chairman, Biomedical Research Council (BMRC)	Prof Sir George Radda
Chairman, Science and Engineering Research Council (SERC)	Prof Sir John O'Reilly
Chief Scientist, A*STAR	Prof Sir David Lane
Deputy Managing Director (Corporate & Legal), A*STAR and General-Counsel	Mr Suresh Sachi
Executive Director, Biomedical Research Council, A*STAR	Dr Benjamin Seet
Executive Director, Science and Engineering Research Council, A*STAR	Dr Tan Geok Leng
Chief Executive, Exploit Technologies Pte Ltd (ETPL), A*STAR	Mr Philip Lim
Executive Director, A*STAR Graduate Academy, A*STAR	Prof Alfred Huan

A*STAR Organisation Chart



Updated as at 1 July 2015

Major Shareholder of Subsidiary Companies

Name of subsidiary company:	Exploit Technologies Pte Ltd
% shareholdings in company:	100%

Exploit Technologies Pte Ltd (ETPL)

ETPL is the technology transfer arm of the Agency for Science, Technology and Research (A*STAR), Singapore's lead agency for fostering world-class scientific research and talent. A*STAR oversees 18 biomedical sciences, physical sciences and engineering research institutes and consortia. As a one-stop resource, ETPL supports A*STAR in transforming the economy through driving innovation and commercializing its research outcomes.

ETPL enhances the research output of A*STAR scientists by translating their inventions into marketable products or processes. Through shaping and facilitating licensing deals and spin-offs, ETPL actively engages industry leaders and players to commercialise A*STAR's technologies and apply them to building ecosystems that benefit business, industry and economy.

For more information, please visit http://etpl.sg

List of A*STAR Research Institutes and Consortia

A*STAR has 18 research institutes and consortia, spanning a broad range of research areas from the biomedical sciences, to the physical sciences and engineering.

Biomedical Research Institutes and Consortia
Bioinformatics Institute (BII)
Bioprocessing Technology Institute (BTI)
Experimental Therapeutics Centre – Drug Development and Discovery (ETC-D3)
Genome Institute of Singapore (GIS)
Institute of Bioengineering and Nanotechnology (IBN)
Institute of Medical Biology (IMB)
Institute of Molecular and Cell Biology (IMCB)
Singapore Bioimaging Consortium – Clinical Imaging Research Centre (SBIC-CIRC)
Singapore Institute for Clinical Sciences (SICS)
Singapore Immunology Network (SIgN)

Science and Engineering Research Institutes and Consortia
Data Storage Institute (DSI)
Institute of Chemical and Engineering Sciences (ICES)
Institute of High Performance Computing (IHPC)
Institute for Infocomm Research (I^2R)
Institute of Materials Research and Engineering (IMRE)
Institute of Microelectronics (IME)
National Metrology Centre (NMC)
Singapore Institute of Manufacturing Technology (SIMTech)

Staff Strength in A*STAR

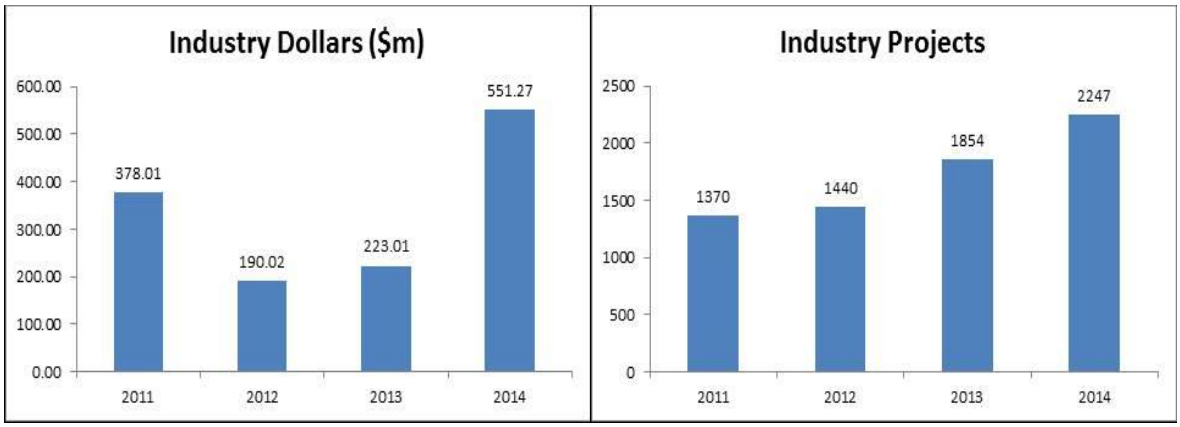
The total strength of the A*STAR community, including scientists and researchers, technical and non-technical staff, and industry development and commercialisation staff was 5,476 as at 31 March 2015.

