Advancing the Future of Manufacturing – A Singapore’s Perspective

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Old models are not working, new models are coming thick and fast, and we're having to adjust and to keep up, because of **technology and globalisation**. And the **disruption will happen over and over again**, relentlessly.

- Prime Minister Lee Hsien Loong, National Day Rally 2016

“As we mature as an economy, we must compete on the quality and novelty of our ideas, and our ability to create value. We need to build a strong **innovation and enterprise** engine…”

- Finance Minister Heng Swee Keat, Budget 2017

“A*STAR’s research have always been geared towards **meeting the needs of industry and society**. They always have been mission-oriented. …More and more innovations are now occurring at the interstices of disciplines. Companies must increasingly **draw upon multi-disciplinary capabilities to develop new solutions**, and they need to do that with greater speed.”

- Minister for Trade and Industry (Industry) Mr S. Iswaran, Committee of Supply Debate 2017
Maintain competitiveness of manufacturing sectors

**Committee of Future Economy Recommendation**

Singapore manufacturing to be at 20% of GDP over medium term

**FUTURE OF MANUFACTURING**

Leverage technology to boost existing sectors and to capture new growth opportunities

- Electronics
- Precision Eng.
- Chemicals
- Transport Eng.
- Pharmbio Mfg
- General Mfg & Others

Customised across existing verticals

**Cross-Cutting Technologies**

- Autonomous Robots
- Big Data and Analytics
- Additive manufacturing
- Industrial Internet of Things
- Simulation
- Cloud Computing
- Cybersecurity
- Advanced Materials

**Future Workforce:**

- Smart tools, new skills, high degree of automation
A*STAR’s
Future of Manufacturing (FoM) Initiative
Recognised drivers impacting manufacturing …

Factors that affect value creation and value capture

**Consumer demand**
- Personalisation and customisation
- Consumers as creators

**Nature of products**
- From ‘dumb’ to ‘smart’
- From product to platform
- From product to service

**Economics of production**
- Exponential technologies
- Eroding barriers to learning, entry, and commercialisation
- Emerging manufacturing models

**Economics of the value chain**
- Eroding value proposition for intermediaries
- Direct consumer engagement
- Faster speed to commercialisation
- Build to order vs build to stock

... and digitalisation is crucial in a fully connected manufacturing value chain eco-system

Adapted from Industry 4.0, Roland Berger Strategy Consultants, March 2014
... and digitalisation is crucial in a fully connected manufacturing value chain eco-system

Need to adopt an **eco-system approach** and be a **convenor of partnership platforms** to bring the different players together to **co-innovate and demonstrate** fully the potential of FoM

Adapted from Industry 4.0, Roland Berger Strategy Consultants, March 2014
A Technology Strategy for FoM

1. Create public-private partnership platforms to drive technology innovation, knowledge transfer and adoption
   - a) Tech Labs (Model Factories)
   - b) Tech Access
   - c) Tech Depot

2. Invest in R&D programmes that create differentiation
PUBLIC-PRIVATE PARTNERSHIP (PPP) PLATFORMS
Tech Labs (Model Factories) - Features of Model Factories in A*STAR

1. Experiential Learning Environment
   Companies will be able to experience and learn the benefits of new and advanced technologies to their manufacturing processes and operations.

2. Improving Production Processes
   The dynamic production environment in the Model Factories will allow companies to optimise and improve their production processes.

3. Co-Innovation Platform
   Test bedding facilities will allow the ecosystem of research performers, technology providers and end-users to co-create and test new innovations.

MODEL FACTORIES @ SIMTech and @ARTC
Operating Model of Model Factory

- Technology Providers/ System Integrators
- Research performers
- End users

Co-create technologies

Dissemination of end user requirement

Technologies and tools

Interactions

Model Factory @ SIMTech

Model Factory @ ARTC

Problem statements

Technology solutions
Future of Manufacturing PPPs – in addition to A*STAR Model Factories

McKinsey & Company Digital Capability Centre at ARTC

Working with Feinmetall to build their advanced manufacturing capabilities

Pharma Innovation Programme Singapore (PIPS) MoU Signing at the Future of Manufacturing (FoM) Summit
McKinsey & Company Digital Capability Centre (DCC) at ARTC:

• Groom talent for jobs in advanced technologies through workshops and on-the-job training
• Draw on ARTC’s state-of-the-art facilities and R&D capabilities
• Help companies to deepen their skills in advanced manufacturing, improve productivity and scale up

“We see DCC Singapore playing an integral role in the ecosystem, drawing on ARTC’s state-of-the-art facilities and research and development capabilities across A*STAR, ranging from manufacturing, data analytics, virtual process modelling, and digital solutions for complex manufacturing processes.“
- Oliver Tonby, McKinsey’s South-east Asia managing partner
“Feinmetall’s partnership with A*STAR has been an enriching journey that has lasted almost 10 years. A*STAR builds our technology capability; we build the business – it is a perfect partnership. The agency has also helped me to think out of the box, and tap on technologies that I never knew I needed or wanted to grow the company.”

