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# ASIA'S AI AGENDA

## The Deep Dive Editions: Australia

MIT Technology Review

In *Asia's AI Agenda: The Deep Dive Editions*, MIT Technology Review is re-examining the trends in technology, venture capital, government, and enterprise strategy that are converging on this region to drive adoption of innovations in artificial intelligence (AI) and assessing how specific Asian markets are taking advantage of these trends. This holistic view of AI's trajectory and its manifestation in each of four markets—Singapore, China, Australia, and India—has revealed that advances in automation technology are quickly changing the way Asia's firms manage and develop their human talent, forcing them to examine the very nature of what a “job” is.

AI and automation are changing the ways firms manage and develop human talent in each of Asia's economies. Australia is fostering AI development in several key industries, including healthcare and financial services, and also through its green-economy focus on energy and utilities.

Specific AI and machine-learning-related technologies, processes, and enterprise culture shifts have captured the imagination of policymakers and business executives across Asia. Australian firms are contending with the challenges posed by a small, labour-starved market, and automation technologies are seen as one possible solution. Yet Australia's talent constraints could limit its capacity for developing AI applications.

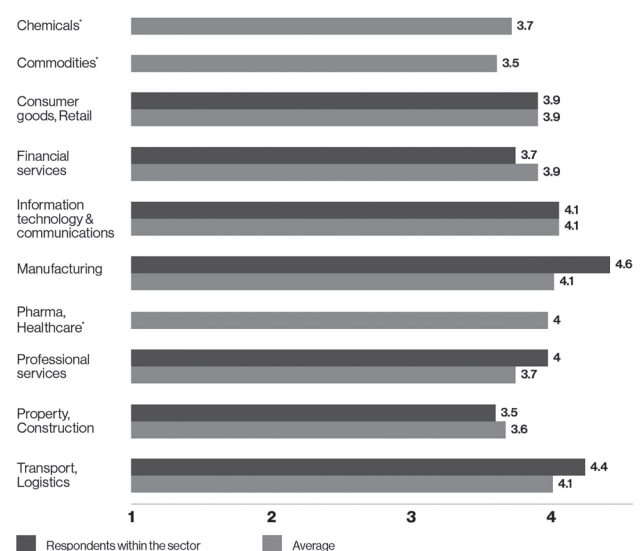
### Asia's AI Agenda

#### Business leaders in Asia see disruption, not disintermediation, in future AI deployments

Asia-based senior executives in global firms believe that artificial intelligence and robotics will have an immediate, profound, and positive impact on their business performance. While much of Asia lacks the depth of technical skills and R&D facilities needed to keep pace with AI development, there are significant pockets of the natural

resources that economies need to promote and develop their own machine-learning capabilities. China, India, and other large Asian economies generate a copious amount of data, which is critical to pushing AI's capabilities forward. Australia and Singapore, despite their small size, each punch well above their weight in the development of indigenous R&D resources for AI, and they have clear visions for how machine learning can complement and enhance the competitiveness of their established leading industries.

Figure 1. AI's impact on industries in Asia (1 being least positive, 5 being most positive)



\* Sectors for which only the “Average” metric had a statistically significant number of respondents.

Source: MIT Technology Review



#### The quote

*Australia is fostering AI development in several key industries, including healthcare and financial services, and also through its green-economy focus on energy and utilities.*

Ironically, given a common presumption that AI will be responsible for disintermediation of jobs at all levels, it is Asia's human capital—the billions of constantly Internet-connected workers and consumers—that will propel AI development in the region farther and faster. In October 2016, MIT Technology Review surveyed over 60 Asia-based senior executives to gather perspectives on the impact of AI and robotics on Asia's business landscape. Additionally, two dozen human-capital professionals were polled to assess the impact on jobs in Asia—and the future of their roles in particular.

Overwhelmingly, these respondents felt that technological advancements in AI and robotics will have very positive effects on most industrial sectors in Asia. In last year's survey, Asia-based executives also felt even more positive about AI's ability to add value to their own industries—with the exception of respondents in financial services, who were less confident.

