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GROWING GLOBALLY COMPETITIVE INDUSTRIES

Powered by Australia's innovation technology

A White Paper by the Australian Information Industry Association

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Disclaimer
This white paper does not necessarily reflect the views and recommendations of individual members of the White Paper Steering Committee.

Introduction

Growing globally competitive industries - *Powered by Australia's innovative technology*

The past decade has seen an acceleration in changes to the world's economic, political, environmental and social frameworks. Global economies are becoming more competitive more rapidly. Australia has both a significant opportunity to benefit as it has a challenge to keep pace and compete. Technology is driving the growth globally; it is both solving and creating problems. Investment in innovation is now a given and this paper identifies areas of our economy where we must focus to ensure we keep pace and ensure future national economic success.

The transformative opportunity that technology provides is now undeniable. It is clear that those countries, industries, governments and enterprises that successfully drive technology innovation at the core of their strategies are the ones that will maximise opportunity from the shifts occurring in our world. As Australia's global trading partners are investing heavily in technology, we must recognise now that our country runs the real risk of becoming uncompetitive. This would ultimately result in Australians being consumers rather than producers of products and services to global markets which in turn can threaten the very core of our economy and its primary industries.

Australia's economic success is reliant on being globally competitive across our core trade-exposed industries. Australia does have the capability to maintain its world leadership across our key industries with a strategic approach to investment in technology. This White Paper outlines our nation's key policy challenges and opportunities as it presents the path forward for Australia in the context of critical industries and core technology capabilities that must be supported.

There have been positive steps forward already taken by government to support this critical agenda.

Twelve months ago, the Australian Information Industry Association (**AIIA**) released its white paper, *Building Australia's Digital Future in a Post-COVID World*[1]. We were only months into a global pandemic when the AIIA saw the need for new thinking in the way governments respond to the societal and economic challenges that were and are still facing in Australia. We remain proud of this work and the ongoing policy influence it has achieved and the results it has produced. Among the recommendations, it is pleasing that the government has adopted:

- Recognising that digitising the economy is critical to our national success;
- Increasing the R&D tax incentive and introducing a patent box;
- Appointing a Minister for the Digital Economy;
- Funding a National Freight Hub;
- Investment in digital skills; and
- Investing in cyber security resilience.

We have also seen, in recent state and federal budgets, significant investments in the digital opportunity, with the Prime Minister stating as a major economic and policy goal for Australia to be a leading digital economy by 2030, which has been backed up with significant funding, including the $1.2 billion Digital Economy Strategy. Likewise, the NSW Government maintains its leadership position in digital government and service delivery with its $2 billion Digital Restart Fund to ensure that NSW is well placed to succeed as a global economic hub for the next generation.

However, there is much more to be done to achieve this objective. The AIIA has, in this white paper, focused on what we believe to be the key industry 'verticals' in which success and innovation is essential for Australia to remain globally competitive.

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[1] https://aiia.com.au/wp-content/uploads/2021/03/Building-Australias-Digital-Future-in-a-Post-COVID-World-AIIA-Whitepaper-2020-1.pdf

These industry verticals are health, manufacturing, agriculture, and digital government.

The AIIA has also dedicated chapters to cross-industry 'horizontals': AI, Quantum, digital engineering, industry incentives and cyber security.

We are calling on Australian governments to continue to take a leadership position on technology strategy for Australia. However, to ensure that this leadership position is realised, critical Australian industries must receive strategic government support and focus to evolve into their digital futures to ensure Australia can continue to compete globally.

We call on the Federal Government to take the lead in accelerating the digitisation of Australian industry through the creation of industry hubs and incentives; to play a leading role in coordinating Industry, Government and Technology to initiate a new era of technology innovation in Australia; to ensure standards and interoperability requirements are in place to maximise the opportunity that technology presents to Australia; and to ensure the new generation of Australian technology innovators are supported to thrive, not just survive, through a strong shift from a research driven agenda to one of commercialisation.

It is important to note that an innovation technology driven agenda that places Australia as a global leader across our priority industries is only reliant on our ability to invent and commercialise. It is not dependent on our size or our location. This mindset can change the way we and others view us.

During this time of significant transformation, whether it be geo-politically, economically, technologically or socially, we must continue to focus on building a resilient, flexible and future-focussed Australia that is able to maximise the opportunity that technological advancement is providing.

By continuing to take a lead in prioritising critical industries and investing in critical technologies, Australia has an opportunity to secure its place, and its industries, in the global arena.

Much like we saw Australia take up the digital mantle in 2020, the AIIA is asking that Australian governments and industry strengthen their resolve to drive a true digital future for all Australia and its critical industries.

Note

What the AIIA has not specifically focused on with its own discrete chapter, but have instead referenced across the paper as a core capability or barrier, is the skills agenda.

In the 2020 AIIA White Paper, there was a large focus on the importance of digital skills required across the economy and this remains an outstanding area for government policy focus and execution.

Whilst the federal government demonstrated it could be agile and responsive in 2020 during the initial stage of the pandemic response, 2021 has shown that fundamental public sector digital skills and leadership can be lacking, an obvious reference point being the vaccination roll out and lack of a common digital platform.

Other urgent policy reforms in the skills portfolio are moving, in places, at a glacial pace, with traditional approaches and vested interests in the sector slowing down progress, with the microcredential skills acquisition and accreditation area one example.

The AIIA has released, in 2021, two other significant contributions to the public policy debate in Australia covering government procurement as it relates to a domestic capability policy framework for digital technologies as well as recommendations for Australia to increase its adoption of virtual care in the health sector.

These papers can be accessed via these links:

- [AIIA Domestic Capability: Framework Policy](#)

- [Beyond Telehealth: Towards Virtual Care White Paper](#)

Steering Committee

The AIIA would like to thank the following for their time, effort, expertise and dedication in assisting with the drafting of this white paper; however content and recommendations are those of the AIIA and do not necessarily represent the views of member companies.

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- **Ron Gauci**, AIIA
- **Ramah Sakul**, SAP
- **Peter Anstee**, CyberCX
- **Ashok Mysore**, Infosys
- **Kristina Kipper**, KPMG
- **Anna Phan**, IBM
- **John Mackenney**, Adobe
- **Ben Peterson**, IBM
- **Michelle Frazer**, DB Results
- **James Jackson**, Accenture
- **Simon Bush**, AIIA

We would also like to thank for their contributions the following people who have provided input, advice or guidance through the course of the drafting:

- **Dr Tim Mumford** - Infrastructure Australia
- **Marie Truelove** - CSIRO Data-61
- **Dr. Ian Oppermann** - Chief Data Scientist, NSW
- **Adam Beck** - Smart Cities Council, Australia & New Zealand
- **Dr Graeme Kernich** - Frontier SI
- **Teresa Scott** - Australasian Procurement and Construction Council
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- **Jordan Griffiths**, Accenture

About the AIIA

The Australian Information Industry Association (AIIA) is Australia's peak representative body and advocacy group for organisations in the digital ecosystem.

Since 1978, the AIIA has pursued activities to stimulate and grow the digital ecosystem, to create a favourable business environment for members and to contribute to Australia's economic prosperity.

We do this by delivering outstanding member value by providing a strong voice of influence; building a sense of community through events and education; enabling a network for collaboration and inspiration; and developing compelling content and relevant and interesting information.

For more information, please contact Simon Bush, AIIA GM of Policy and Advocacy, via email simon@aiia.com.au.

Summary of Recommendations

Agriculture

Recommendation that:

- AgTech be recognised as a standalone industry which is both supportive and complementary to Agriculture. It is recommended that Government and Industry form a new standalone oversight body and governance framework specifically focused on Agtech as a sector, as well as facilitation of an increase in co-ordination of AgTech development initiatives across departments, such as the Department for Agriculture and the Department for Industry, Science, Energy and Resources.

- The Federal Department of Agriculture establishes a standalone AgTech Branch.

- The Federal Government create a Robotics Commercialisation and Acceleration fund under the framework of the AIIA proposed National AI Commercialisation Hub as recommended in the AI chapter, with a distinct AgTech allocation under the Hub.

- The Federal Government provide funding to conduct research and business case establishment into establishment of a pilot AgTech Regional Innovation Centre to bring the various AgTech stakeholders together, using incubator style engagements, connecting RDC's, Start-ups with research, Industry, and investors to improve commercial outcomes.

- The Department of Agriculture work with Industry and Standards Australia to ensure standardisation in areas such as sensors and hardware facilitating interoperability and easy adoption.

- The Federal Government establish a dedicated AgTech funding stream of $10 million within the Department of Industry's 'Entrepreneurs' Program.

- There be a review of the $1.2 bn a year in levy funds which is currently distributed between the 15 Australian Rural Research and Development Corporations (RDCs) for research to ensure alignment to development of AgTech innovation and commercialisation.

Health

Recommendation that:

- Government identify, promote and prioritise new digital delivery models that are secure, flexible and scalable to meet the burgeoning needs of Australia's health care systems.

- Government consult health and technology industry providers, funders, industry associations and consumer groups appropriate members of the health industry and the ICT industry for input into frameworks, policies and funding mechanisms.

- Government work with industry to ensure standards alignment and interoperability for digital health, including cloud-based infrastructure and services to drive accessibility and Fast Healthcare Interoperability Resources (FHIR) for interoperability, and make these publicly available in a central repository or catalogue.

- National Cabinet (Federal and State Governments) agree that we need a more integrated, modern and seamless digital health capability for Australia.

- The Federal Government works with state governments and industry to develop a national capability or platform designed to provide interoperability and integration. This will promote a federated platform accessible to Industry which ensures all digital health solutions have a base level of Cyber security, Interoperability, adherence

to protocols, Data Privacy, Quality, Data Trust, Accessibility and Standards:

- ° Identify, promote and make available digital low-code platforms which provide rapid delivery of digital solutions capability to industry and government to fast-track digital innovation and implementation.

- ° The federal government to build a Digital Development Assistant which sits above these technology platforms and ensures consistent application of standards, cyber security protocols, interdependency principles, patient centric design principles and rapid technology delivery approaches.

- ° That government provide appropriate support to industry to develop a commercialisation framework that encourages the building of a library of reusable components and innovative emerging technology tools such as Artificial Intelligence, Robotic Process Automation, Internet of Things.

- Governments to develop and implement new funding models and processes that encourage collaboration, development of innovative technology solutions, and enhanced health outcomes and ensure that agencies where appropriate can move from cap ex to op ex delivery models.

- Create specific digital technology funding programs, to encourage organisations to undertake digitisation projects, with accelerated approval processes.

- Successful pilot digital innovation projects should be fast-tracked onto procurement panels for implementation and extensively promoted throughout the industry.

- Re-engineer My Health Record to become a true digital health record with a database of discrete data, and software algorithms to analyse the data, identify health risks and provide alerts to prompt immediate action.

- For Governments to introduce legislation to provide clarity on the capture and recording of comprehensive quality and accurate health records and associated data being owned by the patient. The purpose of this then is to provide centralisation, privacy and trust relating to patient information.

- Mandated key patient information flow from health organisations and health software suppliers to re-engineered My Health Record within five years (2025).

- The enactment of anti-information blockage legislation, with significant loss of funding or penalties for organisations and suppliers who do not comply with the mandatory sharing within the specified timeframe.

- Easy and secure access to My Health Record data via a direct portal (not through MyGov) which is accessible on any device.

Digital Government

Recommendation that:

- Following the lead of the commercial sector, governments should invest in citizen journey management technologies.

- Government agencies establish an AI Process Transformation agenda that delivers Government process optimisation that not only achieves budget savings but allows adoption and integration of modern technologies. This agenda must be supported by full engagement of the appropriate stakeholders and enables the identification of suitable candidate business processes for piloting, both internal and external.

- Government agencies will need to identify and empower AI Champions to support and drive this agenda - at the senior business agency level.

- That government should accelerate the work being undertaken around digital skill mapping, and the work of the APSC on digital and career pathways, to ensure that government policy objectives are met. The AIIA and its members would be willing to work on industry matched skills and training accreditation, especially on short and micro-courses needed to rapid up and cross-skilling (e.g. cyber).

- Appoint a cabinet minister focussed on citizen centric delivery for those jurisdictions that do not have this in place.

- Review government funding processes for Digital and IT investments for those jurisdictions that are not leveraging centralised funding mechanisms to drive integrated digital citizen experience outcomes.

- Australian governments have underinvested in digital capability and they need to allocate funding in Citizen focused Digital Restart Funds with appropriate timelines and funding criteria (as digital is now the preferred channel for citizens 56%).

- Governments adopt cloud first policies with clear KPIs.

Manufacturing

Recommendation that:

- That Industry 5.0, which is currently omitted from the Federal Government's Modern Manufacturing Strategy and roadmaps, be incorporated as part of an update to reflect this new evolution of person and machine collaboration.

- Government and industry to collaborate and invest in a Modern Manufacturing Technologies Hub. The Hub incorporates academic, industry and government and focuses on the key technology enablers and capability into the Australian manufacturing SME ecosystem. Ideally this would be industry led and have a commercialisation focus.

- That the proposed national hub bring together and provide needed scale to many smaller projects including Victoria's Swinburne University Advanced Manufacturing Industry 4.0 Hub and South Australia's Flinders University Line Zero.

Engineering (Digital Twins)

Recommendation that:

- The Federal Government establish an Office of National Digital Twin (eg. UK Centre for Digital Built Britain, Digital Twin Victoria) to drive Digital Twin capability development and application on existing infrastructure, urban growth planning and spatial agencies (as an example) can champion Digital Twin advancement and be a starting point in creating a Digital Twin strategy and programs of work.

- The Australian Government should develop a National Digital Twin Infrastructure Standards roadmap that would seek to increase digital adoption and consistency in all Australian infrastructure delivery and operations and to deliver maturity frameworks, templates, risk framework, methods for increasing data safety.

- Government establish a National Digital Twin Consortium (on similar lines to DT Consortium in UK) - a collaborative organization driving the innovation of digital twin technology adopting national standards, consistent approaches and open-source development. It amalgamates industry, government and academia to drive consistency in vocabulary, architecture, security and interoperability of digital twin technology. The consortium advances the use of digital twin technology in many industries from aerospace to natural resources.

- As part of the remit of the Office of the National Digital Twin, state and federal governments agree to establish a National Data Quality Management (NDQM) Framework which is necessary to enable effective data management across the built environment that addresses secure, resilient

interoperability, which is fundamental for creation of a national digital twin.

- In conjunction with NDQM create a NDQM Data Injection Standards / Platform, which all States / Territories can use to create and enrich consistent time value contextual intelligent data sets and can share data within policies established by ONDC (Office of National Data Commissioner)

- Government establish a central Data Registry-as-a-Service that provides consistent, intelligent, time-value contextual data to all entities within the ecosystem while supporting federated data sharing as per numerous principles cited in ANZLICs, UK's Gemini Principles and others.

- That the Office of the National Data Commissioner be given responsibility for driving data requirements around digital twins.

- Government to establish a National DT Skills Framework akin to the Skills and Competency Framework under CDBB's National Digital Twin Program that is the people enabler needed to develop and execute National Digital Twin Roadmap.

- That the Digital Skills Organisation's responsibilities be extended to support the National DT Skills Framework.

- Similar to investments in "3D Digital Atlas", the Federal Government should explicitly state the quantum of investments allocated to National DT Infrastructure initiatives.

Quantum Computing

Recommendation that:

- Government needs to dedicate resources to identify the potential quantum-era security exposures across all departments and keep abreast of the developments in post-quantum cryptography standards, to implement solutions as they become available.

- Investment is needed to amplify Australia's significant strength in quantum research, commercialise emerging quantum technologies and solidify Australia's leadership. This investment needs an accompanying national quantum technology strategy with governance and oversight to ensure focus and coordination.

- The Federal Government invest a minimum of $110 million over four years in a National Quantum Computing Centre if we are to keep pace with global trends. This investment is based on the Quantum centre needing to be at least double that of a national artificial intelligence centre due to the wider breadth of quantum computing research and development, in both hardware and software.

Commercialisation

Recommendation that:

- The Federal Government commission a comprehensive review of how Australia supports innovation, from ideation through to commercialisation with the objective of creating a national framework for support and recommending how existing gaps can be addressed. This review must necessarily consult with key stakeholders including state governments, industry associations, research institutions and higher education and should cover tax incentives, grants and other government programs that currently support industry-based innovation.

- Government focus immediate efforts on supporting and enabling industries of strategic importance to not only ensure sovereign and domestic capability, but to also make them globally competitive and act as exemplars for other Australian industries.

- Government works with industry and research organisations to develop mechanisms to foster greater collaboration.

- Government considers an innovative software development tax incentive or grant to support development of innovative software which does not qualify for the R&D Tax Incentive, but has the potential to create innovative products and services that will benefit the Australian economy.

- Government extends the ambit of the proposed patent box regime to patents relating to all sectors of strategic importance.

Cyber Security

Recommendation that:

- Government supports the growth of our domestic and strategic cyber security capability to ensure Australia has the skills necessary to secure critical technologies by:

  - initially focusing on developing standardised cyber security requirements (leveraging the work done by the NSW Cyber Standards Harmonization Taskforce), such as certification and accreditation requirements for industry. These could build on the good work achieved through the NSW Standards Harmonisation Taskforce. In meeting such standards, industry would have to invest in internal and external talent and the technology required to uplift their security.