Overview of FY2014 Achievements

1. Singapore's R&D landscape has grown considerably since A*STAR was formed in 2001. In 2013, Singapore's gross expenditure on R&D was S$7.6 billion and sales from the commercialization of R&D products/processes contributed over S$22.3 billion in revenues to public and private entities[1]. The number of Research, Scientists and Engineers (RSEs) reached a new high of 32,000 in 2013 from 17,000 in 2003, as investments in R&D continue to create high-value added jobs in Singapore. The growth was especially significant in the private sector – 1,100 out of the 1,800 new RSE jobs created in 2013 were in the private sector.

2. The growing stature of our research efforts is also reflected in Singapore's performance in innovation reports. Singapore was ranked 7th in INSEAD's 2014 Global Innovation Index, top among all Asian economies. A*STAR was also conferred the Frost & Sullivan 2014 Asia-Pacific Economic Development Innovation: Policy and Program Implementation Excellence Award in R&D and Innovation for Manufacturing.

3. A*STAR has had a particularly productive year in FY2014, with the number of industry dollars attracted and industry projects peaking within the 5-year tranche. In terms of industry dollars attracted (comprising the KPIs of industry funding received and IAF industry R&D spending), A*STAR saw an increase of 147% over the past FY. The number of industry projects has also increased by 21% over FY2013 (see charts below). A*STAR RIs have continued to forge significant public-private partnerships across a range of industries including partnerships with Coca-Cola, Delta Electronics, GE Healthcare and Sembawang Shipyard, as well as expanding R&D collaborations with companies such as Nestle, Micron, Fujitsu, GlaxoSmithKline, GlobalFoundries, SingTel and DBS.



4. From the Research, Innovation and Enterprise (RIE) 2015 perspective, from 1 April 2011 to 31 March 2015, A*STAR has undertaken more than 6,900 industry projects which catalysed more than S$1.3 billion in industry R&D investments in Singapore. We have achieved greater commercialisation outcomes and have already matched the achievements of the last five-year tranche in licensing (825 licenses from 1 April 2011 to 31 Mar 2015).

[1] Source: National Survey of R&D of Singapore, 2013

5. On talent, A*STAR has a vibrant, dynamic and cosmopolitan community of more than 5,400 staff from 61 different countries (including Singapore). Of the more than 4,500 researchers, engineers and technical support staff, 53% are PhDs, of which 39% are Singaporeans. New additions to A*STAR's scientific community includes Nobel Laureate Prof Thomas C. Südhof, who joined A*STAR as Visiting Investigator in 2014. Within the community, Prof Philip Ingham (IMCB), Dr Li Haizhou (I2R), Dr Yap Fung Ling (IMRE), Prof Loh Kian Ping (IMRE), and Dr Melissa Fullwood (NSS BS-PhD Scholar) had won prestigious scientific awards.

6. Four young A*STAR researchers, Peh Ruey Feng (Singapore-Stanford Biodesign), Zhou Lihan (MiRXES, an A*STAR spin-off), Benjamin Tee (NSS PhD scholar), and Shawn Tan (IMRE), won the prestigious Asia-Pacific Technology Review Under 35 Awards.

7. A*STAR is on track to achieving our Key Performance Indicators (KPIs) for the RIE 2015 tranche. In a number of KPIs, we have already surpassed the 5-year target. KPI achievements for FY2014 are summarised below.

