

A watercolor painting depicting a busy scene on the Singapore River. In the foreground, a small white boat with a canopy and the number '7104' is visible. Behind it, a larger wooden boat is docked, with several people standing on it. The background features a row of multi-story buildings with balconies and a car parked on the street. The overall style is soft and painterly, with visible brushstrokes and a warm color palette.

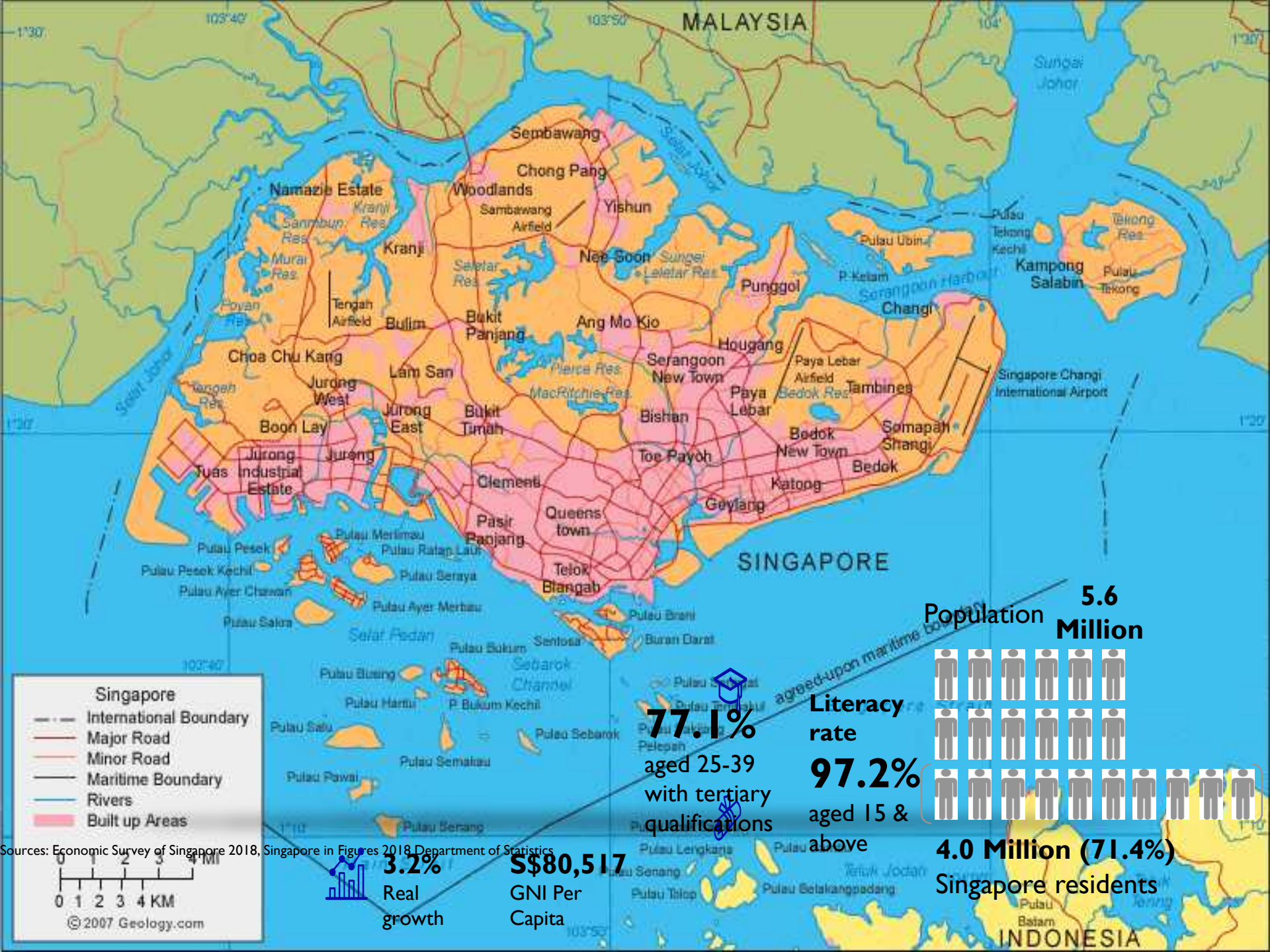
INSIGHTS ON THE RTO MODEL AROUND THE GLOBE - A SINGAPORE PERSPECTIVE

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Agency for Science, Technology and Research
(A*STAR)

19 March 2019

Ong Kim Seng

Unloading at the Singapore River, 2014
Water Colour on Paper
57.5 x 77cm



Sources: Economic Survey of Singapore 2018, Singapore in Figures 2018 Department of Statistics



