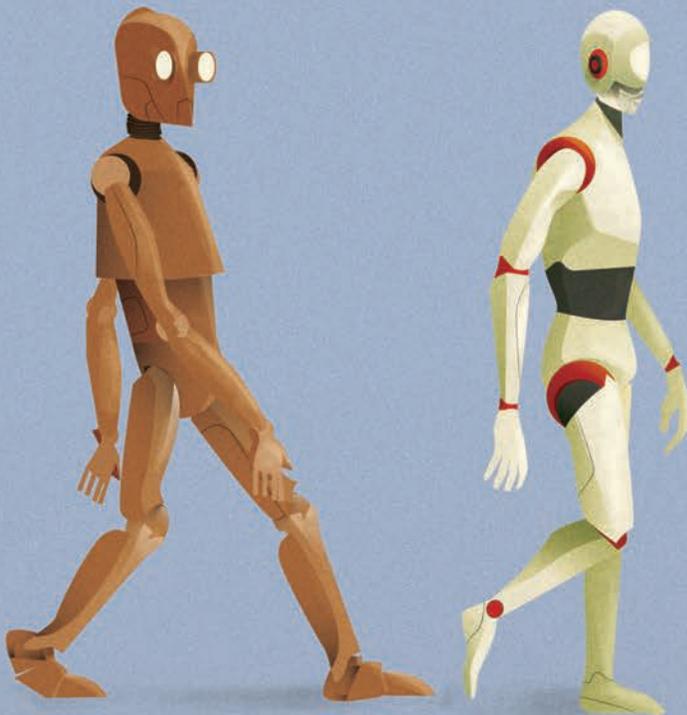


CHINA'S TRANSFORMERS

As China aggressively expands its industrial robot market, **Jemelyn Yadao** talks to experts about the broadened scope of robotics innovation beyond manufacturing, and Hong Kong's place in the rise of intelligent machines

Illustrations by Gianfranco Bonadies





Why are you sad?” asks Pepper, a four-foot-tall human-like robot with a touchscreen for a chest. Pepper, made by Japan’s SoftBank Robotics, was designed to read and interact with human emotions and be a friend in people’s homes. But since its introduction in 2014, the humanoid has not only been a companion, but also a good employee – talking like a coffee expert at Nescafé stores in Japan, helping customers choose wines at Carrefour grocery stores in France and, most recently, greeting customers for bar and restaurant Pyramid Ale Taproom at Oakland International Airport. This talking, dancing and joke-telling robot is a far cry from the industrial robotic arms seen primarily in the manufacturing industry performing laborious and repetitive tasks.

Indeed, when it comes to industrial robots, China is the world’s largest market. In 2016, the worldwide sales volume of industrial robots reached 290,000 units, with China accounting for 25 percent, according to the International Federation of Robotics, ranking the country no. 1 globally in robot sales volume. However, the country still has a lower robot penetration rate relative to its working population compared with Germany, Japan and South Korea.

What experts are most excited about are the less-mature service robots, from surgical devices to emotional robots like Pepper, and the artificial intelligence that aids them. “The really exciting developments in robotics are happening not just in the physical realm, but in what is being called the 4th Industrial Revolution: disruptive smart technologies that are blurring the boundaries between the physical and digital. Intelligent robots are playing a crucial role in driving this revolution,” says Steve Lo, Managing Partner, Technology, Media and Telecommunications at EY.

Service robots will be increasingly integrated into sectors beyond the heavy industries. Another example is Amazon’s Prime Air drone delivery, which completed its first public demonstration in the U.S. in March, carrying a box filled with sunscreen.

Scott Likens, Emerging Technologies Partner at PwC Experience Centre, describes service robots as a combination of AI, data and mechanization.



“It started with industrial applications in China, but with the digitization of the world, there are new robots out there that are a little more scary, but more interesting in what they can do tomorrow to disrupt businesses,” he explains.

“I wrote AI code around 20 years ago, and it only started to scare me this year because it’s got infinite access to data, it can remember things forever, and with infinite access to processing it can get close to human thinking. The real use case is around how AI in robots is being used to digitize businesses.”

At your service

Experts believe that the service robot industry is on the cusp of growth, particularly in China. “The development level of service robots is expected to surpass that of industrial robots,” says William Chou, National Technology, Media and Telecommunications Industry Managing Partner at Deloitte China. “In emerging markets such as China, the technology gap between foreign and domestic is decreasing, and domestic companies will have the natural advantage of understanding the local culture,” he adds, citing “empty nesters” – parents in China left behind by children working in big cities – who want a companion, even if he or she is a robot.

Three areas will see significant future developments, according to Chou: medical robots (surgical and rehabilitation), logistics robots, and financial robots. While many medical robot companies are still at the research and development stage, Siao Tin Soh, an analyst at GCiS China Strategic Research, agrees that they are set to transform parts of China’s healthcare industry.

