SCIENCE & TECHNOLOGY AUSTRALIA
POLICY SUBMISSION

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SELECT SENATE COMMITTEE INQUIRY INTO ADOPTING ARTIFICIAL INTELLIGENCE

Science & Technology Australia thanks the [Select Committee on Adopting Artificial Intelligence (AI)](#) for the opportunity to respond to this inquiry.

Science & Technology Australia is the peak body for the nation's science and technology sectors, representing 140 member organisations and more than 225,000 scientists and technologists. We connect science and technology with governments, business and the community to advance science's role in solving some of humanity's greatest challenges.

The Australian Government's (the Government) broader role in artificial intelligence (AI) will be to ensure that it is used to deliver a public good. The Government must support the development of globally competitive sovereign AI technology and foundational elements including a sustainable digital infrastructure and workforce.

This will deliver greater and ongoing economic benefits, maintain our competitiveness with other nations across all industries and maintain Australia's position as a leader in AI. We would be letting key opportunities slip past if we buy foreign off-the shelf capabilities rather than invest in our own AI industry and our own workforce.

Key points

- Widespread adoption of AI across the economy is inevitable. It is imperative Australia develops and nurtures deep sovereign capability in artificial intelligence.
- Failure to develop sovereign AI capability places us at great risk of becoming dependent on other countries for AI research and applications.
- Sovereign capability is critical to ensure AI applications are relevant, appropriate and safe for Australian society and people including vulnerable groups.
- To realise sustained economic benefits, key elements to support the local AI sector include fundamental research, workforce development, digital infrastructure and regulation.
- Climate change and resource use should be critical considerations of digital infrastructure investment.

Science & Technology Australia Recommendations

1. The Australian Government should support Australia's sovereign artificial intelligence capability through deep investment in fundamental research, our workforce, digital infrastructure and regulation.

2. Both Government and industry investment in AI capability must include secure funding to develop effective AI regulation and monitoring, as well as mechanisms to ensure personal and sensitive data remains uncompromised as integral components of Australia's sovereign AI capability.

3. The Australian Government, universities, schools and industry employers must work together to position mathematics as a vital subject at all levels of education to ensure the future AI workforce has the necessary skills and capabilities.

4. The Australian Government should explore potential avenues to upskill out-of-field maths teachers at scale.

5. Support Australia's local AI industry and sovereign tech capability by funding adequate digital infrastructure to support sustainable growth in AI compute power.

6. Australia should capitalise on its strong research foundation when it comes to developing artificial intelligence with specific capability and applicability to the Australian context.

7. Support research into public and business opinion on adoption of AI to better understand and address attitudinal change and boost AI adoption in a responsible way.

8. The Australian research sector should continue to take a proactive approach to develop policies, guidelines and strategic frameworks to support academic and research integrity.

9. Ensure that renewable energy policy and net zero investments are a key part of developing digital infrastructure to support AI use in Australia as part of its net zero 2050 commitment.

Recent trends and opportunities in the development and adoption of AI technologies in Australia and overseas, in particular regarding generative AI

Artificial intelligence is developing at a rapid pace, fuelled by a high level of international competition in R&D that is seeing computer memory and speed doubling every 3-4 months – significantly boosting AI capacity and potential. Australia must support growth and sustainability in artificial intelligence. These include developing an adequate AI workforce, infrastructure, funding, workforce and intersectoral collaboration. The 2024-25 Federal Budget outlined $39.9 million in existing funding with roughly half going to the National AI Centre and the rest focusing on developing industry capability and coordination and mitigating national security risks.

This pales in comparison to other developed countries with a similar GDP to Australia. Spain earmarked $991 million between 2021-2023 to develop AI technologies, guarantee an ethical framework outlining individual and collective rights and attract global talent. Canada announced $2.7 billion over 5 years to boost investment in Canadian owned and located AI infrastructure and support for commercial start-ups and scale-ups. South Korea plans to spend $10.6 billion by 2027 to invest in semiconductor chips as well as expanding research and development (R&D) to support the next generation of AI including Artificial General Intelligence (AGI) – AI that would have the capability of being self-aware.

