What the future of manufacturing holds

Judith Tan looks at how A*Star is helping Singapore manufacturing companies adopt Industry 4.0 technologies to stay competitive

PICTURE this: a factory where machines run the floor – from production line to after-sales servicing. No humans needed.

Science fiction? Not anymore. Industry 4.0 – the digitalisation of manufacturing – ushers in high-mix, low-volume production, unifying technologies such as advanced robotics, artificial intelligence, sophisticated sensors, cloud computing and data analytics. Machines communicate via telemetry. Amid technological disruption, such innovation advances Singapore's core industry, manufacturing, which contributes 20 per cent to the gross domestic product (GDP).

The Agency for Science, Technology and Research (A*Star) initiated a Future of Manufacturing strategy in late 2015 with the Ministry of Trade and Industry (MTI), the Economic Development Board (EDB) Singapore and Spring Singapore, under the Government's Research, Innovation and Enterprise 2020 plan. The goal: to sustain Singapore's competitiveness in manufacturing and technology innovation, making it a location of choice for developing, test-bedding and deploying advanced cutting-edge technologies in the manufacturing sector.

As Singapore's lead science and technology agency, A*Star established two model factories – one at its Singapore Institute of Manufacturing Technology (SIMTech) and the other, to be officially opened at the Advanced Remanufacturing and Technology Centre (ARTC) this year.

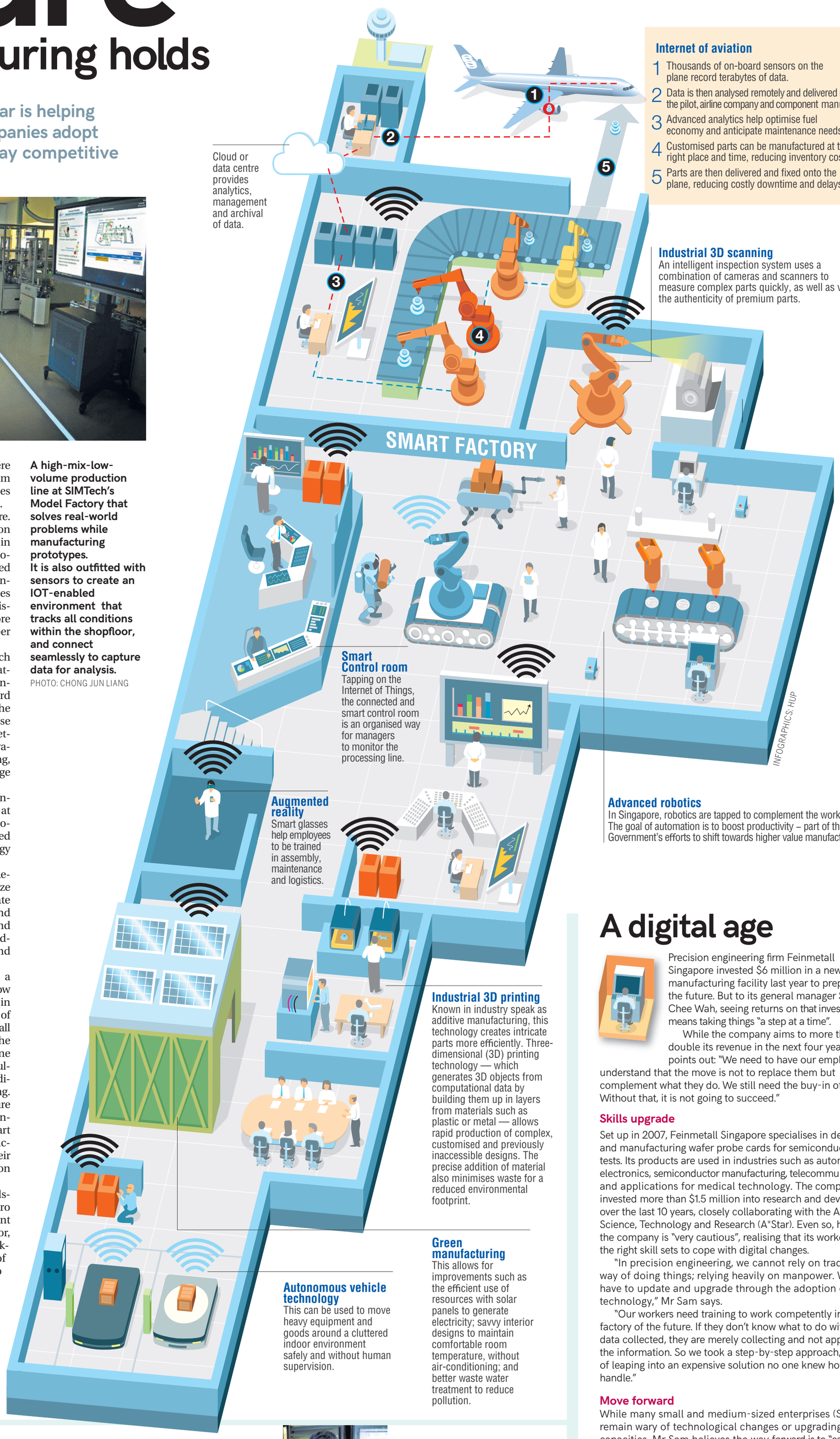
Executive director of Science and Engineering Research Council (SERC) at A*Star, Professor Tan Sze Wee, says: "We created digital sandboxes to create assimilations in a safe harbour, where designers and engineers in manufacturing can play together and converge faster on the definition of specific products. There is certain trust among the players, and protection of intellectual properties."

