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Response to the '*Safe and responsible AI in Australia'* *Discussion Paper,* Department of Industry, Science and Resources.

ANU School of Cybernetics
The Australian National University

Genevieve Bell, Maia Gould, Matthew Holt, Sharon Lopez, Andrew Meares and Gabrielle Vannithone

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The Australian National University acknowledges, celebrates and pays our respects to the Ngunnawal and Ngambri people of the Canberra region and to all First Nations Australians on whose traditional lands we meet and work, and whose cultures are among the oldest continuing cultures in human history.

Executive Summary

Here in Australia, and globally, we are facing many challenges from growing wealth inequality to climate change, diminished trust in social institutions and the role of new and emergent technologies in our daily lives, economies, and democracies, just to name a few. In contemplating how we might navigate these challenges, at the Australian National University (ANU) School of Cybernetics we have come to realise that we need to lift our focus from the technologies per se, to the systems of which they are always and already a part.[1]

This is nowhere truer than in Artificial Intelligence (AI) governance and regulation. In our school, **we work hard to help people understand that AI is not a technology per se, but rather a constellation of technologies, infrastructures and practices**. We believe that cybernetics – an approach to complex dynamic systems that concentrates on the relationships between the human, the technical and ecological, as well as the individual component pieces – is an important way to approach AI, and therefore is a way in for those working in AI governance and regulation to steer towards better outcomes. **We see significant value in an approach focused on how we build new capability and capacity in systems thinking, framed by cybernetics.**

Furthermore, any safe and responsible deployment of AI systems requires a range of government activities, from standards and regulations to policies and laws as well as convening conversations, steering groups and advisory bodies, and even, as evidenced by the White House's recent announcement, creating voluntary mechanisms for AI safety at scale.[2] **Supporting AI governance means acknowledging that AI governance itself is a system, and as such a critical role for those participating in that system is incorporating diversifying viewpoints, increasing connections, understanding feedback loops and aligning goals.** In this spirit, we believe that the safe and responsible deployment of AI systems requires an investment in capability and capacity building.

In this submission, we recount our experiences as one of the newest academic units at the ANU, where we have been developing and delivering the skills necessary to take AI systems safely, sustainably and responsibly to scale. Our key recommendations are summarised by our lessons learnt at the end of the report.

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[1] Bell, G. (2021). *After the pandemic: cybernetic systems and an approach to the future. Garran Oration, 2021.* https://cybernetics.anu.edu.au/news/2022/03/29/the-garran-oration/
[2] The White House (2023, July 21). *FACT SHEET: Biden-Harris Administration Secures Voluntary Commitments from Leading Artificial Intelligence Companies to Manage the Risks Posed by AI* [Press Release]. https://www.whitehouse.gov/briefing-room/statements-releases/2023/07/21/fact-sheet-biden-harris-administration-secures-voluntary-commitments-from-leading-artificial-intelligence-companies-to-manage-the-risks-posed-by-ai/

Introduction

The *Safe and responsible AI in Australia Discussion Paper* provides an overview of various governance mechanisms to manage risk and promote opportunities for AI in Australia. The overview is comprehensive and makes clear that input from individuals and organisations across a variety of industries and sectors is now needed to assess the value of additional investment in certain aspects of this governance landscape.

In our submission, based on our experiences, we will focus on the role that educational institutions can play in providing the support and capability building, that will be required across many areas in government, including voluntary principles and regulatory mechanisms.

At the ANU, our team has been experimenting with how to educate diverse groups of people about technology, its contexts and impacts on people, environments and cultural systems for the last 5 years. In this submission we draw on those experiences for insight into how we might imagine society-wide capability uplift in AI innovation and regulation.

Our school was established in January of 2021 with the aim of empowering society to navigate major societal transformations. Whilst our school is comparatively new, we have the advantage of being able to take advantage of the pioneering work of the Autonomy, Agency and Assurance Institute (3Ai) founded at the ANU in 2017 under the leadership of Distinguished Professor Genevieve Bell, AO FTSE FAHA, inside the then College of Engineering and Computer Science.[3] The 3Ai was established to help scale AI safely, sustainable and responsibly; and its centering on cyber-physical systems informed our current approach. Over the last 6 years, we have continued to iterate and evolve our thinking. Today we focus on the past, present and future of complex adaptive systems, with computing, often AI, at their core.

We have built our school on the principle that diversity, in all its forms, is critical to learning about AI, and in building capacity and capability around AI-systems. In the classroom and beyond, our students encounter faculty, staff and partners who come from varied backgrounds, genders, and life experiences, with extensive work experience in the public, private and community sectors. Our student population is consistently at least half female, as is our faculty, which gives us a very distinctive feel in the STEM sector. First Nations peoples and perspectives are also an important part of this diversity in our Australian, regional and national university

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[3] Bell, G. (2021). Touching the future. In A. Hay (Ed.), *Griffith Review 71: Remaking the balance* essay, Griffith University. pp. 251–263.

context, which brings cutting-edge and Country-centred AI systems approaches and stories to the transformational learning experiences we develop.[4] As is our commitment to First Nations students, faculty and staff. Amongst our graduates are the first 3 First Nations students to complete master's degrees in the 50 plus year history of our College. We also focus on diversity as we approach research collaborations and partnerships, where we actively seek out a wide range of engagements and contexts. As a whole, this diversity brings an important rich knowledge base and a diversity of approaches to our curriculum, our research outputs and to the ways we are helping to build new kinds of capability and capacity for the 21st century.[5]

Building capacity through education and learning

There have been significant investments in educational programming around AI across Australia, as well as broader kinds of AI-literacy activities. Importantly, this programming helps provide skills and capabilities in computer science, information science and data science. Beyond this discipline and field specific capability building, there is also a need to develop a broader set of AI-literacy and AI-systems skills.