Category	RIE 2015 KPIs	FY2014 Achievement Cumulative (% achieved)	RIE2015 Target
Public R&D	Industry funding received ($mil)	$242 mil (95%)	$255 mil
	No. of industry projects	6,625 (401%)	1,651
	No. of Translational and Clinical Research (TCR) projects	275 (118%)	234
	IAF Industry R&D spending ($mil)	$1,105 mil (133%)	$830 mil[2]
	IAF Industry projects	286 (381%)	75
Innovation & Enterprise	No. of RSEs from RIs seconded to industry (GET-Up only)	255 (93%)	275
	No. of licenses (overall)	825 (154%)	535[1]
	No. of licenses or spin-offs arising from completed Gap Funded projects	229 (119%)	192[1]
	No. of licenses or businesses facilitated by IPI[3]	53 (66%)	80

[2] 5-year targets have been revised upwards following an increase in budget.
[3] National initiative administered by A*STAR. KPI achievement is monitored by and reported to the IPI Steering Committee and the RIE Standing Committee on Innovation & Enterprise.

Category	RIE 2015 KPIs	FY2014 Achievement Cumulative (% achieved)	RIE2015 Target
Talent	No. of PhD postgraduates trained or being trained by the RIE2015 talent budget	662 (85%)	780
	No. of PhD postgraduates who work in Singapore upon graduation	*Lag KPIs. Data will only be provided towards the end of the RIE2015 tranche.*	399
	No. of PhD postgraduates who work in Singapore within a 5-year window upon graduation		399

Information as at 31 March 2015, rounded to the nearest whole number

Industry Engagements

Partnerships with Companies

8. In FY2014, A*STAR made strides in forging strategic partnerships with many companies that have brought in significant investments into Singapore and created high-value added jobs. Since FY2011, A*STAR has undertaken four times more industry projects compared to the previous tranche and equivalent to 6 new industry projects a day. Some examples of industry partnerships include:

Delta Electronics. In January 2015, Delta Electronics INT'L (Singapore) and IBN announced the official opening of the Delta-IBN Life Science and Diagnostics Lab at the Biopolis. This partnership brings together IBN[1]s strengths in medical diagnostics, microfluidic systems and biological assays, and Delta[1]s expertise in microelectronics, optical devices, and global operations. The lab aims to develop the next generation of infectious disease detection kits through collaborative research projects undertaken by Delta and IBN. The lab is also expected to employ over 50 Delta staff, who will work on these joint projects.

AstraZeneca. AstraZeneca signed an agreement with A*STAR's GIS, National University Hospital (NUH) and National University of Singapore (NUS), study the pathophysiology of heart failure with preserved ejection fraction (HFpEF), a complex syndrome, for which there is currently no effective treatment for patients. The collaboration will make use of high quality clinical, cardiac imaging and blood data which have been collected through the Singapore Heart Failure Outcomes & Phenotypes (SHOP) study from patients with heart failure representative of the Asian populations in and around Singapore. This collaboration would spur the development of more targeted cardiovascular diagnostic and treatment tools, with the aim of improving outcomes for our patients and the healthcare system.

GlobalFoundries. IME established multiple partnerships with GlobalFoundries. Building on the MEMs Consortium established in 2010, IME and GlobalFoundries signed a Memorandum of Understanding (MOU) on November 2013 to establish a MEMS R&D Twin Lab to develop sensor technologies. A subsequent Master Research Collaboration Agreement (MRCA) was signed on April 2014 to further develop MEMS processing and technology capabilities in Singapore.

Nestlé. A*STAR has stepped up its engagement of Nestle significantly. Between October and November 2014, 3 new projects were initiated. SICS and Nestec (Nestle's research and commercialization arm are conducting a clinical trial with pre-pregnant and pregnant women and their offspring, known as NiPPeR. The partnership culminated in the opening of the Nestlé Food Science and Nutrition (NFSN) Hub at Biopolis on 3 Dec 2014. The hub, expected to host 10 employees, will complement its 120-staff strong R&D Centre in Jurong.

GE Healthcare. A*STAR and GE Healthcare signed a 5-year MRCA on 8 Dec 2014. Through the partnership, the parties have established a joint fund of US$20M to undertake the co-development of the next generation of medical technologies in areas such as patient monitoring, computed tomography and magnetic resonance imaging. The collaboration to sustain pipeline products and improve global healthcare delivery reflect GE's expanding partnership with A*STAR.