- Government incentivise and prioritise increased investment to grow Australia's cyber workforce pipeline. Investment should seek to strengthen the Cyber Security National Workforce Growth Program and the Cyber Skills Partnerships Innovation Fund detailed in Australia's Cyber Security Strategy 2020. The cyber security industry covers a broad range of skills. A clearer view of the most critical cyber security roles would be welcome.

- Global partnerships are developed to ensure continued access to secure critical technology supply chains, for example:

  - Partnerships should be pursued and deepened within existing structures including the Five Eyes, Quadrilateral Security Dialogue and with broader like-minded nations that play key roles in setting standards for, and the development and manufacturing of, critical technologies.

- Australia should also establish public-private partnerships and consortium models that recognise and support secure industry partners to compete on the global stage – acknowledging that competition is currently skewed with some suppliers receiving significant state support.

- In recognition of the global demand for secure critical technology solutions, there should be greater investment in Australia's development of critical technologies.

- That government and industry identify areas of critical technologies where Australia has competitive advantage and economic opportunity exists. Government should provide greater support to our world-leading research and development sector to direct their efforts towards critical technologies. Our investment should be bolstered in areas that Australia is already making significant strides, such as quantum computing.

- There should be clear articulation from government of the technologies deemed critical, the applicable security requirements and greater visibility of the threats.

- That government provide clear guidance of how existing legislative and regulatory requirements apply to critical technologies as it rolls out enhanced security requirements for critical infrastructure and include in any such framework appropriate checks and balances that first empower and enable industry to drive security outcomes, then support public-private partnerships in times of crisis.

- That government and industry develop critical technology security standards

aligned with international partners to enable trusted trade and engagement, resilient underpinning capabilities and support Australian industry to compete on the global stage.

- That, in developing a mandatory reporting scheme for businesses that pay ransoms to cyber criminals, the Government carefully consider whether the collected data is kept confidential or published and work with industry in developing this policy.

- That the Australian Government makes the necessary changes to the Privacy Act 1988, including removing exemptions for employee records and small business, which will better enable it to seek adequacy status under EU law, and increasingly the law of some of its major OECD trading partners, therefore remove compliance red-tape for Australian business wishing to establish global markets in digital commerce.

- That, in consultation with the membership, the AIIA develops a set of industry level privacy guidelines that will enable business to better meet current and emerging regulatory and community requirements for the handling of personal information, and better equip businesses of all sizes to be competitive in the global digital economy.

Artificial Intelligence / Machine Learning

Recommendation that:

- Industry and Government collaborate to harness the power of AI to help solve Australia's economic challenges in a critical industry. See example of disaster resilience further in this chapter.

- Governments consider rolling out targeted education about AI to Senior Executive level staff within government agencies, to foster a better understanding of AI across government and the opportunities it presents.

- Government agencies set targets/KPIs for adoption of AI.

- Government agencies publish a constantly updated portfolio of AI enabled customer service enhancing projects.

- As part of the Secretaries ICT Committee, the Federal Government should stand up a Government AI Ethics Committee and invite in external members for example, (industry, University sector) to review citizen facing use of AI projects.

- Government as a major ICT procurer should support the local AI ecosystem and establish a cross-agency panel process to allow agencies to put problems out to tender and allow companies to come forward with AI enabled solutions.

- That leaders from within the Australian AI industry partner with a government agency and lend their insights and expertise to empower that agency to fully harness the benefits of AI – to become a "model AI citizen" – as a case study.

- That government and industry come together to establish a national AI Commercialisation Hub that is focused on AI research translation, investment attraction and support of AI start-ups to scaleups to enterprises to realise the $315bn potential dividends for the Australian economy of digital technologies including AI.

- Industry, government and the education sector work together to develop a National AI Skills and Jobs Agenda to ensure the future workforce has the skills necessary to support the growth of the Australian AI industry into the future.

- That the National AI Skills and Jobs Agenda consider the establishment of a universal, nationally recognised qualification standard in relation to AI, to ensure the Australian AI workforce continues to demonstrate consistently high standards of competency and professionalism.

- With the support of the AIIA, that Industry and Government work together to develop an AI ethics framework, to ensure Australians can confidently and comfortably engage with and leverage AI in their day to day lives.

- That, once established, the AI ethics framework operates as a self-regulating industry Code of Practice.

- The Federal Government as part of the EMA's operational enhancements and strengthening of the Australian Government Crisis Coordination Centre ensure that this work explicitly includes world leading applications of AI. We also recommend that this is extended to other phases of disaster management e.g. preparedness and recovery phases.

Agriculture

Introduction

Agricultural technology, or AgTech, is predicted to become Australia's next $100 billion industry by 2030[2]. The sector is fast becoming a vital part of the Australian economy and a growing source of both income and investment. Thriving AgTech ecosystems, world-class research institutions and high-quality produce, make Australia an ideal environment for AgTech innovation.

Fueling the strong growth of this sector are the ambitious growth targets set by the federal government. To meet this challenge, the industry needs to almost double its current annual growth rate, from 3 per cent to 5.4 per cent.

A rising middle class, especially in the Asia Pacific, is moving from a simple diet to one that is much higher in the kind of agriculturally intensive foods in which Australia specialises. At the same time, demand for locally-grown sustainable food is growing in the domestic market.

Global warming and diminishing natural resources present obstacles to meeting this changing demand. So too does the rising cost of energy, labour and production inputs. These challenges have created the perfect environment for AgTech to flourish.

There is a growing trend towards consolidation within the agriculture industry due to factors such as an increase in climate variability, additional cost and investment needed due to increasing compliance requirements on the back of safety incidents such as the strawberry contamination crisis of 2018, as well as other factors such as generational shifts away from agriculture. As a result of these changes in dynamics, many smaller businesses are being acquired by larger operators.

There are challenges faced in adoption of technology and innovation however as the agriculture sector has several unique dynamics compared with other leading industries such as financial services and industrials.

Factors such as diverse backgrounds, sizes, and structures of agri-businesses as well as a lack of digital skills and industry standards have proven to be impediments to broad base adoption of cutting-edge technologies and pressures on AgTech Start-up business models have caused friction around areas such as data sharing and privacy.

In recent years, the global market opportunity in agricultural and food innovation has continued to grow – attracting greater international focus and investment. Sadly, Australia has not yet managed to attract a significant proportion of this investment, despite having a competitive, if somewhat immature, AgTech Start-Up ecosystem. Of the US$16.9 billion invested globally in 2018, Australia attracted only US$29 million.[3]

The low level of investment in AgTech in Australia was also reflected in the 2021-2022 Federal Budget, which is in line with the Agriculture 2030 Strategy.

An investment of $34.8 Million for Agricultural Innovation directed attention to four priority areas, export market development, climate resilience, biosecurity, and digital agriculture. Together with a focus on the digitisation of the bio-security infrastructure and technologies focussed on soil health and biodiversity, there is limited focus on developing AgTech as a core industry or capability in Australia.

There is a need for an increased focus on commercialisation by ensuring a tighter collaboration between industry, researchers and investors and a regular review of funding and policy settings to ensure that outcomes achieve potential.

There is also an opportunity to create industry standards that will allow for economies of scale and mass customisation to meet the varying needs of agri-business while at the same time enabling innovation.

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[2] https://invest.nsw.gov.au/sector-opportunities/agtech

[3] https://www.ausagritech.org/

Agriculture's place in Australia

Australian agriculture accounts for:
- 55% of Australian land use (427 million hectares, excluding timber production in December 2020) and 25% of water extractions (3,113 gigalitres used by agriculture in 2018–19);
- 11% of goods and services exports in 2019–20;
- 1.9% of value added (GDP) and 2.6% of employment in 2019–20

Australia has a diverse agricultural, fisheries and forestry sector, producing a range of crop and livestock products.

The gross value of agricultural, fisheries and forestry production has increased by 7% in the past 20 years in real terms (adjusted for consumer price inflation), from approximately $62 billion in 2000–01 to $67 billion in 2019–20.

Exporting is and will continue to be a key driver of industry growth. In real terms, the value of agricultural exports has fluctuated in a range between $40 billion and $60 billion since 2000–01 with meat and live animals being the fastest-growing export segment, growing 86% over the period, followed by horticulture up 64% and forest products up 16%.

Exports to Australia's eight largest markets in Asia increased by 62% to $33 billion over the 20 years to 2019–20 and accounted for 62% of the total value of agricultural, fisheries and forestry exports in 2019–20.

China is Australia's largest export market for agricultural, fisheries and forestry products, at $16 billion in 2019–20.

Exports to China are about 5 times larger than they were in 2000–2001. Asian demand is projected to double between 2007 and 2050, providing opportunities for exporters of high-value, high-quality agricultural and food products.

Agricultural Production is Growing

Agricultural production is a growing industry. Drivers of output growth over the past 20 years vary by sector:

- In cropping, long-term falls in real prices have been offset by volume growth, as producers have improved productivity by adopting new technologies and management practices.
- In livestock, higher prices have been the main driver of growth, reflecting growing demand for protein in emerging countries and some temporary factors, such as drought in the United States and disease outbreaks such as African Swine Fever in meat importing countries. This poses a great opportunity for the Australian Agtech sector through leveraging technology and innovation to maximise returns in traditional protein markets as well as in the rapidly growing alternative Protein market.

Managing slowing productivity growth is critical to driving the economic performance of the industry.

Over the last 20 years, Australian crop growers have increased production volumes by approximately 19%, while prices have fallen by more than 10%.[4] The ongoing declines of output prices of crops including Horticulture need to be countered with a focus on productivity growth. Prices for Australian producers are set on international markets, meaning Australian farmers must produce an internationally competitive product to be profitable. Maintaining productivity growth and continued innovation is therefore required if Australia is to remain internationally competitive.

Australian farmers have historically achieved strong productivity growth, increasing the volume of output produced from a given set of inputs. Agricultural productivity growth has been stronger over the long term than that observed in most other sectors of the Australian economy. It has also been comparable to farmers in other high-income countries. This growth has been driven by improvements in technology and structural change. According to the precision agriculture report

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[4] https://www.agriculture.gov.au/abares/products/insights/snapshot-of-australian-agriculture-2021#agricultural-production-is-growing

called 'Precision to Decision', the Broadacre sector has received significant research and development investment including the online move to GPS guided harvesting and seeding and reduced chemical use.

In recent years, however, agricultural productivity growth has slowed due to deteriorating seasonal conditions and less intense research and development efforts. In addition, the indicative analysis suggests that if all broadacre farms had the same output per hectare as the highest performing 20% of farms, the total value of broadacre agricultural output would be around 24% above current levels, and farm cash income would be around 46% above current levels.

With the need to address the slowing productivity growth, and with smaller farms being less profitable on average than their larger counterparts, there is a great opportunity to leverage technology innovation to achieve similar levels of productivity and profitability with the right investments and policies in place.

Opportunities to accelerate in AgTech

The criticality of Agriculture to the Australian economy and the future of Australia is clear, as are the needs to step change addressing productivity to ensure market growth continues and is maximised. The linkage between the role of technology and productivity growth of the agricultural sector, AgTech has not been widely acknowledged as an industry in its own right as well as a facilitator of industry growth.

The Australian AgriTech Association estimates that the industry could produce $20 Billion in products and services and with the right structures in place, could thrive, driving benefits to both the industry itself and more broadly across Agriculture.

AgTech is also seen as a subservient industry to the agriculture industry rather than a distinct Sector. This disconnect has contributed to the Australian agriculture industry being among the least digitised industries in the world.

Recommendation

- That AgTech be recognised as a standalone industry which is both supportive and complementary to Agriculture. It is recommended that Government and Industry form a new standalone oversight body and governance framework specifically focused on AgTech as a sector, as well as facilitation of an increase in co-ordination of AgTech development initiatives across departments, such as the Department for Agriculture and the Department for Industry, Science, Energy and Resources.
- That the Federal Department of Agriculture establishes a standalone AgTech Branch.

The AIIA has identified specific opportunities in AgTech for Australia to address productivity in the Agriculture industry, these include:

- Robotics and automation
- The creation of Regional Agriculture Centres to support evolution of AgTech solutions such as
- Supply chain traceability including use of blockchain technology
- Synthetic biology and creation of new proteins opportunities

Robotics and Automation

Agriculture offers one of the ripest opportunities in Australia to advance the robotics and automation industry. The shortage of labour to pick fruit, as exacerbated by the closure of Australian borders during the COVID-19 pandemic, highlights the role autonomous robots can play in securing the agricultural industry and advancing productivity.

An example of Australian innovation in robotics and automation is the company 'Freelance Robotics' which has developed a range of its own off-the-shelf robots and autonomous navigation system as well as provides and builds bespoke robots for a range of industries. This is an example that Australia is capable of building local robotics and automation capabilities without being dependent on overseas innovations to cater for what is now

an applicable technology solution to a well evidenced critical industry issue.

There is a lack of skills and scale in key areas of opportunity in Australia such as robotics. Australia should be well-placed to seize on robotics in agriculture as a global opportunity but is up against well-funded competition from places such as Abu Dhabi, which is investing $US100 million into automated, self-sustainable agriculture. As part of our recommendation around creating a robotics commercialisation and acceleration fund, any commercialisation, pilot programs and on farm adoption should be considered as part of the Modern Manufacturing Fund grants program.

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Recommendation:

- Create a Robotics Commercialisation and Acceleration fund under the framework of the National AI Commercialisation Hub as recommended in the AI chapter. Recommend a distinct AgTech allocation under the Hub.

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Regional Innovation Centres - a Case Study in AgTech best practice

Agri benchmark,[5] a joint initiative between several European Government, Industry, research and investment organisations, was showcased at the recent Global Forum for Food and Agriculture as being an example of global best practice through its focus on cross-skilled and cross-functional collaboration and focus on comprehensive scientific and commercialisation methodologies.
There are two prime examples of how a regional innovation centre could commence work on the latest technologies available to Agriculture. For example:

Supply Chain Traceability

Over the last 18 months, there has been a rise in second generation AgTech offerings such as Agridigital in the grain industry, which is a supply chain traceability offering, however there is

much more opportunity to create disruption in supply chains, including 'paddock to plate' blockchain ecosystems.

Traditional value chains include many intermediaries but there has been a realisation that the value chain itself is a legacy construct. The concept of a transparent blockchain ecosystem is seen by many traditional value chain members as confusing and a threat and are therefore resisting adoption. New business models can be created to enable producers to create a direct relation with the consumer, with blockchain enabled oversight and compliance built in. Producers can market directly to overseas customers, reducing inefficiencies and providing more value through Smart Contracts and DeFi features. Due to the complex, ecosystem wide engagement and implementation that would be required, an Industry oversight body and a set of standards would be required in order for such initiatives to be successful.

Regional Innovation Centres could assist in providing proof-of-concept and minimum-viable-product studies for ecosystem members, aligning with the industry oversight body. Synthetic Biology.

AgTech is also providing the ability to create new segments and industries such as the new protein space. New technologies such as synthetic biology compete directly against traditional proteins. The companies Fable Food Pty Ltd[6] and v2food Pty Ltd[7] are examples of alternative protein manufacturers who are in direct competition with traditional meat and livestock producers. This provides an opportunity for traditional producers as there is always more demand than supply for protein. The increased competition and diversification in the protein sector helps to meet demand and lower prices. Inputs for alternative proteins include soy and legumes. The dramatic increase in demand for these inputs provides new market opportunities for broad acre farmers who may be seeing reduced yields who can now sell directly to the alternative protein producer for value add.

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[5] http://www.agribenchmark.org/home.html

[6] https://fablefood.co/

[7] https://www.v2food.com/

Regional Innovation Centres could assist growers and producers in understanding changing market demand and options to maximise returns on investment in terms of types of proteins and other produce.

In summary, the creation of Regional Innovation Centres will bring the various AgTech stakeholders together, using incubator-style engagements, connecting RDCs, start-ups with research, Industry, and investors to improve commercial outcomes. Establishing Regional Innovation Centres would not only bring a much-needed AgTech focus on evolving technologies, it would also bring economic development to regional areas whilst enabling technology and the beneficiaries to work to improve industry outcomes.

Recommendation:

- Provide funding to conduct research and business case establishment into establishment of a pilot AgTech Regional Innovation Centre to bring the various AgTech stakeholders together, using incubator style engagements, connecting RDCs, start-ups with research, Industry, and investors to improve commercial outcomes.

Challenges facing adoption of AgTech Innovations

The AIIA has identified two key challenges for AgTech in Australia. The challenges include:

- Lack of interoperability
- Reaching scale

Lack of interoperability and standardisation

Many leading AgTech innovations and Start-ups involve a combination of software and hardware in order to deliver the proposed solution. Many of these solutions involve sensors which are needed in order to capture, analyse and manage the various data points from across the operation. Currently, there is no standardisation across these sensors and systems, leading to farmers needing to use disparate systems, sensors and platforms such as satellite systems. Many of the interviewees

from across the ecosystem reported that there is a need for an integrated, 'single pane of glass' technology platform. Further, sensors and hardware need to be fit for different purposes (due to the lack of standardisation as per the above) needing relatively large amounts of upfront capital.

Recommendation:

- Department of Agriculture to work with Industry and Standards Australia to ensure standardisation in areas such as sensors and hardware facilitating interoperability and easy adoption.

Scalability

Reaching scale for AgTech innovators, start-ups and scale-ups is a challenge due to the various nuanced requirements across agribusinesses. Barriers for entry are incredibly high requiring access to diversified markets in order to become viable and thriving businesses.

