Creating and Boosting the Life Sciences Industry, National Models: Singapore

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Singapore

a little red dot on the map
From a fishing village…

To Independence in 1965…

Singapore today…

http://www.city-infos.com/singapore/

http://www.nestle100years.com.sg/growing-up.html#prettyPhoto
Innovation in Singapore

Jurong Island
Petrol-chemical

Desalination Plant
Resources - Water

Port of Singapore
Port / Logistics

Integrated Resort (IR)

One-North
Biopolis + Fusionopolis

National Research Foundation
Education, Research & Enterprise

Tourism /
Entertainment
## Stages of Singapore’s Economic Development & National Innovation System Change

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<tbody>
<tr>
<td><strong>Economic Development</strong></td>
<td>Beginning of DFI-Driven, Export led Industrialization</td>
<td>Transition to NIE</td>
<td>Transition from NIE to Developed Economy</td>
<td>Transition to Knowledge-based Economy</td>
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<td>Sustaining growth through skills, innovation &amp; productivity</td>
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<td><strong>National Innovation System</strong></td>
<td>Primary focus on developing Operative Capability to man Production</td>
<td>Primary focus on developing Adaptive Capability to support Process Technological Deepening</td>
<td>Primary focus on developing Innovative Capability to support applied R&amp;D</td>
<td>Primary focus on developing Intellectual Capital Creation and Commercialization/Entrepreneurial Capability to support Knowledge-based economic growth</td>
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Note: The Economic Strategies Committee recommends that R&D Expenditure as % of GDP (GERD) be increased to 3.5% by 2015 (from current 3%). This will be mainly driven by increased investment in public sector R&D.
Some History

1990’s – Looking beyond the region

• Asian Financial Crisis sparks repositioning oriented toward “global knowledge economy”
• Developing an external economy linked to domestic economy
  • Create new economic space by tapping on land and manpower resources of other countries to establish industrial parks
  • Companies investing in these parks, use Singapore to control operations, etc; and working in an environment similar to Singapore’s work ethics
• Shift toward knowledge-based innovation-driven economy
• Welcomes talent from around the world to work in Singapore
China-Singapore Suzhou Industrial Park, China

Vietnam-Singapore Industrial Park, Vietnam

International Tech Park Bangalore, India

Batamindo Industrial Park, Indonesia

Sino-Singapore Tianjin Eco-City, China

http://www.singbridge.sg/singapore-experience.html
Worked on Our Strengths …

Singapore’s Economy
• Use our core strengths:
  - Geographical position
  - Apt Infrastructure
  - Integrated communications system
  - Political stability
  - Workforce; People

Economic Development – has to be pragmatic
• Reinforce position as an entrepôt
• Foray into banking, finance & high value-added sectors, i.e., knowledge economy
Identified Areas of Focus

4 Pillars of the Singapore Economy:

- Chemicals
- Electronics
- Engineering
- Biomedical Sciences
“The 21st century has been termed the “Biocentury”…Our goal is to develop our research capabilities across the full value chain: from basic to applied and clinical research.”

Philip Yeo, then-Chairman of EDB, 8 September 2000, speech at NUS

Competitive Manufacturing Hub
Bringing Quality Products to Markets

Courtesy of EDB
A Competitive Hub for BioPharmaceutical Manufacturing

Highly-skilled Manufacturing Workforce
Ensuring a pool of highly skilled workforce through education and continuous education

Quality Manufacturing Track Record
FDA & EMEA approved manufacturing facilities with zero major observations with regulators

Leadership in Process R&D
Ensuring the sustainability of Singapore’s pharmaceutical manufacturing industry

Scalable Manufacturing Needs
- cGMP Biologics Manufacturing Facility
- cGMP Cell Therapy Facility
- BioProcess Development

Courtesy of EDB
Highly Skilled Manufacturing Workforce

Skill Development Programme

Manufacturing Manpower Development
- Targeted at Technician/Operators
- Co-developed with industry players
- Focus: Practical & Soft-skills certification and diplomas

Talent Pool With Relevant Skills

Number of Graduates Yearly
- Pharmacy (124)
- Chemical Engineering (450)
- Chemistry (250)
- Process Engineering
- Bioengineering (173)

Science & Engineering Talent Base

Strong Focus on Science & Engineering
>40% (32,000 a year) of graduates are trained as engineers or science-based

10 Institutes of Technical Education
5 Polytechnics
3 Universities

Pilot Scale Facility for Training

Integrated Primary and Secondary Pilot Plant Facility for Training
- Diploma in Pharmaceutical Sciences
- Diploma in Food Sciences
- Diploma in Molecular Biotechnology

Courtesy of EDB
Local Contract Manufacturing Solutions

Biologics Manufacturing Facility
cGMP Commercial scale manufacturing 40,000 Litre