Fujitsu Limited. Fujitsu, A*STAR and the Singapore Management University (SMU) signed an MRCA on 15 October 2014 to establish an Urban Computing and Engineering Centre of Excellence in Singapore. This is a combined effort to use high performance computing methods to develop solutions for sustainable urban operations such as crowd mobility and transport engineering, with researchers using Singapore as a "living lab" to simulate a new generation of solutions to real urban issues.

Coca-Cola. A*STAR has entered into a joint collaboration agreement with The Coca-Cola Company, to develop potential new technologies and innovations that add value to consumers and support a sustainable world. Through this open-innovation partnership, Coca-Cola will establish external technology activities in Singapore. This will set the stage for cutting-edge research in different areas. As one of Coca-Cola's external partners, A*STAR will complement Coca-Cola's existing R&D centres in Asia. The partnership with A*STAR will tap onto both parties' expertise in a range of advanced technologies and research fields that will help Coca-Cola to optimise its production processes, as well as gain new insights into consumer needs and preferences. By providing opportunities for researchers at A*STAR to embark on collaborations with Coca-Cola's R&D centres globally, this

partnership will also boost A*STAR's research activities in food and nutrition research.

Industry Consortia

9. A*STAR's industry consortia programmes leverage on the span of technical expertise at research institutes to help the local industry move up the value chain. Bringing together multiple companies to work with numerous public sector R&D performers on a single platform, such programmes provide the conduit as well as opportunities for local companies to work with industry giants via research collaborations or membership programmes.

10. More than 20 large-scale Joint Programmes/Entities have been set up since FY2011. Several multi-partnerships, such as the Skin Research Institute of Singapore (SRIS) and the Singapore Centre for Nutritional Sciences, Metabolic Diseases and Human Development (SiNMeD), involving A*STAR, universities, academic medical centres, and healthcare institutions, were established in the last 2 years. 19 joint labs were launched in FY2014, bringing the total number of joint labs to 40 since FY2011. Notable collaborations are as follows:

Advanced Semiconductor Joint Labs. A*STAR has built a global network of R&D partnerships with companies such as GlobalFoundries, Qualcomm, Murata, and Micron, to provide solutions for a rapidly evolving global Electronics market. Following the success of the IME-Applied Materials Centre of Excellence, A*STAR launched four Advanced Semiconductor Joint Labs with ten industry partners[4] to provide an integrated platform for complex micro-chip manufacturing R&D. This global partnership represents a first for Singapore as it draws major companies across the value chain to advance electronics packaging technologies for the next generation of integrated chips and devices.

Clinical Nutrition Research Centre. Three Food, Nutrition, and Consumer Care R&D facilities have opened in Singapore recently – Fuji Oil Asia's R&D Centre, Abbott Nutrition's pilot plant, and food ingredient supplier DSM Nutritional Product's Nutrition Innovation Centre for Asia-Pacific. Companies are increasingly looking to use Singapore as a location for product development and innovation in the emerging FNCC sector.

Last year, together with the National University Health System, the Clinical Nutrition Research Centre was opened to undertake research across the food industry value chain. This new S$20M centre is the first centre in Asia, to house under one roof, research and clinical capabilities from the early exploratory science of foods to understanding the nutritional impact of developed food products. CNRC conducts studies in research areas such as nutrition in women, children and the elderly, and body weight control, to understand the causes of metabolic diseases such as diabetes and obesity, and develop products and formulate diets that can reduce the risks of these diseases. These studies could reduce economic costs through

[4] Applied Materials, Dai Nippon Printing, DISCO, KLA-Tencor, Mentor Graphics, Nikon, Panasonic Factory Solutions Asia Pacific, PINK, Tokyo Electron Ltd. and Tokyo Ohka Kogyo.