Most executives surveyed responded that they felt AI would significantly improve their own competitiveness in Asia, especially their process efficiency and their ability to delve into customer data to achieve better insight. Again, responses from the financial industry lagged the average. However, only a small percentage of global firms are currently investing in AI development in Asia, according to the survey.

Significantly, the HR executives surveyed for Asia's AI Agenda felt that adoption of AI and robotics will result in significant job losses in Asia over the next five years. Unsurprisingly, nearly all these respondents felt this would soon have a major impact on their roles and functions. Specifically, they expected to move into broader, and more strategic, productivity management roles. They said they believe that their roles will encompass the management of both human and artificial talent in the next five years.

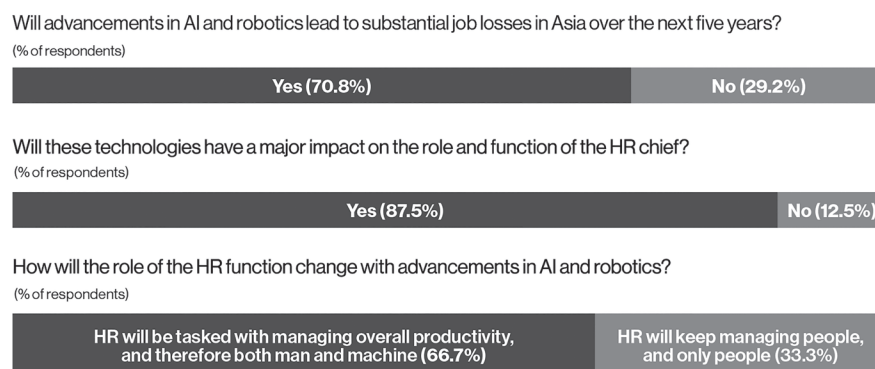
### Australia's road to AI excellence The 'rocks and crops' economy seeks a technology upgrade

Australia is a labour-constrained, geographically dispersed, and relatively small consumer market—and as such, is often used a test bed for innovative technologies that have transformed labour-intensive industries such as mining. The country already has one of the world's most automated mining industries: the combination of labour constraints and a years-long downturn in commodities markets has pushed firms to invest heavily in self-driving trucks and other technologies to enhance process efficiency. There are immediate societal and economic benefits, says Toby Walsh, a professor of artificial intelligence at the University of New South Wales and a group leader at the national innovation group Data61. These include increased safety and logistics efficiencies—"significant benefit for an economy cursed by distance, where 10 percent of GDP is transportation costs."

Collectively, these factors now also frame the country's AI development, in several key ways. One focus of the push toward AI is development and maintenance of public infrastructure, increasingly one of Australia's primary challenges. Australia has the world's longest interconnected power system of utility grids, and it is increasingly struggling to cope with load shedding and blackouts, often as a result of extreme and prolonged heat. In November 2016, 200,000 homes and businesses in South Australia lost power amid a confluence of massive storms and a scheduled disconnect with the grid in neighbouring Victoria.

To address this problem, Australia is moving to a smart-grid future, aiming to incorporate IoT technology and AI into its power grid. Delivered and funded by the Australian government, the Smart Grid, Smart City (SGSC) project aims to increase visibility into power demand throughout the electricity grid, improve fault recognition

Figure 2. Human resources



Source: MIT Technology Review

and resolution, better manage voltage, develop new infrastructure, and identify infrastructure requiring maintenance. The Australian National Institute's Energy Change Institute has a group of researchers developing technologies based on artificial intelligence, including demand management and a "microgrid" pilot concept to address the remoteness of Australia's utility grids. Through increased usage of smart appliances and smart metering, the government hopes, the grid could provide A\$28.5 billion in benefits over the next two decades.

"There are great financial incentives to chop electricity markets up into more efficient delivery systems as more energy-intensive megacities grow," says David Martin, managing director of Power Ledger, a Perth-based start-up that builds blockchain-based platforms for decentralized energy distribution. "Distributed markets within smart-grid configurations will be more resilient, able to reroute supply more easily." This is a compelling proposition in markets like Australia, where electricity generation is often a long way from the load centre.

