Japan's Automation and AI development in COVID-19 Era

The global pandemic of COVID-19 has harmed almost every country from various perspectives in 2020. Japan, as one of the dominant powers, is no exclusion. According to a survey conducted in Japan, approximately 83% of retail business experience an impact of the coronavirus. Adding the companies which predict a possible impact in the near future, almost 96% of Japanese business would be somewhat affected by this virus outbreak. Before the outbreak, Japanese economy was already in recession (Figure 1). The expected GDP growth rate for 2020 is -7.9%, which is not a surprise.

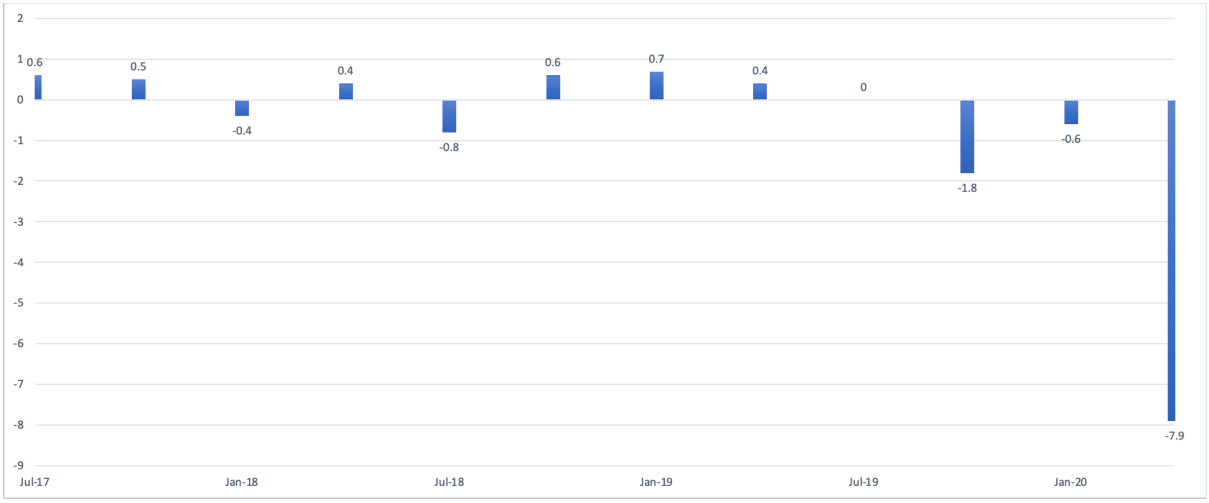

Figure 1 Japan GDP growth rates between 2017 and 2020

In order to curb the economic fallout, Prime Minister Shinzo Abe plans to roll out a multi prolonged economic stimulus of ¥117.1 trillion in order to hand universal cash handouts of ¥100,000 to each individual and to help business receive interest-free loans. Financial aids may be able to help business go through this tough period, but a more longer plan needs to be made to boost the country's economy. The pandemic has led to a new norm of work style to avoid 'three Cs' – closed spaces, crowded places and close-contact settings. Every company, organisation and individual must face the inevitability of preparing for the post-corona era. One way for adapting to the new norm is to accelerate the application of automation and Artificial Intelligence (AI) technology in Japanese business. Automation is a

broad term that describes technology to allow minimum human input in many areas. This can include business process automation, IT automation, market automation and industrial automation. Typically automation is designed to perform monotonous and repetitive tasks. AI is a machine or software system that uses learning algorithms to seek pattern, self-select a choice from given input. In this article, we will discuss the reasons and motivations for adapting to a more automated and AI driven society in Japan. Steps to realise the plan will also be presented.