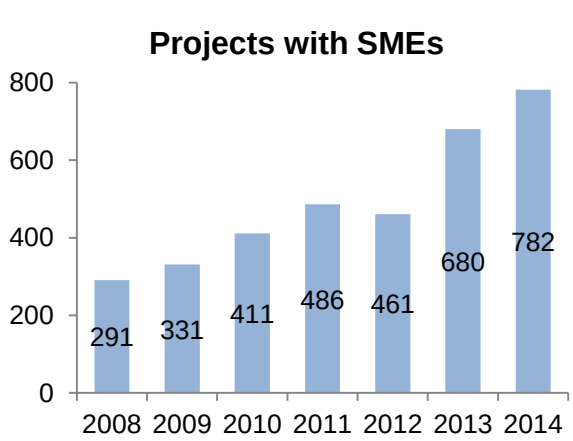
promoting a change in eating habits, hence enhancing nutrition in food systems and impacting health outcomes.

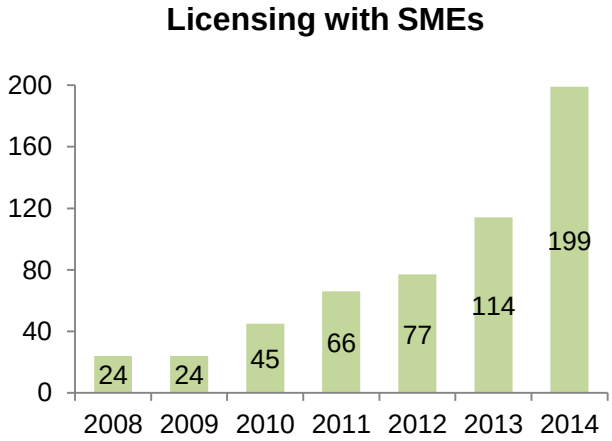
Chip-on-Wafer (CoW) Consortium. IME has formed a consortium to enable semiconductor firms to develop commercially-viable capabilities for making 3D chipsets, focusing on enhancing a Chip-on-Wafer bonding technique with the use of Copper-Copper (Cu-Cu) diffusion bonding technology. Members of the new consortium include ON Semiconductor, KLA-Tencor, Panasonic Factory Solutions Asia Pacific, Singapore Epson Industrial Pte Ltd, Tera Probe Inc, and Tokyo Electron Ltd. Low temperature Cu-Cu diffusion bonding, demonstrated by IME and its partners, aims to reduce manufacturing time and costs, enabling higher levels of 3D chipset integration, such as CMOS image sensors, signal processors, logic and memory, and memory stacks.

Operations Management Innovation (OMNI) Programme. The programme, which involves a framework of 'Learn-Practise-Implement', was adopted by more than 90 companies since its launch in August 2010. Productivity improvements achieved by these companies ranged from 20-200%. This programme saw participation by companies from different industries. In the marine and offshore industry for example, the LLEs such as Sembawang Shipyard, Keppel Shipyard and Jurong Shipyard participated and benefitted from the programme.

Working with SMEs

9. A*STAR uses multiple platforms to engage SMEs, and has introduced schemes to make it easier for SMEs to adopt technology and innovation. Over the past seven years, A*STAR has engaged about 900 SMEs in more than 3,400 projects. Licenses to SMEs have increased eight-fold from 24 in 2008 to 199 in 2014.





SME Day. A*STAR's second SME Day was held on 16 April 2015. This event represents A*STAR's continued drive to deepen technology adoption by SMEs through new partnerships with SPRING Singapore and the

signing of two Memoranda of Understanding (MoU) with Singapore Productivity Centre and NTUC Health. The SPC will identify gaps that may be addressed with technology, and A*STAR will match companies with the suitable solutions.

The event was graced by Guest of Honour Minister S. Iswaran, and had a total of 904 participants. 85% of SMEs attending had not worked with A*STAR.

Growing Enterprises for Technology Upgrade (GET-Up). Over the past 12 years, the GET-Up programme has engaged over 2,200 new companies and helped about 500 companies. Apart from providing technical advice, GET-Up has provided about 200 technology road-mapping services to about 180 companies. A*STAR has also seconded more than 550 researchers and scientists to over 300 companies under the T-Up Scheme.

