Recognizing the importance of human capital for a city state with no natural resources, the Singaporean government has successfully tried to develop Singapore into the international hub for Research and Development (R&D) in the South East Asian Region. To achieve this goal the Ministerial Committee on Research and Development (MCRD), chaired by the Prime Minister, was formed in 2004. Singapore has laid out its R&D policies in the Strategic Direction for S&T Policy 2006-2010 and the S&T Plan 2010. The Singaporean government has identified three strategic areas of R&D. Those are in the fields of Environmental and Water Technologies (Clean Water and Clean Energy), Biomedical Sciences Translational and Clinical Research and Interactive and Digital Media.

In addition, the Singapore government will invest $16.1 billion over 2011-2015 due to its commitment to further boost research, innovation and enterprise (RIE), with the aim to grow Gross Expenditure on R&D to 3.5% of GDP by 2015 through increased private sector R&D expenditure. This RIE2015 Plan defines Singapore’s key R&D strategies, to support its long term vision to be a research-intensive, innovative and entrepreneurial economy comparable to countries like Sweden, Finland or Israel.

In 2012, Gross Expenditure on R&D (GERD) was $7.2 billion, or 2.1% of GDP and the Compound Annual Growth Rate (CAGR) over the past 10 years (2002-2012) was 7.8%. Besides there was further growth in R&D expenditure in the local private sector, as Singaporean companies increased their investments in research and development activities by 16 per cent or nearly S$180 million from S$1.1 billion in 2011 to S$1.3 billion in 2012. The R&D sector also continues to provide and create high-value jobs in Singapore, as the number of R&D jobs peaked to a new high of 37,077 in 2012.

Gross Expenditure, Business Expenditure and Public Expenditure on R&D as a percentage of GDP (1990-2012)
1. Urban Development and Mobility

Singapore is aiming to become the “test bed” for the development of technologies which could contribute to enhance the quality of life in large cities by implementing a sustainable development which might one day serve as an example for the growing mega cities of the region. A new research centre, TUM-CREATE Centre for electromobility is poised to tap on the vast German engineering experiences, was opened in 2010 to conduct research in electromobility. Together with local universities and Singapore-based industry, the initiative will address the individual and public transport needs.

Singapore managed to handle a significant population growth since the 1980s and could still double the city’s green areas. The lion state aims to increase its sky-rise greenery with an additional 50 hectares by 2030. Since land is scarce in the city state the goal is to gain 9 hectares through green roofs on multi-storey carparks in public housing estates.

Since 2008, to strengthen critical capabilities of companies to increase implementation of solar energy technologies, the government set aside S$20 million for businesses to offset part of the capital cost involved in installing solar technologies in new energy-efficient buildings.

2. Bio- and Medical Technology & Pharmaceutical Research

Singapore has become one of the most important locations for biomedical and pharmaceutical research in Asia. The excellent research environment in the city state has attracted many reputable international researchers and scientists as well as important international companies. About 4300 scientists work in the R&D laboratories of more than 50 globally operating enterprises and 30 public research facilities and university hospitals and other hospitals in the state. Some of the international companies that are represented in Singapore are Bayer Schering Pharma, Pfizer, GlaxoSmithKline, Roche, Merck and Novartis.

3. Clean Technology

Singapore will invest S$680 million in Clean Technologies until 2015. The government predicts that the sector will contribute S$1.7 billion and will create 18,000 new jobs until 2015. To promote the development of a Clean Tech sector, the Clean Energy Program Office (CEPO) was founded. It is an inter-agency workgroup comprising of different governmental agencies and is responsible for planning and executing strategies to develop Singapore into a global Clean Energy hub. The Solar Capability Scheme (SCS) and Clean Energy Research and Testbedding (CERT) Programme are two of the several initiatives by CEPO to develop the solar energy industry in Singapore.

Launched in 2008 for the private sector, the S$20 million SCS seeks to encourage innovative designs and the integration of solar panels into green buildings. The objective of the scheme is to build up the capabilities of our solar energy systems integrators through increased adoption by lead users in Singapore.

Another CEPO programme is the S$50 million Clean Energy Research Programme which supports R&D efforts in academia and industry.
4. Information and Communication Technology

Information and communication technology is one of the research areas where Singapore has a strategic advantage. After the success of Biopolis, a second research campus “Fusionopolis” dedicated to Infocomm and Engineering was established. 2012 saw Singapore’s Infocomm industry revenue increase by 23% to reach S$102 billion whilst Infocomm exports grew 33% to reach S$78 billion. Singapore is home to more than 80 of the top 100 software and services companies of which many have their regional or Asia Pacific headquarters here.