“It will mean less invasive surgeries, and operations being performed with greater precision; it will mitigate healthcare professional shortage with robots taking over some of the repetitive and admin

tasks, allowing the doctor or nurse to focus more on patient care; and it will enable the provision of home care, alleviating pressure on the public healthcare system,” says Soh. She expects to see more surgical robots in China’s hospitals in the near future.

Logistics robots will also have a promising future. “Currently, online shopping transactions account for 20 percent of China’s total retail transactions, and the percentage is expected to increase, which makes automation equipment and intelligent logistics equipment a must to speed up the warehouse processing and delivering,” says Chou. Alibaba, he adds, has already started testing its autonomous drones in the company park, while JD.com’s delivery drones are expected to launch this year.

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Lastly, financial robots can provide customer services such as business consulting, security, for example early-warning detection, and data analysis through so-called robo-advisers. “Using voice recognition, autonomous mobility and other intelligence technology, financial robots can analyse customers’ preferences during conversations to recommend financial products or credit cards and obtain clients for banks. Meanwhile, robo-advisers can provide asset management strategies to clients with the support of big data and AI,” says Chou.

Hong Kong’s services industries are prime for such robots, notes Likens at PwC. “Finance, banking and insurance, these industries that have tremendous amounts of data that humans look at today are ripe

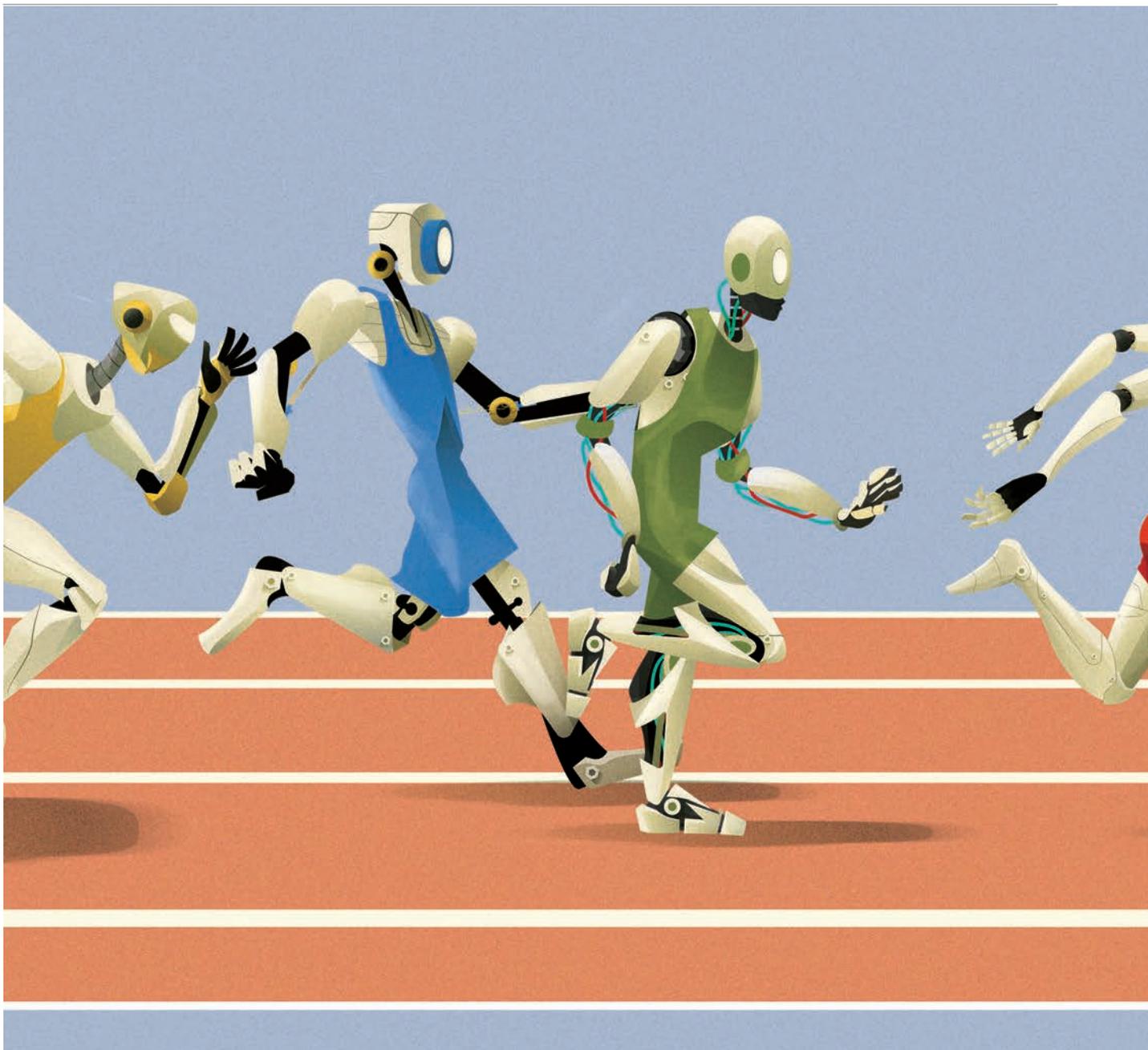
for this transition into making work more efficient through robotic automation,” he says. “We see our clients very interested in it, but it’s still early days. They’re trying to figure out if it’s much more efficient at an industrial scale. Robotics automate tasks so humans can focus on more innovative and creative thinking. But the reality is, robotics offer exponential cost savings over humans.”