An example of a company which participated in T-Up was BeCe Pte Ltd, a SME specialising in the production of test sockets for various applications in the semiconductor industry. Mr Lim Wei Yi, an IME researcher, was seconded to BeCe, where he developed over five new semiconductor testing products and helped in the characterisation and classification of BeCe's interposers. This allowed BeCe to achieve tighter inventory control leading to cost savings of up to 30 per cent. The launch of the company's new high frequency test sockets in the American and European regions also secured more than half a million dollars' worth of orders in 2014, representing a 100 per cent increase in sales compared to the previous year. Mr Lim received the T-Up Excellence Award at SME Day.

An independent survey of GET-Up conducted by the NUS Entrepreneurship Centre in 2013 found that 85% of companies developed new skills and capabilities and 80% had launched new products. Companies surveyed also reported a nearly two-fold increase in annual employment growth and over 35% increase in annual sales revenue growth.

Technology Adoption Programme (TAP). The TAP initiative was launched in July 2013, and aims to enable SMEs to gain easier access to practical and affordable technology solutions to boost productivity. To date, TAP has undertaken over 7,000 engagements with companies and facilitated over 1,300 adoptions of its Ready-to-Go packages, which span across multiple industries to enable swift adoption of productivity technologies. More than 900 SMEs have benefited from TAP since its inception, with an average productivity gain of over 20 per cent.

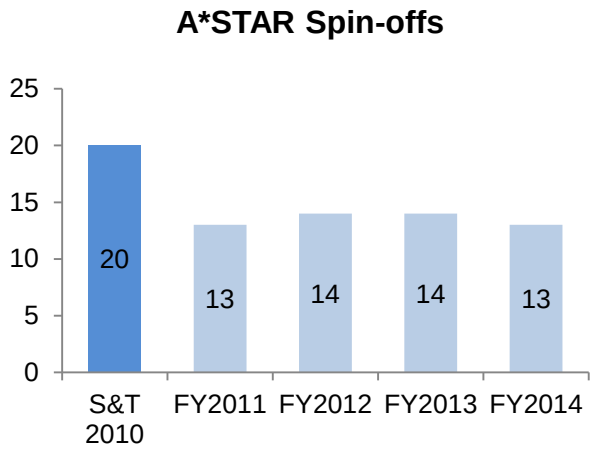
One such SME is FOSTA, a high tech fiber optic sensing instrumentation and monitoring company in the building and construction industry. FOSTA monitors noise and vibrations at construction sites to ensure that they remain within safety limits. Previously, workers had to manually retrieve data at the construction site, and return to their office to generate reports. This posed potential safety hazards when the noise and vibration levels exceed safety limits as data collected were not timely

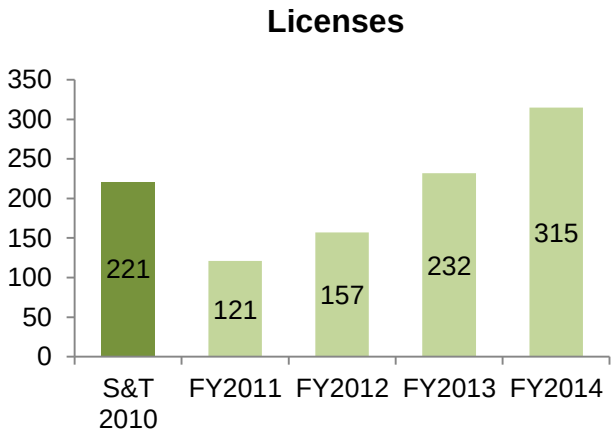
enough to generate the required alerts. Through TAP, I2R developed an IoT-based monitoring system which facilitates machine-to-machine communications over the Internet, and allows for real-time, remote access to on-site information. Following its deployment in 2014, timely reporting was achieved through the automated collection of data. FOSTA achieved manpower savings of nearly 90 per cent and reduced processing time by 50 per cent across its 40 worksites.

Headstart Programme. Headstart was launched in 2014 to encourage more local SMEs to leverage on emerging technologies to gain a competitive advantage and to participate in R&D. Under this programme, local SMEs that collaborate with A*STAR are granted royalty-free and exclusive intellectual property (IP) licenses for the first 18 months. Exclusive use of the IP can be further extended at business-friendly terms through ETPL. Headstart complements existing A*STAR schemes that provide SMEs greater accessibility to practical and affordable technology. A*STAR would also continue to incubate the technologies through our Gap Funding programme to push up the readiness of the technologies for SMEs to develop and productize.