A recent report from a bipartisan group of US Senators, urging the US Congress to significantly and swiftly ramp up investment in AI R&D – suggesting the use of 'emergency' funding appropriations – highlights the urgency of the challenge, and the need to improve Australia's own AI R&D capability. The bipartisan nature of this call is also compelling – the AI challenge is clearly a matter of national importance that transcends political boundaries.

These examples highlight that Australia is at risk of falling behind internationally. A strong foundation to support local AI R&D is critical for economic and national security alongside regulation and safety.

Recent modelling by the Kingston AI Group, which consists of Australia's leading AI experts, shows Australia would gain $200bn per annum from now until 2030 and create 150,000 jobs if key industries made AI part of their core business. Such development of sovereign AI tech would be a significant boost to Australia's economic and national security independence.

Australia's digital infrastructure is critical to enabling the full scope of artificial intelligence development and commercialisation. Existing facilities need to scale up as the degree of computing power AI demands increases. This is only expected to worsen as AI adoption and AI computing needs increase. Building digital infrastructure on Australian shores is key to supporting local AI industry. 77% of AI practitioners believe access to adequate AI computing infrastructure is among the most important factors progressing AI projects. The alternative is to be dependent on other nations which could compromise our capabilities and security.

Given the high level of electricity usage and water systems for cooling there also needs to be a clear strategy to incorporate the use of renewables alongside AI development to ensure a sustainable future.

Science & Technology Australia Recommendation 1:
The Australian Government should support Australia's sovereign artificial intelligence capability through deep investment in fundamental research, our workforce, digital infrastructure and regulation.

Risks and harms arising from the adoption of AI technologies, including bias, discrimination and error

There are several risks and harms that can potentially arise from AI. These include:

- Bias and discrimination – e.g. inability to differentiate between fact and fiction or AI reflecting creator or societal bias in outputs.
- Misuse of AI – e.g. use or training of AI for harmful purposes.
- Ethical concerns – e.g. the data used to train AI, IP/copyright considerations, whether AI has ownership of outputs generated, use of AI for life or death situations.
- Privacy – e.g. collecting and using personal and sensitive data without permission and protection of data.
- Job displacement – e.g. 60% of employment will be impacted by AI with half being negatively impacted through labour substitution and job loss.
- Security risks – e.g. AI systems may be exploited through external attacks which can have wide ranging consequences including for national security.

An interwoven set of actions that work to focus and address these risks and strengthen our sovereign AI tech capabilities is necessary. These actions include supporting effective regulation and monitoring, ensuring personal and sensitive data remains uncompromised and retaining human oversight and control. Ensuring Australia develops these capabilities as integral components of a deeper sovereign AI capability will be critical. As such, the biggest risk Australia is facing is failing to develop our own sovereign capability – we must ensure we do not become reliant on AI technologies developed in other countries that might not be suitable to Australia's unique communities and context.

Building the maths capacity needed for a future AI workforce

Another significant risk lies in failing to nurture the specialist workforce needed to build and then maintain a deep AI capability. A key component underpinning a strong future AI workforce is deep capability in maths. Recent trends in Australian maths education are not encouraging.

A low population of students studying mathematics will have significant implications for the future of Australian AI industry. A 2018 study of year 12 students found 12% and 21% of boys studied advanced mathematics and physics respectively compared to only 6% of girls for each. In 2020, the number of students studying advanced maths in year 12 dropped below 10% for the first time and has not recovered. Strong maths literacy is necessary to support the strong maths-trained workforce needed for a future AI industry.

Universities also have a key role to play in student participation in maths subjects. In 2020, an Office of the Chief Scientist report into prerequisites for university courses found 11 of 40 universities had no maths prerequisites for any courses and only 19 (~1%) of 1587 courses required any higher mathematics and we have seen more recent moves to further remove maths prerequisites from some universities.

This sends a message to senior school students that significantly diminishes the importance of maths, meaning university years are spent catching up, or students are simply ill-equipped to take on subjects requiring deep maths capability – such as the IT and programming skills needed for AI. This compromises our capacity to build the workforce we will need.

This is compounded by significant teacher shortages with more than 75% of year 7–10 students estimated to have been taught by out-of-field teachers untrained in mathematics. This has clear ramifications for student learning.