Currently there are two main mechanisms by which AgTech start-ups and innovators are able to secure funding, Private capital and Venture Capital investment, or via the Research Development Corporations (**RDCs**). Further to this, start-ups need to raise significant venture capital which leads to high expectations around agtech business models. Given the lack of traction in building a thriving AgTech industry in Australia, these mechanisms need to be addressed.

An example of why additional support is required in these early stages of growth of AgTech start-ups is evident when one evaluates the impact of Venture Capital influence on the evolution of product development. Currently, for Venture Capital-backed AgTech business, in order to continue to fund product development and market growth, early-stage start-up/scale-ups in the AgTech business often are encouraged to monetise their customers (ie. farmers') data. Farmers have been reluctant to allow their data to be monetised however, thereby inhibiting the uptake of certain innovations. An example of this is Digital agricultural services (**DAS**) which was in the position of providing digital satellite

imagery. The business model relied on providing captured data to third parties for purposes such as insurance risk analysis, which created negative perceptions among the farmers involved. This ultimately then creates a sub-optimal business case that encourages further investment, thereby limiting growth and viability of the business.

Recommendation:

- Create a dedicated AgTech funding stream of $10million within the Department of Industry 'Entrepreneurs' Program.

There are 15 Australian Rural Research and Development Corporations (**RDCs**) for research into the Agricultural Industry. The federal Government matches those funds with a 1:1 ratio, which equates to $1.2bn of funding.

Given the lack of traction in evolving innovation and technology for Agriculture in Australia, a review of this state of affairs should take place as should ensuring appropriate distribution of these funds to maximise alignment to building a vibrant AgTech industry in Australia. [8]

Recommendation:

- A review of the $1.2bn a year in levy funds which is currently distributed between the 15 Australian Rural Research and Development Corporations (RDCs) for research to ensure alignment to development of AgTech innovation and commercialisation

Managing slowing productivity growth is critical to driving the economic performance of the industry.

Image by No One Cares on Unsplash

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[8] https://www.agriculture.gov.au/ag-farm-food/levies/publications/levies_explained

Introduction

When the Spanish Flu Pandemic swept the world in 1918, government responses globally relied on isolation, quarantine, good personal hygiene, use of disinfectants, and limitations of public gatherings. In 2020, despite advances in technology, Australia was forced to follow the same path with a lack of standards, interoperability and agile decision making processes hampering the use of technology to help manage outbreaks despite its potential.

The advancement of health through digital technologies in Australia has seen many improvements for patients, health professionals and funders for example with the rapid acceleration of adoption of telehealth, virtual care and e-prescriptions. However, Australia is in its infancy in terms of levels of digital health development and deployment when compared to the more advanced countries.

The World Index of Healthcare Innovation ranks Australia as 26th out of 31 countries for Science and Technology, citing restrictions on the use of new technologies as a major barrier to innovation.[9]

Adding to this, the recent "Wild Health Webinar"[10] revealed the US and UK are now in front of Australia from a digital health perspective and are moving much faster towards a more interoperable ecosystem because of COVID19 induced digital health innovation as well as making critical significant investment in technologies, policies and industries 3 to 5 years ago that would enable a consistent, high performing base for provision of Health Care.

For example, the UK's National Health Service cloud-based solutions like Carenotes allowed staff to view and share patient medical records from a desktop or mobile device anywhere in the UK, while in the US the implementation of Fast Healthcare Interoperable Resources standard provided similar data sharing capabilities. While New Zealand implemented a national COVID-19 vaccination booking system

Australia's response has been hampered by the federated structure of government meaning mandating a national approach is difficult.

In comparison, Australia's lack of investment in a national approach to health technology, made it difficult to deliver the data sharing and national innovation required to better manage the pandemic.

It is not too late for Australia to recover this leadership position and once again be a thought leader and direction setter in health care, but it will need the combined efforts of Territory, State and Federal Governments, and Industry.

This focus is warranted especially when the health industry is providing the biggest jobs growth in Australia, with employment expected to increase by 12% or 200,000 between 2020 and 2024.[11] Technology, automation, and Artificial Intelligence (AI) are driving change in health across the world, making it vital the Australian government focus on this area in order to create a globally competitive health industry and workforce, delivering leading edge health services and systems.

The AIIA believes that through a combined set of initiatives, Australia can lead the way in health by establishing a common technology framework with associated policies and processes that delivers a:

1. Digital solutions to transform health care;
2. National Platform to drive collaboration, standards, cyber security and interoperability;
3. Revised Industry Health Funding Models; and
4. Re-engineered and 21st Century My Health Record.

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[9] https://freopp.org/australia-health-system-profile-11-in-the-world-index-of-healthcare-innovation-164225723e08

[10] https://wildhealth.net.au/why-the-uk-and-us-are-now-in-front-of-us-in-digital-health/

[11] https://nationalindustryinsights.aisc.net.au/industries/health

Digital solutions to transform health care

As noted, the advancement of health through digital technologies has seen some improvements and one of the very strong indicators to come out of the COVID19 pandemic is that as a society we have no choice other than to accept digital technologies. The government needs to ensure they have the policies and frameworks required to move quickly on making the right technology decisions.

Digital technology is extremely important to Health for the following reasons:

- **Greater Access** - Developing, promoting, and making available various channels through digital solutions and platforms give more of the community access to health services via private and public health providers.
- **Greater Efficiency** - Digital implementations and transformations are being deployed in small and large health organisations (such as hospitals) to streamline processes, avoid replication and reduce the cost of healthcare with implementations done in an agile and manageable way. Many state governments in Australia have become risk adverse to health technology projects which are holding the country - and care of patients - back.
- **Mobility** - The public are more connected now than they have ever been in history and the technology behind smartphones allows them and service providers to connect on many levels, anywhere at any time of the day.
- **Assurance** - Using digital to put in place seamless, traceable, auditable, health service provision that provides solid assurance.

In the UK, the implementation of a "Cloud First" policy three years ago had driven health care providers to adopt web-based solutions. So, when the pandemic hit, they had the infrastructure to enable wide uptake of video Telehealth and NHS cloud-based solutions like Carenotes allowed staff to view and share patient medical records from a desktop or mobile device anywhere in the UK.

Cloud-based contact tracing was able to be quickly implemented with citizens, on average, starting self-contact tracing within 12 minutes of getting a positive notification. It will also allow for the easy adoption of a digital Vaccination passport when the decision is made to implement it.

In the US, providers and vendors had been working for four years to comply with regulatory requirements for interoperability, including the implementation of nationwide standards and mandatory FHIR interfaces.

As a result, data sharing capabilities were well established, allowing health care providers, suppliers and patients to have good access to health data.

In New Zealand, the government implemented NZ COVID Tracer app to help to speed up contact tracing by allowing app users who have been exposed to the virus to alert their own contacts. They also successfully rolled out a national COVID-19 vaccine booking system and just recently, started trialling an app that may provide early detection of COVID-19.

In all these cases, a high level of digital preparedness gave these countries the ability to innovate, share and communicate information much more readily and implement more rapidly.

In contrast, Australia's lack of standards and interoperability was exposed, as some of our governments struggled to develop, implement and make use of technology in managing the pandemic.

The lack of coordination and a national approach to QR codes and contact tracing has exposed the fault lines in our federated model and inconsistencies which negatively impacts on both patient outcomes (saving lives) and the economic cost of lockdowns.

In the same way, a national COVID-19 testing solution could have coordinated testing appointments to ensure centres were being utilised efficiently, distributed results promptly and supported critical triage of those who needed hospitalisation versus those who could be safely home quarantined.

An example of a national digital health capability that is standing up well to meet current challenges is the Australian Immunisation Register (AIR) where all records of Australian children and the broader Australian population have their immunization records. It is a single source of the truth and accessed easily through MyGov accounts. During the COVID vaccination rollout in Australia, every state, federal and GP clinic is required by law to update this register for every patient. This should be a template for future digital health reforms.

If My Health Record had been implemented as a modern, distributed and open system, it could have acted as the lynchpin to streamline and monitor the COVID-19 mass vaccination program. However, the lack of cloud architecture, integration to service provider systems and ease of access has hampered timely collection of data, which in turn makes it difficult to assess the effectiveness of the program on a national basis.

A standard approach to using technology to recruit people for their COVID-19 vaccination has also been impossible to achieve. While the Ministry of Health in New Zealand released a national booking system,[12] Australia is relying on a collection of disparate booking systems used by various Australian governments, GPs and hospitals. Indeed, many small and remote GP practices do not have contemporary technology in their operations. Through interoprable standards and leadership, the opportunity exists to leverage the significant federal government investments in national

electronic health record platforms but we are not harnessing the power of interoperability to achieve a true national integrated framework. While some organisations are advising patients when they become eligible for the COVID-19 vaccine, there is little follow up or promotion of availability. Operational efficiencies that can also assist with risk mitigation are not being utilised.

As a consequence, vaccines with limited shelf life are not being used in time and have to be disposed of. It is estimated that between 5 and 25 percent of vaccines are being wasted[13] due to bookings not being attended or vacancies not being filled, which could have been minimised by email and/or SMS alerts to eligible patients, advising them of local booking availability and encouraging them to attend in order to minimise wastage and optimise vaccine rates.

We know that the cost of existing IT systems when compared to newer digital service delivery models are prohibitive in an already overburdened healthcare system. Equally, and probably more importantly, they do not currently meet the evolving service requirements of governments core customers, its citizens.

The Australian government needs to identify, promote and prioritise new digital delivery models that are flexible and scalable to meet the burgeoning needs of Australia's health care systems.

Whilst governments are not competing with commercial digital channels for market share, they do need to be mindful of the importance that building the confidence and digital trust of Australian citizens plays. This will be particularly relevant for the adoption and sustainable utilisation of new digital healthcare service delivery models.

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[12] https://www.pulseitmagazine.com.au/new-zealand-ehealth/6012-nz-to-roll-out-national-vaccination-booking-system-next-month

[13] https://www.abc.net.au/news/2021-04-03/vaccination-wastage/100040666

Recommendations:

- Identify, promote and prioritise new digital delivery models that are secure, flexible and scalable to meet the burgeoning needs of Australia's health care systems.
- Consult health and technology industry providers, funders, industry associations and consumer groups appropriate members of the health industry and the ICT industry for input into frameworks, policies and funding mechanisms.
- That government work with industry to ensure standards alignment and interoperability for digital health, including cloud-based infrastructure and services to drive accessibility and Fast Healthcare Interoperability Resources (FHIR) for interoperability, and make these publicly available in a central repository or catalogue.

National Platform to drive collaboration, standards, cyber security and interoperability

The pandemic has highlighted the need for a national cloud based inter-operable solutions integrating best of breed products which ensures all digital solutions have a base level of Cyber security, Interoperability, Data Privacy, Quality, Data Trust, Accessibility and Standards. Effectively providing a National Cloud Off the Shelf Ecosystem for provision of HealthCare. Whilst the federal government has been investing in digital health systems, it is currently not meeting national health needs with lack of interoperability and different models and approaches in different jurisdictions.

Our health and policy decision makers don't have the standards, frameworks and decision-making processes required to move quickly on making the right technology choices.

Australia urgently needs to develop a framework of specifications and standards to drive healthcare interoperability, with agreement on the responsibilities of federal and state governments as well as the ICT industry, in driving synergy of decision making and implementation.

Australia's health economy is characterised by a nationally run My Health Record and a mix of state based public and private health delivery services, funders and policies operating independently of each other and fragmented by a lack of standards, frameworks, operating models and infrastructure. Our health system is also governed at State level with state based systems across hospitals, aged care and medical practices.

This ultimately can result in variations of health terminology, measurement units and code sets which makes data sharing difficult and s noted by the Aged Care Royal Commission,[14] incomplete or inaccurate handovers can result in clinical care mistakes such as medication errors which can lead to poor health outcomes.

The demand and opportunity for the government to accelerate and transform the Healthcare service digital offerings for Australian citizens is now. Citizens are looking for governments to take a lead in establishing a national approach to data collection, management and use of health-related data, as well as enabling greater individual control of healthcare information and the way that they engage with services.

Furthermore, the concerns of people regarding privacy and trusted use of personal data need to be strengthened and maintained as digital solutions are developed and adopted to ensure that public trust continues. There needs to be a social contract between government and the public involving transparency on how health data will be collected and used. Importantly, citizens need to be the custodians and in control of their own healthcare data. Without this in place there will be limitations in terms of widespread adoption of digital health tools and the collection and use of digital health data.

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[14] https://agedcare.royalcommission.gov.au/publications/final-report

A combination of patient centric design and proven digital solution design principles, underpinned by a strong framework of standards, policies and interdependency pathways will mean that investments like My Health Record, CovidSAFE, QR Code Applications, telehealth solutions, appointment booking systems and COVID contact tracing solutions will have greater chance of delivering on the promised benefits.

Government has achieved some success with the rollout of e-prescriptions and telehealth services (albeit voice not video). Another example is HealtheLink,[15] a collaboration between clinical specialists and industry provider DB Results, which produced an online platform and new e-health model of care for management of chronic disease, which uses technology to empower GPs to work with specialists and sophisticated decision support tools, to deliver a better level of care. It is an example that projects should not always be led by government but should include the Health and the ICT Industries in collaboration and co-design.

A federated but joined-up approach to digital, with centralisation of core functions, while retaining flexibility in delivery for organisations, government and health would ensure a high quality and standardised approach to the design, building, hosting and secure delivery of health solutions.

This could achieve for the country what Queensland Health achieved for their state when they standardised public pathology 20 years ago by consolidating 31 laboratories into a single software system.[16] This created a single patient record across the state with the benefit of real time data and reporting, quality monitoring against benchmarks, reduced duplication, increased efficiency and throughput and, most importantly, improved clinical care and health outcomes.

This can be achieved by implementation of a National Cloud based platform, capable of providing a Health Standards Approved secure environment for the nation and integrating best of breed products accessible to Industry, which ensures all solutions deliver to essential standards.

This should include selection of digital low-code platforms which provide rapid delivery of digital solutions capability to industry and government that not only support multiple devices (ie: Mobile, Desktop, PC) and multiple languages without needing to code for every situation but also provide accelerators, security protection and integration which can be re-used to significantly speed up delivery of quality solutions

In addition, the Government should build an automated Digital Development Assistant technology tool which sits above these technology platforms and ensures consistent application of standards, cyber security protocols, interdependency principles, patient centric design principles and rapid technology delivery approaches.

Finally, the federal government should establish a commercialisation framework that encourages Industry to participate in building the library of reusable components and innovative emerging technology solutions such as AI.

The commercialisation models implemented by major global technology platforms to create these ecosystems are strong examples of what can be achieved at scale. The AIIA would welcome discussing this further with the Federal Department of Health to scope out a commercialisation framework that encourages an innovative digital health sector.

[15] https://au.healthlink.net/

[16] https://search.informit.org/doi/10.3316/INFORMIT.897089494163677

Recommendations:

- That National Cabinet (Federal and State governments) agree that we need a more integrated, modern and seamless digital health capability for Australia

  ° The Federal Government works with state governments and industry to develop a national capability or platform designed to provide interoperability and integration. This will promote a federated platform accessible to Industry which ensures all digital health solutions have a base level of Cyber security, Interoperability, adherence to protocols, Data Privacy, Quality, Data Trust, Accessibility and Standards.

  ° Identify, promote and make available digital low-code platforms which provide rapid delivery of digital solutions capability to industry and government to fast-track digital innovation and implementation.

  ° The Federal Government to build a Digital Development Assistant which sits above these technology platforms and ensures consistent application of standards, cyber security protocols, interdependency principles, patient centric design principles and rapid technology delivery approaches.

  ° For Federal Government to provide appropriate support to industry to develop a commercialisation framework that encourages the building of a library of reusable components and innovative emerging technology tools such as Artificial Intelligence, Robotic Process Automation, Internet of Things (IoT).

Revised Health Industry funding models

Australia's ability to take advantage of new technologies and deliver collaboration between government departments and industry is hampered by funding models that are no longer fit for purpose. For the government to strengthen our health system in the digital era and facilitate a rise in global competitiveness that will attract the best talent and innovation, funding frameworks need to be much simpler, faster, and more responsive to changing technology offerings.

By focussing funding models on levers for healthcare innovation, such as industry collaboration, improved patient experience, improved health outcomes and substantially lower costs, the government can deliver a paradigm shift to the way health organisations think and act.

Government also has a responsibility to ensure the benefits of successful innovation are widely distributed and shared, so organisations do not spend time and money reinventing the wheel including reviewing the fundamental funding models for effectiveness.

If the current gaps in government action continue, Australia will fall further behind in innovation and the global health economy with the result that valuable R&D and IP will move offshore.

Government funding models have been outpaced by modern technology frameworks and the history of incentivising health providers for keeping pace with technology has become a spiralling financial burden the country cannot continue to afford. As Federal Minister, Stuart Robert MP said in 2019,[17] Traditional CapEx and OpEx investment strategies do not enable the uptake of digital technologies and restrict the ability of organisations to undertake digital transformation such as consuming services and building platform ecosystems in the Cloud.

For the government to facilitate global competitiveness in the digital era, funding frameworks need to be much simpler, faster, and more responsive to changing technology offerings.

Diverting funding from capital investments such as on-premises technology stacks, building footprints and staff resources will free up significant sums, which should be repurposed into specific digital technology funding programs.