In its 2012 Infocomm Technology Roadmap, the IDA identified nine technology themes that would be of significance for the Infocomm & Technology sector in the next 3-5 years:

- Big Data
- Cloud Computing
- Cyber Security
- ICT and Sustainability
- Comms of the Future
- Social Media
- New Digital Economy
- User Interface
- Internet of Things

The ITR will serve as a guide to understand the ICT landscape as well as build new capabilities and sustain Singapore’s competitive edge into the future.

In March 2014, the Ministry of Communications and Information (MCI) also introduced the Infocomm Media Masterplan which focuses on the vision and opportunities available for infocomm and media (ICM) in 2025. The Masterplan will look at ICM Infrastructure, ICM Enterprise & Industry Development, ICM Talent & Manpower Development, Economics Social Transformation as well as ICM technology & R&D to establish Singapore as a Smart Nation and to nurture innovative talent and enterprises.

World-class research infrastructure

Singapore aims to create an attractive environment by providing good infrastructure support and high quality facilities to support research and technology activities. Below are the major developments:

The One-North-Community
The One-North community is located in central Singapore, a 200 hectare district which comprises several connected research clusters for biomedical Sciences, Infocomm Technology (ICT), media, physical sciences and Engineering.

Data Research Centre
Targeted to be operational in 2016, the IDA, EDB and JTC are developing a Data Centre Park to strengthen
Singapore's position as an economic hub by attracting MNCs and enterprises to set up their HQ and premium DC operations here. Entrenching Singapore as an infocomm and media hub by having more Telco carriers located here will also attract more world-class Internet and media companies Internet traffic and international network providers. This would ultimately enhance Singapore's global connectivity and competitiveness.

**Biopolis**

Biopolis is one of the industry-focused clusters and is at the core of Singapore’s R&D strategy in the biomedical Sciences sector. Its construction began in 2001 with the goal to build up the biomedical sciences as a key pillar of the Singapore economy. Home to public as well as corporate research laboratories, Biopolis brings together over 2,000 scientists, researchers, technicians and administrators in one location with its state of the art research facilities. By the time it finishes its third phase, Biopolis is expected to comprise up to 5000 scientists.

**Fusionopolis**

Another cluster is the Fusionopolis. It envisioned to be Singapore’s R&D hub for Information communication Technology, Media and Physical Sciences & Engineering. It will be a cradle for knowledge convergence, where next generation applications are incubated and test-bedded. Fusionopolis mainly houses Singapore’s public sector research institutes but will also attract multi-national corporations, start-ups, and venture companies seeking to develop new innovations.

**Universities and Polytechnics**

Singapore's eight universities and polytechnics (Nanyang Polytechnic, Nanyang Technological University (NTU), National University of Singapore (NUS), Ngee Ann Polytechnic, Republic Polytechnic Singapore, Management University (SMU), Singapore Polytechnic, Temasek Polytechnic) play a crucial role in Singapore’s R&D effort. While R&D is mainly conducted as faculty lead research within the universities, the polytechnics focus more joint projects with the industry and local enterprises.

**German pharmaceutical companies in Singapore**

- Bayer - R&D
- B.Braun - Sales
- Boehringer-Ingelheim - Drug Discovery Unit (R&D)
- MERCK - Sales
- Pfizer - Clinical Research Unit (R&D)
- Roche - Sales

**Singapore’s Infocomm Landscape**

To-date, Singapore has established a highly connected nation with a globally competitive infocomm industry, infocomm-savvy workforce and spearheaded the transformation of key economic sectors, government and society.

To ensure sustained progress, in May 2005 the Infocomm Development Authority of Singapore (IDA) jointly developed with the people and the private sectors in2015, Singapore's 10-year masterplan to grow the
To infocomm sector and use infocomm technologies to enhance the competitiveness of key economic sectors.

Not only will iN2015 fuel creativity and enable innovation among businesses and individuals by providing an infocomm platform that supports enterprise and talent, but it also aims to connect businesses, individuals and communities, giving them the ability to harness resources and capabilities across geographies. iN2015 will be the gateway which will enable access to the world's resources and for Singapore to export her ideas, products and services to the global marketplace.

Sources:
- Rachel Au-Yong: High-tech film focuses on new R&D facility, in the Strait Times, Wednesday July 21st.
- http://www.nrf.gov.sg/media-resources/media/news-reports/infocomm-media-masterplan

DATE: May 2014