For us, from our very first moment in the classroom, we have been deliberate in our approach to AI.[6] We taught our students that AI is NOT just a technology, and it is not singular. We have impressed upon our students – in all their learning moments – that AI is a system, and must be approached from that stance. This echoes the definition of AI in the *Discussion Paper*.[7]

In all of our educational activities, we teach our students that AI systems have backstories, pre-histories, values, models and a range of cultural assumptions that underpin their development, use and acceptance (or lack thereof) in society. We encourage our students to frame questions about AI in its cybernetic system contexts, including understanding AI's building blocks and the values embedded

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[4] Our students are our teachers, and we are all learning and connecting multiple knowledges and stories in multiple ways, including those generated with AI, such as the work Mikaela Jade does at Indigital and talks about in her 2022 ANU Commencement Speech (https://cybernetics.anu.edu.au/news/2022/02/22/Cybernetics-an-opportunity-for-connection-and-to-help-build-our-ai-enabled-future/). Many Indigenous perspectives on AI also flow into and out of our educational experience in multiple forms through residencies, partnerships and resources, such as: Abdilla, A., Kelleher, M., Shaw, R., Yunkaporta, T. (2017) Out of the Black Box: Indigenous protocols for AI, https://oldwaysnew.com/news/2021/10/27/unesco-paper-published-anat-stories.
[5] ANU School of Cybernetics, (2022), *Re/defining Leadership in the 21st century: the view from cybernetics.* A white paper developed by the ANU School of Cybernetics powered by The Menzies Foundation, Australian National University & Menzies Foundation, Canberra, Australia.
[6] Daniell, K.A. (2021) 'Perspectives on three years of prototyping an applied cybernetics education program' ISSS Conference (Online). https://vimeo.com/590385643/70e891fa05
[7] Department of Industry, Science and Resources (2023). Safe and responsible AI in Australia Discussion paper. June 2023, p5.

within them which shapes and constrains futures. We also encourage our students to be 'critical doers', and to that end they engage in the hands-on making of prototypes of cyber-physical systems. We need to understand systems from both the inside and the outside.[8]

In our degree-bearing classroom activities we have chosen to focus on cohort-based learning. We believe it helps build strong ties and community and offers an important alternative to personalised and individual learning journeys. In orienting to cohort-based learning, we also work hard to carefully scaffold the student journey to sustain student experience and cohort cohesion, including learning design, learning outcomes and pastoral care. This helps us ensure a safe cultural environment for our diverse student body (intellectual, social, gender and intergenerational diversity). We have also utilised team-teaching and pivoted wherever possible to peer-to-peer learning. We treat students as experts, and as teachers themselves – they need to bring their experiences to the class and assist other students.

Essential to all of our educational activities is an investment in diversity. In the classroom and beyond, our students encounter faculty and staff who come from varied backgrounds, with extensive experience in the public and private sectors in addition to higher education. On our teaching staff, we have, for example, anthropologists, archaeologists, computer scientists, designers, engineers, historians, and physicists. This range of experience and expertise brings a rich knowledge base and a diversity of approaches to our curriculum, coursework material and program delivery. This also speaks to the fact that we need all these skills to navigate our democratic systems and face the challenges of our emergent AI systems.

We have therefore also experimented with introducing our students to the widest possible set of perspectives, skills, and points of view and our choices of external speakers and participants, as well as reading and learning materials, have all been shaped by this. We work to ensure we are providing materials that are gender diverse, multinational and incorporate First Nation voices and perspectives. There is, furthermore, a concerted effort to present students with different genres and mediums of resources, spanning legislative and legal material, blogs, reports, and traditional and non-traditional research outputs.

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[8] This active making is a core part of the year-long Master's cohort experience and a regular aspect of shorter learning experiences the school runs. Public exhibitions of student work occur twice annually through the School of Cybernetics Demo Days. E.g. (Sem 1 2023: https://cecc.anu.edu.au/news/cybernetics-cohort-shines-demo-day and a virtual example through COVID which further developed student video-making skills: https://cybernetics.anu.edu.au/news/2021/11/17/Master-of-Applied-Cybernetics-Virtual-Demo-Day-2021-Cohort/)

Over the last 5 years, we have invested in building a diversity of educational and learning activities. We have considered different types of education programs, with different cohorts, and over different time horizons – spanning from a PhD program, to a year-long intensive master's program and a range of short courses, lasting from hours to days. Currently, we offer three quite different kinds of learning experiences (see Table 1) to build a range of AI system literacy and competence.