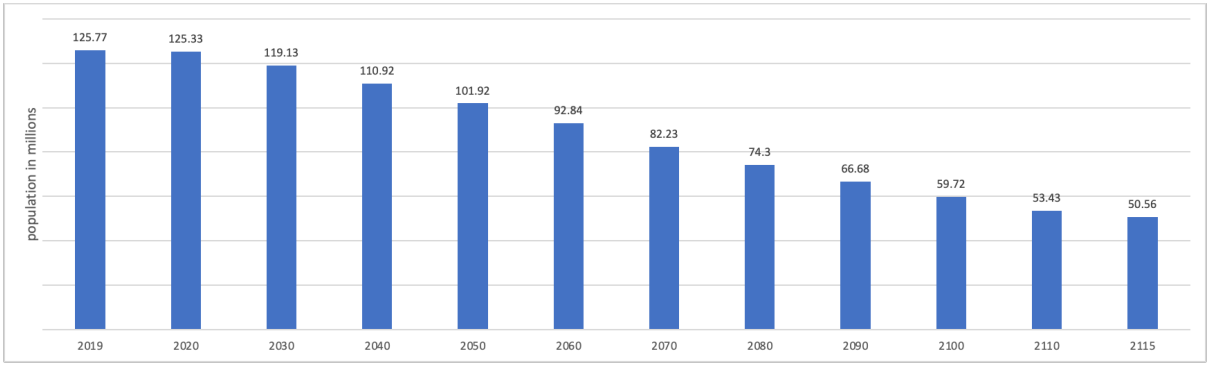

Figure 2 Japan population prediction

Apart from the new norm, a traditional factor faced by Japan is the shortage of workforce. Some reports warn that Japan's total population could fall by 30% to 87 million by 2080 (Figure 2). The country's low birth rates and rising life expectancy have led to a reduction of the domestic workforce (aged from 15 to 64 years) to 59%. Even though companies are now hiring more women, retirees, and foreign workers, the situation is still quite troublesome. Without enough human resources, productivity can be heavily limited and the GDP growth rate can therefore be stalled in the next decade. To mitigate this factor, introducing more automation and AI technology can help replace many human workers so that production capacity can be greatly enhanced.

For example, Korea, who is also facing labour shortage, is spending hundreds of millions of dollars every year to help automate and upgrade its industries. As Figure 3 shows, it has by far the highest density of robot use in manufacturing according to International Federation of Robotics (IFR). There are 631 robots per 10,000 employees, which is eight times the

global average. IFR also estimates that one robot can do the jobs of more than 15 full time workers. Comparing to Korea, Japan is ranked fourth and the number is approximately halved, 303 robots per 10,000 employees.

