Digital Economy Strategy team
Department of Industry, Innovation and Science
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Via online submission

Digital economy consultation: submission

On behalf of Innovation and Science Australia (ISA) I would like to present the following submission for consideration in response to the *Digital Economy: Opening up the Conversation* consultation paper.

I would like to thank the Department's Digital Economy Strategy team for presenting to the ISA Board in October 2017 and for directly engaging with individual board members during the consultation process. ISA would welcome the opportunity to continue to work closely with the Department on the Strategy, particularly given the essential role the digital economy plays in Australia's innovation system.

ISA was established by the Australian Government as an independent statutory board with responsibility for providing strategic whole-of-government advice on all science, research and innovation matters. As part of its mandate, ISA recently submitted a strategic plan for the Australian innovation, science and research system to 2030 to Government (see Attachment A)[1]. The 2030 Strategic Plan aims to contribute to the wellbeing and prosperity of all Australians by ensuring that Australia reaches its innovation potential. ISA's 2030 Strategic Plan considers the key challenges likely to face Australia's innovation system through to 2030, including the impact of digital transformation. ISA has concluded that Australia's ability to secure a position in the top tier of innovation nations will depend critically on our ability to harness digital technologies in all domains.

This submission highlights key digital opportunities and challenges for Australia including a specific new recommendation to build a stronger domestic Artificial Intelligence (AI) and Machine Learning (ML) capability. We also recognise the importance of building digitally capable businesses and a skills pipeline; ensuring governments are creating favourable enabling conditions; recognising the increasing value of data and acknowledging that Australian society has unique requirements of the digital economy.

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[1] ISA anticipates releasing the 2030 Plan in early 2018. This submission should be treated as in-confidence prior to the release of the Plan.

1) Australia needs to build key capabilities to harness global digital economy opportunities

<u>Australian businesses are benefitting from digitally transformed global markets</u>
Digital technologies are lowering the barrier to entry for digitally-enabled businesses across most sectors. These developments are reducing transactions costs and improving market access. For Australia, this means that the "Tyranny of Distance" which was an essential feature of global business in an analogue world has been significantly reframed.

In the early years of the digital economy small groups of Australian entrepreneurs seized on this increased capability to compete in global markets and produced leading digital businesses, such as Atlassian, focused on solving problems for customers wherever they may be located. Similarly cloud-based accounting software business Xero experienced a rapid rise from its New Zealand home to become a global force in the field in just a few years.

More recently, some sectors have successfully leveraged more specifically Australian strengths: for example, the digital creative sector is performing well and growing at a rate higher than the economy as a whole.[2] This sector boasts success stories including Canva in the graphics and photodesign market; Culture Amp, which has grown to an international success offering services to companies to help them better understand their employees and improve their organisational culture; and Envato which is offering a world-leading marketplace and ecosystem of sites and services for digital assets and creative people.

Digital technology is also transforming markets for physical goods and services. Online platforms such as Alibaba and Amazon, combined with falling transportation costs, mean Australian exporters can now enjoy equal status with any other vendor around the world, and in many cases the platforms themselves can assist with physical logistics. However even new digitally enabled market entrants face intense competition, particularly in the online retail market. Australian businesses need to demonstrate greater capability in not just attracting but also understanding and maintaining a global customer base to maintain competitive advantage in the online world.

<u>There is a pressing need to develop digital capability and awareness</u>
A forward-looking Digital Economy Strategy for Australia should ensure that our citizens, and especially our businesses, are sophisticated users of digital tools and able to deploy them to capture value. Preparing citizens for the next technology wave will require greater engagement and understanding of current and evolving technologies such as autonomous vehicles, the Internet of Things (IoT) and cryptocurrencies, and

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[2] Clun, R, July 2017, Digital creative industries claim a growing share of the Australian economy
http://www.smh.com.au/business/the-economy/digital-creative-industries-claim-a-growing-share-of-the-australian-economy-20170703-gx3vm8.html

future evolutions of the current "apps" approach to consumer computing. The Australian Information Industry Association (AIIA) states that without a minimum baseline of digital knowledge, skills and resources, citizens will have difficulty finding a job in the future.[3] While most Australian firms have been good adopters of new technology, ISA's Performance Review identified that Australian businesses have a tendency towards incremental rather than new-to-world innovation.[4] ISA has heard that most businesses are not ready or well placed to capture the opportunities afforded by ICT, data and analytics.