Table 1: Learning Experiences to build Capacity and Capability

	Aim	Participants	Capabilities
Master of Applied Cybernetics (MACYB)	A year-long, intensive, cohort-based, master's program aimed at creating the next generation of cybernetic practitioners.	Intersectional representation from diverse (age, ethnicity, education, orientation and gender).	The master's trains students to take into account people, technology and environments in approaching new technologies. Along with industry experts and the students themselves, the program develops cybernetic tools and methods to apply to complex systems, including AI systems. The master's instils collaborative effectiveness by building diverse teams with diverse perspectives. The master's is also a hands-on experience, with students designing and making both individual and joint cyber-physical systems. They also collaborate with industry on specific projects with a focus on governance and risk management through systems awareness.
PhD (Cybernetics)	A cohort-based PhD program aimed at creating the next generation of cybernetic expert practitioners with a strong focus on work experience.	Drawn from our master's graduate cohorts.	The HDR program provides in-depth opportunity for students to extend in novel ways the cybernetic knowledge and tools developed in the master's to create real impact on industry and government. Thesis work encompasses all fields – regulatory, legal, ethical, political, and cultural –to address emerging technologies from a cybernetic perspective. There is a continued focus on building tools and methods for supporting better futures for our democratic systems.

Micro-learning modules	A suite of external facing one-day learning experiences to enable and empower people with cybernetic tools and methodologies to tackle complex systems, new forms of leadership, emergent and disruptive technologies, and imagine better, alternative futures.	Selected cohorts of up to 40 people from community, business and Government (e.g., a team within an organisation, or senior executive group). Individual sign-up options are also available to bring diverse participants together.	The micro learning modules establish baseline systems literacy and cybernetic methodologies for decision makers and leaders experiencing AI development and deployment. The modules provide a space for wide-ranging, critical and open discussion on the impact of emerging technologies.

Building capacity through partnerships

The impact that an education program can have on broader communities is constrained by who is able to participate in the programs. We have therefore worked hard to ensure we are also creating other capability building pathways, beyond the formal classroom. One core way we have achieved this is through our engagements with external parties. We have actively sought research collaborations and partnerships with industry, government and the non-profit sector. We seek value alignment with our partners and identify where there is a good prospect of driving impact together. We exercise full transparency about our partners including who they are and what they have funded and the ways in which we have partnered.

We have a deliberate feedback loop on the research we are developing and how it might be useful for "next users". It is as much about pathways to capability building, as it is about commercialisation. We have created and tested new tools, built public facing experiences, experimented with new forms of learning and invested in new ways of doing research and creating research outputs. We have had a range of other partnerships focused on the practical application of cybernetic tools and methods to particular "challenge" spaces (see Table 2). All were designed to test and iterate the theoretical research of the school, with real world examples and challenges that were meaningful to a range of people building the future. The output of these partnerships is upskilling of people involved in the projects supporting their ability to apply a risk management and "by-design" approaches to technology development and deployment.

Table 2: Partnership for Capability Building, Acceleration and Exchange

Organisation	Collaboration	Output/s
National Library of Australia (2021-2022)	Scope technology transition in collections in the context of AI tools.	"Custodians and Midwives" report maps the history of technology in libraries, and offers a cybernetic framework for thinking about new technologies and a roadmap to responsible technology adoption.
Menzies Foundation (2020-)	Develop a body of work focused on leadership in the twenty-first century.	White paper articulating the tenants of Cybernetic Leadership. Now translating this theory into practical application in executive and post-graduate education, and global community development.
Paul Ramsay Foundation (2022-)	Examine how cybernetics could provide a new point of view on data and disadvantage.	Research exploring data flows in policy design, development, implementation and evaluation, particularly looking at personal data and cohorts traditionally considered to be "disadvantaged". Final report to be delivered September 2023.
Meta (2022)	Gift from the Responsible Metaverse fund.	Developing a cybernetic approach to designing the metaverse safely, responsibly and sustainably. Final report to be delivered August 2023.
Defence Science and Technology Group	Making sense of complex systems: practical principles and frameworks.	Capability building workshops and report, delivered 2023. Ongoing work proceeding with other areas of Defence.
Arts Organisations (Including the National Gallery of Australia and the Australasian Dance Collective)	Engaging with public audiences around technology and its role in our lives.	A number of projects delivered in 2022-2023 including the Untour experience and Lucie in the Sky performance.

Other industry/government partnerships have included the Commonwealth Bank and the Australian Government. Our partners have fostered training and development in their organisations by supporting their people to participate in the Master of Applied Cybernetics. They have also hosted student placements and industry projects. These programs enable an interface and feedback loop between the systems and those who are working within and impacted by them. This supports

capability uplift in a timely fashion, and helps organisations build on their cultures and perspectives in a way that supports a risk management approach.

We believe these models of industry/government-academia collaboration are ones that should be emulated. Too frequently industry-academia collaboration is talked about only in the context of commercialisation. We believe this is a missed opportunity. There is huge opportunity for better engagement between government, industry and academia in the areas of joint capability building and providing diverse pathways in and between these places for workers, learners and change-makers. Industry engagement is about more than commercialisation – commercialisation should be seen as a *subset* of national capability building, that also includes learning and community development among other things.

Our experience shows that engaging across the community and industry sectors can be led from within the system – we do not need to wait for government to initiate education programs or public education. Our businesses, academic institutions and community organisations need to connect with each other and foster creative and collaborative connections based on mutual growth and learning. Capability building depends on this.

