Australian Government
Department of Education and Training

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Research brief: developments in artificial intelligence (AI) in Japan and implications for Australia

Executive summary

Japan's government and private sector are making large investments in artificial intelligence (AI) technologies as key drivers of future competitiveness. Japan sees itself on the "front line" of developed countries making a technology-based economic transition. As the world's 3rd largest economy (and 3rd largest investor in R&D) and Australia's 3rd largest overall trading partner, this shift in Japan has major implications for us. We share a long history of high-quality science collaboration, but not necessarily in areas driving developments in AI, and Japanese companies that currently invest in Australia are rapidly shifting to new AI-driven markets and opportunities and are seeking the education, research and business partnerships required.

Artificial intelligence (AI) has emerged as the largest focus of the Japanese government and private sector in seeking to drive technology-based change and future competitiveness. The government's 5th Science and Technology Basic Plan (2016-2020) sets out a goal of Japan leading the transition from "industry 4.0" to "society 5.0", where all aspects of society (not just manufacturing and other industries) are transformed by new information technologies and systems.

A March 2017 report from the new Cabinet Office Advisory Board on Artificial Intelligence and Human Society notes that "Japan, with its energy and resource constraints and demographic pressure, is placed among developed countries on the front line in seeking new societal models". The report defines AI as technologies that can perform portions of human intellectual activities, such as perception, recognition and decision-making, and then take action based on these activities. AI draws on developments in machine learning and rapid advances in data collection and processing – a recent UK Royal Society report notes that IBM estimates that 90% of all the world's data has been created in the last two years.

Government approach to emerging AI technologies

Prime Minister Abe established a Strategic Council for AI Technologies in 2016 to ensure a coordinated approach across multiple ministries and agencies to developing AI research, education/skills and business. In April, Prime Minister Abe announced plans to increase the science and innovation budget by 900 billion yen by 2020 to drive competitiveness. The Ministry of Internal

Affairs and Communications (MIC) has forecast that in 2045 (the year in which some estimate AI will surpass human intelligence), the economic impact of AI for Japan will be 121 trillion yen.

New policy and funding programs are being implemented this year across MIC, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Economy, Trade and Industry (METI), as well as the health and agriculture portfolios.

Research and innovation policy and funding

AI is the number one priority for research funding under MEXT, which has established a new Tokyo AI Centre in the leading research institute RIKEN, as well as a network of AI labs around Japan (through the Japan Science and Technology Agency) and new research infrastructure including data platforms, supercomputing and quantum technologies. MEXT is also funding international collaboration in AI with the USA and Israel and new programs aimed at tripling research-industry collaboration in Japan by 2025.

METI is funding complementary R&D centres, including a focus on AI and robotics at the National Institute of Advanced Industrial Science and Technology (AIST). MIC is funding R&D focused on communication and language processing/translation, the health ministry is promoting AI for digital image diagnosis and personalised (genomic) medicine, and the agriculture ministry is funding the application of AI to livestock management and farming.

In November 2016, METI announced an expansion of the R&D tax exemption to cover the development of new services using AI and big data. METI has also released a draft report (April 2017) on enhancing the intellectual property rights system to deal with AI and the fourth industrial revolution – key findings will be incorporated into the government's new mid-year growth strategy.

Education, training and skills needs

MEXT and METI are working together to promote new education and training programs to ensure that Japanese graduates have the skills required for new AI-enabled industries. The two ministries convened a new "national consultative body" in April 2017 with universities, the Japan Business Foundation (Keidanren) and other industry groups to cooperate on new education programs for AI technologies. At this stage, the policy focus is on ensuring that post-graduate students enter the workforce with cutting-edge knowledge to accelerate the development of these new technologies. MEXT recently announced new funding for three clusters of universities and AI-related companies to work together to train PhD students.

The broader issues for education and training across the economy are still being discussed, but there is potential for Australia to collaborate more closely with Japan in the vocational education and training (VET) sector in the future, particularly with the development of new "professional universities" (see separate brief on VET reform in Japan).

Industry developments

Large companies (which dominate the Japanese R&D system in terms of investment and patenting) are also moving quickly into AI, with a focus on manufacturing, autonomous vehicles and healthcare/medicine. Japanese companies view AI as a driver of parallel developments and investments in robotics and the "internet of things" (IoT) – for example, METI is subsidising the development of new robots with built-in AI.

Toyota opened a new $1 billion lab in Silicon Valley in late 2015 with a focus on autonomous driving and robotics and Honda announced a new AI research centre in April 2017. NEC has increased its R&D investment and co-located staff at the AIST centre. Hitachi – which also already invests in

research and Cooperative Research Centres in Australia – is funding new collaboration with German manufacturing research institutes to prevent workplace accidents using AI. Hitachi is also focusing heavily on the application of AI in biology and disease detection, through partnership with Kyoto University. 50 companies (including Takeda Pharmaceutical and Fuji Film, which have both invested in R&D in Australia) have created a new consortium to use AI to accelerate drug development, and Panasonic is creating new AI joint appointments with universities. Finally, NEC and Hitachi are working with the Japan Exchange Group to track financial transactions and market manipulation using AI.

Differing views on Japan's technological future

Despite the clear focus on AI in Japan from both the public and private sectors, there are also some voices of caution. AI is often cited as part of Japan's response to labour shortages and a declining population, but senior research leaders have noted the risk of AI technologies driving greater standardisation and homogenisation. They say that Japan could derive greater benefit from increasing diversity, and that the focus on AI should be matched by a focus on creativity and the humanities and arts. There is also an emerging debate about the education system and whether focusing too much on STEM skills is short-sighted given that new technologies may increasingly automate this work.

Implications for Australia

These developments in Japan can have major implications for Australia. Our current science relationship – like our trade and investment relationship – is strong, but may not be well aligned with the new direction of the Japanese government and private sector. Over the last decade, the top areas in our bilateral research collaboration have been medicine, physics/astronomy, chemistry, geosciences and plant and animal sciences. We derive a major quality and rankings boost from collaboration with Japan but will need to actively engage with new centres and initiatives in AI. Our long history of high-quality and mutually beneficial cooperation, and the new innovation framework agreement signed as part of Prime Minister Abe's visit to Australia in early 2017, provides opportunities for Australia to build on our strong university, science and business links with Japan to take advantage of future technology trends.

Prepared by: Paul Harris (Counsellor, Education and Science), Australian Embassy Tokyo