The Model Factory @ SIMTech encompasses a digital Learning Factory platform that shows how advanced manufacturing technologies operate in a real-life setting for companies at the beginning of their digitalisation journey. It works with local small and medium-sized enterprises (SMEs) to pilot the Manufacturing Control Tower (MCT) – an all-in-one data platform that tracks real-time data from multiple machines using sensors, analyses the data, diagnoses problems and improves decision-making. Meanwhile, ARTC's model is a Factory of the Future platform for companies investing in advanced manufacturing processes. It focuses on coupling smart and virtual capabilities, featuring a virtual production line through which companies can model their product design and development before starting on a physical prototype.

A*Star teamed up with British engine giant Rolls-Royce early and last September, with Singapore Aero Engine Services (SAESL), set up a S$60-million joint lab. Dr Bicky Bhangu, Rolls-Royce's regional director, South-east Asia, Pacific and South Korea, says working with A*Star will accelerate the deployment of new technologies. "It gives us the opportunity to increase productivity, achieve cost effectiveness, and enhance the skill of our workforce. That helps us deal with evolving customer needs and create new services that meet tomorrow's business demands."

Citing the example of video-streaming service Netflix, Prof Tan says: "It is no longer about customers wanting to watch what you produce for television. It is more about producing what the customers want."

A high-mix-low-volume production line at SIMTech's Model Factory that solves real-world problems while manufacturing prototypes. It is also outfitted with sensors to create an IOT-enabled environment that tracks all conditions within the shopfloor, and connect seamlessly to capture data for analysis.
PHOTO: CHONG JUN LIANG



A digital age

Precision engineering firm Feinmetall Singapore invested $6 million in a new digital manufacturing facility last year to prepare for the future. But to its general manager Sam Chee Wah, seeing returns on that investment means taking things "a step at a time".

While the company aims to more than double its revenue in the next four years, he points out: "We need to have our employees understand that the move is not to replace them but complement what they do. We still need the buy-in of the staff. Without that, it is not going to succeed."

Skills upgrade

Set up in 2007, Feinmetall Singapore specialises in designing and manufacturing wafer probe cards for semiconductor wafer tests. Its products are used in industries such as automotive, electronics, semiconductor manufacturing, telecommunications and applications for medical technology. The company has invested more than $1.5 million into research and development over the last 10 years, closely collaborating with the Agency for Science, Technology and Research (A*Star). Even so, he says, the company is "very cautious", realising that its workers need the right skill sets to cope with digital changes.

"In precision engineering, we cannot rely on traditional way of doing things; relying heavily on manpower. We have to update and upgrade through the adoption of technology," Mr Sam says.

"Our workers need training to work competently in a factory of the future. If they don't know what to do with the data collected, they are merely collecting and not applying the information. So we took a step-by-step approach, instead of leaping into an expensive solution no one knew how to handle."

Move forward

While many small and medium-sized enterprises (SMEs) remain wary of technological changes or upgrading capacities, Mr Sam believes the way forward is to "cast away those fears and successfully move forward with technology adoption".

Eventually, he hopes to see a greater uptake among the small businesses, so that "everyone is on the same page, and no one needs to wind up his business".

He says: "If an entrepreneur can set aside those fears and take the first step towards innovation through technology adoption, this will inspire fellow SME entrepreneurs to start thinking about innovation seriously and follow in their footsteps.

"By embracing innovation, entrepreneurs will develop an open mindset that is on a constant pursuit of ideas, which can help to differentiate them from their competitors. Feinmetall will continue to embrace innovation to further create high-value jobs, products and services for our customers."

Technology matters

LOCAL family-run company CKE Manufacturing is a small and medium-sized enterprise that provides precision machining and re-manufacturing services, and one of the earliest to buy into digitalisation efforts led by the Agency for Science, Technology and Research (A*Star).

In late 2015, it started a pilot project with the Singapore Institute of Manufacturing Technology (SIMTech) to link five of its shop-floor machines to the Manufacturing Control Tower (MCT) platform, a key feature of the Model Factory@SIMTech. "It was very clear to me that to survive, small businesses like ours needed to adapt, and quickly," said Mr Kwan Lifeng, CKE's enterprise development manager when it first started working with SIMTech.

CKE used the MCT – an all-in-one platform that tracks real-time data from multiple machines using sensors – to at once track the performance of all its machines digitally and plan future operations, without having to physically inspect them.

Mr Kwan says: "Our engineers analyse data coming in and make improvements daily or weekly. Previously, it would take months. Now they operate more machines concurrently and it improves our productivity."

Kwan Lifeng. PHOTO: CKE

Today, 80 per cent of the company's machines are linked up either to the MCT or CKE's internal server, and workers too, are learning how new technology complements, rather than replaces, them. "While workers' experience empowers them to visualise what is going on, they still need to be trained to interpret and present the data. We, as the employer, come in to support them to reskill and develop new key performance indicators."