Building capacity through storytelling

In addition to our educational and partnership activities, we have a commitment to building new forms of capacity, specifically around the socio-technical imagination of AI systems. For better or worse, AI systems also exist through the stories we have been told, in novels, television shows, and movies. The influence of science fiction in shaping the way we make sense of and respond to AI should not be underestimated.

In January 2023, we formed a group in our school explicitly to catalogue, analyse, and challenge stories of the future, while helping to advance new, more hopeful ones. Whilst it may seem strange to assert it in a government submission, we believe that the creation, curation, and sharing of compelling intuitive and analytical descriptions not only helps us to make sense of the world but also enables agency, impetus, evaluation, and validation to change the way we act in the present. Stories help us make connections between each other and our environments over time and place and may reveal or inspire patterns and emotions oriented to purpose. Stories shape dynamic systems by providing cohesion – to the system as it is and the system as it could be. The consideration, iteration, and circulation of hopeful stories about many futures lets us explore new ways of being and doing and is an organising function that informs the decisions and actions we make now as we collectively build the future. The stories we tell about AI systems matter – and we need to develop a rich set of practices around how we tell such stories and to whom.

In our efforts to help build capacity in this space, we have sought to create environments for different kinds of conversations. Building on similar programs in the United States, we established an experimental Residency program. Through the program, we sought to bring diverse voices into our classrooms, conversations and community – we hoped that this might engage the broader public and help deepen capability in more tacit ways. Our intent was to inspire different kinds of discussions and possibilities, and engage far more broadly than more traditional scholars and scholarship. Our first two cohorts of residents (see Table 3) are extraordinary and already helping re/shape the way we think and work.

Table 3: Residents 2022-2024

Cohort Year	Cybernetic Imagination Residents
2022 - 2023	Kate Crawford. A leading scholar of the social and political implications of artificial intelligence. Author of the award-winning book Atlas of AI, and a creative artist who co-produced Anatomy of an AI System and Excavating AI. Lynette Wallworth. Artist and filmmaker creating profoundly empathetic works while pushing the boundaries of emerging technologies. Her award-winning works include Evolution of Fearlessness, Coral, Tender, Collisions and Awavena. Mark Thomson. An author and photographer with several best-selling books, including Blokes & Sheds, Rare Trades, Makers, Breaker & Fixers and The Lost Tools of Henry Hoke.
2023 - 2024	Ambelin Kwaymullina. An Aboriginal academic and creative practitioner who comes from the Palyku people. Her works across a range of storytelling forms including speculative fiction novels, poetry, picture books, essays and visual art. Angie Abdilla A Palawa-Trawlwoolway woman. She is the founder and Director of Old Ways, New, and works with Indigenous knowledges to inform placemaking, strategic design and deep technologies. Caroline Pegram. An experienced science media and tech producer. She ventured into the world of Artificial Intelligence in 2017 as the Innovation & Strategy Director at Uncanny Valley and in 2020, her team won the very first global AI Song Contest. She is part of the inaugural SXSW Sydney team, focusing on all things innovation and technology.

Over a 12-month period, each Resident works closely with our students, staff, partners and the general public to craft cybernetic stories, artefacts (physical and digital), collaborations and learning experiences. We hope that this Residency program will prove to be a distinctive way of creating conversation about AI systems and their consequences, through more human-scale interventions, and as a result, also build new kinds of capability and capacity in the broader community.

Lessons learnt

In this submission, we have recounted some of our experiences as a newly formed academic unit that is committed to building capability and capacity around AI systems in Australia, and beyond.

Our key insights are:

- A foundational concept in capability building is the recognition that AI is a not a singular technology, but is a constellation of technologies, people and practices. Put another way, **AI (including AI governance) is a complex, dynamic system** and we need to frame our approach to capacity and capability building for the future with that in mind. We need translation and integrators not just traditional AI experts. And we need systems thinkers across all aspects of AI governance.

- **Basic literacy about AI is essential, and it is more than learning to code.** As our educational programs have shown, education in an environment of rapidly changing technology must critically engage with that technology as a system to give a basic understanding of how it was made, where it is used, and where it might be going. In order to effectively regulate a system, those designing regulation need to have as much diversity (and knowledge) in their ranks as exists in the system they are regulating (whether that is AI or ADM or any other technology). **This learning should happen together with those who are operating in the areas being regulated.**

- **Diverse teams need to be encouraged to create, test and adapt these tools for their own needs and values.** A risk management approach requires a constant conversation with multiple perspectives from those building technology all the way through to those it peripherally touches. Many of the risks and challenges of AI tools go back to who has created them, as well as the underlying social and environmental impacts of tool development and use. AI systems will have inbuilt structures and biases, based on the choices made in the development of its building blocks (e.g., in data sets, sensors, models, networks, infrastructures and how they are constructed and curated over time). In our Australian context, this includes the need to support and enable proactive programs for First Nations inclusion and leadership.[9]

As a school, we are committed to building new capability and capacity around AI systems for Australia and beyond. We have been using cybernetics – with its strong focus on both the components of a system (the human, technical and ecological)

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[9] An excellent example of this is **Indigital's Minecraft Education Challenge** focussing on the development of Indigenous cultural stories through AR/VR story-telling: https://www.indigital.net.au/educators.

and the dynamic relationships between them (connections and feedback) – to orient us towards better decision-making in complex AI-systems. We build innovative and transformational educational experiences that engage critically and openly with AI systems, as both a subject of inquiry and a tool for building new opportunities. We build partnerships and collaborations that allow us to co-design active engagement with new and existing AI systems. And we invest in creating new stories about the future with AI. Put another way, we see our mission as capacity building: through teaching, partnerships, collaborations, and even through storytelling.

