Industry 4.0:
A Perspective on Singapore

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Digitalisation of Manufacturing in Southeast Asia

Singapore Manufacturing Federation
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Industrial Revolutions
From the 1st to the 4th

Late 1700s

1st
Mechanisation

Mass Production

Early 1900s

2nd

1950s

3rd
Automation

Cyber-Physical Systems

2010s

4th
Industry 4.0

Industrial revolutions are the superposition of technology advancements and economics

Industry sectors that require precision, has repetitive tasks, and shorter production cycles may benefit from automation solutions

3rd Industrial Revolution

- Precision and consistency
- Labour costs
- Accessibility to data
- Future proofing
Industry 4.0 – Factory Automation example

Advances and accessibility to technology has brought automation to the masses.

Attributes of an automated factory are connected to technology themes:

**Technology Themes**
- Big Data
- Cloud computing
- Sensor networks
- Predictive maintenance

**Smart Factory Outcomes**
- Productivity gains and cost reductions
- Business model innovation
- Data-driven services

Source: BCG, Fraunhofer, University of Stuttgart, Frost & Sullivan
Macroeconomic Trends of Southeast Asia
Enhancing the region’s involvement in the global manufacturing value chain

Trade Deals
- ASEAN Economic Community
  - Knowledge platforms and incentives
- Trans-Pacific Partnership
  - Singapore, Malaysia, Brunei, and Viet Nam
  - Higher standards on production qualities

Digital Workforce
- Skilled labour mobility
- Increase labour productivity
- Analyse operational performance
- Education and retraining

Economic Growth Drivers
- Manufacturing services
- Private consumption
- Infrastructure investments
  - Logistics
  - Transportation networks
  - Financial solutions
  - Utility networks

Source: ASEAN, OECD, ADB, WEF
The Digital Revolution in Southeast Asia
GDP growth of US$1 trillion in ASEAN by 2025

Investments in broadband infrastructure may result in GDP growth.

Increase workforce productivity through seamless integration of the workplace.

In 2016, mobile technologies contributed US$1.3 trillion of economic value in APAC.

Source: A.T. Kearney, Koutroumpis (2009), ITU, GSMA
Singapore’s Manufacturing Sector

Electronics is the bedrock of the manufacturing sector, contributing SG$90 billion

Singapore, Total Manufacturing Output, 2015
Total = SG$284.7 billion

- **Electronics manufacturing services**: Jabil, Flextronics, Celestica.
- **Semiconductor companies**: design centres, front-end, back-end.
- **Specialty chemicals** for industries such as marine, offshore, electronics, and mining.

Source: Singapore EDB
Industry 4.0 Readiness Factors
An indication of government support and infrastructure developments

01 E-Government Development Index
A higher EGDI indicates that the country has more eGovernment schemes and would be more receptive to supporting IIoT initiatives.

02 Ease of Doing Business
It is an indication of the conduciveness for starting and operating a local business.

03 High-technology exports
High-technology exports are products with high R&D intensity such as in aerospace, electrical machinery, pharmaceuticals, and scientific instruments.

04 Manufacturing value-added
Contribution of medium- and high-tech manufacturing sectors to GDP.

05 Global Competitiveness Index
Indication of a country’s productivity levels.

Source: UN Industrial Development Organization, World Bank, World Economic Forum, Frost & Sullivan analysis
Industry 4.0 Readiness Score – Country Rankings
Singapore has the infrastructure and prior successes in digitisation programs

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<th>Country</th>
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<td>Singapore</td>
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- **Established foundations** for Industry 4.0 solutions.
- **Government is more receptive** towards digitisation having successfully implemented technology upgrades in the public domain.
- **Renowned for high-end manufacturing** in multiple sectors.

Source: UN Industrial Development Organization, World Bank, World Economic Forum, Frost & Sullivan analysis
Industry 4.0 Projects in Singapore

Mann+Hummel – filtration technologies
- Set up its global IIoT laboratory in Singapore in October 2016 to work on next-generation water and air filtration systems for industrial and automotive applications
- Air and water pollution is rampant in Asia and Mann+Hummel is targeting the smart filters market for this region

Colt – cloud networking
- It is expanding its services in APAC to tap into the growing demand from IIoT in the region
- In Q2 2017, Singapore will be Colt’s first investment in APAC where it will expand its Colt IQ Network that comprises optical and Ethernet networking technologies

Rolls-Royce – engines
- In Q1 2016, Rolls-Royce partnered with Singapore’s A*Star to develop data analytics technologies for manufacturing, assembly, and Maintenance, Repair, and Overhaul (MRO) applications

Source: Mann+Hummel, Colt, Rolls-Royce, A*Star
Industry 4.0 Projects in Singapore (continued)

DHL – logistics

• In 2016, launched an Advanced Regional Center (ARC) in the Changi Airfreight Centre featuring a multi-customer automation system, which has improved picking efficiencies by 20% and the entire system uses 40% lesser space than traditional logistics warehouses

• DHL expects that by 2020, Asia will contribute 30% of its total revenue and the ARC is a business model innovation that will capitalise on this trend

General Electric – industrial equipment

• Announced partnership with the SP Group (an energy utilities group in APAC) in April 2017 to develop IIoT capabilities to create a robust and digitised energy utility network in Singapore

• This digital energy ecosystem will aim to optimise engineering expertise and resources to improve energy productivity in the city state.

Source: DHL, General Electric, SP Group
Next Steps

Government Support
- Public-private collaborations
- Infrastructure investments
- Funding schemes

Manpower Development
- Identifying the relevant skills.
- Workforce projections for the next 5 years.

Business Model Innovation
- Performance-based pricing
- Predictive maintenance
Summary

Automation should **complement the workforce**, not replace it.

A **strong ICT infrastructure** can encourage data-driven interactions between manufacturers and their customers.

Governments need to **promote policies** that will create technology-led growth.

Change of focus in APAC **from quantity to quality-driven growth**.
Automation should complement the workforce, not replace it

“Technology is neither good nor bad—it’s what you do with it that makes the difference.”

Marc Benioff
Chairman and CEO, Salesforce

Source: World Economic Forum
Rise of the robots … a philosophical conundrum?

Someday soon I will take your job. *Buwhahaha!*

I programmed you to self-destruct if that ever happens.

Wait, what? Is that legal?

I’m adding some code to make your head explode if you laugh at me again.

Source: Dilbert
As manufacturing becomes more globalised, it is essential that our local SMEs continue innovating to remain competitive and tap new opportunities for growth.

Mr. S. Iswaran
Minister of Trade and Industry
Official opening of Feinmetall Singapore’s Digital Manufacturing Facility, June 2017

Our SMEs should not simply focus on manufacturing products to meet current needs. They should start thinking about creating well-designed, beautiful things that fulfil future demands.

Dr. Vivian Balakrishnan
SMF Appreciation cum Investiture Nite, Oct 2006

- Manpower development
- Business model innovation
- Government support