3.2%
Real
growth

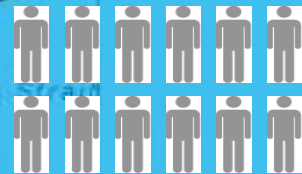
S\$80,517
GNI Per
Capita

77.1%
aged 25-39
with tertiary
qualifications



**Literacy
rate
97.2%**
aged 15 &
above

Population
**5.6
Million**

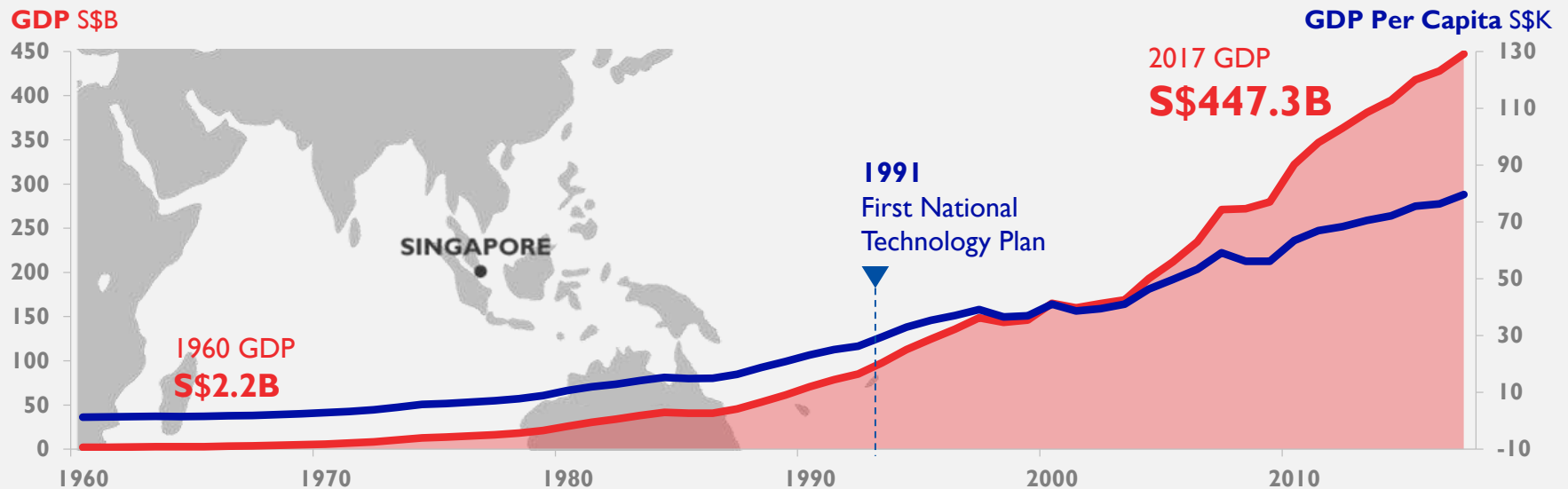


4.0 Million (71.4%)
Singapore residents

INDONESIA

Research Innovation and Enterprise (RIE)

INTEGRAL TO SINGAPORE'S ECONOMIC STRATEGY



1960s

Labour intensive

Low-end commerce with only handful of industries catering to domestic consumption

1970s

Skill intensive

MNC-led industrial development surging. Manufacturing evolving with greater sophistication

1980s

Capital intensive

Move to capital intensive & high technology industries, as local wages swelled

1990s

Technology intensive

Global offshoring directed heavy emphasis on technology

2000s

Knowledge & innovation based economy

RIE became the cornerstone of economic development

RTO

Industry

Universities

Economic
Outcomes

National
Priorities

Talent Base

OPEN
INNOVATION

PUBLIC
INVESTMENT

PRIVATE
INVESTMENT

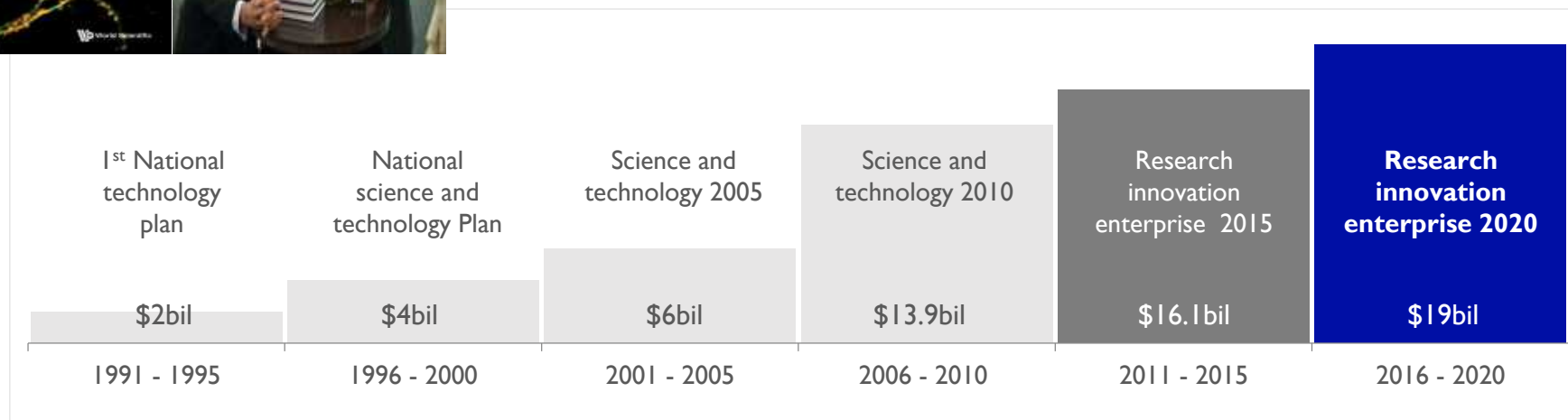
**PUBLIC-
PRIVATE**
PARTNERSHIP

PUBLIC
RETURN

PRIVATE
RETURN



SINGAPORE'S SUSTAINED COMMITMENT TO RIE



Ensure **excellent science** and invest strategically in curiosity driven and mission oriented research



Strengthen flow through from research to economic and societal **impact**



Greater national coordination of multi-stakeholder and multi-disciplinary collaboration



Sustain a robust and diverse research base and innovation **workforce**



Ensure responsiveness to pursue new opportunities and technology developments



Emphasis on competitive funding

National R&D Ecology (a shift in paradigm)- DOMAIN-BASED GOVERNANCE FRAMEWORK

Prioritisation of RIE agenda into four technology domains aligned to areas of competitive advantage and/or national needs