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[17] https://www.itnews.com.au/news/federal-it-funding-shake-up-floated-by-services-australia-minister-534843

The Federal Government can learn from the initiatives of some state governments, such as:

- SA Government - a $120 million 'Digital Restart Fund' that will fund a series of IT projects across government over the next four years.
- NSW Government - Targeting to spend 30 percent of its $2.5 billion annual IT procurement budget with small and medium enterprises (SMEs) from April.
- NSW Government - $2 billion+ 'Digital Restart Fund'.

Digital projects also come with less risk if done properly. Modern application development platforms like OutSystems allow organisations to build solutions fast, build them right and for the future. The agile process together with Patient Centric Design (PCD) techniques can ensure projects are developed in an iterative manner, with each stage of development tested and adapted to suit emerging understandings of the organisation and the patient's needs, ensuring the end product is not a large white elephant, as has so often happened with large, rigid system implementations.

Prioritising funding for digital technology will provide better return on investment, delivering faster transformation, across a wider reach of government departments and organisations, at a smaller cost.

The COVID-19 pandemic put enormous pressure on the traditional operating practices of health organisations, providing a glimpse into the kind of collaboration and innovation projects that could be delivered to improve health outcomes, for example:

- Monash Health and The Alfred partnered with Deakin University to trial artificial intelligence for patient triage with ongoing monitoring using medical grade monitoring equipment via an app in the home.
- Austin Health partnered with Arden Street Labs to deploy a 'digital first' solution in which every COVID-19 test patient (positive or negative) could enrol in an online monitoring program with an app to detect and escalate clinical deterioration.

By focussing funding models on levers and incentivisation for healthcare innovation and its uptake, such as industry collaboration, improved patient experience, improved health outcomes and substantially lower costs, the government can deliver a paradigm shift to the way health organisations think and act.

For example, hundreds of GPs have voluntarily signed up to HealthElink due to its patient centric design, ease of use for clinicians, and ability to deliver a better level of care for Hepatitis C patients.

In addition, the health funding model where health budgets are distributed between state and federal governments results in a solution like HealthElink being applauded by both governments but not being funded due to the precedence it sets on who should fund this type of holistic solution.

Government has a responsibility to ensure the benefits of successful innovation like HealthELink are widely distributed and shared, so organisations do not spend time and money reinventing the wheel, however we do not see the fundamental funding models being reviewed for effectiveness.

Recommendations:

- Governments to develop and implement new funding models and processes that encourage collaboration, development of innovative technology solutions, and enhanced health outcomes and ensure that agencies where appropriate can move from cap ex to op ex delivery models.
- Create specific digital technology funding programs, to encourage organisations to undertake digitisation projects, with accelerated approval processes.
- Successful pilot digital innovation projects should be fast-tracked onto procurement panels for implementation and extensively promoted throughout the industry.

My Health Record Investment and Reform

Australia is falling further behind other OECD countries by failing to deliver a national health information exchange which would enable patient and citizen centred care.

As the following table shows, England, Scotland, Switzerland and the US have established national frameworks for connectivity and standards implementation, underpinned by patient centric use and data ownership to allow data exchange across the traditional boundaries of health economies.

The data that has been uploaded to My Health Record is predominantly in PDF form, making it difficult for patients and clinicians to find the information they need and limiting the ability to efficiently analyse or use that information in meaningful ways.

This creates a vicious cycle where My Health Record is not seen as useful, so health professionals and services do not add data to it, which perpetuates the lack of usefulness.

	Sender has health information in electronic form	Recipient can accept health information in electronic form	Incentives for exchange exist	Secure medium for exchange	Legal and ethical framework exist
China	●●	●●	●	●●	●
England	●●●	●●●	●●	●●●	●●●
India	●●	●●	●	●	●●
Scotland	●●●	●●	●●●	●●●	●●●
Switzerland	●●	●●	●●	●●●	●●●
United States	●●●	●●●	●	●●	●●●

Dots indicate the extent to which these requirements have been met in each country.
3 = Fully implemented; 2 = Partial or inconsistent implementation; 1 = Very litttle implementation; 0 = Absent

Figure 1 - Requirements for clinical information exchange and their state in six countries, Status of health information exchange: a comparison of six countries (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6815656/)

However, in the context of My Health Record there are a number of examples that indicate the need for transformation. The government's decision to automatically "opt in" all citizens to My Health Record, led to concerns that many patients have not given informed consent to the sharing of their records, which gives health professionals another reason to resist uploading data.

Health organisations and suppliers, by law, own the records they create and resist sharing that information. The government offered health practices up to $50,000 a year for uploading 0.5% of their patients' shared health summaries to My Health Record, but incentivised quantity over quality.[18]

As a result, patients are forced to collect manual copies of records from GPs, Hospitals, Radiology, Pathology, Pharmacy and other allied health services in order to create their own record of medical history.

Each visit to a new health professional or service requires a manual retelling of this information by the patient, sections of which are inevitably incomplete or incorrect, which compromises the quality of clinical care with resulting medication errors, late diagnosis and/or misdiagnosis leading to poor clinical outcomes or even death, which may have been prevented if only patients had a digital health record that they had easy access to.

[18] https://mforum.com.au/my-health-record-into-the-ether/

In order to ensure Australia is in line with emerging global standards, Australia first needs to catch up to other countries who are more progressed towards a national single patient record.

Estonia is currently leading the world with an on-line e-Health record for each person that has visited a doctor, that is identified by an electronic ID-card, and uses blockchain technology to ensure data integrity and security. The e-Health Record actually retrieves data as necessary from various providers, who may be using different systems, and presents it in a standard format via the e-Patient portal.[19]

The AIIA welcomes the Government's recent tender for a My Health Record application, to eliminate the need for authentication via MyGov and provide easy access anytime, from any device. However, we note that there is no reference to taking a patient centric or Human Centred Design and iterative testing approach to ensure a high level of intuitive usability.

As a step towards centralising records, the US recently introduced 'anti-information blocking' legislation requiring organisations to alter their products to make them widely accessible and connectable to everything else in the system, with five years to be ready.[20]
In Switzerland a federal law enforcing a shared patient record was enacted in 2015, giving citizens the power to control access to their data and health organisations not connected by 2022 are at risk of losing reimbursement for services.[21]

One thing few countries have so far achieved, is a single digital patient record that enables preventative care initiatives. Like My Health Record, most countries have solutions that contain health documents, not discrete data. Each document has to be opened and viewed independently, making it time-consuming and difficult to analyse the information, identify trends or risks.

Data security and privacy has in the past been a major barrier to developing national databases of discrete data. However, advances in technology are solving these problems.

Blockchain is a governance technology with the ability to resolve the current healthcare provider interoperability, data privacy and security issues and joint industry and university projects have shown that blockchain can be used to ensure data ownership resides with the patient, who can then authorise access to their data. The Australian Federal Department of Health is already using blockchain technology. In 2018 it developed a centralised, cloud-based system for storing de-identified My Health Record data, with raw data stored in ASD certified Government cloud infrastructure and retrieved patient data notarised using a blockchain platform. Standardising the way health data can be shared by health providers is an essential focus for enabling blockchain utilisation.

The country that creates a national database of discrete data, with secure data protection, accepted controls to protect privacy, and software algorithms that can be used to analyse the information, identify trends and risks and prompt users to take action, will lead the world in preventative health care. The Australian Productivity Commission estimated in 2017 that even small improvements in managing or preventing chronic conditions can produce substantial benefits for people's wellbeing, labour markets, productivity and avoided health care costs.

Ultimately, Australia needs to take the lead in the development of a national patient record. The Australian Federal Government has an opportunity to leapfrog to the forefront of the international health industry by making this a priority. $301.8 million has been allocated for My Health Record in the 2021/22 Budget and the government should focus on re-architecting My Health Record to be a global leader in this space.

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[19] https://e-estonia.com/solutions/healthcare/e-health-record/

[20] https://www.hhs.gov/about/news/2020/10/29/hhs-extends-compliance-dates-information-blocking-health-it-certification-requirements-21st-century-cures-act-final-rule.html

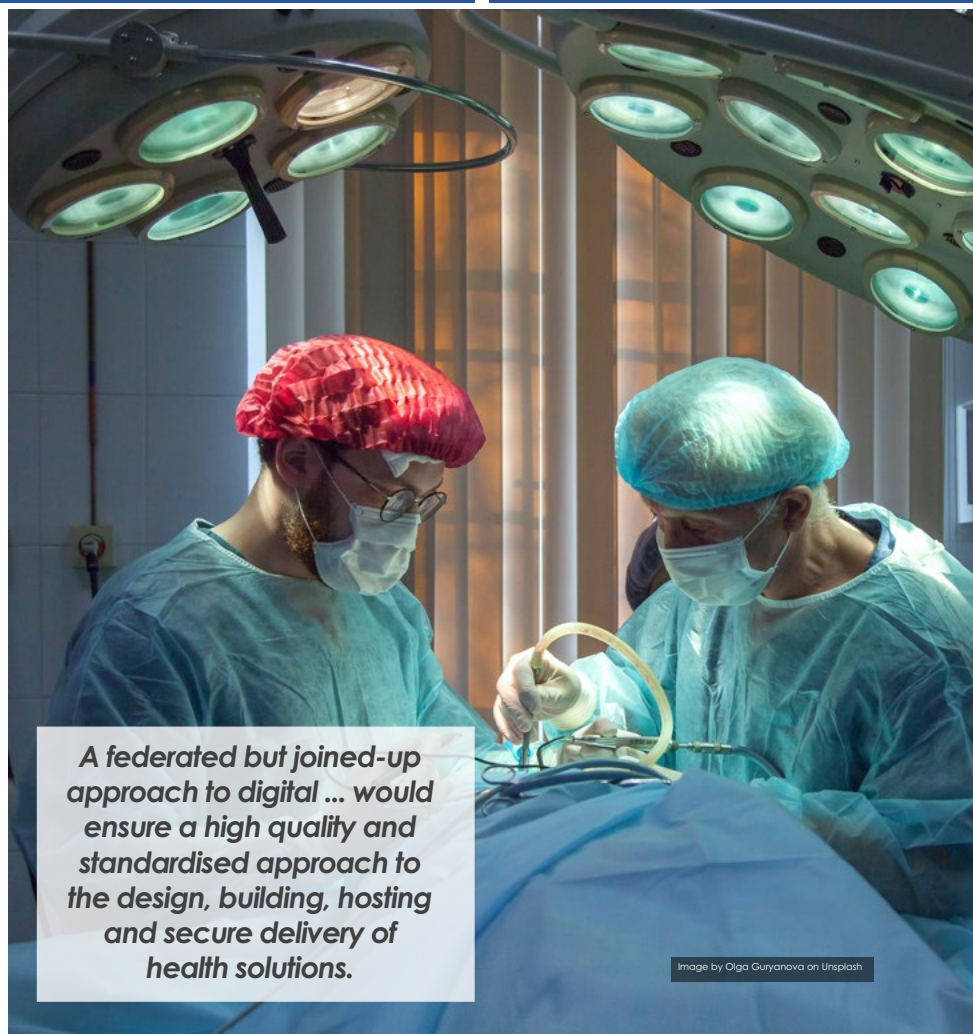[21] https://pubmed.ncbi.nlm.nih.gov/29153922/

The ambition of successive federal governments in Australia has been to have a single electronic health record and single source of the truth, yet we are still some ways from achieving this.

Whilst we do have a national e-health record it falls short of the stated policy intentions around quality data that is owned and controlled by the patient.

The AIIA understands the complex stakeholder issues at play in the health sector including different levels of government and GPs and pharmacists, but nonetheless the federal government needs to lead and push through the necessary reforms.

Recommendations

- Re-engineer My Health Record to become a true digital health record with a database of discrete data, and software algorithms to analyse the data, identify health risks and provide alerts to prompt immediate action.

- For Governments to introduce legislation to provide clarity on the capture and recording of comprehensive quality and accurate health records and associated data being owned by the patient. The purpose of this then is to provide centralisation, privacy and trust relating to patient information.

- Mandated key patient information flow from health organisations and health software suppliers to re-engineered My Health Record within five years (2025).

- The enactment of anti - information blockage legislation, with significant loss of funding or penalties for organisations and suppliers who do not comply with the mandatory sharing within the specified timeframe.

- Easy and secure access to My Health Record data via a direct portal (not through MyGov) which is accessible on any device.

A federated but joined-up approach to digital ... would ensure a high quality and standardised approach to the design, building, hosting and secure delivery of health solutions.

Image by Olga Guryanova on Unsplash

Digital Government

Introduction

In today's world, digital and data disruption is placing extreme new demands on operating models and consumer expectations. Citizens expect that government services can be provided to them in the same way that they enjoy in their personal lives, and consistent pressures to maximise government budget allocation to front line citizen services are both driving the demand for true digital government.

The expectation is for a good digital experience. Citizens take for granted that governments will have digitised forms and channels. These need to not just exist, but be easy to engage with, personalised, and enable them to transact with government at a time and place that suits their needs. Through their private sector experiences, they are coming to expect multi-channel communication that resolves the situation, respects their time and which provides a consistent experience across each.

A joint BCG and Salesforce research report, Trust Imperative 2.0[22], found 62 per cent of Australian customers said digital government services would be greatly improved if they were personalised to customers' specific situations. Across A/NZ, 76 per cent of customers said that they expect government services to be tailored to their individual circumstances and 87 per cent expect some level of proactivity from agencies.

By some measures, Australia is performing well on this front, and digital channel share of citizen transactions with state and federal Governments are rising from 60% to 74%[23] over the 3 years leading into 2020 and the COVID-19 pandemic.

Since the onset of the COVID-19 pandemic, Australian Government websites have received over 1 billion visits as the demand for trusted public information and support services significantly increased across the population.

At one stage, MyGov alone had 3.2 million logins in a 24-hour period. While the nature of the public health crisis meant that online access to Australian Government services and information was a necessity, it has also now embedded digital as the medium of choice for the majority (56%) of Australians. However, estimates of transactions through traditional channels such as shopfronts, contact centres and mail rooms are as high as four years ago.

Whilst governments have a clear focus on citizen experience, significant barriers have impacted on the ability to transform. These barriers, plus a constrained budget environment in the future, present a complex set of challenges which include:

- The Australian Government has seen an explosive growth of digital interactions with citizens in 2020 with over 1.7 billion web visits from March to December[24].

- Whilst over the last five years digital has expanded rapidly, Australian Government interactions in assisted channels such as contact centres have remained constant.

- For the Australian Government, there are technology barriers to the digital experience with a heavy reliance on open-source web management solutions, basic web analytics capabilities and the absence of personalisation and orchestration capabilities. The absence of these capabilities results in a lower level of experience compared to the private sector that has invested in these capabilities over the past decade.

- A fragmented content management approach which has led to over 64 million pages of content across gov.au websites at all levels of government. This content is managed at an excessive cost and is frequently not up to date – causing confusion for citizens. 22%[25] of Australians say they need to go to more than one source to get the information they need from the Australian Government.

- Australian Government digital and assisted

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[22] https://www.salesforce.com/au/form/pdf/trust-imperative-2/?ve=g-recaptcha-response

[23] **Rethinking the digital dividend**: Government needs to deliver better citizen digital experiences: Adobe/Deloitte 2019

[24] **SimilarWeb traffic**: Government websites Feb - January 2021

[25] **Blueprint for Enhanced Citizen Experience**: Adobe/Deloitte 2021

channels act as silos, resulting in high call volumes, large average handling times and inconsistent information for citizens. This disconnected nature of channels is a significant barrier to realising the full benefit of digital transformation.

- The Australian Government is unable to track citizen journeys across all government touch points, which results in citizens being served in high-cost channels rather than online.
- Many Australians say they face delays in interacting with the Australian Government[26]. Some 75% cite long hold times, and 59% are not sure when they will get the requested information.

The Australian Government's aspiration of achieving 80% of transactions via digital channels is being progressed faster than anticipated.

Prior to the COVID-19 pandemic it was estimated that 74% of transactions were going through digital channels rather than in-person, on the phone or through the mail. But in many cases it represents just an initial step – a shift of channel – not a consistent digital experience.

In fact, the progress to date has mostly been achieved through a dramatic increase in the number of digital transactions – they have been easier and cheaper for both citizens and government departments, and so have almost doubled from 473 million to 825 million[27] in around three years.

The total number of transactions via traditional channels has remained steady from 290 million in 2014 to 293 million in 2018, noting differences in data sources makes it challenging to track changes in the volume of these transactions over time.

Reimagining intelligent operations for a true Digital Government

To deliver on the goal of Digital Government, governments need to be advanced across 6 pillars of digital maturity.

1. Strategy & Leadership

Leading governments have the following characteristics:

- Leadership across government are prioritising digital
- They facilitate a culture of innovation and risk taking
- They encourage and ensure data driven decision making
- They focus on business agility.

2. Citizen-centred organisation

Citizen-centred governments have the following characteristics:

- Roles and responsibilities are defined to drive cross-department coordination
- KPIs are aligned and reflect meaningful service delivery outcomes
- Invests in and empowers teams
- Governance guides best practices for scale, security, and compliance
- Cadence of KPI goal setting, reporting and accountability is established
- Align KPIs with the omni-channel citizen journey and establish consistent tracking of the omni-channel customer success (e.g. Net Promoter Scores and Customer Satisfaction Metrics,)
- Enable teams to be self-reliant through technology investments, and equally invest in training
- Implement technologies and process to create real-time dashboards for visibility and accountability.