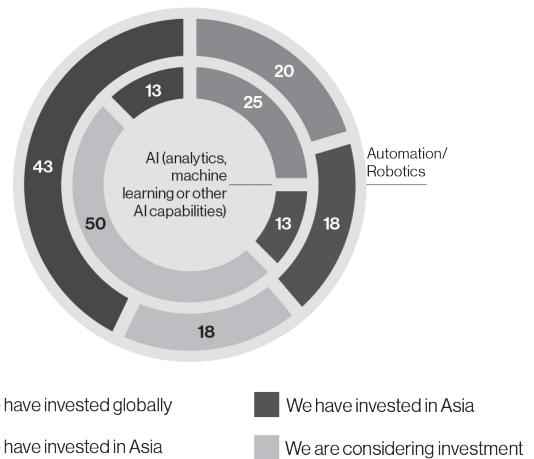
Power Ledger is attempting to get "behind the meter" with a peer-to-peer energy trading platform designed to increase speed and dynamism in the market. The hope is that this will more efficiently align supply and demand, thus reducing grid overloads. Martin observes that Australia's low-density, mixed-demand neighbourhoods make it more challenging to deploy smart meters; in high-rise-intensive Asian cities, they will be easier to install, which will accelerate the technology's development. "Asia is still a number of years out from having large networks with high-quality smart meters," he says. "Only when they have been deployed in scale will we have access to the volumes of data needed to make smart grids work."

The Australian AI market has also seen a lot of development in the financial services sector, focusing on labour-saving chatbots and cybersecurity. Digital financial advisors use information that customers provide about their financial goals and risk tolerance, and robot advisors use algorithms and mathematical models to calculate investment strategies. Financial giant AMP has begun testing fintech Flamingo's online chatbot to help consumers with product selection. Commonwealth Bank of Australia is developing AI technology to help with cybersecurity, fraud detection, and regulatory compliance, and Westpac announced in July 2016 that it would begin to trial AI in its digital banking systems.

Other companies are also incorporating AI into their services. Acorns Grow Australia provides automated online financial and investment advice: the start-up allows consumers to round up their daily expenses and invest the "change" in a diversified portfolio of index funds, based on the customer's preferences. Black AI provides a platform that develops machine-learning-based computer vision and smart sensors that help bots understand their environment in more detail. Widespread AI deployment may also make an impact in areas including mining, transport and logistics, and agriculture.

The Committee for Economic Development of Australia (CEDA), in its report "Australia's Future Workforce," found that Australia had left innovation "woefully underfunded" compared with global competitors. Still, Australia has taken a few steps to stay competitive. The University of Technology Sydney opened the Centre for Artificial Intelligence recently; the Department of Human Services in the Australian government is deploying bots to handle inquiries from citizens; and there are numerous conferences held to disseminate knowledge in this field, including the yearly Australasian Joint Conference on Artificial Intelligence.

Figure 3. AI investment plans (% of respondents)



Source: MIT Technology Review's 'Asia's AI Agenda'

## Straining at the seams

### Australia is working within its talent constraints to achieve AI self-sustainability

After China and the U.S., Australia had the world's third-highest number of scientific articles published last year citing deep learning, according to research from the U.S. government's National Artificial Intelligence Research and Development Strategic Plan. "Australia's science community has a long history of punching above its weight in automation and robotics. We've hosted the world's largest AI conference twice—and we've held the RoboCup world championships five times," notes Professor Walsh.

If academic interest is strong, however, Australian companies are still struggling to deploy AI more widely. In a survey conducted by Infosys and presented at the World Economic Forum, Australia placed last among seven major economies both in the skills required for AI take-up and in plans to integrate the technology. Access to people with technical skills is lacking, and government support—in the form of policies and training—is likewise inadequate.

To Walsh, this highlights Australia's biggest constraint: brain power. He points to a 2015 study by the Australian Computer Society, which forecast that by 2020, the country would have a gap of some 100,000 positions in information and communications technology—roughly equivalent to 15 percent of the technology labour force today. "We frequently get into recruiting conversations with banks where the only question is 'How big is the graduating class?'" he says, adding that it is "sometimes a struggle to get people to finish their programs" before they elope to start-ups.