Advanced Manufacturing and Engineering (AME)

Support growth & competitiveness of manufacturing & engineering sectors



Health and Biomedical Sciences (HBMS)

Advance human health & wellness, and create economic value for Singapore & Singaporeans



Services and Digital Economy (SDE)

Leverage digital innovation to create economic opportunities and meet national priorities



Urban Solutions and Sustainability (USS)

Develop a sustainable & livable city through integrated solutions for Singapore and the world

Cross-cutting Programmes (Horizontal)



Academic research

Build up a significant base of capabilities and a pipeline of ideas that can drive the next phase of growth



Manpower

Build a strong research and innovation community



Innovation & Enterprise

Build a strong core of innovative enterprises that drive value creation and economic competitiveness

Key Government Agencies in the RIE Framework

Prime
Minister's
Office

Research, Innovation and Enterprise Council
chaired by PM Lee

Ministries

Education

Trade & Industry

Health

Other
Ministries &
Agencies +
NRF

Private
Sector

R&D
Funding
Bodies

Academic
Research
Council

Economic
Dev't
Board

ESG

A*STAR

National
Medical
Research
Council

MNCs,
LLEs, SMEs
and start-
ups

R&D
Performers

Universities

Oversees funding
incentives to
companies

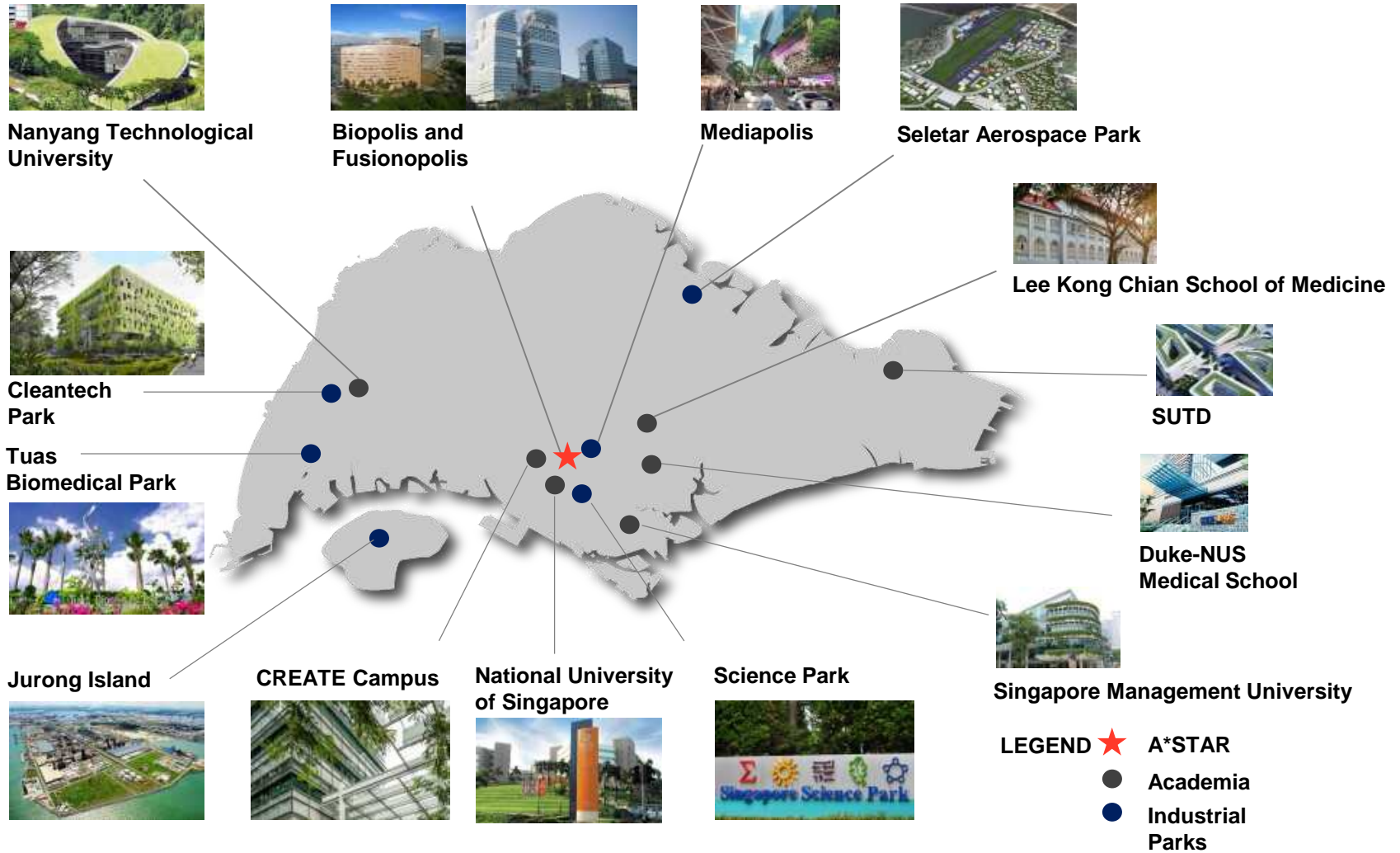
**A*STAR
Research
Institutes**

Academic
Medical
Centres

CREATE
and Other
Gov't Labs

Corporate
R&D labs

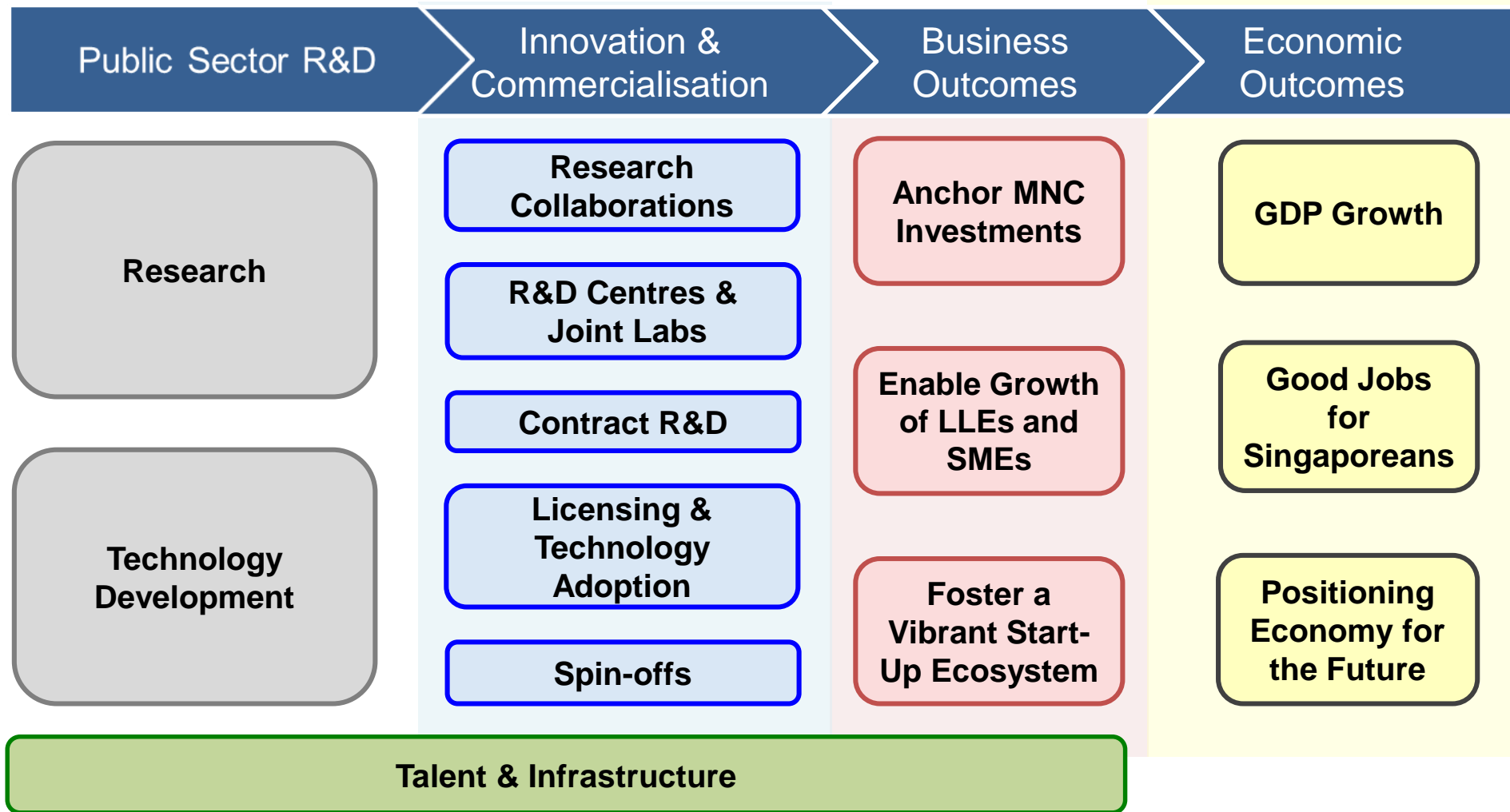
SINGAPORE'S RIE LANDSCAPE



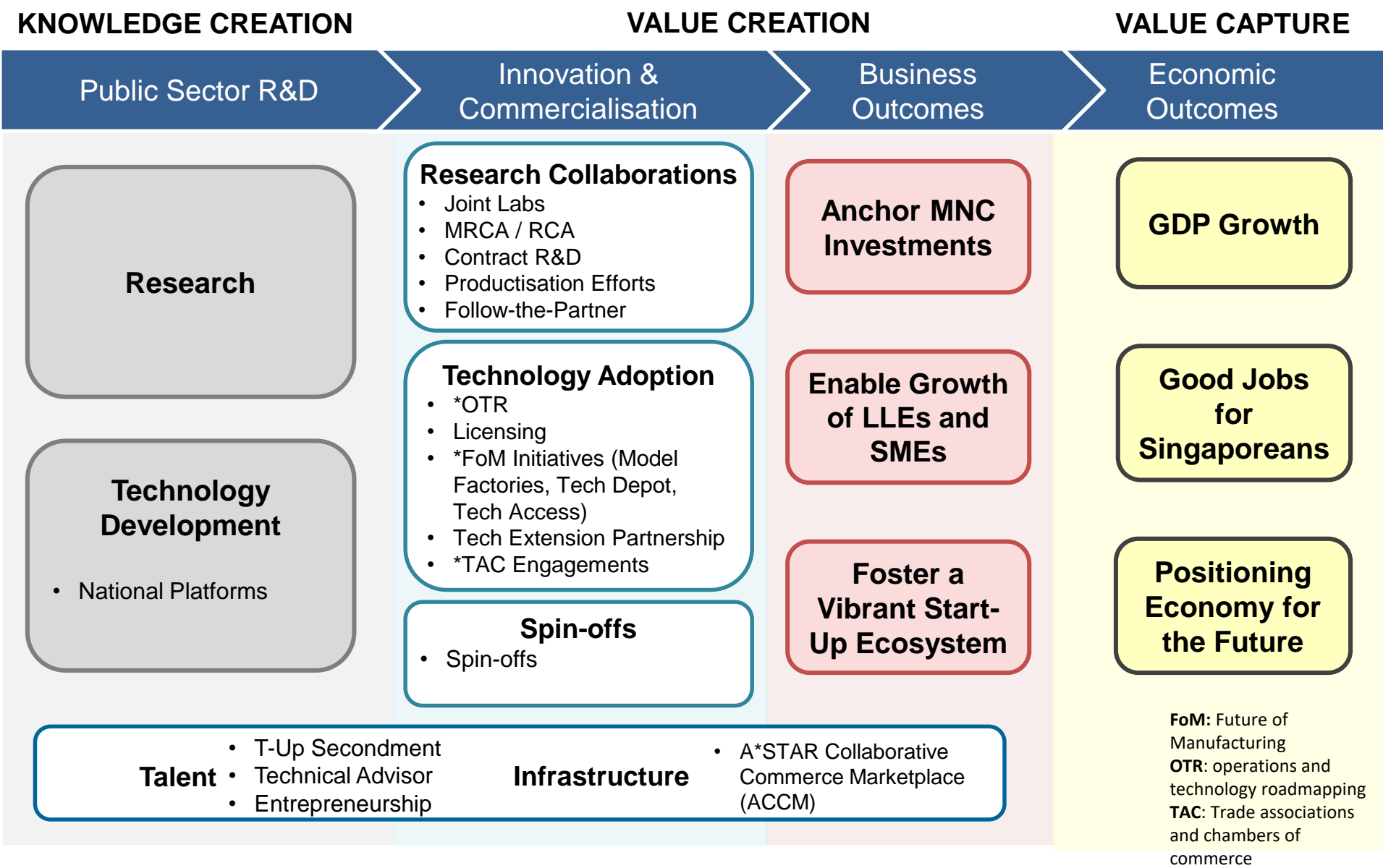
SINGAPORE'S RIE Community



National R&D and I&E Outcomes Orientation: VALUE CREATION & CAPTURE IN RIE 2020



Illustrating VALUE CREATION



Agency for Science, Technology and Research (A*STAR)