Human capability is a factor that is limiting the ability of Australia's corporate and public sectors to respond. Sufficiently skilled and experienced staff, management teams and boards need to be able to recognise digital opportunities and translate this in to the day to day of business operations. We need to equip Australian executives and board directors with the capability to adapt to, and exploit, the accelerated state of change being brought about by digital technologies and to start using their data holdings in meaningful ways. Investor capability could also be improved by supporting local investors with the capacity to inform themselves and take intelligent commercial risks. Ensuring growing Australian firms have access to finance from start-up through to scale-up stages remains an issue. Government can assist by identifying best practice and profiling successful examples of digital transformation in the Australian corporate environment, including through partnerships with industry.

It is estimated that over ninety percent of future jobs will require some form of digital skills[5] and forty-five per cent of jobs will need people who can configure and work confidently with digital systems and technology. Science, technology, engineering and mathematics (STEM) skills are therefore of increasing importance. Recent studies have made it increasingly apparent that the greatest number of high-paying STEM jobs are in the "T" – technology. Research from the USA shows that shortages have been observed in a relative handful of fast-growing fields like data analytics, artificial intelligence, cloud computing and computer security.[6] At the same time, Australia is experiencing a significant gap between the supply of, and demand for, ICT graduates.[7]

There is also evidence that Australia's ICT workforce suffers from a lack of diversity. In particular, the participation of women in ICT roles is low relative to other professional occupations. Women comprised only 28% of all ICT workers in Australia in 2016 -

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[3] Australian Information Industry Association, 2017, *Skills for Today. Jobs for tomorrow*
https://www.aiia.com.au/__data/assets/pdf_file/0020/81074/JOBS-FOR-TOMORROW-FINAL.pdf
[4] Innovation and Science Australia 2016, *Performance review of the Australian innovation, science and research system*, ISA, https://industry.gov.au/Innovation-and-Science-Australia/Pages/default.aspx.
[5] Stanwick, J, Lu, T, Rittie, T & Circelli, M 2014, *How young people are faring in the transition from school to work*, Foundation for Young Australians, https://www.fya.org.au/report/how-young-people-are-faring-2014
[6] New York Times, Where the STEM Jobs Are (and Where They Aren't)
https://www.nytimes.com/2017/11/01/education/edlife/stem-jobs-industry-careers.html
[7] Innovation and Science Australia 2016, *Performance review of the Australian innovation, science and research system*, ISA, https://industry.gov.au/Innovation-and-Science-Australia/Pages/default.aspx.

unchanged since 2015[8]. Greater participation of women in STEM studies and the ICT workforce could help fill identified skills gap. ISA's 2030 Plan recommends that the Government maintain a long-term policy commitment to achieving greater gender diversity in the STEM workforce, including by raising awareness of gender diversity in government programs (see Recommendation 25). The Plan also makes recommendations on education and skills relevant to the digital economy including strengthening STEM education and ensuring the VET sector is responsive to new priorities presented by innovation, automation and new technologies (see Recommendations 1-5).

A focus on Artificial Intelligence (AI) and Machine Learning (ML) capability is essential
There is a burning need to be bold in relation to preparing Australian citizens and businesses for AI and ML. These technologies are transforming almost all industries, from transport to healthcare and education, and the rate of advance is accelerating. In just a few short years AI has experienced a transition from research curiosities to essential components of major consumer products such as smartphones. These technologies are also being adopted internationally at great speed and Australia should be proactive in harnessing them. AI is not a new concept nor is it new to Australia: Australia's mining sector led the world in the application of automation to remote sites. Australia also punches above its weight in AI research and translation.[9] However, what is new is the breadth of application of these technologies, and the speed in which they are having impact on consumer expectations and experiences.

Globally, the rapidly expanding field of AI is being driven by significant investments which are highly concentrated in China and the USA, two of Australia's major strategic partners. While both nations have great capacity to lead the world in AI, the concept of one nation leading will be complicated by the diversity of technical and social challenges and the different inputs needed for different applications.