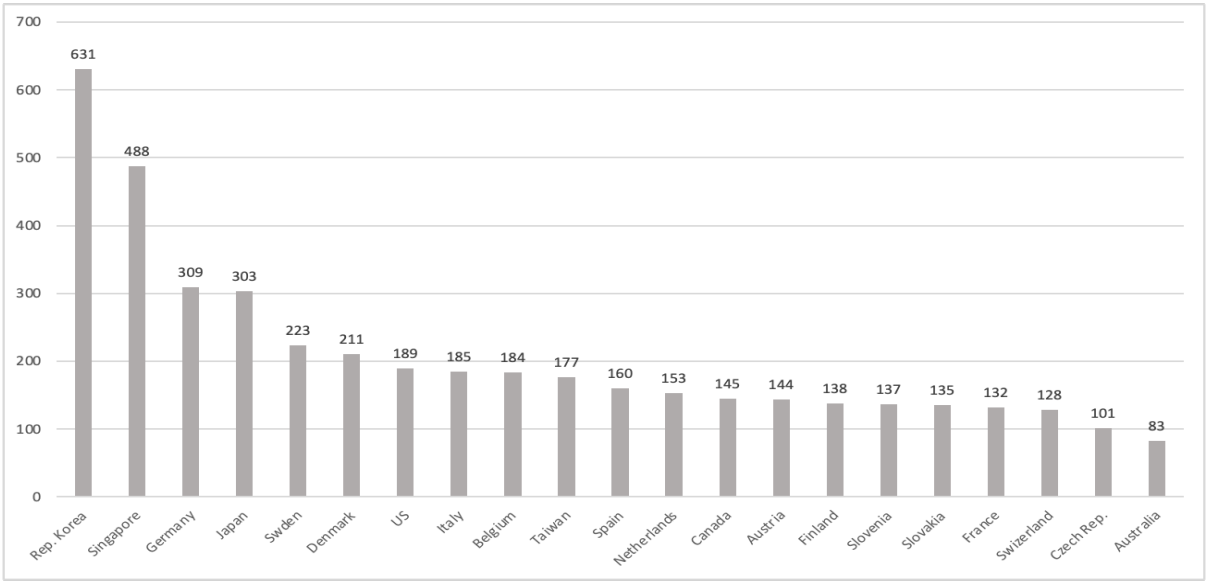

Figure 3 Number of industrial robots per 10,000 employees 2016

Japan is a world leader in manufacturing robotics who delivers 52% of global robotics supply. This means it has the capability to introduce more automation into its domestic business. Prior to the pandemic, Japan was on track to automate 27% of work tasks by 2030. The automation upgrade is now more important than ever as we may need to live with the pandemic for a long period. Researchers estimate that automation can displace more than 50% of workforce, enabling companies lower costs and boost profit despite a decreasing workforce.

As described at the beginning, automation is primarily focused on performing repetitive tasks. A more intelligent way, AI, of utilising computers and machines has come to our life whether we realise it or not. Google Maps use machine learning to calculate the fastest route based on traffic data; Amazon predicts the products we may like based on our shopping history; Delivery robots are used to deliver food and mails in Wuhan during the lock-down; Machine learning algorithms are used in banking to detect and prevent credit

card fraud. Many countries are already benefiting from AI applications (Figure 4). We can see the real gross value is tripled for Japan with the help of AI. Experts estimate that AI could contribute up to EUR 13 trillion to the global economy in 2030, more than the total output of China and India.