Appendix: An AI-Ready Society Paper

Paper by Distinguished Professor Genevieve Bell, AO FTSE,
(with additional input from 3A Institute, The Australian National University)

Responding to action item:

Action 4: Professor Bell to prepare a paper for the first meeting of the Council in 2020 on possible focus areas for the Council on AI, including what Australia can do to ensure an AI-ready society and international developments, in consultation with Department of Industry, Innovation and Science.

Paper by Distinguished Professor Genevieve Bell, AO FTSE,
(with additional input from 3A Institute, The Australian National University)

AN AI-READY SOCIETY: 2020 Blueprint

Genevieve Bell, The Australian National University, March 2020
(with additional input from 3A Institute, The Australian National University)

> *Artificial Intelligence is a general purpose technology with the potential to be applied across almost every industry within the Australian and global economy* (Department of Industry, Innovation and Science and CSIRO Data61 AI Roadmap, 2019)

In 2019, the Australian Government in collaboration with CSIRO's Data61 published the Artificial Intelligence (AI) Roadmap, identifying strategies to help develop a national AI capability. The Roadmap spans a range of issues associated with AI, including ethics and trust in AI systems; its focus is primarily on driving productivity and research innovation in AI: using AI to solve problems at home, and export these solutions to the world. The roadmap focuses on natural resources and environment, cities and towns, and health, ageing and disability as three areas of specialisation for Australian researchers and industry.

Around the world, governments are trying to plan for how AI might facilitate new products and services and innovations, as well as how society both influences and is influenced by AI. The Australian government has already made progress in tackling next steps for AI at a national level, with recommendations and thought leadership provided through: the Artificial Intelligence Roadmap; the Australian Council of Learned Academies report on *The Effective and Ethical Development of AI* (2019), and the Australian Human Rights Commission's *Human Rights and Technology Discussion Paper.* All of these actions help shape our future with AI – and still leave room for more.

Because we have set the foundation for AI research funding in Australia, we now have an opportunity to take a step back and look more broadly. There are a number of places from which we could draw inspiration and learnings. In the commercial sector, we see companies starting to talk about being AI-ready, or AI-first – in these instances, they are seeking to ensure that their companies can take advantage of the emergent technical systems. Think of this as being akin to the moves in the 2010s that saw various large companies go "cloud-first" – notably Microsoft who have pivoted their entire business model accordingly. There have been broader conversations in France, with the French government launching its *AI for Humanity* report, and the Canadian government contemplating how it might take a broader perspective, and work towards a different kind of AI agenda, beyond university research funding models.

What might it look like for us to contemplate something bigger too? After all, Australia is a small country with finite resources. However, we also have big ambitions to continue to build a fair, equitable and prosperous future for all. AI can clearly play a large part in that. Ultimately, this not a conversation about funding or budgets per se, it is a conversation about a point of view, and a possible approach.

What might it look like if we tackled AI from a whole-of-government and whole-of-society vantage? And what might it look like if we gave ourselves a five year window in which to turn Australia into an AI-ready society? That is, a society ready to take the fullest advantage – economically, socially, politically – of the benefits that AI could and will confer.

A whole-of-society, whole of government approach

To foster an AI-ready society, we must avoid the temptation to focus on AI first and only as a limited technical system. We need to think about AI in all its broader context. The World Economic Forum predicts that AI technologies will be at the heart of the Fourth Industrial Revolution. They are also clear that we will all need to do more than just build the technology. Instead, we should turn our minds to society at the outset.

So what would it look like to take a whole-of-society, whole-of-government approach to AI? Of course, different groups of people across Australia imagine AI in different ways; and have different needs, constraints, aspirations and use cases. This needs to be factored into all our preparations. Clearly such an approach is not without its complexity.

However, looking across the breadth of places where AI can and will have impact, we believe there are 6 focus areas that together, ensure we maximise AI to its fullest potential. Thinking about these focus areas holistically, as areas with interdependencies and feedback loops that shape the future of AI, helps us to prepare for and navigate challenges associated with AI while realising the benefits.

These are:
- A sustainable approach
- A balanced regulatory framework
- A vibrant creative sector
- A learning focus
- An engaged society
- A healthy economy

Under each focus area, this paper provides a glimpse of work going on in Australia and overseas, and areas of interest that could shape a richer blueprint for Australia realising the benefits of an AI ready society (see Appendix A for a deep dive on where the Council could engage).

1. **A SUSTAINABLE APPROACH.**
   AI technologies have historically been very energy intensive, in terms of electrical requirements, component pieces and even supply chains. How do we help develop a sustainable approach to an AI-driven future for Australia?