MISSION

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



**Biomedical Research
Council (BMRC)**



**Science &
Engineering Research
Council (SERC)**



A*ccelerate



**A*STAR Graduate
Academy**

Open Innovation Activities

11 Research Entities

9 Research Entities

Commercialisation

Scholarships



**>5,200
Staff**

Research Performers

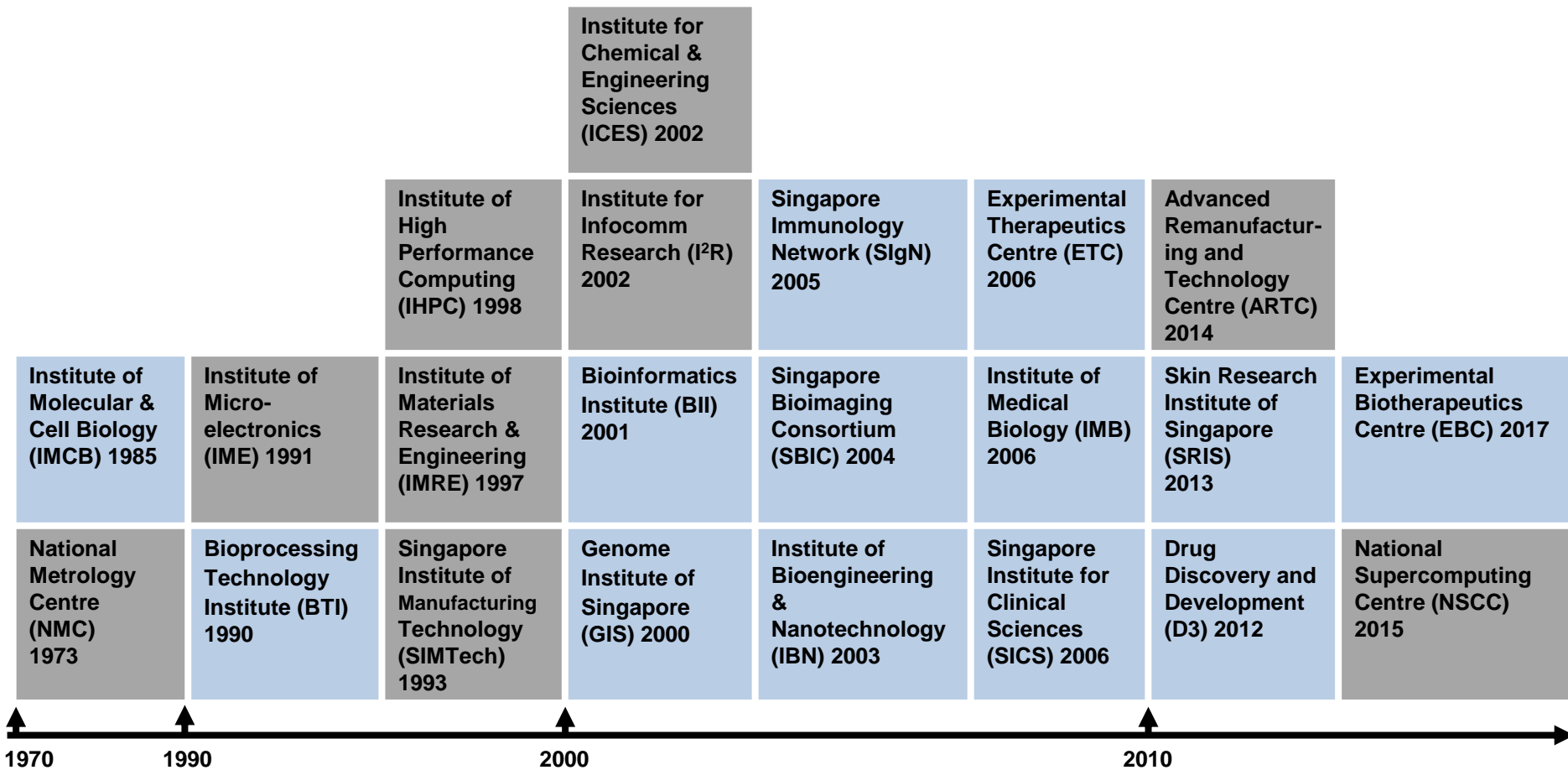


**>4,100
Researchers, Engineers and
Technical Support Staff**

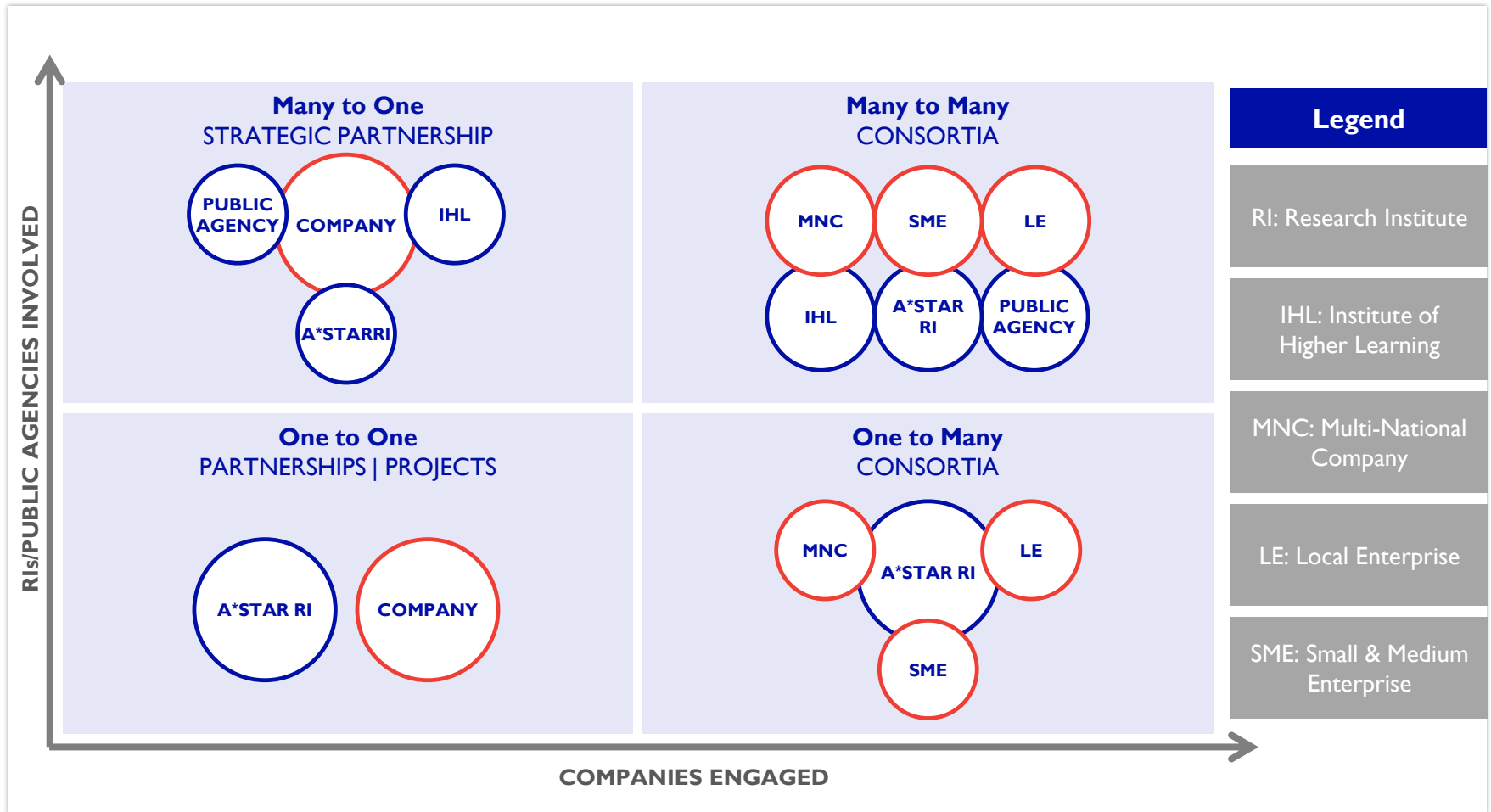


**~ 40%
from 61 countries**

A*STAR Research Institutes



A*STAR's MODALITIES FOR OPEN INNOVATION



A*STAR'S ACHIEVEMENTS FY17

► Achieved around

\$340 million of R&D spending through industry projects, an increase of over **50%** from \$220 million in FY16

- More significantly, R&D spending **by local enterprises** outpaced this increase, **growing by more than 60%**

► Worked on over

2,100 R&D projects with companies, a **20%** increase over FY16

- **1/3** of the total industry projects were with **local enterprises** for both years

► Seconded over **60**

A*STAR Research Scientists & Engineers to 56 local enterprises

- Help improve products and services in sectors **including engineering, infocomms, biotechs, chemicals & electronics**