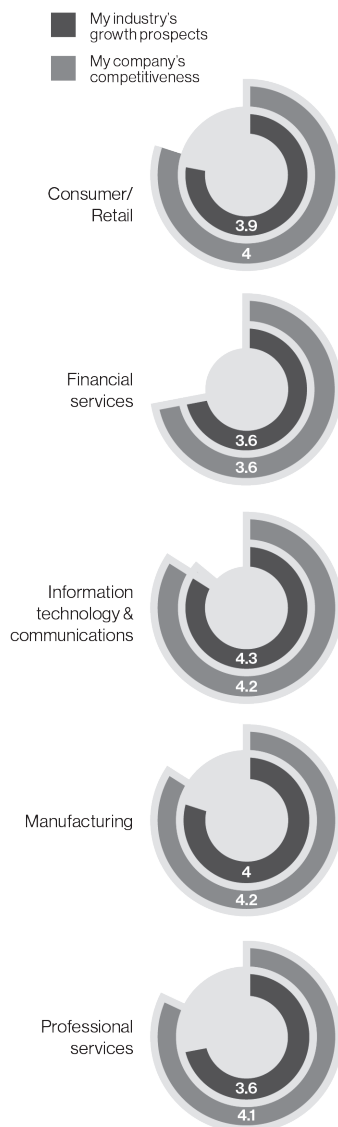
Ethical concerns may also complicate Australia's path toward AI development, with legislation emerging about where and when AI may be deployed and how data can be safely collected, stored, and used for algorithmic decision-making. The technology's impact on employment is also a major issue. Companies may be slow to re-skill and reassign people displaced by AI. Two-thirds of Australian businesses polled by Infosys noted that they plan to replace jobs with AI or have already done so, and a third of those said the affected workers

would be made redundant. Australia is sensitive to these potential labour implications: the Committee for Economic Development of Australia (CEDA) predicted in 2015 that 40 percent of urban jobs and 60 percent of rural jobs could be automated by 2025

This alarming claim is mitigated by the fact that the report's methodology was derived from the seminal 2013 Oxford University study by Frey and Osborne, which regarded a "job" in somewhat binary terms—either it exists as a static collection of tasks and responsibilities, or it is eliminated. As this report has discussed, AI's real impact on everyone's job is to force an examination, and perhaps a disaggregation and reassembly, of some or all of those tasks.

**Figure 4. AI's impact on growth and competitiveness**

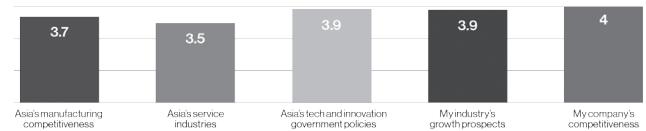
What degree of impact will advancements in AI and robotics have over the next five years? (1 being least positive, 5 being most positive)



Source: MIT Technology Review's "Asia's AI Agenda"

**Figure 5. AI's impact on Asia's business landscape**

What degree of impact will advancements in AI and robotics have over the next five years? (1 being least positive, 5 being most positive)



Source: MIT Technology Review's "Asia's AI Agenda"

## The cognitive firm

### Listening to machines—and employees—to enhance productivity

Asia as a regional economy is poised not only to benefit greatly from advancements in AI technologies, but also to define them and leverage them for potential economic transformation. This prospect is particularly resonant for organizations in Australia. "This is literally a choice that all companies can make: they can choose to automate simply to create efficiency," notes Professor Walsh. Focusing on efficiency gains is a tempting choice in a high-wage, labour-constrained market such as Australia, but that strategy "is a race to the bottom," Walsh warns. "Firms with vision should use AI to enhance customer experience," he says. "Hard-nosed businesses will use automation to produce with 30 percent less people, but more visionary businesses will use AI to free up 30 percent of their employees' head space to think about strategy, or talk to customers."

AI, when deployed correctly, will not eliminate jobs so much as deconstruct them and reorganize them around groups of competencies, enabling both humans and machines to work in more productive ways. Australian businesses stand to rise faster by aligning the country's "natural resources"—an economy defined by process-intensive extractive industries, and an emerging AI research cluster—with its need to overcome productivity constraints. In Professor Walsh's estimation, "We have a choice to lift our game."