The solution would be two-fold. We must position mathematics as a vital subject at school and university level, not diminish its importance. Additionally, we have to train existing teachers and upskill them in mathematics as well as improve rates of new teachers with mathematics qualifications. Evidence from Ireland suggests a national postgraduate upskilling program brought down rates of out-of-field teaching in mathematics from 48% in 2009 to 25% in 2018. Australia should explore potential pathways to support our students' education, future AI workforce and AI sovereignty.

Building a strong digital infrastructure and high-performance compute capability needed for AI

Australia relies heavily on its digital infrastructure and high-performance computing and data (HPCD) capability including for health, agriculture and weather prediction services. Demand for these facilities often exceeds supply with our most powerful publicly available facilities, the National Computing Infrastructure and Pawsey Supercomputing Research Centre, oversubscribed. With the expected increase in AI use, a lack of greater investment creates a significant risk in meeting our national priorities.

In addition to data protection, government policy should seek to ensure national sovereignty and efficiency in its digital infrastructure investments. This can be done by:

- Investing in adequate digital infrastructure to support sustainable growth in compute power
- Identifying key industries that rely on digital infrastructure including defence, finance, communications and health
- Standardising digital infrastructure to support AI system transparency, interoperability with sectors that rely on it and address ethical and societal concerns such as bias and privacy.

Aligning digital infrastructure with Australia's expected sovereign AI capabilities will deliver a strong foundation for innovation and expand our capacity to prioritise local industry.

Science & Technology Australia Recommendation 2:
Both Government and industry investment in AI capability must include secure funding to develop effective AI regulation and monitoring, as well as mechanisms to ensure personal and sensitive data remains uncompromised as integral components of Australia's sovereign AI capability.

Science & Technology Australia Recommendation 3:
The Australian Government, universities, schools and industry employers must work together to position mathematics as a vital subject at all levels of education to ensure the future AI workforce has the necessary skills and capabilities.

Science & Technology Australia Recommendation 4:
The Australian Government should explore potential avenues to upskill out-of-field maths teachers at scale.

Science & Technology Australia Recommendation 5:
Support Australia's local AI industry and sovereign tech capability by funding adequate digital infrastructure to support sustainable growth in AI compute power.

Emerging international approaches to mitigating AI risks

Artificial intelligence related risks are best mitigated through multiple but complementary approaches.

Achieving compliance from artificial intelligence technology companies is necessary in order to ensure safety and effectiveness. Top US tech firms including Amazon, Google, Meta, Microsoft and OpenAI have agreed to new voluntary AI safeguards with the White House to ensure their products are safe before being publicly available. The European Union (EU) began with voluntary standards and then introduced the EU AI Act now in force. The Act aims to protect users and bring trust and predictability to the market through targeted product-safety regulation. They are creating a tiered approach with higher risk applications and applications in high-risk sectors like law enforcement being subject to stricter obligations before being publicly available on the market. This example would be directly relevant to Minister Husic's proposed 'mandatory guardrails' approach.

International collaboration to support risk mitigation will be essential, particularly considering many of the largest AI tech companies are based overseas. In addition to implementing the Bletchley Park agreement to ensure the security of Australians, the Government should take note of ongoing developments on international AI cooperation. This includes the US and UK Memorandum of Understanding on AI safety which includes potential personnel exchanges and joint testing on a publicly accessible AI model. Australia must be aware of international developments to take advantage of future opportunities in AI.

Although not an international reference for AI, Standards Australia also provides independent guidelines on world class standards to adhere to for AI development. It can support high quality AI development from design to implementation. Keeping pace with robust standards will mean that our sovereign AI industry is supported by firm foundations while contributing to greater confidence in, and higher rates of, AI adoption.

Opportunities to adopt AI in ways that benefit citizens, the environment and/or economic growth, for example in health and climate management

There are many recent trends and opportunities to adopt artificial intelligence applications from here and overseas for the betterment of Australia. These include:

- Tennis Australia using AI to assist blind spectators to watch a tennis match,
- detecting counterfeit items - from luxury goods to pharmaceutical medicine
- detecting smoke and other signs of fire to enable rapid early response and fire prevention.

Manufacturing is a key industry in which generative artificial intelligence (Gen AI) can deliver substantial benefits – up to $2-5 billion dollars, according to the Tech Council of Australia. Advances include reducing time to market, increased innovation and enhanced decision-making. Airbus has used Gen AI to build partitions separating the passenger compartment from the galley in their A320 cabin. It generated thousands of design choices based on slime mould and mammal bone structures to develop a lighter, stronger partition. This can reduce the plane's weight by 500kg, decreasing fuel use and CO_2 emissions by 166 metric tonnes per plane each year.