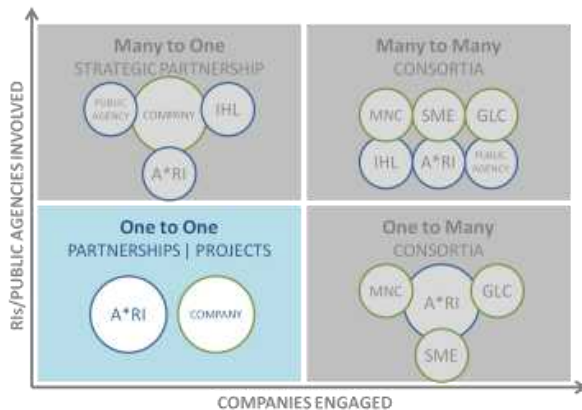
► **More local enterprises** taking up A*STAR licenses

- **3/4** of over 260 licensing deals were with local enterprises
- Compared to about **60% of 235 licenses** that went to **local enterprises** in FY16
- Licenses were deployed to companies in various sectors **including digital technology, advanced manufacturing, biotech & medtech**

One to One

ENGAGEMENTS

Building partnerships with companies in targeted research areas



Setting up a center of Excellence in Advanced Packaging in Singapore



R&D Project with Rohm Semiconductor on AI chip



NovogeneAIT – GIS: Next Generation Sequencing and Bioinformatics center



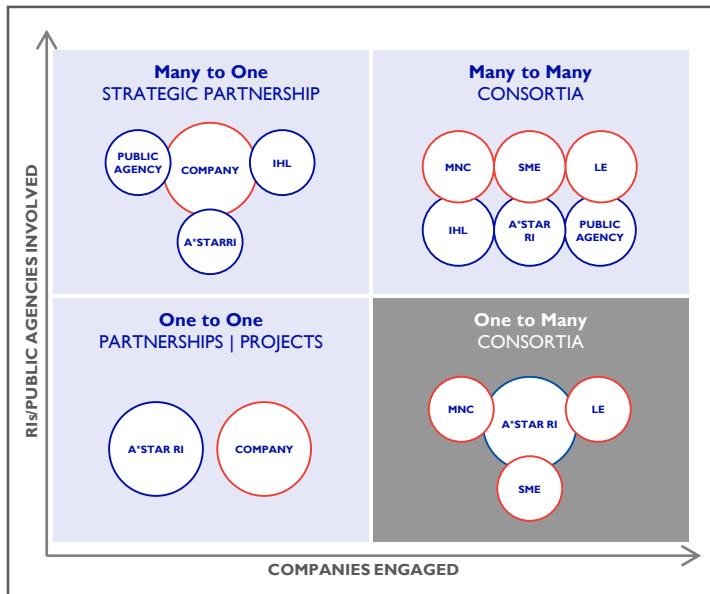
Public-private partnership between A*STAR and a JV between Novogene and AITbiotech

OPEN INNOVATION ONE TO MANY

One to Many

Consortia

Leveraging an RI to bring companies together to collaborate on common research areas



Industrial Consortium on Nanoimprint

To demonstrate applications of nanoimprint technology and develop roll-to-roll nanoimprinting



Fan-out Wafer Level Packaging Consortium

Platform for testing, developing new advanced packaging processes as well as high-volume manufacturing

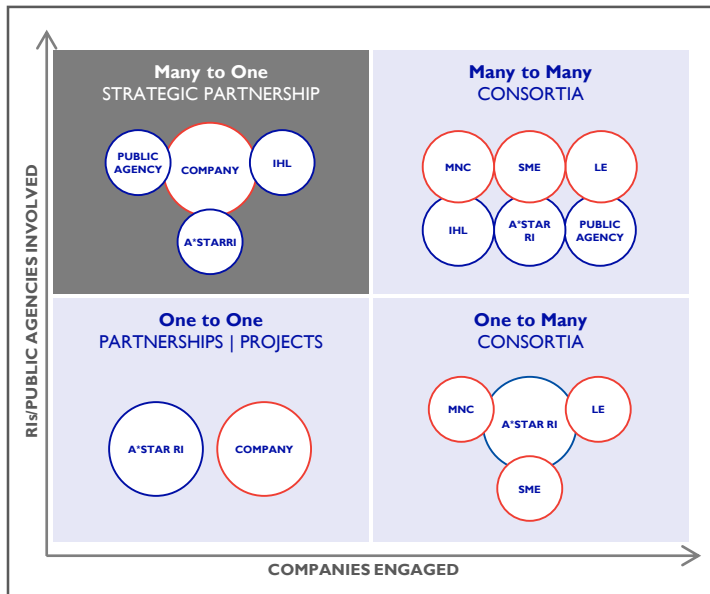


OPEN INNOVATION MANY TO ONE

Many to One

Strategic Partnerships

Integrating scientific capabilities across disciplines for impact



A*STAR-Singapore Airlines Master Research Collaboration

5-year MRCA in innovations and solutions for the Aviation sector (e.g. joint lab on predictive analytics for aircraft engine components launched in July 2018)



A*STAR – P&G MRCA



- **\$250** million, **32,000** sqm facility
- **500**-man Singapore Innovation Centre
- **MRCA** renewal in Aug 2018
- Beauty and grooming, health and well-being & household care