AI technologies will be part of reducing carbon emissions and promoting sustainable ecosystems around the world. AI systems relying on significant computing power and large volumes of data, however, are by their nature energy intensive. Large language models, for example, trained on billions of parameters, require multiple GPUs and significant energy to scale.[1] There are a number of ways in which AI technologies can support a more sustainable environment, including:

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[1] NVIDIA's MegatronLM, a model with 8.3 billion parameters, took 512 V100 GPUs running continuously for 9.2 days to train. One estimate places the amount of energy used to train this model at over 3x the annual energy consumption of the average American. https://heartbeat.fritz.ai/deep-learning-has-a-size-problem-ea601304cd8
In January 2020, Microsoft announced the release of its Turing NLP model, trained on 17 billion parameters.

As industries undertaking research in AI:
- [Continued investment](#) in research exploring making [deep learning models smaller, faster and more efficient](#).
- Emphasising areas of research within which AI technologies can help to reduce carbon emissions: for example, in remote sensing of emissions; reducing/optimising transport activity; improving climate predictions.[2]

As organisations using AI technologies:
- Committing to being carbon neutral: Google has been carbon neutral since 2007. It matches 100% of the electricity consumption of its operations with purchases of renewable energy. It buys carbon offsets for emissions not eliminated. It diverts 75% of its waste from landfill.[3]
- Committing to being carbon negative: Microsoft has committed to being carbon negative by 2030, and to have removed all its historical carbon emissions by 2050.[4]
- Committing to renewable energy: Australian company Atlassian has committed to running operations on 100 percent renewable energy by 2025.

As an industry, producing products to help other companies track and reduce carbon emissions:
- Salesforce, in 2019, launched Sustainability Cloud, software helping businesses track and analyse environmental data. Salesforce's market size and reach could see initiatives like this foster standardised ways of energy reporting. It grew out of its own efforts to track its carbon emissions, and has pledged to be 100 percent renewable energy use by 2022. [5]

2. **A BALANCED REGULATORY FRAMEWORK.**
   An AI-ready society is more than ethics principles. How do we ensure we have a suite of laws, regulations, standards and policies for AI to encourage a healthy economic outlook, with a focus on innovation but also safety, sustainability and responsibility? Do we also need to understand and make conscious choices about how we intersect and harmonise with global regulatory frameworks?

A number of regulatory trends are beginning to transition focus from individual consumer choice, control and consent, to sector-wide practices that would shape more responsible, sustainable systems. These approaches seek to:

Reduce monopolistic effects surrounding AI systems:
- Growing interest in 'data trusts' - trusted data sharing arrangements with some legal structure, sustainable funding and rights and duties over stewarded data – in the UK and internationally[6]

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[2] In 2019, several AI leaders, including Demis Hassabis, Andrew Y. Ng and Anna Waldman-Brown co-authored a paper identifying key areas within which ML may help to reduce emissions: https://arxiv.org/pdf/1906.05433.pdf

[3] https://storage.googleapis.com/gweb-sustainability.appspot.com/pdf/Google_2018-Environmental-Report.pdf

[4] https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/

[5] https://www.theverge.com/2019/9/18/20871301/tech-salesforce-carbon-accounting-tool-sustainability-cloud

[6] https://www.lexology.com/library/detail.aspx?g=28b042fa-1027-4c6c-b1a8-70250691c226

Impose clearer duties / responsibilities on providers of AI systems:
- Ideas of information fiduciaries, popularised in Jack M Balkin's 2017 paper exploring legal issues surrounding AI systems, are beginning to shape reform proposals (linking information management responsibilities to fiduciary duties, as held by company directors or licensed professionals)[7]
- Rewriting of data protection laws to equip individuals with more control over their personal data (e.g. the General Data Protection Regulation in the EU)

Develop technical standards supporting safer AI systems:
- Increasing investment in sector/use specific technical standards to support safer, more transparent AI systems (ex: in Australia, technical standards underpinning the Consumer Data Right [necessitate certain technical forms of personal data exchange](#))
- Learning from established engineering disciplines about the emergence of standards, rules, codes to guide the use of new, experimental materials.

3. **A VIBRANT CREATIVE SECTOR.**
    The 4th Industrial Revolution is often talked about in terms of jobs and productivity; it has broader potential. How we take advantage of AI technologies in entertainment, the arts, sport and the broader creative sector? How can we help develop different stories about why AI is good for Australian society?

Because AI is often talked about in terms of job growth, the power of AI technologies within the arts can be overlooked. AI technologies are helping to:

Provide people with insight into other lives and experiences:
- Australian artist Lynette Walworth uses immersive technologies to connect people with distant places and other experiences. Her film, *Collisions,* a VR journey into the land of indigenous elder Nyarri Morgan and the Martu tribe in the remote Western Australian desert, was the winner of the 2017 Emmy Award for Outstanding New Approaches to Documentary.[8]

Transform a storytelling experience:
- In 2016, the Royal Shakespeare Company partnered with Intel and the Imaginarium Studio to use motion capture to render a live, interactive CGI Ariel for their production of *The Tempest;* with 200,000 files running simultaneously to visualise the avatar, and 50 million times the memory of the computer used for the moon landing, this version was not only watched live but broadcast in over 500 cinemas around the world.[9]