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[26] **Blueprint for Enhanced Citizen Experience**: Adobe/Deloitte 2021

[27] **Rethinking the digital dividend**: Government needs to deliver better citizen digital experiences: Adobe/Deloitte 2019

3. Data & Architecture

Leading governments have a:

- Integrated omni-channel data that translates to holistic view of the citizen context
- Have enabled usage of AI/ML at scale, as a foundation for citizen experience
- Have the ability for elastic scale with cloud investments
- Have invested in a SaaS driven architecture that is open and flexible
- Have enabled data democratization to deliver data-driven decisions independently
- Modularized enterprise architecture where business units/functions can connect seamlessly through standard interfaces and API services (Headless).

4. Content at Scale

Leading governments have a:

- Scalable content strategy that is based on a person's wants and needs
- Iterative and collaborative asset creation/authoring process that is adopted
- Dynamic content that is designed for omni-channel personalization at scale
- Standard templates and design systems that are employed for scale.

5. Life Journey Management

Leading governments:

- Support life journeys based common profiles across channels
- Employ journey orchestration across channels that is personalized, optimized and automated and driven by micro decisioning engines at touch-point level and macro decisioning engines at profile level
- Execute personalised, cross-channel journeys in real-time
- Real-time decisioning and intelligence based on citizen context and channel.

Recommendation:

- Government has long held the ambition to deliver programmes through citizen life events but has not invested in technologies to understand real digital journeys and take action on them in real-time. As a result, the government has failed to capture the benefits of digital personalisation and a citizen centric approach. Following the lead of the commercial sector, the government should invest in citizen journey management technologies.

6. Optimised Experiences

Leading governments:

- Use leading technologies like data analytics and AI to constantly evolve to deliver customized service delivery and tailored personalized solutions.
- Citizen co-creation, and prototyping drive experience innovation and optimization.
- Seamless channel activation across online, contact centre and face to face.

Data and AI-driven government operations

Much of the discussion around opportunity in government is centred on digital and data driven citizen centric services and ultimately the case of NSW has demonstrated that doing this drives a substantial amount of benefit in rapidly evolving the delivery capability and perception of government.

However, much as the private sector has prioritised customer experienced based transformation, the opportunity for public and private sectors is now turning to leveraging organisational efficiencies through AI. The a post-COVID world has accelerated digital transformation, for economies and societies to thrive and grow, governments, along with the private sector, must shift their operations strategy to enable true process reimagination and lay the path toward AI driven and intelligent operations.

Up to 40 per cent of the time spent on tasks performed by the APS today involves highly automatable data collection and processing[28]. In research looking at 1,000 early adopter organisations those of the 9% who are using AI in combination with process transformation are achieving improvements of between 5 and 10 times more in key performance indicators (KPIs) across those processes including manufacturing, sales and marketing and enterprise functions[29]. The opportunities to improve the Government's citizen facing and its internal enabling services is clear and will ultimately enable Government and the APS to deliver better outcomes.

There are two key outcomes of effectively transforming the operations of government which will provide additional significant benefits, over and above organisational efficiencies. Through the establishment of AI driven processes, Government will be able to ensure that much needed data and analytics makes its way into the processes of Government, and the use of AI, machine learning and automation makes access to and quality of data and analytics richer. In addition, what has been highlighted through COVID more so than at any other time, is the need for Government to adapt and change to evolving environments and circumstances. Automated processes supported with effective use of AI will all serve to ensure the platform of Government can respond as needed to emerging threats and opportunities.

The time is now ripe for governments to consider how it can leverage AI and automation-driven operations to maximise efficiencies. By investing in these transformations, it will enable more Government funding to be directed to services and capabilities that directly benefit the citizen.

In research conducted by the Professional Services Council Foundation in the US into the adoption of AI in the Federal Government, many benefits and use cases apply to government. Outside of the clear benefits of reducing costly administrative work and manual burdens to free up employees for higher value work, taking a holistic approach to process and AI can deliver benefits such as resource allocation optimisation, acceleration and improvement of decision making in lengthy government processes, as well as combatting efficiency and fraud. There are also intrinsic benefits such as extracting value from vast data stores, improving programmatic performance across a wide span of mission domains and reducing or eliminating backlogs or rapidly accelerating workloads.

In order to achieve intelligent operations transformation, one of the first steps that must be taken is to ensure that executive leadership is engaged in driving the adoption of AI augmented process transformation, thereby ensuring that the functional and business owners have the mandate and oversight to execute successfully. Learnings from the private sector have indicated that having an 'AI Champion' is critical to ensuring focus and engagement of those at implementation levels. Having an appropriate AI Champion in senior levels of government and the public service being a critical component has also been reinforced by experience garnered in Federal Government in the United States[30]. For those organisations that do not, they often rarely move beyond proofs of concept (PoCs) and pilots which are implemented by technologists without clear delineation to defined business outcomes. On identification of AI and automation driven Operations as a strategic priority, and identification of appropriate executive support in an AI Champion, the framework around identifying and engaging key stakeholders of the process is key. Within the NSW Government, Service NSW has successfully created a centralised service for the rest of NSW departments and agencies to redesign Citizen Centric processes and incorporate these into the Digital Fabric of Service NSW. Taking this well proven approach but broadening it, Governments across Australia should be working proactively to identify internal and external processes for redesign or re-imagining.

[28] https://www.apsreview.gov.au/resources/priorities-change

[29] https://www.accenture.com/au-en/insights/technology/human-plus-machine

[30] https://www.accenture.com/_acnmedia/PDF-104/Accenture-Psc-Federal-Ai-Adoption.pdf

Experience to date with AI and associated outcomes has also highlighted that in order for process reimagination to be realised with priority processes and outcomes, close collaboration is needed between business and IT.

Thus, the framework created must be centred on engagement with key stakeholders in the process.

A focus on business outcomes hinges on wide-ranging and engaged conversations between the business, IT and senior levels of Government. These will elevate process reimagination from tactical to strategic and accelerate the move to true Intelligent Operations for Government.

There has appropriately been much discussion regarding skills and capability within the Australian Public Service.

The Independent Review of the APS: Priorities for Change identified that in order to execute on the opportunity from Digital Technologies for Government, automation and digitisation will ultimately "create opportunities for APS employees to build new skills and take on new roles".

It is through building 'strong partnerships' with the technology industry that government can seek to build its own internal capability.

Government should seek to build flexible and mutually beneficial operating models that support internal APS capability growth in the rapidly evolving area of AI and digital technologies.

This capability however must be centred on deep understanding of outcomes and value of the business processes and not in the technologies alone[31].

Recommendation:

- Government agencies to establish an AI Process Transformation agenda that delivers Government process optimisation that not only achieves budget savings but allows adoption and integration of modern technologies. This agenda must be supported by full engagement of the appropriate stakeholders and enables the identification of suitable candidate business processes for internal and external piloting.
- Government agencies to identify and empower AI Champions to support and drive this agenda at the senior business agency level.

Barriers to transformation

Governments have several barriers and unique challenges in delivering world class citizen experiences. These include:
- The Future of the APS
- Traditional government structures and funding approaches
- The changing data & privacy landscape
- Equitable service delivery

The Future of the APS

In 2019, an independent review into the public service was released that provided a thorough analysis of the skills and capabilities of the Australian Public Service (APS) to support government through a period of substantial environmental change. It found that 'the APS needs to accelerate its adoption of data and digital technologies to 'deliver personalised, integrated and proactive services' and 'drive productivity and efficiency'.

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[31] https://www.apsreview.gov.au/resources/priorities-change

Further, data from a recent report on digital skills in Australia from Salesforce[32] found that three quarters (74%) of managers believe that the COVID-19 pandemic has accelerated the need for digital skills in their organisation, however, managers working in the public sector (90%) are more likely than those working in the private sector (72%) to believe that the COVID-19 pandemic has accelerated the need for digital skills in their organisation. The report also suggests that government needs to do more and eight in ten (79%) managers surveyed believe there are barriers for their organisation acquiring additional digital skills.

The current skills gap across the public sector limits the ability to work in a more responsive and agile way. Furthermore, it impacts the ability to quickly adapt and deliver innovative solutions that meet the changing demands and expectations of citizens.

Several steps are being taken across Government in Australia to address this potential deficit in skills in an increasingly Digital world. Federally the Digital Transformation Agency (DTA) and the Australian Public Service Commission (APSC) have launched the Digital Profession to address current and future digital capability needs for the Australian Public Service. The focus is on establishing common standards, productive pathways and the growth of professional communities providing the APS with the flexibility and mobility of a digital workforce that can surge around government priorities across agencies.

The Digital Professional Stream also delivers ongoing capability uplift, through activities such as the digital graduate, apprentice and cadet programs, the women in digital programs, and the placement of a Digital Professional Stream delegate on all recruitment panels for digital and ICT focussed SES roles. While utilising an internal consulting model, Digital Squads allows for quick support and deployment of digital experts to agencies with digital priorities.

NSW Public Service Commission's Digital Capability Uplift initiative is transforming NSW Government departments, its leaders and public servants with a set of six new digital capabilities. This initiative aims to develop NSW into a world-class public service, prioritising an enhanced customer experience to support sustainable, innovative practices and future operations in digital government.

The Government must have a digitally-confident workforce which is supported by a digitally-enabled workplace and digital tools. To do this, government must continually develop and refine programs and opportunities for public servants to continually upskill themselves, adapt to new challenges and requirements, and work more effectively across agencies as well as with citizens and businesses.

Recommendation:

- The AIIA acknowledges the work being undertaken by the federal government around digital skill mapping and the work of the APSC on digital and career pathways, however the Government should accelerate this work to ensure that government policy objectives are met. The AIIA and its members would be willing to work on industry matched skills and training accreditation, especially on short and micro-courses needed to rapid up and cross-skilling (eg cyber).

Traditional government structures and funding approaches

The NSW Government has been widely recognised as being extremely successful in driving leading digital government innovation and has been largely due to significant structural reforms in Government. By having a minister dedicated to citizen centric delivery, the NSW Government was able to mandate a centralised digital design system and policies to start to bring alignment across multiple silos of government.

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[32] https://www.salesforce.com/au/resources/research-reports/digital-skills-australia-2021/

This was then augmented by the creation of a government funding cabinet sub-committee for all large NSW Government investments in technology. The NSW Government Delivery & Performance Committee (DAPCO) sits alongside Cabinet and the Expenditure Review Committee (ERC). It is tasked with assessing the digital or data components of every new policy proposal to ensure services are more seamless and uniform and it has been a powerful instrument for NSW Government to ensure Digitised citizen centric services are realised.

The nature of digital transformation also challenges traditional funding approaches with fresh thinking required to respond to a fast-changing environment.

The NSW government has now allocated over $2 billion to invest in digital transformation projects through The Digital Restart Fund.

The Digital Restart Fund is administered by the Department of Customer Service and funds iterative, multi-disciplinary approaches to planning, designing and developing digital products and services in NSW. It encourages projects that use modern methodology and foster customer-driven business transformation and collaboration across the NSW Government Sector.

Increasingly forward-thinking governments are adopting cloud first approaches with measurable key performance indicators which encourage agencies to adopt modern and agile platforms.

Recommendation:

- Appoint a cabinet minister focussed on citizen centric delivery for those jurisdictions that do not have this in place
- Review government funding processes for Digital and IT investments for those jurisdictions that are not leveraging centralised funding mechanisms to drive integrated digital citizen experience outcomes.
- Australian governments have underinvested in digital capability, and they need to allocate funding in Citizen focused Digital

Restart Funds with appropriate timelines and funding criteria (as digital is now the preferred channel for citizens 56%).
- Governments adopt cloud first policies with clear KPIs.

The changing data and privacy landscape

There have been ambitious statements over the last decade about the potential economic and societal opportunities for exploiting data. While some of those hopes have been realised, there have also been some high-profile examples where attitudes towards data have damaged trust in institutions. The most notable in recent years is perhaps the role of Facebook data being used for political purposes. Turning the promise of data into tangible, measurable and consistent outcomes remain elusive.

The Federal Government is committing to deliver Australia's first Data Strategy (the Data Strategy) setting out how the Government will enhance effective, safe and secure data use over the period 2021 to 2025. Data is critically important to building a modern digital economy and delivering better outcomes for Australians.

The Data Strategy will outline the Australian Government data system and opportunities to enhance it, including:

- the Government's settings to support use, value, custodianship, sharing and security of both public and private data in Australia to improve outcomes for Australians
- commit Government agencies to building and enhancing data maturity, visibility and capability in the Australian Public Service
- Increase consumer awareness, use and control of their data for personal benefit.

The **Consumer Data Right** is designed to give consumers greater access to and control over their data. It improves consumers' ability to compare and switch between products and services, and encourages competition between service providers, leading not only to better prices and service quality for customers but also more innovative products and services.

Following the launch of the Consumer Data Right in the banking sector in July 2020, the framework is now entering a multi-year period of growth with expansion to the energy sector already underway and telecommunications identified as the next priority sector.

Whilst the AIIA supports the CDR process in banking and energy, we have not seen justification, use cases or data to support an economy-wide CDR or expansion to other industry sectors.

The NSW Government's Data Strategy sets a vision for the NSW Government to deliver better outcomes for the community by putting data at the heart of decision-making through a collaborative, coordinated, consistent and safe approach to using and sharing data.

The Strategy also ensures that we maintain the highest privacy, security and ethical standards.

It is another good example of how to ensure the management of data is at the core of any Digital strategy.

Equitable service delivery

As we adapt to the new normal post COVID-19, government will need to address the issues with equitable service delivery in an increasingly digital world.

The service required from governments' high needs citizens is different from the majority of the population, who now prefer digital as their primary interface with government.

Governments will need to view personalisation through this equity lens and adjust delivery mechanisms to support individual customer needs.

This will involve the government building a framework for understanding the best channel to service particular citizens ensuring technology also enables face to face and contact centre channels.

This could also extend to digital literacy programs for citizens to ensure equity in service delivery.

Australia's Digital Transformation Strategy outlines an ambition to be one of the top three countries in the world for digital government, delivering world-leading digital services for the benefit of all Australians.

This includes a focus on building a government that is easy to deal with, informed by citizens and fit for the digital age.

While there have been some notable successes in improving digital experiences for citizens, investment has been ad-hoc and progress has not been consistent across agencies.

And while the benefits are implicitly understood, the government has struggled to quantify or measure them in a consistent way.

Government at all levels must ensure equitable service delivery is a core consideration in all digital programs of work.

The time is now ripe for governments to consider how it can leverage AI and automation-driven operations to maximise efficiencies.

Image by Marius Masalar on Unsplash

Manufacturing

Introduction

Whilst manufacturing peaked at 25% of Australian GDP in the 1960s and now represents less than 10% of GDP due to global market forces it is still a vitally important part of the Australian economy and one which stands to substantially benefit from current advances in technology. Whilst other economies have long embraced Industry 4.0 where manufacturing and traditional industries are embedded with technology to boost productivity, Australia has lagged. According to the May 2020 Australian Manufacturing Performance Report, Australia's manufacturing industry currently contributes around $100 billion to Australian GDP annually and employs around 900,000 Australians. Manufacturing also contributes a high proportion of business expenditure on research and development (R&D) at 26.4%.[33]

The critical importance of manufacturing for Australia was underlined through the October 2020 Australian Federal Government budget announcement of $1.5B of new funding to be invested over 4 years in the Modern Manufacturing Strategy (MMS)[34] to make Australian manufacturers more competitive, resilient, and able to scale-up to take on the world. The federal government should be commended on this initiative.

By playing to Australia's strengths, strategically investing, and boosting the role of science and technology in industry, Australia can open up new markets and take more quality products to the world.

The plan is based on the 4 pillars of:

- getting the economic conditions right for business,
- making science and technology work for industry,
- focusing on areas of advantage; and
- building national resilience for a strong economy.

The centrepiece of the Strategy is the $1.3 billion Modern Manufacturing Initiative (MMI), which will see the Government strategically invest in projects that help manufacturers to scale up and create jobs.

The MMI will support projects within six National Manufacturing Priorities which reflect Australia's established competitive advantages or emerging areas of priority:

- Resources technology and critical minerals processing;
- Food and beverage;
- Medical products;
- Recycling and clean energy;
- Defence and Space.

Each of these priority areas (6) then have a published roadmap in the MMI. Roadmaps have been developed with industry to set out plans for both industry and Government to strengthen Australia's manufacturing capability. The road maps have been led by industry taskforces to identify and set a future vision for priority areas with clear goals, opportunities and actions over the next 2, 5 and 10 years.

MMS Growth Opportunity Enablers

These MMS Priority Area Roadmaps call out **enablers** that are required to achieve **growth opportunities**. By distilling these enablers, we can identify technology enablers that are common across these roadmaps and critical for achieving growth objectives.

The MMS has its focus on lifting Australia's capabilities in key sectors:

- Resources Technology & Critical Minerals Processing
- Food & Beverage
- Medical Products
- Recycling & Clean Energy
- Defence
- Space.

The key common technology enablers across these industry sectors include:

- cyber security;
- artificial intelligence;

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[33] https://www.industry.gov.au/publications/australian-manufacturing-performance-report

[34] https://www.industry.gov.au/data-and-publications/make-it-happen-the-australian-governments-modern-manufacturing-strategy/our-modern-manufacturing-strategy

- digital twinning and digital engineering;
- big data and analytics;
- automation;
- cloud infrastructure;
- collaboration tools;
- blockchain; and
- IoT.