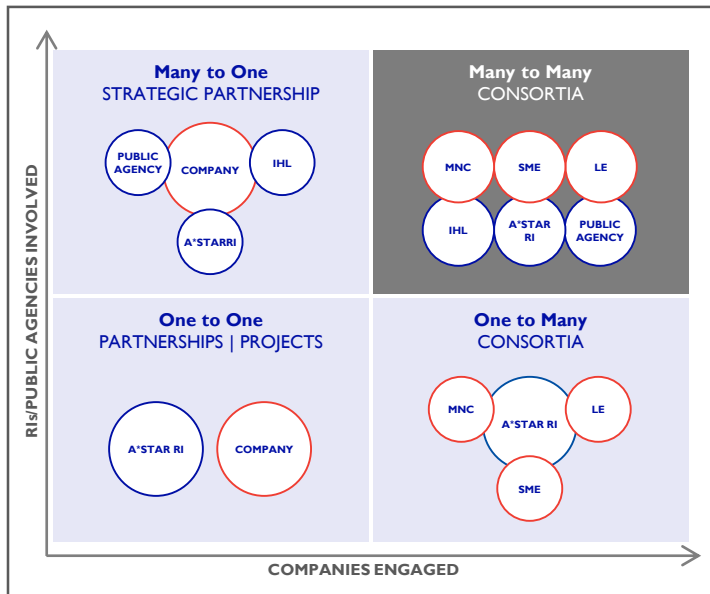


OPEN INNOVATION MANY TO MANY

Many to Many

Consortia

Creating effective platforms for both public and private sectors to collaborate



EpiGen Consortium

3 Countries
5 Member institutes
30 Principal Investigators
200 Scientists
 Multiple industry Collaborators



Aerospace Consortium

To drive innovation and collaboration amongst aerospace industry leaders in pre-competitive research topics

R&D Focus

- Manufact'g & Maintenance Processes
- Shopfloor Intelligence
- Material Development
- Inspection
- System Development

AIRBUS

BOEING

BOMBARDIER

Pratt & Whitney

Rolls-Royce

SAFRAN

SPRINT

Honeywell

HEXCEL

DSTA

RAI ENGINEERING

ST Engineering

HOCHTIEF

Biopolis and Fusionopolis

Fusionopolis

Biopolis

SINGAPORE'S ONE-NORTH

Co-location of research institutes and industry to bring together public and private R&D activities and synergise the knowledge of different domains for open innovation



46,000

Knowledge workers



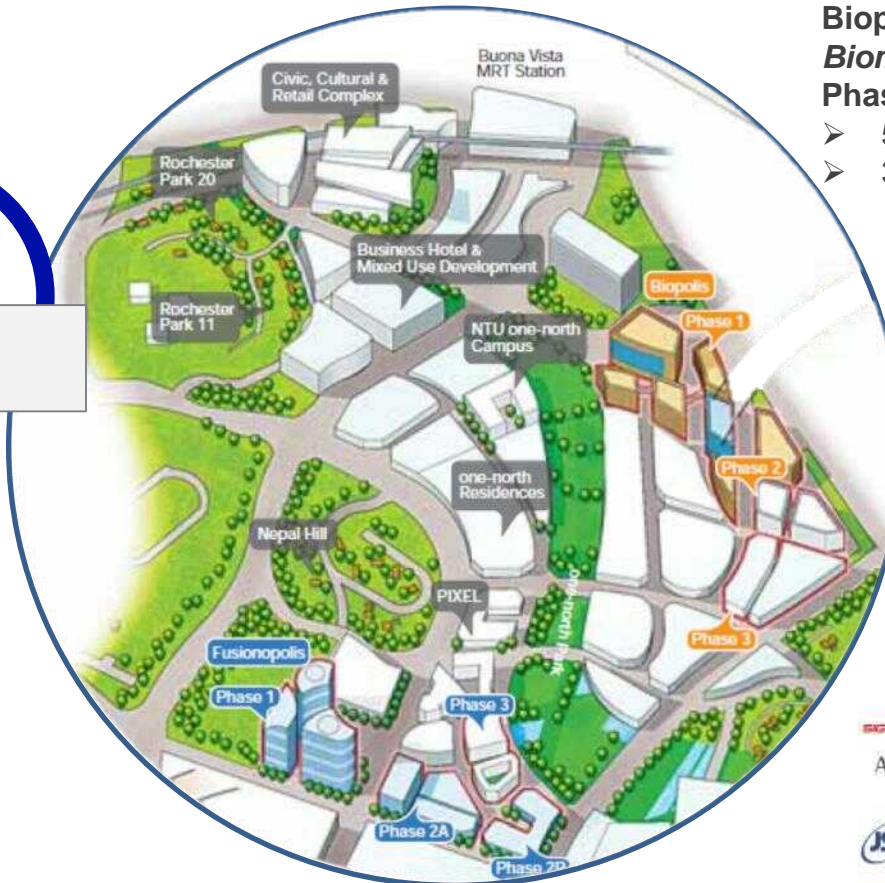
400

Companies

Fusionopolis

Science & Engineering hub

- 10,400 employees
- 312,000 sqm (GFA)



Biopolis

Biomed hub

Phase 1 to 5

- 5,600 employees
- 335,000 sqm (GFA)



eden
strategy
institute



gumi
One Step Beyond.



QUALITY OF LIFE SERVICES



Startups Ecosystem: 800 Startups in a single location



Advanced Manufacturing Training Academy (AMTA):

Training Manpower for Key Industries (An RTO's proposition)

AMTA is a “Whole-of-Government” effort to empower Singapore’s workforce in Advanced Manufacturing technologies with the following vision:

- Provide thought leadership on Advanced Manufacturing Training through a private-public partnership
- Academy to develop and provide practice-oriented advanced manufacturing courses using higher-end, state-of-the-art equipment and processes.
- Programmes will focus on:
 - Applied-learning
 - Industry-centric environments(with >70 different companies as members)
 - Real Industry 4.0 applications and challenges
- Located at CleanTech Park with 1300 square meters to accommodate 2000 trainees a year and use existing advanced equipment at A*STAR Research Entities (ARTC, SIMTech), and Institutes of Higher Learning



- Industry 4.0 and the Future of Manufacturing
 - Practice Oriented Training
 - Applied Learning Environment

THANK YOU