Create new business models and markets:
- *Unreal Engine,* created by Epic Games and currently the world's most advanced 3D game creation engine, began as a video game engine. Since then, Unreal Engine has become an engine used to

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[7] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2890965

[8] http://www.collisionsvr.com/

[9] https://www.rsc.org.uk/news/archive/what-makes-arts-and-technology-partnerships-work

power animations in architecture, film and television, automotive manufacturing and training and simulation.[10]
- Using data from wearable sensors, ground statistics and historical match information, the AFL has transformed analytics around football. A range of secondary uses of this information, beyond individual player performance to ground management, exercise analytics and audience interaction, are being developed.[11]

4. A LEARNING FOCUS.
Succeeding in the 4th Industrial Revolution requires the acquisition of new skills in many different sectors. How do we encourage everyone to gain essential AI skills, though traditional and non-traditional education mechanisms? And how do we ensure that we are making room for more voices and experiences?

It's been recognised that for AI to benefit diverse communities, the voices contributing to the design, implementation and maintenance of AI systems must be diverse. A number of non-traditional and traditional approaches to education are trying to expand the faces of AI.

Engaging children in primary school and high school in AI technologies:
— In Australia, Dr. Linda McIver has founded the Australian Data Science Education Institute (ADSEI) to provide tertiary and secondary students with data science and literary skills. ADSEI equips teachers in STEM classes with materials to teach data science in their classrooms, using real world projects.[12]

Amplifying historically marginalised voices in technology:
— Indigitek is a community of Aboriginal and Torres Strait Islander people in Australia continuing the proud tradition of Indigenous innovation and entrepreneurship in STEM. Supported by organisations including Atlassian, Microsoft and Slack, Indigitek primarily supports industry networking events for Indigenous people working in tech, job placements with technology sector companies and tech sector engagement.[13]

Experimenting with alternative approaches to university education:
— In the United States, the Massachusetts Institute of Technology and Stanford University are both pioneering new programs to help incorporate a focus on AI into a broad range of their educational offerings. Other universities are developing new educational formats and offerings to bring skills to the broader community. Several large corporations are also working on skills-based learning programs for their employees to ensure continuous learning, including here in Australia with companies like Fortescue Metals Group.
— At the Australian National University, the design of the 3A Institute Master's program and institutional approach has been carefully designed to purposefully expand skill sets and contributions to computer science. In marketing the program, 3Ai has attempted to challenge stereotypes in traditional computer science education. It uses humour and colour in program

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[10] https://www.unrealengine.com/en-US/
[11] https://www.vice.com/en_au/article/mg83jy/analytics-in-the-afl-the-most-data-rich-sport-on-earth
[12] https://adsei.org/
[13] https://www.indigitek.org.au/

material; retro-futurist imagery, and a curriculum combining software and hardware skills development with critical theory. As a result, its first cohort was over 50% female, ranged in age from 25 – 60, and diverse in ethnicity, disability and sexual orientation.

5. **AN ENGAGED SOCIETY.**
   One important measure of a society its level of engagement with civic and civil institutions; a healthy society is frequently characterised by a strong sense of citizenship, trust and participation in community, state and national activities. There is a great deal of concern in Australia about the scale and impact of current advanced technologies. How do we ensure that the adoption of AI technologies supports Australian cultural and social values? How do we ensure civic and civil engagement whilst minimising harm, polarisation and disconnections?

Promoting and fostering uses of AI technologies that encourage a sense of civic and civil engagement is increasingly being recognised as important to healthy societies. Sometimes, this can be leveraging existing platform infrastructure to engage communities. Sometimes it means building something new. What this looks like varies from country to country.

Harnessing the power of online platforms to engage communities in civic matters:
- In the UK, the Parliamentary Digital Service uses a range of tools and techniques to engage people in the proceedings and history of how government works. Legislation.gov.uk was the first machine readable, linked form of legislation as data in the world, facilitating near real time updates to amended legislation and debates before Parliament. They maintain an active social media presence and provide citizens with educational material on government.[14]

Engaging citizens in the design of AI services:
- The use of AI to provide services for people is increasingly being met with concern and distrust. In some countries, efforts to counter this have involved inviting people to collaborate in the design of a service, making it open to inspection and review. In the United States, Allegheny County in Pennsylvania invested in a service using analytics to detect children at risk of abuse and neglect. It is county-owned, was designed in conjunction with townhall meetings and community groups, and able to be inspected.[15]

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[14] https://pds.blog.parliament.uk/
[15] https://www.nytimes.com/2018/01/02/magazine/can-an-algorithm-tell-when-kids-are-in-danger.html

6. **A HEALTHY ECONOMY.**
   The 4th Industrial Revolution is likely to have profound impact on the economy. How do we ensure that we prioritise appropriate economic growth, including for small and medium business, through the adoption of AI technologies? How do we ensure a focus on managing the impact of jobs, skills and market sectors in a way that balances the short and long term?