Further to these technology enablers being identified, it is also called out in the strategy that, as a barrier to scale, Australian manufacturing SMEs do not have adequate access to understand these technologies and understand how they can form part of their solutions and processes.

Many of the above identified technologies from priority area roadmaps are also aggregated under the term Industry 4.0 technologies and this term is also used in the roadmaps.

The Fourth Industrial Revolution (4IR or Industry 4.0) is generally defined as the ongoing automation of traditional manufacturing and industrial practices, using modern smart technology.

Large-scale machine-to-machine communication (M2M) and the internet of things (IoT) are integrated for increased automation, improved communication and self-monitoring, and production of smart machines that can analyse and diagnose issues without the need for human intervention.[35]

Industry 5.0 is also now a manufacturing industry term and refers to people working alongside robots and smart machines.

It involves robots helping humans work better and faster by leveraging advanced technologies such as the Internet of Things (IoT) and big data.

It adds the human quotient to the Industry 4.0 pillars of automation and efficiency.

Industry 5.0 is all about connecting the human and machine; collaboration between humans and smart systems.

Industry 5.0 is already here having its arrival accelerated by the onset of the COVID-19 pandemic.[36]

The focus of Industry 5.0 is currently omitted from the roadmaps and should be incorporated into the roadmap strategies and execution.

The Fifth Industrial Revolution is evolving from a concentration on the digital experience to one where humans are back in charge. The results will combine the skill and speed of automation with humans' critical and creative thinking.

As such, Industry 5.0 represents the ultimate partnership between intelligent humans and smart manufacturing machines.

While Industry 4.0 marks an era of automation, artificial intelligence, the Internet of Things (IoT) and autonomous actions without human intervention, Industry 5.0 puts the focus back on people.

This is an important evolutionary step, not a major revolutionary one.[37]

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[35] https://www.techradar.com/news/what-is-industry-40-everything-you-need-to-know

[36] https://www.forbes.com/sites/forbestechcouncil/2021/12/28/how-covid-19-is-driving-the-evolution-of-industry-50/?sh=4a8513032062

[37] https://www.forbes.com/sites/forbestechcouncil/2021/12/28/how-covid-19-is-driving-the-evolution-of-industry-50/?sh=1c11e83f2062
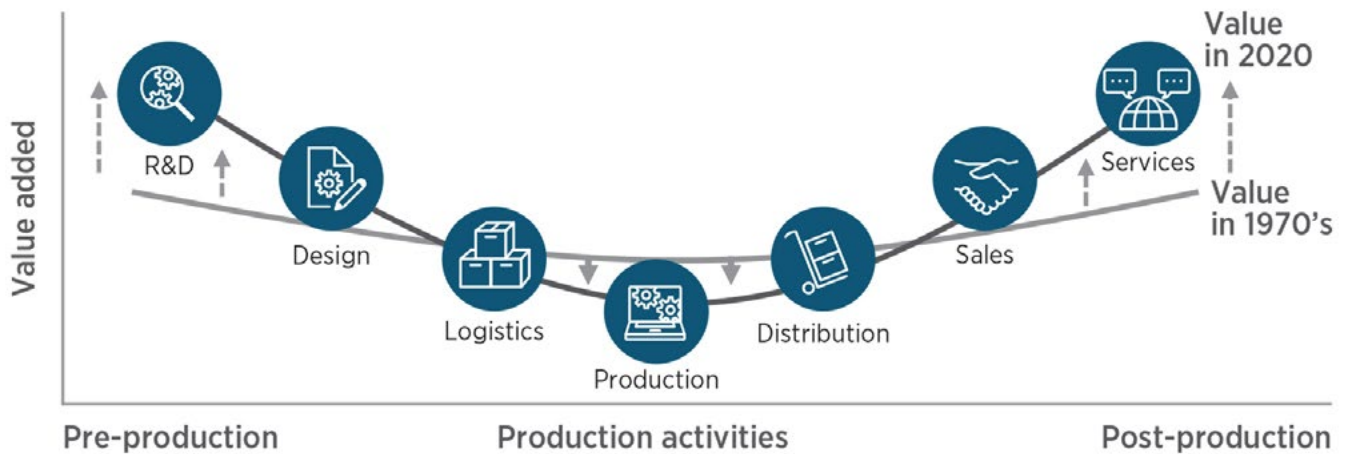
Figure 1: The manufacturing 'smile curve' demonstrates the value Australian manufacturers are well-positioned to capture if they are able to strategically shift their market focus and adapt technology.[38]

This Industry 5.0 focus is a further accelerator of the 'Smile Curve' (Figure 1) for Australian manufacturing to capture value based on technology adoption and market focus shift. High levels of automation and robotics are employed in logistics, production and distribution allowing a higher human/machine focus for R&D, design, sales and services.

Recommendation:
- Industry 5.0 is currently omitted from the Federal Government's MMS and roadmaps and should be updated to reflect this new evolution of person and machine collaboration.

Technology and Supply Chains

The COVID-19 pandemic raised concerns about Australia's ability to supply goods and services to meet Australians' needs. Fear of shortages led to panic buying across the nation. Australia was not unique in this respect, with most countries manifesting concerns about how their reliance on imports would jeopardise their ability to meet their population's needs during the COVID-19 pandemic.

The March 2021 Productivity Commission Interim Report into Vulnerable Supply Chains[39] examined the nature and source of risks to the effective functioning of the Australian economy and Australians' wellbeing associated with disruptions to global supply chains, identifying any significant vulnerabilities and possible approaches to managing them.

The report[40] called out the use of IoT, Blockchain and AI, Machine Learning and Analytics as significant supply chain technological advancements making it easier for firms to understand their supply chains. Advances in tracking technologies, data analytics and machine learning have made it easier to predict where and when disruptions might occur.

These advances have also made it easier to access real time information about disruptions, facilitating a quicker response and recovery. For example, consumer goods manufacturer Procter & Gamble has integrated multiple types of real-time data for its suppliers and distributors, including inventory levels, road delays and weather forecasts. It also runs scenarios in the event of a disruption to identify effective solutions.

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[38] https://www.industry.gov.au/sites/default/files/October%202020/document/make-it-happen-modern-manufacturing-strategy.pdf

[39] https://www.pc.gov.au/inquiries/current/supply-chains/interim/supply-chains-interim.pdf

[40] https://www.pc.gov.au/inquiries/current/supply-chains/interim/supply-chains-interim.pdf, p.77

Cyber is also called out in this report. The intricate web of economic interdependencies means that our supply chain is potentially exposed to the many types of shocks that can affect every business, both in Australia and overseas: geopolitical (for example, a trade war), environmental (a natural disaster), economic (a financial crisis), societal (a pandemic) and infrastructure-related (cyber-attacks). The AIIA looks at specific cyber security risks in the Cyber Chapter.

Modern Manufacturing Technologies Hub

As identified, there are a raft of common technologies (cyber security, artificial intelligence, digital twinning and engineering, big data and analytics, automation, cloud infrastructure, collaboration tools, blockchain, and IoT) that are called out in the Government's Modern Manufacturing Strategy Priority Area Roadmaps as being enablers of growth opportunities. Lack of access to expertise and skills in these technologies for manufacturing SMEs is called out as a barrier to scale.

Further, the March 2021 Productivity Commission Interim Report into Vulnerable Supply Chains shows where many of the same technologies can be employed to predict and mitigate disruptions to Australia's vulnerable supply chains.

Recommendation:

- Government and industry to collaborate and invest in a Modern Manufacturing Technologies Hub. The Hub incorporates academic, industry and government and focuses on the key technology enablers and capability into the Australian manufacturing SME ecosystem. Ideally this would be industry led and have a commercialisation focus. The national hub would bring together and provide needed scale to many smaller projects including Victoria's Swinburne University Advanced Manufacturing Industry 4.0 Hub[41] and South Australia's Flinders University Line Zero[42].

The focus of Industry 5.0 is currently omitted from the roadmaps and should be incorporated into the roadmap strategies and execution.

Image by Rob Lambert on Unsplash

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[41] https://www.swinburne.edu.au/research/strengths-achievements/strategic-initiatives/industry-4-0-hub/about-us/

[42] https://www.flinders.edu.au/research/braveminds/line-zero

Engineering (Digital Twins)

Introduction

"It is difficult to find a single universally accepted definition of Digital Twins because of the range of implementations the concept encompasses. A Digital Twin can range from monitoring the key readings of a single asset to a 3D visualisation of a city integrated with live information from an Internet of Things"

- ABAB Digital Twin Positioning Report[43]

The Centre for Digital Built Britain (CDBB) notes: "What distinguishes the digital twin from any other digital models is its connection to the physical twin."

A digital twin enables users to visualise the asset, check status, perform analysis and generate insights to predict and optimise asset performance.

For the purposes of this chapter, we should consider the following definition:

A digital twin is a digital representation of a physical asset, process or system, that provides information to allow its users to understand and model its performance. A digital twin is a living "thing" – like an organism, it is enriched by continuously updating itself from multiple sources so that its working condition and operational representation is near realtime.

The challenge is that the data that will contribute to infrastructure digital twins, and a national digital twin ecosystem is not 'owned' by a single domain – multiple domains contribute with their expertise, eg GIS, BIM, IoT/Sensor, and standards will be driven by their domains. The bigger challenge is around standards in bringing all this data from traditionally siloed domains together.

A digital twin ecosystem for Australia would bring together a broad range of government, industry, construction, manufacturing, transport and utilities sectors.

It would have no single owner or contributor but comprise interoperable data and connected Digital Twins likely set within a set of common and open standards.

The AIIA has been very active in working with States (VIC and NSW) and Infrastructure Australia on their Digital Twin strategy and supporting with content and across government advocacy.

There has been some success federally by getting this important issue on the agenda and helping IA in this process. The PMC DTT is also looking at including digital infrastructure in its Digital Australia Strategy[44].

The AIIA has been strongly advocating for digital infrastructure investments - click ready projects - and corresponding digital twins.

We have been working with Infrastructure Australia in supporting its forthcoming strategy as well as the Prime Minister's Digital Technology Taskforce (DTT) and welcome the leadership of the States in piloting digital twin programs, especially in Victoria and NSW.

When governments invest billions in traditional infrastructure projects such as road, tunnels and railways ($59Bn across 44 new infrastructure proposals as cited in Infrastructure Priority List 2021 | Infrastructure Australia, digital-by-default should become the standard where digital tools and practices support the planning, design, delivery and operations of infrastructure.

The ultimate goal is to deliver more for less as a result of the productivity enhancements that will come from digital-by-default.

The AIIA would like to see a Centre for Digital Build Australia to provide leadership federally and be supported by digital twin offices in each state.

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[43] https://www.abab.net.au/wp-content/uploads/2021/01/ABAB-Digital-Twins-Position-Paper-Web-210118.pdf

[44] https://www.pmc.gov.au/digital-technology-taskforce/lifting-sectors-through-technology

Through the Australian Government's $1.2 billion Digital Economy Strategy, $40.2 million will fund Geoscience Australia's development of a Digital Atlas of Australia, which will create a location-based platform consisting of over 90,000 datasets, complementing pre-existing digital twin initiatives in other jurisdictions. Notwithstanding these investments, affordability of infrastructure development and management of assets continues to be a pressing concern, with the region facing a widening fiscal gap due to a changing demographic, among other things. Our construction industry is well established but is constrained in capacity, with productivity in the sector plateauing over the last 20 years with Labor Productivity Index (LPI) falling 23% between 2014 to 2020 as noted in Australia - construction industry labor productivity index 2020 | Statista.

Given this context, it is vital that our governments consider significant changes to the way infrastructure is planned, delivered and operated, to optimise capital investment, reduce whole life costs and ensure the best possible service delivery is provided and that social outcomes are achieved.

Case study: The NSW Spatial Digital Twin

The NSW Spatial Digital Twin[45] is a NSW Government program led by the Department of Customer Service (DCS), Spatial Services is a useful case study to consider. At it's launch in March 2020 it provided an extensive range of new 3D foundation spatial datasets with geographic coverage including that of the Western Sydney City Deal partnership that brought together federal, state, and local government under a set of 38 commitments. The Spatial Digital Twin was part of the project's commitment to coordinating information that supports planning and broader liveability targets.

Data has become its own type of asset, and the NSW Spatial Digital Twin is a data infrastructure that will benefit private industries, government, and the public into the future. The project has set a standard for how urban or city scale digital twin data platforms will be made and used for data discovery, sharing, visualisation, for applications domains such as integrated planning.

At launch the NSW Spatial Digital Twin was the largest 3D modelling project ever undertaken, with the final product i.e. the interactive tool, that captured 22 million trees with height and canopy attributes, almost 20,000km of 3D roads, and 7,000 3D strata plans and 546,206 buildings at under 5cm pixel resolution across the greater Western Sydney region (World leading Spatial Digital Twin launched in NSW | NSW Government[46]). And this coverage continues to grow.

Key to this endeavour was Australian 3D modelling expert Aerometrex, who captured and processed the necessary 3D data to underpin the NSW Spatial Digital Twin. It spent several months capturing, processing, and combining the imagery.

What makes the NSW Spatial Digital Twin so remarkable is its open-source presentation, publicly accessible through a browser-based web portal, developed in partnership by CSIRO Data61. That foundational information source brings compounding efficiency benefits as government, private industry, and the general public can all refer to a central and consistent data source.

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[45] https://www.spatial.nsw.gov.au/what_we_do/projects/digital_twin

[46] https://www.nsw.gov.au/media-releases/world-leading-spatial-digital-twin-launched-nsw

The Hon Victor Dominello MP, the NSW Customer Service Minister, said the high availability of aggregated data will help with planning future development:

"Using the digital twin, we can model where we put the roads, hospitals, schools, etc. with precision planning like we've never done before. This is truly transformational technology and the best thing about it is that it's open source – industry can use it, councils can use it, everybody can get involved and build this asset together for all of us".

Open source 3D 'reality mesh' (or 3D imagery) data reduces costs and time frames for infrastructure planning regardless of the project size. Every project stakeholder uses the same validated source, making duplicate data investments unnecessary. 3D visualisation gives all stakeholders a more tangible and dynamic sense of space. Users can see and understand space and how the change will impact it.

The Australian Government has been slow compared to other countries like the UK and Singapore at vision, standards and policy setting. Government also lags behind the private sector when it comes to actionable insights through data collected in everyday life. While many private sector companies (e.g. telecommunication companies, online tech platforms like Google, financial companies and retailers) know what one buys, where you go, what transport you use, cities and governments use very little of it. Professor Chris Pettit, director of the city analytics program at the University of New South Wales, points out, "For instance, cities know how many people use certain sections or roads or ride mass transit, but they don't know how many people walk or ride their bikes. Your mobile service provider, however, likely knows."

Australia is missing out on economic, productivity and societal benefits.

Organisations like ABAB, CSIRO Data61, Infrastructure Australia, Standards Australia and others have been providing advice to governments on BIM, approach of Digital by Default (rather than Digital by Exception), Open

Data Standards.

AIIA believes that it is critical to have a national approach for Digital Twins to create a digital twin ecosystem for Australia and has identified four areas for the Government to focus further development – this includes:

1. Standards and Governance around data models, data management, integration, data security and privacy;
2. Data Accessibility and Open Data;
3. Capability Building and Upskilling; and
4. Investments.

1) Standards and Governance

The Organisation for Economic Co-operation and Development (OECD) estimates that about 80% of global trade is affected by standards or regulations. A sound measurement system must be in place, so that the application of standards and regulations does not become a technical barrier to trade[47]. For this reason, the creation and use of consistent standards, through the input of both the private sector and governments, is fundamental for the medium to long-term sustainable development of the global digital economy, including in relation to Digital Twin notes Smart Cities - ANZ Digital Twin.

To enable informed dialogue about Digital Twins by the many stakeholders within government (national, state and local), Industry, National Standard Bodies (NSB) and Academia, there has to be a common language for describing them. A commitment to creating Common Standards with a one national approach for Infrastructure Digital Twin roadmap is critical for unlocking productivity, delivering cost effective nation building projects and realise value through better design, build, operate and maintaining infrastructure assets. In many cases, standard ways to aggregate common personal, spatial or temporal parameters would increase the level of automation of producing more safe data.

It is critical the Australian Government takes a leadership position on Digital Twins, given the important role it plays in effective policy making, project funding and service provision.

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47 https://link.springer.com/article/10.1007/s11018-020-01791-3

It has been demonstrated around the world (eg. UK, Singapore) that national leadership plays a significant role in successful market transformation.

Digital Twin ecosystem participants i.e. Governments, Industries, Academia, National Standard Bodies (such as Standards Australia), Research Organisations (such as CSIRO Data61) should participate in defining a roadmap that includes, but is not limited to, the below focus areas:

- Coordinate the development of Digital Twin standards to help ensure consistency, build new procurement models (that include social value elements into contracts), catalyse markets and promote trade and investment

- National data strategy for the built environment, developed by a federal/national agency - collection, procurement of data via Infrastructure Australia, while building state-wide data asset management, sharing and exchange opportunities

- Provide a clear directive around the application of Digital Twin capability in government funded projects. Link project funding mechanisms to the use of Digital Twin capability and delivery of outcomes

- Guidelines on procurement and investment models such as PPP to activate Digital Twin capability in the market,

- Introduce Digital Twin capability development and use into the National Cabinet reform agenda and help guide State/Territory action and investment

- Explore business case reform opportunities to value data, and include in project balance sheets

- Ensure agencies responsible for major asset development and community services are providing leadership and guidance on Digital Twins, (eg. New Zealand Transport Agency, Queensland Corrective Services,

Queensland Department of Resources, Department of Transport and Main Roads, Melbourne Water, Sydney Water). Integrate Digital Twin capability with existing and emerging asset management/operation/maintenance practices (eg. preventive and predictive maintenance using IoT and artificial intelligence)

- Standards and guidelines to build products and services that are interoperable and based on open standards.