Commercialisation Activity

10. Through its commercialisation arm ETPL, A*STAR concluded 315 licences in FY2014, a 36% increase over FY2013. Cumulatively, A*STAR achieved 825 licences from FY2011 to FY2014. A*STAR also nurtured and incubated 13 start-ups in FY2014, resulting in a total of 54 start-ups between FY2011 and FY2014.





Licenses. A*STAR had signed more licenses in 2014 than as a consequence of:

i. **Improved outcomes from Gap funded projects**. A*STAR funds projects to bring technologies downstream. Multiple licenses were signed for projects which we funded in areas such as Organic Semiconductor Materials, Microfluidics, and Infocomm technologies.

ii. **An increased uptake of Ready-to-go (RTG) licensing** that was targeted at SMEs. Launched in 2013, a total of 142 RTG licenses were signed in FY2014 in areas such as technologies that served productivity improvements.

Spin-offs. A*STAR is part of an integrated ecosystem that provides funding and advice at various stages: Research Grants, Gap Funding, POC Funding, POV Funding, Angel & VC Investment. In 2014, there was a continuing trend of the startups being spun out with the involvement external entrepreneurs. This suggested not only the continued interest of our researchers to engage in technopreneurial activities, but also an increase visibility of A*STAR's technologies for such purposes. Examples of A*STAR spin-offs as follows:

Company Name	Technology	RI	Remarks
ASTrio Pte Ltd	Industry IT solutions provider specialising in design and development of supervisory control, real-time networked control and optimization, information integration systems in various industrial sectors.	SIMTech	Heavily involved in the design and development of the complex warehouse and logistics management systems for SATS air cargo terminal and the Monetary Authority of Singapore.
AMI HealthTech	Provides clinically validated cloud based medical data-management and information sharing solutions, designed for clinicians in collaboration with clinicians.	SBIC	Addressing unmet needs, the company's solutions have elicited interests from Asia-Pacific based hospitals and health care institutions.
InvitroCue	Uses Bioanalytics to determine the stage of liver fibrosis, allowing better decision making in preclinical studies, clinical trials and diagnostics.	IBN	Technologies have been developed and validated with leading pharmaceutical companies and collaborators, including NUS and Massachusetts Institute of Technology, can be applied to drug testing and R&D of cosmeceuticals and medical devices.

Awards Won by A*STAR

11. A*STAR was awarded the Innovation Excellence Award in October 2014. It is the highest accolade given to innovative organisations in Singapore and is based on the business excellence niche standard for innovation. The award recognises and celebrates organisations whose outstanding innovation capability development approach has contributed significantly to business excellence. A*STAR was also awarded the Singapore Quality Class (SQC) Star and People Developer certification in FY2014.

12. A*STAR's scientists won several international awards in FY2014:

- SIMTech is among this year's winners of the **R&D 100 Awards**, which is widely known as the "Oscars of Innovations". The international competition recognizes the 100 most technologically significant products introduced into the marketplace in the past year. SIMTech's winning submission was an invention called Flexure-Based Electromagnetic Linear Actuator (FELA), that has unique performance in delivering nanometric positioning, large force generation, and high actuating speed, in millimetre-range displacements.

- I^2R's Human Language Technology team participated in the **2014 US National Institute of Standards and Technology (NIST) Open Keyword Search (OpenKWS)** international benchmarking and achieved leading performance including No. 1 ranking under the Test Audio Reuse (TAR) conditions and No. 2 ranking under the Full Language Pack No Test Audio Reuse (FLP NTAR) condition. NIST OpenKWS represents the highest technology standard and best performance in academia and industry.

- The prestigious **2014 Fellow of the Institute of Electrical and Electronics Engineers (IEEE)** was awarded to Dr Li Haizhou, Principal Scientist from I^2R, for his leadership in multilingual, speaker and language recognition research and development. Dr Li is among the 293 individuals worldwide elevated to Fellow for 2014.