Each of the preceding sections are essential to building a healthy economy using and innovating with AI technologies. Here, a healthy economy means:

- Driving *sustainable* practices, and harnessing the power of technologies to reduce climate emissions. The world's largest asset management firm, BlackRock, declared in January 2020 that climate change would fundamentally transform the nature of finance, and framed reducing carbon emissions as an economic imperative.[16]

- Ensuring *regulations* support, not hinder, small to medium businesses emerging in AI. One of the challenges facing regulators shaping more responsible, safe uses of AI is ensuring regulatory burdens do not effectively price smaller competitors out of the market. Sliding scales of regulatory requirements and penalties can help to reduce impacts for SMEs.

- Encouraging *creativity* and innovation: In Australia, the Bureau of Communication and Arts Research (BCAR) released analysis in 2016-17 showing cultural and creative activity contributed $111.7 billion to the economy.[17] Through partnerships between the arts and new technologies, new business models and markets emerge.

- Creating future *contributors* to AI, and innovating in education: a skills shortage has already been identified in the Australian technology industry. As workforces transition to increasingly connected, knowledge-based work, ensuring we have the capacity to engage with and build with new technologies is essential.
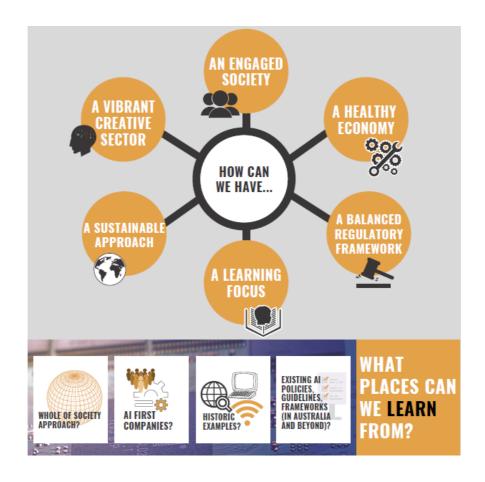
Conclusions and next steps

For Australia to realise the benefits of AI, more is required than simply investment in technological improvements. As a society, an economy, and a workforce, Australia needs to be able to use, engage with and support the uptake of AI technologies. Without an AI-ready society, Australia risks losing out on benefits from AI at scale. It requires a whole-of-government, whole-of-society focus to ensure we succeed in the coming decades.

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[16] https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter?cid=ppc:CEOLetter:PMS:US:NA&gclid=EAIaIQobChMIktrLx5eL5wIVip6zCh1nBweOEAAYASAAEgJPFvD_BwE&gclsrc=aw.ds

[17] https://www.communications.gov.au/departmental-news/economic-value-cultural-and-creative-activity

The diagram shows a central circle labeled "HOW CAN WE HAVE..." surrounded by six orange circles:
- AN ENGAGED SOCIETY
- A HEALTHY ECONOMY
- A BALANCED REGULATORY FRAMEWORK
- A LEARNING FOCUS
- A SUSTAINABLE APPROACH
- A VIBRANT CREATIVE SECTOR

WHAT PLACES CAN WE LEARN FROM?

- WHOLE OF SOCIETY APPROACH?
- AI FIRST COMPANIES?
- HISTORIC EXAMPLES?
- EXISTING AI POLICIES, GUIDELINES, FRAMEWORKS (IN AUSTRALIA AND BEYOND)?

APPENDIX A: ENGAGING WITH THE FRAMEWORK

The Council would clearly have a role in supporting a whole-of-government, whole-of society approach to AI. Listed below are a series of considerations the Council could help explicate.

Focus Area	Additional Considerations
A Sustainable Approach, including: 1. **Industries undertaking research in AI and high performance/sustainable computing** 2. **Organisations using AI technologies and how they have approached sustainability** 3. **Organisations and sectors developing products to help other businesses track and minimise carbon footprint**	• Where industries and organisations are taking action to reduce energy usage and support research and product design to mitigate climate change, what might support those activities to scale? • How can commitments to carbon neutrality be encouraged across the Australian ICT industry? • What is needed (standards, incentives, trial projects) to help organisations use AI to track and reduce emissions? • Pace of technology change – communications/incentives need to be managed so as to avoid technology obsolescence or decay. Could technology preparedness be a focus for communication? How can transitions to lower carbon solutions be managed so as to keep pace with rapid technological change at the same time?
A balanced regulatory framework	• How can regulation support and foster innovation? • How can we amplify the promotion of technical standardisation and curation where useful? • Ensuring that regulations proposed do not inadvertently restrict useful/innovative practices emerging in Australia • Recognising Australia's desire to boost IP exports, ensuring that the regulations we adopt facilitate Australian businesses trading both in Australia and overseas (where regulatory inconsistencies may necessitate region-specific variations to technologies)
A vibrant creative sector	• How can Australia best scale creative technology and arts partnerships? • What creative uses of technology does the Council see emerging in the course of their work? • What role might the intersection of arts and technology play in education and citizen engagement?
A learning focus	• What innovative education approaches has the Council seen in the course of their work? How could these be amplified? • How can progress in engaging broader communities in STEM and AI be measured beyond participation in the classroom?
An engaged society	• What actions should Australia take to foster an engaged society? • Issues of diminished trust in AI have ripple effects for providers and users of AI, influencing regulatory interventions, investment and uptake – what are the consequences of an unengaged society?
A healthy economy	• How can we rethink a healthy economy in light of the preceding 5 areas to address for an AI ready society? • How helpful is the "AI race" narrative to Australians? How could this narrative be reframed?