Use cases and Digital Twin Standards adopted are at different levels of maturity in different states. Governments should come together to create a National Digital Twin Standard and Roadmap by amalgamating good parts of the tried and tested successful standards established across various States, for example:

- The NSW Department of Customer Service IDMF provides guidance to support the management of data created and used during the planning, design, construction and operation of infrastructure across NSW Government. It was developed in response to recommendation 27 of the NSW State Infrastructure Strategy 2018-2038, alongside initiatives such as the 4D Foundation Spatial Data Framework, the NSW Digital Twin, the Internet of Things Policy and the Asset Management policy;

- The Victorian Digital Asset Strategy (VDAS) which aims to effectively and consistently coordinate many of the elements critical in planning, delivering, operating and maintaining Victoria's critical state infrastructure; and

- Queensland Government's Maturity Assessment approach which provides information on their audit of information management maturity.

The standards roadmap should also outline the steps required between digital adoption and effectively developing 'digital twins' to enable more informed investment decisions. These standards should be augmented through existing efforts underway by BSI and ISO, keeping in mind the role of ANZLIC Principles[48]

AIIA (*in conversations with Smart Cities Council*) suggests the three level standards on similar foundations of BSI PD8100 framework i.e. strategic, process and technical specifications. Each of these three levels is described as:

- Strategic-level standards promoting Digital Twin Readiness - providing guidance to policy leaders on the why, what and how of Digital Twins.
- Process-level standards promoting Digital Twin Activation - providing guidance on best practice in procuring and managing Digital Twin projects, specifically including guidance on data management and digital representation.
- Technical-level specifications promoting Digital Twin Acceleration - providing practical requirements for Digital Twin products and service delivery to ensure they help build opportunities for scale and replication to achieve the results needed.

Recommendations:

- Establish an Office of National Digital Twin (eg. UK Centre for Digital Built Britain, Digital Twin Victoria) to drive Digital Twin capability development and application on existing infrastructure, urban growth planning and spatial agencies (as an example) can champion Digital Twin advancement and be a starting point in creating a Digital Twin strategy and programs of work.
- The Australian Government should develop a National Digital Twin Infrastructure Standards roadmap that would seek to increase digital adoption and consistency in all Australian infrastructure delivery and operations and to deliver maturity frameworks, templates, risk framework, methods for increasing data safety.
- Establish a National Digital Twin Consortium (along similar lines to DT Consortium

in UK) - a collaborative organization driving the innovation of digital twin technology adopting national standards, consistent approaches and open source development. It amalgamates industry, government and academia to drive consistency in vocabulary, architecture, security and interoperability of digital twin technology. The consortium advances the use of digital twin technology in many industries from aerospace to natural resources.

2) Data Accessibility and Open Data

Digital Twins pivot on a comprehensive representation of cumulative geo-spatial, BIM Infrastructure, IoT/Sensor, knowledge base data. Data sharing is the primary lever to realising the benefits of a digital twin ecosystem, which must be governed by security rules and authorisation processes to enable appropriate, industry context role-based access to securely shared data. With a culture of data leadership and valuing data as an asset, a Digital Twin journey can help inform, decide and communicate the performance of places, landscapes, assets and systems.

Today there are dispersed Infrastructure Digital Twin data sets stored in data lakes in multiple States as they are embarking on their own DT journey. With each new use case additional data silos will be created. Data is dispersed into multiple IT/OT systems leaving Digital Twin to bring all these data sets into a unified model in one shared data pool to make every additional use case to create a more mature DT, delivering speed to value through AI simulation engines, allowing one to run simulations that will help discover new opportunities for optimisation that was not visible otherwise and help realise value through scale. Scale can be achieved more readily at low cost through standardization, appropriate open data, user friendly and role relevant intelligence, to name a few. It is important to move away from flat and single hierarchy data definitions to an Ontology based approach, which is logical,

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[48] https://www.anzlic.gov.au/resources/principles-spatially-enabled-digital-twins-built-and-natural-environment-australia

flexible and semantic based. However, it should be recognized that not all Digital Twin data should be open data.

Common data challenges are seen in nation building infrastructure projects, be it in asset management, operations, procurement, supply chain across design, build, operate and maintain phases are:

- Inconsistent creation and capturing of data through multiple sources (physical data, operational data, sensor data, base knowledge data)
- Data is locked in silos, inaccessible or lost resulting in limited re-use and ongoing data enrichment
- Time value, Purpose or Context of data is not established making it impossible to understand whether its fit-for-purpose
- Legacy data models that inherently have cultural issues since data is defined by WBS (Work Breakdown Structure), CBS (Cost Breakdown Structure) or ABS (Activity Breakdown Structure), which is restrictive and closed

The Australian Government policy on public data is simple: *all government agencies should make non-sensitive data open by default, and it should be free, easy to use, and reliable.* According to the public data policy statement, Agencies should publish anonymised data:

- on or linked through data.gov.au for discoverability and availability
- in a machine-readable, spatially-enabled format
- with high quality, easy to use and freely available API access
- with descriptive metadata
- using agreed open standards
- kept up to date in an automated way

Whilst the open data team at the Digital Transformation Agency (DTA) helps government agency data custodians meet these requirements it is under resourced and wont need the needs of governments moving forward. While a national approach is welcomed, it should be acknowledged that States and Territories do support their agencies to meet open data requirements directly rather than rely solely on the DTA. For example, the

Victorian Government open data team sits within the Department of Premier and Cabinet and is the lead for vic.data.gov.au and has the remit to help the entire Victorian Public Service (VPS) publish open data and uplift data literacy and capability. Data registry from vic.data.gov.au is federated to provide users a national search via data.gov.au using technologies such as CSIRO Data61 Magda.

"*Data can only be truly transformative if we can collect it effectively and, crucially, agree on how we share and use that data to create the best outcomes for everyone. In other words, we all need to be talking the same language.*" Sir John Armitt (Chair, National Infrastructure Commission, UK)

A well defined Information Governance Framework exists in the NAA and similarly, ONDC's The Foundational Four paper identifies Data Governance Framework defines the context for governing data within an agency. However, there isn't a National Infrastructure Data Governance Framework that may reference legislation that is relevant to whole-of-government data policies and initiatives, strategies and policies applicable to States/ LGA, committee structures and reporting relationships, roles and responsibilities of various data stakeholders, and so on.

Recommendations:
- As part of the remit of the Office of the National Digital Twin, state and federal governments agree to establish a National Data Quality Management (NDQM) Framework which is necessary to enable effective data management across the built environment that addresses secure, resilient interoperability, which is fundamental for creation of a national digital twin.
- In conjunction with NDQM create a NDQM Data Injection Standards / Platform, which all States / Territories can use to create and enrich consistent time value contextual intelligent data sets and can share data within policies established by ONDC (Office of National Data Commissioner)
- Establish a central Data Registry-as-a-Service that provides consistent, intelligent, time-value contextual data to all entities

within the ecosystem while supporting federated data sharing as per numerous principles cited in ANZLICs, UK's Gemini Principles and others.

- That the Office of the National Data Commissioner be given responsibility for driving data requirements around digital twins.

3) Capability Building and Upskilling

Realising the digital transformation of the built environment sector and the benefits of the National Digital Twin will rely on the workforce having the necessary skills for different roles, from ontologists to data regulators to technocrats, while emphasising the need for a culture shift towards continuous learning. The pandemic has escalated the speed and scale of digital transformation across a range of sectors, including in the built environment. New innovations are irrelevant unless Australia has the right people and skills in place to use them; digital transformation is as much about talent and skills as it is about technology.

Building a successful Digital Twin (be it Geospatial twin, Manufacturing twin, Design twin, Service twin) generally has a Data Gathering phase (operational data, sensor data, base knowledge data), a Thinking phase (cognitive, reasoning, optimising, Machine-to-Machine, simulations), and an Executing phase (constructing, informing, acting, edge controls). For each of these phases within the continuum, the skills required are varied:

- Digital Twin – Awareness and Understanding
- Data Literacy Skills
- Information modelling - metadata, integration, attribution
- Digital and Technical Skills - AI/ML, Analytics, Cloud & Hyperscaler Skills to enable scaling through compute & storage elasticity, IoT / Sensors
- 3D and Geospatial Skills
- Cyber security skills and awareness as applicable to critical services, like Infrastructure DT
- Digital and Modern methods of construction skills across sectors as well as traditional competencies

In Australia, islands of excellence exist in different States and Territories. Bodies like NSB (National Standard Bodies), Smart Cities Council ANZ, CSIRO Data61, Australian BIM Advisory Board (ABAB), Australian Computer Society, Surveying and Spatial Sciences Institute (SSSI) and others are driving capability and upskilling agenda by raising awareness through national and international seminars and writing white papers that includes capability and skills as cornerstone to the success of realising value through DT. However, these are just that - islands of capability.

There needs to be a concerted effort to up and re-skill DT capabilities in core areas of the economy.

A skills framework sitting under the DT strategy will help identify the skills and competencies needed across a range of relevant roles, helping the State / LGAs / industry assess and resolve any gaps in skills, while setting out a learning pathway for people involved in developing and implementing the digital twins. Government can liaise with Smart Cities Council Digital Twin Task Force who are planning to develop a Digital Twin Skills Framework, to help government bodies and industry navigate the key attributes and issues relevant to Digital Twin capability.

The Digital Skills Organisation is funded by the Australian Government Department of Education, Skills and Employment through the Delivering Skills for Today and Tomorrow package. DSO core focuses to increase the digitally skilled and aims to integrate the 'pathway to work' (employers, potential workforce, and training providers) with the VET sector (Federal and State Policy, regulation, and Assurance) in an agile process that ensures decisions and resources are appropriately prioritised. The AIIA would like to see DSO responsibilities extended to adopt National DT Skills Framework, fund and work with agencies and associations like the ACS, Smart Cities Council ANZ and Data61 to develop targeted role-based training plans, designed to help upskill the workforce in the key technical and non-technical skills and competencies needed to design and operate digital twins.

4) Investments

Australia's infrastructure and broader industry today accounts for nearly 20% of Australia's GDP and directly employs 1.2 million people[49]. However, the sector's productivity has not kept pace with this growth, and productivity growth has not kept pace with other Australian sectors.

The Australian Government in the recent 2021 budget announced substantial investments into digital technology and innovation, including:

- $124.1m for building Australia's capability in artificial intelligence, including $53.8m for a National AI Centre
- $100m to support digital skills, including a digital cadetship pilot program

Out of the above, $40.2 million was allocated to a national "3D Digital Atlas", which will create a location-based platform consisting of over 90,000 datasets, complementing pre-existing digital twin initiatives in other jurisdictions.

Given the sector's size, and magnitude of both current and future investment, further efforts by government to invest in embracing digital technologies and innovation in the Infrastructure DT, will unlock substantial productivity gains for all infrastructure stakeholders: taxpayers, users, governments, and the community.

"This is truly transformational technology and the best thing about it is that it's open source ... everybody can get involved and build this asset together for all of us."

THE HON VICTOR DOMINELLO MP

Image by Touann Gatouillat-Vergos on Unsplash

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[49] https://infrastructure.org.au/chart-group/government-infrastructure-investment/

Quantum Computing

Introduction

Australia has world-class quantum research capabilities and an emerging quantum technology industry underpinned by the expertise and intellectual property developed at its research institutions.

Commercialising quantum technologies could create an $86 billion global industry by 2040[50]. Australia can play a valuable role in this global industry but as its global peers invest heavily in their own quantum ecosystems, it will need to act quickly to remain a key player in this global opportunity.

With our global competitors and trading partners investing heavily in quantum strategies and many of the largest tech companies in the world likewise investing heavily in this new paradigm, Australia has a current leading edge in people (skills) and research that if the government takes the recommendations in this paper will ensure we can become producers, adopters and exporters of capability rather than consumers.

Quantum computing is a fundamentally different way to process information, compared to conventional "classical" computing systems.

All computing systems rely on a basic architecture that allows them to store and manipulate information. Today's classical computers manipulate individual bits, which store information as binary 0 and 1 states. Millions of bits work together to process and display information – the processing power everyone is familiar with on smartphones, laptops, and the servers in the cloud.

In contrast, quantum computers tap directly into quantum mechanical phenomena to encode and manipulate information. To do this, they rely on quantum bits, or "qubits". Unlike a bit that can only be a 0 or a 1, a qubit can be in a combination of states. For example, 50 qubits can represent over one quadrillion data values – available for potential computation; and 300 qubits could represent more values to explore than there are atoms in the observable universe.

Quantum computers are not a replacement for classical systems. They will complement our classical systems by possibly being able to solve some intractable problems that become extremely memory intensive or time-consuming during computation. State-of-the-art quantum computers have been reported to rival and significantly surpass the capabilities of the most powerful conventional supercomputers on test problems.

A novel way to solve existing problems

Quantum computers offer the possibility to solve a variety of problems that are intractable on classical computers. Examples of applications include:

- Materials
  - Simulating quantum mechanical systems is a promising early application of quantum computing. This technique can be applied to fields such as chemistry, materials science, and high energy physics.

- Optimisation
  - Quantum computers may potentially find the best solution among varying weighted options more efficiently than classical computers, and could provide advantage in areas such as vehicle routing and delivery logistics.

- Machine Learning
  - Using quantum systems to train and run machine learning algorithms could allow us to solve complex problems more quickly, potentially improving applications like disease diagnosis, fraud detection, and efficient energy management.

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[50] https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/futures-reports/quantum

- Finance
  - Quantum computing may have the potential to achieve a significant advantage compared to classical computing in computationally intensive finance problems, such as the optimization of financial portfolios or the risk analysis of such portfolios.

These application examples are far from exhaustive. Researchers around the world are partnering with government and industry to explore potential use cases for the small-to-intermediate scale quantum computers that are currently available.

A future risk to cyber security

The advent of quantum computing will test the limits of our present-day cyber security methods. Large-scale quantum computers will significantly expand computing power, creating new opportunities for improving cyber security. Quantum-era cyber security will wield the power to detect and deflect quantum-era cyber attacks before they cause harm. But it could become a double-edged sword, as quantum computing may also create new exposures, such as the ability to quickly solve the difficult math problems that are the basis of some forms of encryption today. While post-quantum cryptography standards are still being finalized, businesses and other organisations can start preparing today. **Organisations need to identify their potential quantum-era security exposures and work with encryption solution providers to deploy quantum-safe alternatives as they become available.**

Recommendation:

- Government needs to dedicate resources to identify the potential quantum-era security exposures across all departments and keep abreast of the developments in post-quantum cryptography standards, to implement solutions as they become available.

A part of a broader technology revolution

Quantum computing is part of a broader technology revolution, based on our growing ability to engineer quantum states. Being able to create and control delicate quantum states like single atoms or particles of light leads to transformational technologies such as quantum computers, quantum communication networks and quantum sensors.

Quantum-enhanced communications systems have potential to advance data, communications and computer security beyond current limitations and enable networking of quantum devices for enhanced utility. Quantum-enhanced precision sensing, metrology, navigation and timing technologies can enable new capabilities or enhanced performance (e.g. size, weight, power, noise, sensitivity, stability) when compared to existing precision sensing technologies.

Successful commercialisation of these technologies can underpin industry growth for decades to come while driving productivity growth and enhancing security across a range of existing industries.

A rapidly evolving global landscape

Global quantum technology research and industry have grown swiftly over the past few years as nations and major corporations have significantly invested in technology development. This rapidly evolving landscape can be characterised by:

- National strategies, agendas, initiatives, programs and funding
  - Many nations have declared national strategies, or initiatives in quantum technology.[51] In general, the policies are focussed on accelerating research and development, developing industry ecosystems, workforce education, industry transformation and community awareness, and investing in infrastructure. These national strategic policies have generally been accompanied by significant public funding.

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[51] This (alphabetically) includes Canada, China, the European Union, Germany, India, Israel, Japan, the Netherlands, Russia, Singapore, South Korea, the United Kingdom and the United States of America.

- Technology industry investment and new ventures
  - Globally, more than 50 quantum technology companies received over US$1 billion of venture capital investment between 2012 and 2018.[52] Additionally, large technology companies such as IBM, Google, Microsoft, Amazon and Alibaba have substantial quantum computing programs, from significant undisclosed investments.
- Industry engagement
  - Companies are either actively seeking to understand and assess quantum computing and its implications or are seeking a first-mover advantage. Some have already invested in experimentation, application discovery and technology development.[53]

The rate and scale at which the international landscape is growing and evolving means that Australia must act decisively to build a thriving competitive local industry.

A fragmented local scene

As a direct result of early investment by the Australian Research Council in collaborative university-based research centres, Australia has developed world-class capabilities in quantum technology research and development. It was a pioneer in the nascent years of quantum computing, establishing early global leadership in both semiconductor and photonic approaches to quantum computing, as well as the theoretical foundations for the field. Australia now hosts a broad quantum computing research community across many universities, which is collaborating deeply with leading international research laboratories and multinational corporations and is complemented by a lively start-up sector.[54] [55]

Case study: The IBM Quantum Hub @ The University of Melbourne[56]

The University of Melbourne established one of the four founding Hubs of the IBM Quantum Network in 2018, opening access to leading edge quantum computing systems for university researchers and students, and serving as an important catalyst of activity in quantum software research and training.