The global AI race is raising the premium placed on digital skills. Australia needs to invest in and secure an AI skills base to remain globally competitive. China is estimated to have more than two-fifths of the world's trained AI scientists and is expected to overtake the USA in AI capability. This is particularly relevant at a time when other nations are re-evaluating their openness to skilled migration. Australia's ability to harness AI and ML will depend on our ability to use and develop both local and overseas sources of talent to drive further growth. ISA has heard that Australian technology companies struggle to find skilled employees and experienced senior leaders because of a lack of scale in the local sector. Skilled migration is essential for Australian businesses seeking to employ relevant experts and retain larger operations in Australia, which in turn means Australia benefits from the tax revenue and a skilled workforce which can train and grow the local sector. ISA's 2030 Plan recommends that

[8] Deloitte, Access Economics for the Australian Computer Society 2017, Australia's Digital Pulse: Policy priorities to fuel Australia's digital workforce boom, https://www.acs.org.au/content/dam/acs/acs-publications/Australia's%20Digital%20Pulse%202017.pdf
[9] Walsh, T 2017, *The AI revolution*, Education: Future Frontiers occasional paper series, NSW Department of Education, Sydney.

Australia build on strength in accessing overseas talent through continuing and targeted updates to skilled immigration rules and improved marketing to suitable talent (recommendation 10).

ISA's 2030 Plan recommends that the Digital Economy Strategy should prioritise the development of advanced capability in AI and ML in the medium to long-term to ensure growth of the cyber–physical economy (recommendation 8). In the context of this Digital Economy Strategy ISA further recommends that the Australian Government commit to a whole-of nation AI and Machine Learning (ML) program, to be led by a suitably qualified institution. ISA could work with the Department to create a terms of reference and performance metrics to ensure effective and accountable governance. The program of work should be designed to:

- Be inclusive of industry, universities and publicly funded research agencies
- Develop Australian capability for application to cyber-physical systems and the Internet of Things (IoT), with consideration of both short term transition and long term plans
- Develop a market pull sector competitiveness plan that identifies Australia's global opportunity in AI/ML, similar to those that have been prepared for other Growth Centres.
- Consider the security, ethical and regulatory environment for deployment in an Australian context.

2) Governments should focus on creating favourable enabling conditions

The primary role of government in the digital economy is to provide enabling conditions for successful individuals and businesses to exploit digital technologies. The Government also plays a key role in the provision of infrastructure to support all citizens to access online services and participate in the digital economy, and should itself be an exemplar user of digital technologies.

Given the pace of change in the Digital Economy, the Government also needs to respond to disruption and ensure the flexibility of the regulatory environment to enable innovation to flourish while protecting consumers and the needs of new and existing industry players. The current government structures are not as conducive to collaboration across government agencies and jurisdictions as they could be. ISA's 2030 Plan supports the work of the COAG Industry and Skills Council to adopt an 'anticipatory regulation' principles-based approach and the exploration of specific areas for cross-jurisdictional collaborative regulatory reform (see recommendation 11). As a small open economy, Australia also needs internationally agreed standards and interoperable systems to support our participation in global supply chains. This will become increasingly important as disruptive technologies such as blockchain are moving information across institutional and jurisdictional boundaries in unforeseen ways.

Improving broadband infrastructure should continue to be a high priority

As the owner of the National Broadband Network, the Australian Government has a key role in the provision of fast, accessible and reliable broadband infrastructure. Internet access is becoming a basic requirement for both fixed and mobile applications.

On the mobile front, Australia is leading the Asia-Pacific region in terms of mobile connectivity speed - our average mobile connection speed is 13.8Mbps, which is ahead of the Americas' region leader Canada (10.3Mbps). This is important because Australia has a very high smartphone penetration rate (77% of the population owns a smartphone[10]) and Australians are amongst the largest users of social media in the world[11]. The next generation of mobile broadband (so-called 5G) is developing rapidly, and Government should consider opportunities to ensure that the rollout of 5G is as fast as possible to ensure Australia's leading position in mobile broadband is maintained.