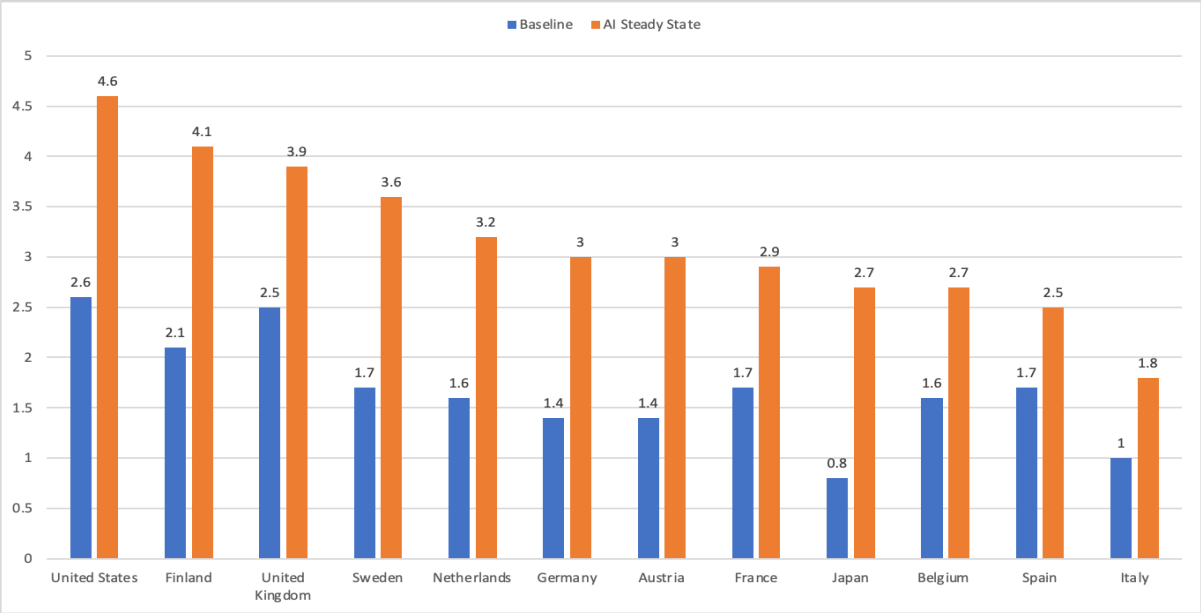

Figure 4 Real gross value added by AI

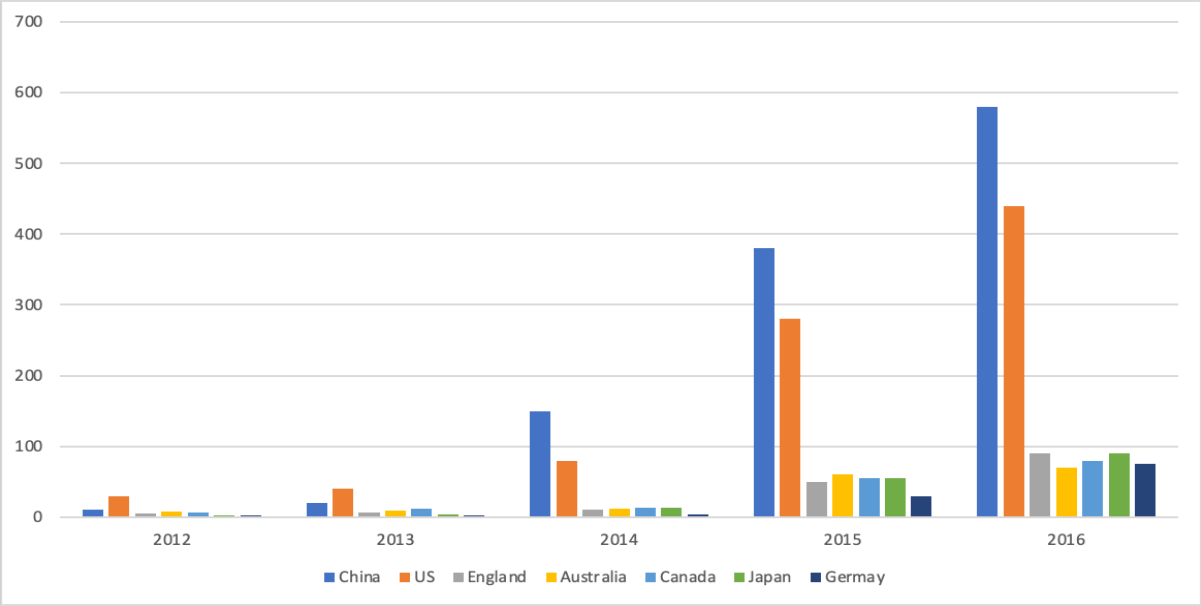

Figure 5 China and U.S. domination on AI research publication

It is often considered that the United States and China are the leading countries regarding AI technology development. U.S. has more than 1,000 AI-related companies, such as Apple, Facebook, Google, Amazon and Microsoft. China's major companies include Alibaba, Baidu, Tencent plus a large number of AI start-up companies. In comparison, Japan now has 200-300 AI-related companies. When it comes to AI research (Figure 5), since 2014, China has taken over U.S. to become the country which published the most papers on deep learning. Currently, Japan only has 2% of academic research on AI. According to Professor Yutaka Matsuo from the University of Tokyo, "AI is one of the few areas that can offer market opportunities for Japanese Industries." Figure 6 shows the AI talent concentration in Japan is behind China and western countries. More efforts need to be put into education on AI.