In the medical realm, AI holds great potential for personalised medicine, early diagnosis, risk identification and can greatly improve patient care and quality of life. Examples include:

- Increased blood test detection rates of Multiple Sclerosis (MS), where it is also more cost-effective and timely than magnetic resonance imaging (MRI) scans.
- Rapid and non-invasive COVID-19 diagnosis – proving to be more effective than PCR testing (currently regarded as the gold standard).
- Automated diagnosis of Autism Spectrum Disorder from a brain MRI scan.

There are also opportunities to deploy AI methods across other sectors of the care industry, such as aged care to support independent living and improved quality of care.

Artificial intelligence has been applied across multiple environmental conservation and climate change initiatives. This includes use of remote technologies for planning and monitoring, species and habitat protection, prediction of extinction risk and for dynamic biodiversity data analytics. It can enable industry, government and the research community to make more informed decisions to better protect Australia's unique biodiversity.

Science & Technology Australia Recommendation 6:
Australia should capitalise on its strong research foundation when it comes to developing artificial intelligence with specific capability and applicability to the Australian context.

Opportunities to foster a responsible AI industry in Australia;

Responsible artificial intelligence involves the incorporation of guardrails to protect against potential risks and harms stemming from the misuse of AI tech. It requires social and democratic values, such as freedom, respect, fairness and equality, to be embedded to enable transparency and accountability to the public. Responsibility must be considered at each stage of the AI lifecycle from concept, design through to adoption and use to ensure there are net benefits and lower risks of harm from AI.

As recorded in their submission, The Kingston AI Group provide some concrete opportunities for building a responsible AI industry:

- Opportunity 1: Reinforcing Australia's existing brand of being a provider of premium, responsible and safe products. We could leverage this existing perception in overseas markets to reinforce the value of Australian developed AI.
- Opportunity 2: Fostering a responsible AI industry can be supported by:
  - Focusing funding on the quality of training delivered to current and prospective Australian AI professionals – it is poorly trained engineers and data scientists who are the greatest sources of developing discriminatory, unsafe, and error-prone AI.
  - Defining what responsible AI is so that Australian companies can understand and develop it.
  - Directing our funding programs to prioritise responsible AI rather than picking sectors to focus AI investment on, government investment could be directed at supporting those businesses that meet pre-agreed criteria for responsible AI.
  - Whistleblowing and penalising irresponsible AI no matter where it comes from. If overseas companies can sell irresponsible AI in Australia with impunity, there is no incentive for Australian companies to do any better.
  - Government becoming an early adopter of responsible, Australian AI. This ensures the Australian government is adopting responsible AI in all of its business practices and providing confidence for other Australian companies to follow suit.
- Opportunity 3: Ultimately, investing in high-quality AI research has the potential for a significant impact on the economy and society by advancing knowledge, improving lives, and building key national capabilities independent of other sovereign nations.

People who engage with artificial intelligence should be critical thinkers. Understanding the reasoning behind AI decision-making is essential to developing and maintaining a responsible AI industry. This will be significantly important when developing sovereign AI so that it does not harm people, especially potentially vulnerable populations such as Indigenous Australians and people with disability.

To ensure that we benefit citizens, we must adopt evidence-backed AI to inform planning, decision-making, implementation and use. In the health sector, the following areas have been identified to support AI adoption:

- Better streamlined governance processes and transparency to support the AI lifecycle to improve decision-making and patient outcomes.
- Increased support for integrating AI into organisations and systems and embedding evaluation and continuous improvement strategies.
- Greater levels of research into AI adoption to develop an evidence base and frameworks to inform decision-making on use, procurement and adapting tools.
- Rigorous evaluation of AI tools and their implementation must be conducted by multidisciplinary teams to support a well-rounded review across relevant criteria.
- Testing and training of health-related AI include data from people of all backgrounds and demographics to prevent bias. For example, AI technologies must be trained on data from all skin types and demographics to support high quality diagnosis in skin disorders.
- The use of patient demographic data and images in training datasets must only occur after appropriate patient consent is sought in accordance with relevant laws.