To take best advantage of AI technology, business leaders will have to actively participate in data analytics projects, and they must be willing to share best practices and insights. They will also need to champion the integration of automation and machine-learning-based process improvements into their firm's broader talent management programs.

AI may start to disintermediate roles and responsibilities in Australia and across Asia, but it will enhance and redefine far more capabilities, and increase the productivity of both firms and workers. **FS**

**Figure 6. A Time Line of AI**

After a century of ups and downs, artificial intelligence is getting smarter.

- 1914:** In what would come to be described as the world's first computer game, Spanish inventor Leonardo Torres y Quevedo debuts *El Ajedrecista*, a machine that can automatically play chess thanks to a simple algorithm built into its mechanical design.
- 1943:** Neuroscientist Warren McCulloch and logician Walter Pitts present a calculus based on neuron-like "logic units" that can be connected together in networks to model the action of a real brain.
- 1950:** In a paper that helps establish a practical goal for artificial-intelligence research, Alan Turing machines think?" He predicts that by 2000 computers will be able to pass as human more than 30 percent of the time.
- 1956:** John McCarthy, Marvin Minsky, and Claude Shannon organize a summertime research meeting at Dartmouth that brings together the leading thinkers on information theory, artificial neural networks, and symbolic logic, christening the field "artificial intelligence."
- 1958:** Oliver Selfridge presents a paper in England describing *Pandemonium*, a new model of a neural network based on lower-level "data demons" working in parallel with higher-level "cognitive demons" in order to perform pattern recognition and other tasks.
- 1960:** Frank Rosenblatt demonstrates the Mark I Perceptron, an attempt to create an artificial neural network for image recognition that the *New York Times* calls the first step toward a computer "able to walk, talk, see, write, reproduce ... and be conscious of its existence."
- 1961:** Marvin Minsky publishes his foundational paper, "Steps Toward Artificial Intelligence."
- 1966:** Joseph Weizenbaum demonstrates ELIZA, the world's first chat program, which is able to converse using a series of pre-programmed phrases, sometimes to comic effect.
- 1972:** AI takes a hit when philosopher Hubert Dreyfus publishes "What Computers Can't Do," a manifesto challenging the predictions of AI researchers, and scientist James Lighthill pens a pessimistic review of progress in AI research in the U.K., leading to funding cuts.
- 1979:** A backgammon program developed by Hans Berliner defeats the reigning world champion in a match, the first time a computer has defeated a champion-level competitor in an intellectual game.
- 1984:** Douglas Lenat begins the Cyc project, an ambitious attempt to create a common-sense knowledge base that can eventually become self-educating. Little progress is seen for decades.
- 1987:** Ernst Dickmanns and collaborators equip a Mercedes van with video cameras, microprocessors, and other electronics to demonstrate autonomous driving at almost 60 miles per hour. After much other AI research falls short, DARPA cuts the project's budget.
- 1997:** IBM's Deep Blue chess computer avenges its prior defeat to world champion Garry Kasparov in a tense match commemorated in a documentary film, *The Man vs. the Machine*.
- 2000:** Cynthia Breazeal designs a sociable humanoid robot named Kismet that is able to express emotion and recognize cues from interaction with humans.
- 2004:** DARPA sponsors its first "Grand Challenge," which pits research teams against each other to design driverless vehicles capable of independently traversing the Mojave Desert.
- 2011:** IBM's Watson defeats "Jeopardy!" champions Ken Jennings and Brad Rutter in a televised two-game, three-night face-off that ends with the computer amassing more than three times the winnings of its human competitors.
- 2012:** A team from Geoff Hinton's lab wins the ImageNet Large Scale Visual Recognition Challenge with deep-learning software that could within five guesses identify a thousand types of objects about 85 percent of the time, a huge improvement in accuracy.
- 2014:** Google acquires DeepMind Technologies, a small London-based start-up focused on deep learning, a relatively new field of artificial intelligence that aims to achieve tasks like recognizing faces in video or words in human speech.
- 2016:** Google's AlphaGo decisively beats the world champion of the complex board game Go.

Source: MIT Technology Review's "AI Takes Off".