- Dr Liang Ying Chang (I^2R), Dr Liu Bin (IMRE) and Prof Zhang Hua (IMRE) were named among **"The World's Most Influential Scientific Minds 2014"** in a Thomson Reuters report in recognition of their work in the area of Computer Science and Materials Science respectively. The report highlights outstanding researchers of the last decade using citation analysis. Prof Zhang Hua was one of two Asian scientists on a list of 17 "hot" researchers, innovators behind the scientific community's emerging trends.

- Four A*STAR researchers won the prestigious **Asia-Pacific Technology Review Under 35 Awards**, which recognizes innovators under 35 years old in the Asia-Pacific region. They are among the ten regional honourees eligible for selection on the global list, for which 35 innovators

under 35 years of age will be picked in October 2015. They include Peh Ruey Feng, Programme Director of Singapore-Stanford Biodesign, Zhou Lihan, Co-Founder and Chief Technology Officer of MiRXES Pte. Ltd, Benjamin Tee, NSS (PhD) scholar and Shawn Tan, Research Scientist at IMRE.

- GIS fellow and NSS (BS-PhD) scholar Dr Wan Yue was the first Singaporean to be conferred the prestigious **Branco Weiss Fellowship** by the Swiss-based 'Society in Science' philanthropic organisation. In recognition of Dr Wan's work, 'Society in Science' has awarded S$700,000 towards her research to tackle the global health issue of Antimicrobial Resistance.

- Kelvin Chan, NSS (BS-PhD) scholar and PhD student at The Scripps Research Institute, was one of 10 recipients of the **2014 GEN TEN Award**, sponsored by biotech publisher *Genetic Engineering & Biotechnology News (GEN),* for an outstanding abstract for his project titled 'Ligand-enabled cross-coupling of C(sp3)–H bonds with arylboron reagents via Pd(II)/Pd(0) catalysis.'

Outlook for the Next Fiscal Year

2014 has been challenging for many countries as they experienced uneven recovery from the global financial crisis. Many governments are strengthening R&D and innovation efforts to bolster their economies – for example, Korea's 'Creative Economy' initiative, the US Advanced Manufacturing Partnership as well as the UK Catapult Centres.

A*STAR is currently in the fourth year of the Research, Innovation and Enterprise (RIE) 2015 tranche. In the coming year, A*STAR will intensify efforts to grow R&D activities in Singapore through:

- attracting new company investments
- developing capabilities that support the transformation of Singapore's economy under the Future of Manufacturing initiative, and
- capturing the economic spin-offs from these investments

The FoM initiative will pre-position Singapore's manufacturing industry to capture new growth opportunities, customised across existing and new verticals (Pharmbio manufacturing, Chemicals, Transport Engineering, Electronics, Precision Engineering, General manufacturing and others). FoM's cross-cutting technologies include digital manufacturing, additive manufacturing, robotics and automation, and advanced materials. A*STAR will also expand co-innovation efforts with Singapore's indigenous large companies, as part of a focused strategy to increase their absorptive capacity for R&D and innovation.

A*STAR is also actively pursuing activities to seed the growth of new industry clusters. For example, A*STAR has begun to invest significantly in R&D for the burgeoning Food and Nutrition industry cluster in Singapore. Leading Food and Nutrition companies such as Nestlé, Danone, and Abbott, as well as ingredient companies like Kerry Ingredients and Ingredion, have either established new facilities or expanded existing operations in Biopolis to be co-located A*STAR researchers. The number of scientists and researchers working on Food and Nutrition, employed by companies in and around Biopolis, increased from less than 300 in 2010 to around 700 today. Many of these companies were attracted to Singapore by research initiatives such as GUSTO and CNRC.

A*STAR will continue to pursue R&D in cutting-edge programmes that strengthen Singapore's capabilities in industry-relevant technologies. Examples of such programmes include the Robotics programme, the Autonomous Vehicle and Smart Nation initiative, the Cell Therapy initiative, and A*STAR's investment in Biotransformation. In October 2015, PM Lee will open Fusionopolis 2. Fusionopolis 2 represents a 15 year journey of steady government commitment to the vision of integration through co-location. A*STAR at One-North will be a truly integrated, multi-disciplinary and mission-oriented research hub housing 4,500 scientists, engineers and executives from public and private sectors.