Next generation manufacturing

China’s burgeoning industrial robot sector is still a key focus for industry watchers. The International Federation of Robotics estimates that the country will account for 40 percent of the global industrial robot market by 2019.

The Chinese government has been pushing for more robots, promoting the wider use of industrial robots in industries such as car manufacturing, electronics, home appliances, aviation, textiles, chemicals, logistics and food production. It issued the *Robot Industry Development Plan (2016-2020)* in April last year, vowing to produce 100,000 robots annually by 2020, with sales reaching 30 billion yuan. The country’s ageing population, and ever increasing labour costs, are also driving China to heavily invest in robots.

It is well known that automotive manufacturers have been using robots to automate assembly for years, while, according to Roger Chung, Research Senior Manager at Deloitte China, other industries such as electronic manufacturing, metal manufacturing, chemical and food processing are beginning to adopt robots. Now, experts see a rising demand for more intelligent manufacturing robots, especially in computing, communications, and consumer electronics industries where robots need to manipulate tiny parts with greater precision. “Carrying loads, moving things around – those are things robots



find relatively straightforward. But to get robots to do more sophisticated assembly jobs like putting a mobile phone together, that's more demanding," says Michael Wang, Professor of Mechanical and Aerospace Engineering, Electronic and Computer Engineering at Hong Kong University of Science and Technology, and Director of HKUST Robotics Institute.

To do more demanding jobs, he adds, robots need to be taught or learn. "That's essentially what AI would enable robots to do. It's still early stages, but we're trying to figure out whether or not AI

techniques can actually make these robots learn to do more than just the very simple things."

Getting a robot to open a door or cut out a hole using a saw requires writing millions of lines of code, he explains. "Doing that for a whole assembly process is too daunting, so you have to use new methods – either teach robots using demonstrations through a hand-held method (moving the robot's arms or other parts for it to imitate the movements to do a task), or make them watch what you do and learn." Wang adds that so-called collaboration robots

for manufacturing industries, in which robots would work alongside humans, is currently a big research area. "It would help keep people safe, and allow people to closely teach robots how to perform."

Taking the lead

With AI and cognitive technology being the core technologies behind intelligent robots, both Mainland China and Hong Kong play a key role in exploring their potential for society and business. "This is where the cutting-edge research is," says Wang, referring to Hong Kong. "You don't see factories here but the



newer technologies that everybody wants in the factories need to be developed and that's where Hong Kong comes in."

He highlights Hong Kong Science and Technology Parks as another catalyst for robotics development with the establishment of its Robotics Technology Platform. "The city would like to become a technology hub that can develop these technologies as solutions for users and customers in China."

The HKUST Robotics Institute has been approached by numerous companies, including some from Hong Kong, about opportunities around autonomous ground

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vehicles, according to Wang. "The ultimate goal is to have robots in homes, but for now, a number of companies think that this type of robot would be good for semi-public spaces like hospitals, hotels, shopping malls, where the machine can interact with humans."

In China, Internet giants Alibaba, Baidu, Tencent and Xiaomi have been investing in service robots in recent years, which could lead to the roll out of some highly intelligent machines in the future, points out Chung at Deloitte. "Service robots consist of several core technologies, including voice and visual recognition, AI, natural language processing and so on. In voice recognition, investments by Internet giants have yielded satisfactory results – Baidu and iFLYTEK have achieved 95 percent speech recognition accuracy, while SenseTime Technology has gained a 99.15 percent face-recognition accuracy rate."

Of course, it's not enough for robotic companies to just rely on the technology. DJI, the unmanned aerial vehicle or drone maker, founded by former HKUST student Frank Wang, is an example of how the commercialization of UAV technology can be realized. "Unmanned auto-piloted aircraft have been around a long time," says Wang the HKUST professor, "but now, with sensors, computing power and motion control being so advanced and economical, DJI, which started from here, managed to put all the right pieces together – including the marketing and a product that is very much like Apple's – to create this half amateur, half professional drone that has opened up a whole new market."



Industrial robots:

The worldwide sales volume of robots in 2016 reached 290,000 units, with China accounting for 25 percent. The sales volume of industrial robots in China is expected to increase by a compound annual growth rate of 20 percent in the next five years.

Service robots:

During 2015-2018, the global sales of personal or home service robots will reach 25.9 million units. The sales volume of professional service robots will increase to 152,000 units.

Source: International Federation of Robotics