Cell Therapy Facility
cGMP Autologous and Allogeneic cell therapy manufacturing

BioProcess Development
Enabling new products to enter into commercial-scale manufacturing

Customised Manufacturing Solutions
- Tableting
- Packaging & Labelling
- Solid/liquid dosage manufacturing
- R&D pilot facility

Commercialisation
- Regulatory Affairs & Registration
- Marketing & Distribution

Courtesy of EDB
Recent Announcements

2011 – Abbott opens new formulation and drug delivery technology lab

2009 – 3M’s lab for inhalation and transdermal products to Asia-Pac customers

2008 – GSK opens first small-molecule pilot plant in Asia (S$84 mil)

2011 – Lonza opens new bioprocess development facility (S$30m)

2006 - Nanomaterials set up a new facility for High Gravity Controlled Precipitation

Courtesy of EDB
Research & Development
Early Phase Clinical Trials

 Courtesy of EDB
First in Man Facilities

Investigational Medicine Unit

3 Public Investigational Medicine Units
- Located in academic medical centres
- For POC and first in man trials, latter phased studies also supported
- 4-6 week trial approval process with parallel submission to hospital ethics board and HSA

NUHS Strengths
- PK/PD Analysis
- Biostatistics
- Cardiovascular Imaging
- Clinical Pharm
- Genetics & Genomics
- 16 bed unit

SingHealth Strengths
- Oncology
- Haematology
- Cardiology
- Gastroenterology
- 30 bed unit

Other Hospitals, Specialty Institutions & Medical Schools

SingHealth

 NUHS

 Changi General Hospital

 NUHS Strengths
- Oncology
- Haematology
- Cardiology
- Gastroenterology
- 30 bed unit

 SingHealth Strengths
- Oncology
- Haematology
- Cardiology
- Gastroenterology
- 30 bed unit

 And others…

 Courtesy of EDB
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<th><strong>Niche CROs</strong></th>
<th><strong>Big 5 CROs</strong></th>
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<td><strong>Pre-clinical research organisation with specialised animal models</strong>&lt;br&gt;Services including Toxicology &amp; safety pharmacology, PK/PD &amp; biomarker</td>
<td><strong>Top 5 CROs for pharmaceutical company’s research needs</strong>&lt;br&gt;<img src="ICON.png" alt="ICON" /></td>
</tr>
<tr>
<td><strong>Fully integrated drug discovery, development, and manufacturing services.</strong>&lt;br&gt;cGMP Manufacturing, Aseptic Fill &amp; Finish and Project Management</td>
<td><img src="QUINTILES.png" alt="QUINTILES" /></td>
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<th><strong>Drug Development Vehicle</strong></th>
<th><strong>Clinical development</strong>&lt;br&gt;Clinical Trial Coordination Hub&lt;br&gt;POC Trial Services&lt;br&gt;Data Management</th>
<th><strong>Commercialisation</strong>&lt;br&gt;Sale Solution&lt;br&gt;Market Access Implementation&lt;br&gt;Medical Science Liaisons</th>
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<td><strong>Alternative drug development model for the Asian market</strong></td>
<td>![ASLAN PHARMACEUTICALS](ASLAN PHARMACEUTICALS.png)</td>
<td><strong>Consulting</strong>&lt;br&gt;Regulatory Filing&lt;br&gt;Market Access Strategy/ Intelligence&lt;br&gt;Late Phase trials</td>
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<tr>
<td>• In-license pre-clinical compounds&lt;br&gt;• Bring the compound through to Proof of Concept&lt;br&gt;• Out-license compound back to partner</td>
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*Courtesy of EDB*
Research & Development
Integrated Location for Pharmaceutical Research needs and Early Phase Clinical Trials
BioPharmaceutical Research & Development

5 key Asian Prevalent Research Area

Specialisation in Asian diseases
Supported by S$125million on translational clinical research of the 5 diseases

Diverse Asian Population

Chinese, 74.2%
Indian, 9.2%
Malay, 13.4%
Eurasian, 3.2%

Multi-Racial patient assets representing Asian population

CROs as Innovation Enablers

Top 5 CROs
- Quintiles
- ICON
- Covance
- Parexel
- PPD

Niche CROs
- AMRI
- maccine

DDV

Investigational Medicine and Early Phase trials

Integrated Research Campus

Biopolis & Fusionopolis
6 Consortia and Centres
14 Research Institutes
20 Companies
A world-Class research hub with a culture of collaboration between private and public institution

3 Public Investigational Medicine Units
Safety, dosage, PK/PD, ADME, Toxicity. POC

Courtesy of EDB
Research in Asia for Asians

5 key Asian Prevalent Research Areas:
- Neurosciences
- Oncology
- Metabolic Diseases
- Infectious Diseases
- Ophthalmology

Translational Clinical Research Flagship Programme
S$125 mil for 5 programmes pooling together clinicians & scientists to better understand pathogenesis of diseases in Asia.