- Mr Sam Chee Wah, General Manager & Director, Feinmetall Singapore Pte Ltd

Designs and manufactures probe cards for semiconductor testing requirements.

Worked with A*STAR on multiple projects:
- T-Up projects
- Enhanced Operational Technology Roadmapping (OTR)
- Snap2Tell Technology - app allows streaming of instructional videos and e-manuals on smart phones and tablets
- Feinmetall Digital Manufacturing Facility - taps on technology solutions under the Model Factory@SIMTech initiative and Tech Depot

*Benefits: Helped Feinmetall staff to operate complex machines on their own, improving productivity.*
Pharma Innovation Programme Singapore

“…PIPS will bring together Singapore's public sector research capabilities and the domain expertise of key players in the Pharma industry to improve and transform the manufacturing operations and technologies of the industry…”
- Mr S Iswaran, Minister for Trade and Industry (Industry)

2020 Vision.....

Lead the global transformation of Pharmaceutical Manufacture creating unique value for Patients, Pharma & Singapore......
PRIORITISED TECHNOLOGIES – INDUSTRIAL INTERNET OF THINGS (IIOT)
IloT in the “making” and “use” of industrial assets

IloT Research Programme
- Cognitive and Secure IloT, Edge-cloud cooperative signal and data analytics
  - Pre-position A*STAR in advanced capabilities

A*STAR Model Factories (SIMTech, ARTC)
- PPP for Innovation in Manufacturing Shopfloor
- Digital manufacturing using IloT

Digital Industrial Customer Care
- PPP for Innovation in Services for Manufacturing
IiOT Research Programme To Build Differentiated Capabilities

A*STAR-led programme in partnership with IHLs to develop IiOT technologies to meet needs of industry. Research grant approved and awarded.

Differentiated capabilities in:

• Cognitive industry wireless communications
• Holistic cyber security
• Edge-cloud cooperative signal and data analytics

Upon development, the technologies will be prototyped into edge devices and gateways for validation through test bedding and deployment with the industry partners.

Initial list of industry collaboration partners lined up.
Establish an Industrial IoT Initiative (I³) to focus on aftermarket services: Digital Industrial Customer Care (DICC)

- Collaborative Initiative for common industrial research needs based on market sensing and inputs (Public-Private-Partnership model, membership based programme)

- Accelerate and drive the adoption of IIoT solutions for industrial customer care in industry

- Focus on Industrial IoT (not B2C, B2B, but Asset2Biz)

- Target industry outcome-based projects in Aftermarket (Product in Service) in 3 sectors – Aerospace, O&M, Transportation

- Partner with MNCs/LLEs/SMEs/Start-ups – both users and providers

- Integrate advanced capabilities of SERC RIs for system implementation to solve industry use cases in IIoT
Industrial IoT Initiative - Digital Industrial Customer Care

- Monitoring performance, utilisation, condition, and inventory of assets in operation

- Industries with **High Capital Equipment** and requiring **High Uptime**

- Gather problem statements from companies

- Current solutions either based on **old technology** or have very **high cost**.

- Need for new sensors, new communications, and new electronics
I^3 - DICC will work on outcome-based projects in 5 focus areas drawn from industry needs

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<th>1. Smart Sensors</th>
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<td>2. Gateways</td>
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<td>3. Industrial Data Analytics</td>
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<td>4. Cybersecurity</td>
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<td>5. Integrated System and Solution</td>
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We have just witnessed the MoU with 13 companies indicating the strong industrial interest in IIoT
Key Value Proposition For Partners

1. Users: Achieve common needs/capabilities cheaper, faster and better than working alone

2. Providers (and RIs): Access to ready pool of users for future solutions (test beds, beta testing)

3. Gain access to facilities, latest tools & A*STAR research resources

4. An opportunity to collaborate with industry leaders
Thank you
Announcements of public-private partnership platforms for FoM

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<th>b) Tech Access</th>
<th>c) Tech Depot</th>
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<td>&quot;I’m pleased to announce that <strong>A*STAR will establish two ‘Model Factories’</strong> to allow companies, particularly our SMEs, to firstly <strong>experience the technologies first-hand in a learning environment</strong>, without affecting their existing business operations; and secondly to <strong>collaborate with stakeholders to test-bed and jointly develop innovative solutions</strong> for their processes.”</td>
<td>&quot;We will also support companies in the use of advanced machine tools for prototyping and testing, which may require costly specialised equipment. <strong>A*STAR will provide access to such equipment, user training and advice under a new Tech Access Initiative</strong>&quot;</td>
<td>&quot;To improve our companies’ access to technology and digital solutions, we will add a one-stop <strong>Tech Depot</strong> to the SME Portal... This is a showcase of <strong>easily adoptable technology solutions</strong>... include A*STAR’s ready-to-go (RTG) technologies as well as IMDA’s pre-qualified Infocomm &amp; Media (ICM) solutions.”</td>
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Minister of State  
Dr Koh Poh Koon  
Committee of Supply 2017  
Finance Minister,  
Mr Heng Swee Keat  
Budget 2017  
Senior Minister of State,  
Ms Sim Ann  
Committee of Supply 2017