Unfortunately, when compared internationally on metrics for fixed-line broadband, Australia's average fixed internet speed of 10.1Mbps puts us in 51st place overall.[12] The Government should accelerate the roll-out of the NBN, and ensure the widest possible coverage of genuinely high-speed network. Importantly, the Government's position as owner of the fixed-line NBN must not be allowed to negatively influence its efforts to foster mobile broadband development.

Digitisation of Government services remains an attractive area of opportunity

Government must not lose momentum on its own digital initiatives. The Government's plans to establish a digital identity system, Govpass, that uses a federated model to create a single login for government services, is encouraging, and a focus on execution should remain a priority. Government can also act as a catalyst in the innovative provision of services. In our 2030 Plan ISA recommends that the Digital Transformation Agency (DTA) be instructed to explore opportunities to achieve greater savings from digitising service delivery sooner than currently planned, while simultaneously improving citizen satisfaction with government services. We also recommend that the DTA should be resourced to provide improved benchmarking and reporting services focused on effective, efficient use of digital technologies and improved service delivery and citizen satisfaction across service delivery agencies (see Recommendation 17).

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[10] Poushter, Jacob, Pew Research Centre (2016), Smartphone Ownership and Internet Usage Continues to Climb in Emerging Economies http://www.pewglobal.org/2016/02/22/smartphone-ownership-and-internet-usage-continues-to-climb-in-emerging-economies/

[11] Pew Research Centre (2017), Not Everyone in advanced economies is using social media http://www.pewresearch.org/fact-tank/2017/04/20/not-everyone-in-advanced-economies-is-using-social-media/

[12] Australian Government Department of Communications, Internet Activity Statistics June 2016 (2016) https://www.communications.gov.au/departmental-news/australian-internet-activity-statistics-june-2016; and Australian Bureau of Statistics (2017) http://www.abs.gov.au/ausstats/abs@.nsf/mf/8153.0/ and Akamai (2017) State of the Internet report https://www.akamai.com/us/en/about/our-thinking/state-of-the-internet-report/

Government must continue to actively build cybersecurity capability
Government has an essential role in leading cybersecurity efforts in the online world just as it has a unique role in defence and policing in the offline world. As more economic activity moves online, issues of cybersecurity are creating their own sets of opportunities and challenges. Establishing trust in an online environment is an increasingly essential component of the digital economy. Digital security and trusted systems will be essential if we are to reap the potential benefits of digitalisation in sensitive areas such as healthcare, education and finance. Cybersecurity is still at a very early stage of development, and Australia needs to ensure it remains at the forefront of this area.

ISA supports the Australian Government's approach to take a lead role and in partnership with others to promote action to protect Australia's online security. Much of our digital infrastructure is owned by the private sector, so securing Australia's cyberspace must also be a shared responsibility. We also need to grow our cyber security capabilities to anticipate and respond to cyber threats. This will require a solutions to the current shortage of cyber security professionals. Similar to AI, it is critical that we build our nation's stock of cyber security skills and in the short term, implement immigration policy that supports access to skills as governments and industry require them. The Cyber Security Growth Network is also supporting Australia's growing role in the global cyber security industry and is a good example of how the Industry Growth Centres initiative can help key industries adapt to technological change.

3) Data is an increasingly important asset in the digital economy

New technologies and take up of mobile technologies and sensor technologies are generating massive volumes of data. By 2020, data production is estimated to increase by approximately 40 times.[13]. Data is the most important ingredient for AI. The more data that is made available, the more AI algorithms can learn and the smarter our AI offerings will be. China's sheer size and diversity mean that just by going about their daily lives, the country's nearly 1.4bn people generate more data than almost all other nations combined.[14] The challenge will not just be in managing and storing large volumes of data, but also developing ways to translate the data into knowledge for both public and commercial benefit.

Government must be a responsible but entrepreneurial custodian of data
Historically, Australia has under-utilised data collected by government agencies. Other economies, including the UK and China, are opening up access to datasets to encourage an open innovation environment. More public data can be appropriately and securely shared, unlocking new markets in interpreting and delivering data in relevant ways to

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[13] Business Tech, 18 November 2017, Three stock to buy and hold for the next decade
https://businesstech.co.za/news/finance/210595/three-stocks-to-buy-and-hold-for-the-next-decade/
[14] The Economist Beijing, 15 July 2017, The algorithm kingdom: China may match or beat America in AI.
https://www.economist.com/news/business/21725018-its-deep-pool-data-may-let-it-lead-artificial-intelligence-china-may-match-or-beat-america

the Australian community. Researchers and industry need to harness the insights from public data to drive innovation and commercialisation.