The above suggestions can also be extended to other domains including climate change, disability, security, and construction thereby delivering sustainable economic growth informed by evidence.

These considerations highlight the imperative that Australia develops deep sovereign AI capability so we are equipped to build the technology and tools that will best serve our unique community.

Developing sovereign capability will also be key to ensuring public confidence in the technology – and willingness to adopt beneficial tools.

These actions must be taken in the context of a global rise in the private sector dominance in AI. Global private investment into AI is expected to be at least $160b USD this year which could lead to behaviours such as market manipulation and exploitation unable to be curbed by the Australian Government. Both greater regulation to support open and responsible innovation and deeper investment into sovereign AI capabilities are required to ensure we remain independent and prevent further threats to trust in our institutions.

Another key issue when considering AI adoption and uptake is the uncertainty it can bring at both a business and individual level. A 2024 Microsoft survey found 75% of desk workers (at the office or at home) use AI at work. Fifty-two percent of AI users at work are reluctant to admit they are using it for their most important tasks while 53% worry their AI use makes them look replaceable. From a leadership perspective, 60% worry their organisation lacks a plan and vision to implement AI. The overall inaction could place firms at greater risk of embedding poor practices and exposure to being hacked. More research is required to better understand and address worker and business attitudes towards acceptance of AI.

This inertia could also lead to significantly overreliance on, and mistrust of, AI. While existing experts may rely more on experience and intuition than AI, the opposite could be true for novices or people in high pressure situations such as emergency services workers. Suboptimal outputs can lead to poor decision making and an erosion of trust and disillusionment that would be difficult to repair. AI adoption must be supported by comprehensive training so that AI supports, rather than substitutes for, effective human decision making. Proactive action to guide responsible AI use will provide a firm foundation for the implementation of sovereign AI tech affording responsible AI use and protection against negative.

Science & Technology Australia Recommendation 7:
Support research into public and business opinion on adoption of AI to better understand and address attitudinal change and boost AI adoption in a responsible way.

Potential threats to democracy and trust in institutions from generative AI

Trust in institutions is coming under an increasing level of strain as misinformation and disinformation proliferates across our society, some of which is fuelled by AI algorithms. Ensuring our education system nurtures critical thinking and strong STEM literacy is key to ensuring a well-informed public that can identify and counteract mis- and disinformation.

In the academic research context, there are concerns about the potential of Gen AI to accelerate the problem of paper mills – i.e. producing fake scientific papers with plausible, but fictitious, data.

A team of researchers from Macquarie University and QUT have taken a proactive approach to develop to proactive measures to mitigate serious risks posed by generative artificial intelligence. They have developed a strategic framework to apply principles of research integrity and responsible AI into practice. This includes assessing research integrity, human research ethics applications alongside AI use and an effective communications and engagement strategy to support better upskilling and use for our future AI workforce.

Science & Technology Australia Recommendation 8:

The Australian research sector should continue to take a proactive approach to develop policies, guidelines and strategic frameworks to support academic and research integrity.

Environmental impacts of AI technologies and opportunities for limiting and mitigating impacts.

AI relies on data centres for storage and compute power. On a global level, data centres account for 1-1.5% of electricity use and are responsible for 1% of greenhouse gas emissions but with the amount of compute power expected to double , one estimate suggests they could account for 14% of global emissions by 2040.

Data centres also use vast amounts of water for cooling equipment to ensure they run efficiently. Google's data centres increased their water consumption by 60% from 12.9 billion litres in 2019 to 21.1 billion litres in 2022, illustrating the huge amount of resources required to support growth in AI.

Australia has large scale capacity to generate green energy. With $12.6 billion allocated to the development of green energy and tech in the 2024–25 Federal Budget, the Australian Government can use the opportunity to create pathways for new 'green' data centres to be built which can further incentivise AI industry to co-locate and use this green energy to claim 'green' AI status.

Energy and water consumption, along with renewable energy policy, must be key considerations relating to digital infrastructure and AI implementation.

Science & Technology Australia Recommendation 9:
Ensure that renewable energy policy and net zero investments are a key part of developing digital infrastructure to support AI use in Australia as part of its net zero 2050 commitment.

Please do not hesitate to be in contact with us to discuss these ideas further or if any additional information is required.

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