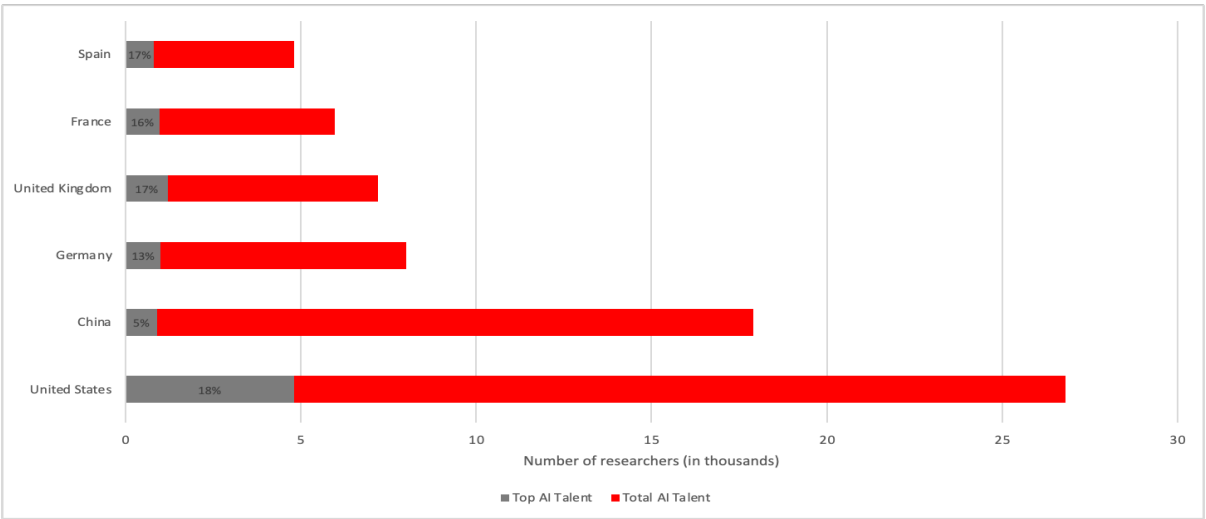

Figure 6 AI Talent concentration

In 2016, the Japanese government sets the goal for Japan to become a 'Society 5.0', which is a vision for the next step in human evolution. It is supposed to enhance industrial competitiveness and help with the form of a society more in tune with individual needs. It recognises the great potential of data accumulation and new technologies, to solve urgent social issues, such as reduced birth rates, aging population, energy and environmental matters. AI, the Internet of Things (IoT), robotics and other cutting-edge technologies are viewed as essential elements in 'Society 5.0'.

As Prime Minister Shinzo Abe stated, the focus of the second stage of Japan's growth strategy is the realisation of the fourth industrial revolution. Personalised services and new business models tailored to each customer will be created as a result of IoT and robots. All plants and shops will be linked through IoT, enabling just-in-time delivery and instantaneous order-made production. This could be a game changer for industry as we know it.

A major change in the COVID-19 era is the attitude towards automation and AI. Not only robots do not get sick or infected by virus, but also the political climate is shifting. Before COVID-19, most people have some degree of understanding of robots and AI. However we also hear discomfort due to legitimate concerns. Some automation and AI applications indeed lead to the loss of jobs and infringement on data privacy. Those worries appear to be have been eased since the pandemic outbreak as AI-related technologies have been utilised to reduce the spread of the virus.

Japan is a country where long office hours, working overtime, going to drinks with clients late at night been seen as indications of success. This workaholic culture meets its change because of the virus. The pandemic has dramatically changed the life and working style in Japan. Schools are closed and people are working from home without commuting in packed public transport. Companies realise that they can actually do remote work. Giant companies such as Panasonic and Unicharm have introduced working remotely, which hit the headlines in Japan. We can see that more and more business and services are moving online, such as food delivery, shopping, education and so on. A more flexible working model has transformed the working norm to minimize contact during the pandemic in ways that could take years to happen. Japanese companies can hire employees who could not work under less flexible conditions. Parents with small children, people in other countries, and those who cannot commit to a traditional office job are now all potential recruits. To enable such working norm in an efficient way, AI and IoT must be incorporated into daily operations. As

once a front runner when it came to innovations – pocket calculators, the Sony Walkman and LED lights, the country is poised to embrace AI and new technologies.

Some AI companies in Japan have already invested a huge amount of money to compete against U.S. and China-based companies. The Tokyo-based AI company, Preferred Networks, is working on applying deep learning to robotics which collect a large amount of data in daily operations. The company's research aims to create innovations in all kinds of settings, from factories, to self-driven cars, to early cancer detection and drug discovery in hospitals.

Recently, it has partnered with Toyota to develop service robots that can assist people in everyday life. The intention is to fill the need in the healthcare of Japan's aging population and tight labor market. The two companies will perform research on Toyota's Human Support Robot, a platform to work beside healthcare workers providing basic care and support in nursing and long-term care settings.