The Productivity Commission's Data Availability and Use report[15] provided a blueprint for reform. ISA supports the Productivity Commission's report and recommendations on the use of public data, which would ensure a regulatory environment that maintains trust while maximising the value from public data. ISA believes that Australian use of open data would be accelerated by improving access and usefulness of the data. It will also enable a solid foundation from which to support a developing Artificial Intelligence (AI) industry. This will enable Australians to create financial value for companies and better service and economic outcomes for governments and citizens, including feeding data in to AI environments. ISA's 2030 Plan therefore recommends:

- developing government capability and capacity to deliver accessible, accurate and detailed public data, balancing release of data with privacy and intellectual property concerns; this will entail sustained investment in data custodianship, maintenance and release
- developing improved mechanisms to encourage feedback to originating departments from industry and not-for-profit user groups to ensure that data released by governments is maximally useful (Recommendation 13).

And

- establishing protocols (including consumer data rights) for maintaining healthy levels of competition in knowledge intensive industry sectors (Recommendation 9).

As holder of large volumes of data, the Government should consider the merits of federated access models against centralised models. The Australian health data sharing model between state government agencies and organisations has helped build Australia's reputation for world-class health and medical science. These research projects demonstrate the benefits of a federated model, having maintained a good track record in protecting data privacy and security. Federated approaches enable the collectors of data to maintain control over its access and use and encourages collaboration not just between Commonwealth and state agencies but external stakeholders within accountable frameworks. The Government should explore the application of federated approaches across other data sharing contexts.

Data-driven business models require the attention of competition regulators
Governments will also need to be alert to anti-trust issues generated by concentration of ownership of valuable datasets. Access to data is emerging as an important barrier to market entry in the digital economy because of the prevalence of powerful network effects. When network effects are created, typically by first movers or those first to scale, the monopoly or quasi-monopoly situation the company enjoys in its own market can then create a secondary monopoly on user data collection. Some of Australia's key

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[15] Productivity Commission 2017, *Data availability and use: Productivity Commission inquiry report*, https://www.pc.gov.au/inquiries/completed/data-access/report.

service sectors – finance, health and education - are data rich environments made up largely of incumbent providers. These situations may lock up economic value because data sets are not exploited by the companies that own them. For example, McKinsey estimate that banks are currently only realising 10 to 20 percent of the potential value of the data they hold[16]. ISA remains concerned about the potential for inhibition of competition and innovation through concentrated control of data in particular sectors. There is a role for government in assisting all sectors to achieve maximum value from these datasets.

Australia should build on its strengths in data science
Australia has clear opportunities to lead in data science. It is worth recalling that the World Wide Web was invented by a scientist seeking better ways to share information amongst many participants at the global particle accelerator CERN. Big science projects create unique challenges, which have to be solved by some of our brightest minds. In data science, Australia has captured a leading role in one of the most data-intensive projects in human history – the Square Kilometre Array. The massive data volumes produced by the SKA will create a potential opportunity to develop advanced data management and computing techniques. The SKA will also require new solutions to challenges associated with transport, processing and storage, including in collaboration with international partners.

4) The digital economy is a social phenomenon as much as a technical one

Social licence must be established in a shifting trust landscape
In framing its Digital Economy Strategy, the Government must not lose sight of the fact that it is a social phenomenon as much as a technical one. Building trust in the online environment is a journey. Digital identify and other online systems earn the right to evolve when they have earned (and retain) the social licence to operate. For example, the move to an opt-out system for the My Health Record is an extremely positive and potentially a transformative development for Australia. ISA strongly supports the Government's plan to develop a framework for secondary use of My Health Record data. However the value of the data can only be realised if the My Health Record enjoys ongoing social licence with users trusting of, and engaged in, the positive impacts that secondary use can deliver.