Diverse Asian Population
- Chinese 74%
- Malay 14%
- Indian 9%
- Eurasians 3%

Representing the demographical population of the Asian population:
- Rising Asian affluence and demand for better healthcare
- Fastest aging population in Asia

 Courtesy of EDB
Biopolis an Integrated Research Campus

World Class Infrastructure

Biopolis & Fusionpolis

Shared scientific facilities
2,000 scientists
20 companies
4.1 million ft²

World Class Talent

Biomedical Research Institutes

7 Biomedical Research Institutes:
Bioinformatics Institute, Bioprocessing Technology Institute, Experimental Therapeutics Centre, Genome Institute of Singapore, Institute of Bioengineering and Nanotechnology, Institute of Medical Biology, Institute of Molecular and Cell Biology

BMRC Consortia
Bioimaging, Stem Cells, Immunology Network, clinical sciences and neurosciences

Courtesy of EDB
Home in Asia to Accelerate Growth in Emerging Businesses
Home in Asia for Top Pharmaceutical Companies

Pharmaceutical companies that have Regional HQs in Singapore

- GSK’s Emerging Markets & Asia-Pacific Hub
  - Shared services hub supports all BD’s operations in Asia-Pacific region.

- Quintiles’s Asia-Pac Regional Headquarters
  - Quintiles Singapore functions as Asia-Pac headquarters providing a full range of clinical development and commercialization services.

- Novartis’s Regional Headquarters for Asia Cluster
  - Regional headquarters for pharmaceutical operations across Asia cluster (7 countries).

Courtesy of EDB
Home to Strategic Headquarters

Asia Pacific Function in Singapore to Accelerate Business Growth Worldwide

- Asia Pacific HQ
- Company’s First and Largest Asia Manufacturing facility for nutritional powder manufacturing
- Center of Excellence for Drug Product Development
  Formulation R&D Lab and Analytical Research Lab

Eastern Hemisphere Headquarters in Singapore that Manages one third of GSK’s Revenue

- Emerging Markets & Asia-Pacific Hub
- Training Hub for health policy and regulatory talent
- Strategic Global Manufacturing Location with new product introduction capabilities
- R&D - Drug Performance Unit (DPU) for Neuroscience R&D, Regional Clinical Coordination hub

Courtesy of EDB
Roche opens its first hub for translation medicine in Asia to focus on enhancing personalised treatment approaches.

MSD Translational Medicine Research Centre focuses on biomarker discovery and development.

Lonza Group opens a new facility for cell therapy manufacturing. This will be Lonza’s global allogeneic cell therapy hub.

GSK opens its first vaccine manufacturing facility in Asia. This facility will be one of the two global sites producing purified bulk polysaccharides and conjugates.

Novartis manages 7 Business Units regional headquarters out of Singapore.
Home to Global Pharmaceutical Leaders

Top 10 Pharmaceutical Companies in 2010

- Johnson & Johnson
- Abbott
- GlaxoSmithKline
- Roche
- Pfizer
- Lilly
- AstraZeneca
- MERCK
- Novartis

50 Manufacturing Plants
S$23B output in 2010
13,000 employees
Courtesy of EDB

50 R&D Centers
S$1B R&D expenditure
4,300 Researchers

30 leading RHQs
Top 10 Pharma & Biotech companies

Courtesy of EDB
A World Class Hub for Business

A Globally Competitive Business City

• Home to 7,000 MNCs

• Located in the heart of Asia-Pacific: 7h flight-time radius from key markets

• Competitive tax regime and tax incentives to facilitate business growth and expansion

“World’s Easiest Place to Do Business” – World Bank

Access to Asia’s Top Business Talent

• With 1.2 million resident expatriates, the best place in Asia to live, work and play

• A “Global Schoolhouse” – with a host of world class management and business universities and programs

• Human Capital Leadership Initiative – to develop business thought leadership in Asia

“First Choice for Asian Expatriates” – ECA International

Courtesy of EDB

A Vantage Point to Capture Business Growth Opportunities

• A neutral location to manage Asia and international operations

• A home to integrate and closely manage key activities across HQ, R&D and manufacturing operations

• A base to accelerate new business and market growth strategies, e.g. for emerging markets, fast-growing business segments

- Novartis opens Asia cluster regional headquarters

- Lonza opens biosciences regional headquarters in Singapore to manage Asia’s business

- GSK manages Eastern hemisphere business (1/3 of total revenue) out of Singapore

“World’s Easiest Place to Do Business” – World Bank

“First Choice for Asian Expatriates” – ECA International

Courtesy of EDB
Thank You