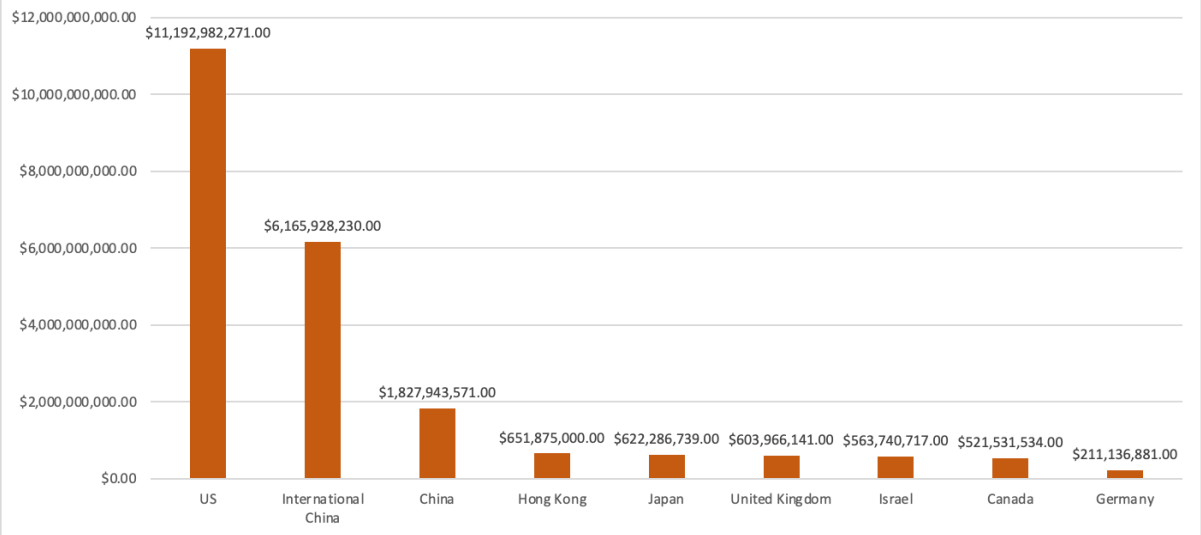

Figure 7 Total funding per country in AI research

To prepare for 'Society 5.0' with a more automated future, efforts need to be made from the top political and business leaders to workers. The government needs to increase research funding on AI. Figure 7 shows that funding on AI in Japan is 10th of that in China

and far behind U.S. Managers need to make a commitment to digital transformation. They need to first understand the implications of digitalisation, automation, machine learning and AI. Workshops for AI education can be conducted and visits to AI companies can be beneficial.

Workers also need to be retrained and reskilled so they can adapt to more intelligent working conditions. Most Japanese companies are small and medium-sized. Retraining and reskilling workers become a great challenge as companies do not have the resources to spare. To solve this issue, government agencies can partner with companies to develop end-to-end training programs and help match graduates with employers.

Note that automation and AI applications can be very expensive, and they cannot solve all issues. Companies should think carefully about how and where they can use the new technology. Experts recommend striking a balance between automation and human employees, where robots are used to help enhance productivity, rather than entirely replace human employees.

Moreover, bias and privacy issues should not be overlooked. First, as the adoption and comfort level increase, we must remember that bias of AI still exists and should be concerned. For example, AI can be trained on large dataset in healthcare decision-making process. It may make a decision on who gets a ventilator in an intensive care unit – which can have a life and death outcome. We know that the quality of the data can be undermined due to patient mistreatment and many other factors. This problem needs to be corrected with more research before AI is widely applied.

Second, the legitimacy of data collection and distribution should be well regulated. For example, companies around the world are making phone-based apps to trace the virus. It is vital to make sure the companies do not use the data in any unsafe way. Otherwise trust

from the society would be greatly damaged, which undermines the development of automation and AI.

The COVID-19 pandemic shows how rapidly the way our life and work can change. For Japan, getting out of this health crisis is both a challenge and an opportunity to speed up the AI development and automation which is critical to its economic growth. If leaders from the public and private sectors can corporate efficiently to priortise agendas, Japan has the chance not just to recover but also become the leading force in the next digital revolution.

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