The role of Government as guarantor of trust may also be challenged. For example, new technologies like Blockchain may dramatically disrupt key aspects of digital commerce, particularly in terms of contracting and payments. Whilst these can present challenges for the traditional role played by the state, the potential overall gains mean that Government should continue to innovate. Australian governments will need to work in partnership with private bodies to ensure a level of transparency and consumer safety in these environments. There is also a role for government in supporting regulatory

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[16] Blackburn, S, Freeland, M & Gärtner, D 2017, Digital Australia: seizing opportunities from the Fourth Industrial Revolution, McKinsey&Company, https://www.mckinsey.com/global-themes/asia-pacifc/digital-australia-seizing-opportunity-from-the-fourthindustrial-revolution

sandboxes to enable fintech startups to pilot products without requiring a full licence.

<u>Australia requires a transparent and ethical deployment of digital technology</u>
The internet is transforming all aspects of life in ways that Tim Berners-Lee at CERN was unlikely to have ever imagined possible. Users are willingly providing rich and valuable data about themselves via online channels and social media in particular. While Australia has very high rates of social media use it is unlikely that many Australians are aware of the extent to which social media is making secondary use of their online data. Other jurisdictions are making use of data in unusual ways. China is piloting a scheme where citizens are being given a Social Citizen Score based on individual actions – from their online shopping selections or patterns of bill payment to the nature of their community engagement – whether the person is aware of it or not[17].

The growth in data and patterns and insights available on big data means that algorithms are now scaling in unprecedented ways. The cultural assumptions deeply embedded in the algorithms of every day consumer tools and services require scrutiny for compatibility with Australian values and expectations. A cross-disciplinary approach will therefore be essential for ensuring algorithmic transparency and ethical deployment of AI within an Australian context.

Other nations are more advanced in national conversations about what is acceptable for their digital economies. Internationally, the United Nations is exploring a convention on weapons that considers the use of lethal autonomous weapons systems. The German government will soon adopt guidelines for self-driving cars inside the country, which will prioritize the value and equality of human life over damage to property or animals. Individual states within the Unites States have begun drafting their own sets of rules for autonomous vehicles and the federal government is progressing national guidelines.

Australia's conversation should include questions of openness and transparency, particularly around data ownership. As Professor Genevieve Bell recently asked in her Boyer lectures[18] – what is it to be human, and Australian, in a digital world? Should Australia pursue a "consent economy" and seek citizen ownership of data, like the European Union or are we comfortable with an opt-out default on our data? Does Australia need a digital human rights framework to expand the focus from a right to access technology to a right to access digital information more broadly? How should we adopt or scrutinise AI technologies that have been developed overseas? We need an Australian solution that reflects our cultural norms.

Finally, digital disruption will impact on different sectors and parts of the population at different rates, so we need to be sensitive to transition issues. ISA's vision is an inclusive
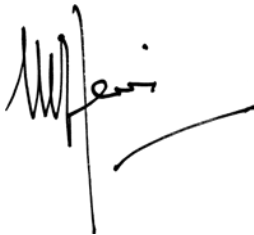
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[17] The Economist Beijing, 15 July 2017, The algorithm kingdom: China may match or beat America in AI. https://www.economist.com/news/business/21725018-its-deep-pool-data-may-let-it-lead-artificial-intelligence-china-may-match-or-beat-america
[18] Bell, G, Boyer Lecture (2017), Fast, Smart and Connected: What is it to be Human, and Australian, in a Digital World.

one, and so it needs to be an inclusive conversation. Recent Australian research shows that the more informed people feel they are about science and technology, the more likely they are to be broadly positive about it[19]. Like innovation, the digital economy has great potential to drive economic growth and new jobs, contribute solutions to complex global challenges and improve the lives of all Australians.

Thank you for the opportunity for the ISA Board to provide input to this process. I invite the Department to present an update to the ISA Board at the 15 February 2018 meeting. I look forward to collaborating on this important strategy and realising a bold vision for Australia's future.

Yours sincerely

Bill Ferris AC
Chair, Innovation and Science Australia
13 December 2017

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[19] Lamberts, R (2017) The Australian Beliefs and Attitudes Towards Science Survey.
The Australian National University. http://www.science.gov.au/community/Documents/REPORT-SCAPA172001-CPAS-poll.pdf

Innovation and Science Australia's 2030 Strategic Plan (EMBARGOED) – see attached PDF document