Research projects span the fundamentals of quantum information and device physics, through to applications in a number of areas, including: traffic optimisation and routing in collaboration with Ford Motor Company, supply logistics with Australian Army, data classification in particle physics, machine learning, materials and chemistry, finance and bioinformatics.

Highlights include the creation of a new approach to quantum simulation, and the verification of whole-device entanglement over 65 qubits. The University delivered the first quantum computing subject in Australia aimed at postgraduate students without quantum physics prerequisites, to accelerate workforce development. Experiencing strong student demand, the curriculum has since expanded to include an undergraduate and another postgraduate subject in quantum software.

The Quantum Hub has been active in broadening access to IBM Quantum systems through initiatives involving all eight Victorian universities via the Victorian Quantum Technology Network, and a proposal for a National Quantum Computer Access Platform involving universities across Australia.

[56] https://www.unimelb.edu.au/quantumhub

[52] https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/futures-reports/quantum

[53] For example, there are currently 150 members of the IBM Quantum Network, including companies such as JPMorganChase, ExxonMobil, Samsung, Daimler, Accenture, Boeing, and Amgen. https://www.ibm.com/quantum-computing/network/members

[54] Growing Australia's Quantum Technology Industry, https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/futures-reports/quantum

[55] An Australian strategy for the quantum revolution, https://www.aspi.org.au/report/australian-strategy-quantum-revolution

Case study: Microsoft and The University of Sydney - Microsoft Quantum Sydney [57]

Since 2017, Microsoft and the University of Sydney have worked together to build Microsoft Quantum Sydney, the Australian arm of Microsoft's global quantum computing initiative to create a useful, scalable general-purpose quantum computer.

The Microsoft Quantum Sydney team is one of only a few experimental quantum teams at Microsoft worldwide.

Led by Professor David Reilly, Microsoft Quantum Sydney is located in the University of Sydney's $150 million Nanoscience Hub.

In the audacious project to build a useful, scalable quantum computer, Professor Reilly and his team have pioneered new techniques for controlling thousands of qubits at cryogenic temperatures.

The team invented a classical control chip, dubbed Gooseberry, that sits next to a quantum device and operates in extreme temperature conditions close to absolute zero.

Above this sits a general-purpose cryo-compute core that operates at slightly warmer temperatures and performs classical computations.

These computations determine the instructions that are sent to Gooseberry which, in turn, feeds low voltage pulses to the qubits.

These novel classical computing technologies are helping to solve many of the issues associated with controlling thousands of unpredictable qubits, the building blocks of quantum technology.

As a nation, Australia is only now beginning to contemplate a long-term strategy and investment priorities for the quantum technology industry.

Federal and some state governments have made significant investments and established important initiatives, however the piecemeal approach to industry development contrasts with other countries described earlier.

As such, while researchers in Australia contribute to the development of quantum computing technology in myriad ways, the scale of demonstrated Australian capability remains small.

Moreover, while Australian quantum computing technology at component scale continues to be world class, the quantum computing areas in which Australian research is world leading have become increasingly limited.

This past year has seen the release of multiple quantum technology roadmaps and reports in Australia with various aims and recommendations, a disparate collection that highlights the local fragmentation and the need for focus.

These recommendations have been summarised over the page.

[57] https://www.sydney.edu.au/nano/industry-partners/case-studies/microsoft-quantum-computing-research.html

CSIRO Quantum Technology Roadmap, May 2020[58]	An Australian Strategy for the Quantum Revolution, ASPI, May 2021[59]
• Develop a national quantum technology strategy • Explore efficient and effective funding mechanisms • Attract, train and retain the best quantum talent • Access the industry capabilities and infrastructure facilities • Establish multidisciplinary and multi-institution projects • Promote Australia's domestic quantum technology capabilities • Provide clarity on the implementation of defence trade control regulations • Encourage proactive local end-user and government engagement	• A new minister for critical and emerging technologies • A national technology strategy • Expand and elevate Prime Minister & Cabinet's whole-of-government leadership role on technology policy • A$15 billion post-COVID19 technology stimulus • Establish an 'Australia distributed quantum zone' • Lure Australian talent back home and attract foreign talent • Build global cooperation and increased direct involvement in quantum development by the defence and intelligence communities • Eliminate uncertainty by developing a national framework outlining national security and defence policy covering quantum technology • Expand the role of education and training within Australia
The Impact of Quantum TecCommunications, ASPI, April 2021[60]	**Australian Army Quantum Technology Roadmap, April 2021[61]**
• Formalise and prioritise Australia-US quantum cooperation • Develop sovereign capability in intermediate-scale quantum computing • Build an international presence in quantum communications • Establish a mathematical and theoretical sciences research institute • Partnering towards Australian quantum technologies	• Rapidly establish a quantum innovation ecosystem focussed on the land domain • dentifying the most disruptive and advantageous applications of quantum technologies for the land domains before competitors. • Developing the related technology, operating concept and modified force designs before competitors. • Supporting the Defence quantum technology strategy as it develops.

An opportunity to focus and grow

As discussed in the CSIRO Quantum Technology Roadmap,[62] to maintain its competitive advantages in quantum research and development, overcome the associated challenges, and enable the growth of a valuable and impactful industry, Australia must consider how it can:

- **Focus** and coordinate its quantum industry development efforts;
- Build Australia's quantum workforce and infrastructure **capability**;
- Support productive **collaboration** with local and international partners; and
- Enhance the **readiness** of governments, society and end-users for next generation quantum technologies.

[58] Growing Australia's Quantum Technology Industry, https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/futures-reports/quantum

[59] An Australian strategy for the quantum revolution, https://www.aspi.org.au/report/australian-strategy-quantum-revolution

[60] https://www.aspi.org.au/report/impact-quantum-technologies-secure-communications

[61] https://researchcentre.army.gov.au/about-us/rico/army-quantum-technology-roadmap

[62] https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/futures-reports/quantum

Applications of quantum technologies are beginning to emerge from the laboratory and their successful commercialisation has the potential to create a new multi-billion-dollar industry generating thousands of jobs for Australia.

The rest of the world is rapidly accelerating its investments into quantum technology.
If Australia wants to remain world-class in this field, it must act now.

Recommendations:

Given the global public and private investment in quantum technology, and the local landscape, the most pressing recommendations for accelerating and growing a competitive local quantum industry are:

1. A national quantum technology strategy
- Investment is needed to amplify Australia's significant strength in quantum research, commercialise emerging quantum technologies and solidify Australia's leadership. This investment needs an accompanying strategy with governance and oversight to ensure focus and coordination.
- Looking overseas at similar government quantum technology policies:
- Canada: in the 2021 federal budget,[63] C$360 million over seven years was proposed to launch a National Quantum Strategy, with the establishment of a secretariat within the Department of Innovation, Science and Economic Development for coordination.
- UK: the National Quantum Technologies Programme[64] has been running since 2014, with the first phase receiving £120 million over five years, and the second phase receiving £94 million over 5 years. This funds a national network of four quantum technology hubs.

For quantum computing specifically, where the future opportunities lie in both developing the hardware, and the software and applications that run on them, the recommendation is:

2. A National Quantum Computing Centre dedicated to researching and developing quantum computers with access to leading technology infrastructure, as well as targeting this research into leading applications with industry alignment and engagement
- The Centre, to explore practical applications and future use cases, requires the partnership of organisations from a variety of industries and disciplines. Partnerships between government, industry and academia can accelerate research and development, and in the process, help address the looming need for a greatly expanded and diverse quantum workforce.
- A similar policy path was taken by the Australian Federal Government in the area of AI: from a Roadmap[65] co-developed by CSIRO's Data61 and the Department of Industry, Innovation and Science in 2019, to an investment of $53.8 million over four years to establish the National Artificial Intelligence Centre[66] which will coordinate Australia's AI expertise and capabilities and drive adoption of the technology in the federal 2021 budget.
- For the federal government to invest a minimum of $110 million over four years in a national quantum computing centre to keep pace with global trends. This investment is based on the Quantum centre needing to be at least double that of a national artificial intelligence centre due to the wider breadth of quantum computing research and development, in both hardware and software.

[63] Canadian Federal Budget 2021, https://www.budget.gc.ca/2021/home-accueil-en.html

[64] UK National Quantum Technologies Programme, https://uknqt.ukri.org/

[65] Australian Artificial Intelligence Roadmap, https://data61.csiro.au/en/Our-Research/Our-Work/AI-Roadmap

[66] https://digitaleconomy.pmc.gov.au/fact-sheets/artificial-intelligence

Supporting innovation from inception to commercialisation

Introduction

This White Paper considers how Australia can better grow key industries to become globally competitive. For each industry covered by this paper, this has involved looking at the current state of that industry and how businesses, government and, in some cases, consumers can work together to create a globally competitive industry.

What is common across each of the industries considered, is the need to continually innovate and the role Government can play in supporting innovation across all stages of the innovation lifecycle - from ideation, through development commercialisation and market development.

At present, Government support for industry innovation takes the form of the R&D Tax Incentive (which offers industry-agnostic support for R&D based innovation at the development stage) and more targeted grant programs at the commercialisation stage. Whilst this support is most welcome, there are many types and stages of industry innovation that miss out.

Addressing this is no easy task as the nature and scope of support needed vary not only on the stage of innovation, but can vary by industry and business size and resources. Further, providing significant support for ideation or early R&D without ongoing support can doom good ideas to failure – more needs to be done to ensure good ideas are successfully shepherded through the innovation lifecycle and that both the innovator and Australia gain the greatest benefit from the innovation.

The AIIA recognises that there is no one size fits all solution when it comes to supporting innovation. Rather we argue that government and industry must continually work together to identify the best (and most efficient) mechanisms to support innovation from ideation to large scale commercialisation. As a starting point, we believe an innovation support framework is needed to map out existing forms of support and identify what more can be done.

As almost all modern innovations involve some level of digital enablement, our focus remains on how to better support digital innovation. In this chapter, we discuss how government can better support digital innovation across a number of strategic industries and how industry, government and in some cases, consumers can work together to make Australia more globally competitive.

National innovation Support Framework

The Organisation for Economic Co-operation and Development (OECD) states that innovation "*goes far beyond the confines of research labs to users, suppliers and consumers everywhere – in government, business and non-profit organisations, across borders, across sectors, and across institutions*". [67]

The OECD's Oslo Manual goes on to classify innovation into four types: product innovation, process innovation, marketing innovation and organisational innovation. These comments and categories can be useful when considering the level and type of support required, especially when combined with other factors such as industry, stage of innovation and resources of the business trying to innovate. For instance, the level of support a medical research start-up requires will be different to the support that might be needed for an established medical manufacturing company – both may be innovating, and both may require and be worthy of assistance, but the nature and scope of that support will likely vary. Similarly, a cleantech start-up and a software start-up will also have very different needs and pathways to market.

At present, state and federal governments provide a range of support; the federal government's primary programs are the R&D Tax Incentive (RDTI) and the Accelerating Commercialisation grant (AC). For state governments, support generally takes the form of in-kind support, small grants and more recently, cheap finance.

All of these are welcome sources of support, but they can be confusing, inconsistent and in some cases, mutually exclusive.

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[67] https://www.oecd.org/site/innovationstrategy/defininginnovation.htm

For instance:

- The RDTI provides a generous R&D tax offset for R&D based innovation, but it does not support non-R&D based innovation and it does not support subsequent commercialisation efforts.
- The AC grant is highly competitive and for every business that receives it, many other potentially deserving businesses miss out. This wasted effort by unsuccessful applicants erodes the overall cost benefit equation of highly competitive grant programs.
- In-kind support is also very helpful, but often relies on government appointed advisors who may have little expertise in the innovation itself.

Critically, the above provide important value, but determining which is available and provides the best form of support for a given type and stage of innovation can be difficult.

To address this, we suggest both a top-down examination of the innovation ecosystem and a bottom-up analysis of existing programs to consider what works well, how different programs work (or don't work) together and where the gaps are. This analysis needs to go beyond tax incentives and grants – it should look at what else is missing in our innovation ecosystem and how to address it (e.g. how to provide the skillets of the future so we can continue to innovate).

The objective is to develop a national approach that provides unified (not necessarily uniform) coverage for Australian industries (and the businesses within them) seeking to innovate and become more globally competitive.

Recommendation:

- That the federal government commission a comprehensive review of how Australia supports innovation, from ideation through to commercialisation with the objective of creating a national framework for support and recommending how existing gaps can be addressed. This review must necessarily consult with key stakeholders including state governments, industry associations,

research institutions and higher education and should cover tax incentives, grants and other government programs that currently support industry-based innovation.

- The premise here is that commercialisation is industry-led and government-supported. Industry is the most capable of delivering commercialisation and governments have the opportunity to provide various incentives, grants and stimuli to encourage investment and support early-stage innovation.

Greater support for Strategic Sectors

Whilst we recommend an in-depth, national review of how to identify and support development and commercialisation of innovation in its various guises, we recognise that this will take time.

In the meantime, the government must work closely with key strategic sectors (e.g. advanced manufacturing, cyber security, food and agribusiness, medical technologies, mining and natural resources)[68].

Assisting these sectors requires a multi-faceted approach; as outlined in other areas of this paper, these sectors often face regulatory and other hurdles which are slowing development and the application of existing and emerging technologies.

For example, robotics and AI as referenced in the Agritech chapter needs direct government incentives and action to ensure that this key Australian sovereign economic capability is maintained and we stay at the forefront of the global Agtech sector.

Finally, as IT is common to all industries, most of the specific measures suggested here for strategic sectors will provide greater support for all industries.

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[68] Per the Australian Government's list of six sectors of competitive strength and strategic priority.

Recommendation:

- Government to focus immediate efforts on supporting and enabling industries of strategic importance to not only ensure sovereign and domestic capability, but to also make them globally competitive and act as exemplars for other Australian industries.
- This paper suggests areas of strategic focus for enabling industries including AI, cyber and Quantum.

Greater support for, and facilitation of, collaboration

Currently one of the primary government mechanisms to support greater collaboration is through Cooperative Research Centres (CRCs) and grant funding for CRC Projects (CRC-Ps). CRCs are created at the industry level, comprise at least one Australian business and one Australian research organisation and receive funding for up to 10 year. CRC-Ps are project specific, comprise two Australian businesses (of which one must be a SME) and one Australia research organisation and receive up to $3 million in matched funding over 3 years. Notably the CRC Program has been well received by industry and done much to increase collaboration.

However, we believe more can be done. Specifically, creating a CRC or competing for CRC-P funding is expensive and depends upon Government approving and endorsing the CRC's objectives. Further, it benefits only a small number of businesses. Similarly, to the R&D Tax Incentive, a more general collaboration tax offset would support business to invest in collaboration with Australian research organisations without having to first seek and compete for Government endorsement.

A collaboration premium would provide a direct benefit to Australian business and would have a secondary benefit in providing much needed income to Australia's research and education sectors. Australia's closed borders and the current geopolitical environment

means Australia's research organisations and educational institutions don't have access to the fee paying foreign researchers and students that we enjoyed in earlier years. Whilst this position may change again in the future, it would be prudent to diversify our higher education sector by encouraging greater collaboration with industry, especially where it provides support for industry to invest in research organisations and for both to profit from mutual collaboration.

Despite collaboration featuring heavily in almost every Government report into innovation, multiple recommendations for a collaboration tax incentive have yet to be adopted[69]. We believe this needs to change and that even a limited and relatively inexpensive collaboration tax incentive would go a long way toward supporting smaller businesses to collaborate with research organisations (whilst providing a valuable source of income and future revenue for the research organisations involved). We therefore recommend that the Government engage with industry and research organisations to develop a narrow collaboration tax incentive to incentivise industry to collaborate with research organisations.

Recommendation:

- That government work with industry and research organisations to develop a collaboration tax incentive to foster greater collaboration.

Innovative software

Software underpins almost every aspect of our lives and permeates all industries and sectors and most types of innovation require some level of software to support their development and commercialisation. At present, the only broad-based support for software is the R&D Tax Incentive which only provides support for software based R&D that meets strict criteria. Most software development is based on re-using existing libraries and code wherever

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[69] https://www.industry.gov.au/data-and-publications/australia-2030-prosperity-through-innovation

possible to minimise the work required and to use tried and proven code and architectures. However, where the resulting solution is innovative regardless of whether R&D is required, an innovative software incentive could be devised to change the focus on the outcome rather than the process of the innovation.

Thus, whilst software-based R&D may account for almost half of all R&D claims, the percentage of software development that qualifies under the R&D Tax Incentive still only represents a fraction of all software development undertaken in Australia. Much of this software relates to the development of innovative products and services yet does not qualify as R&D under the R&D Tax Incentive. Contrast this with arguments that if half of all R&D claims are for software, then software development is being adequately supported. Quite simply this argument fails to recognise just how large the software development industry is and how much does not qualify as R&D.

Of course, not all software development should receive government support, but where the end solution is innovative, surely the (software) development required to achieve that solution should be supported. We therefore believe that a specific software tax incentive would benefit not only the IT industry, but the Australian economy.

However, we also recognise that such a tax incentive must be carefully crafted to ensure only software intended to create innovative products and services should be supported. In this regard, we note the recent announcement of a Digital Games software tax incentive. Whilst the details of the proposed incentive are not yet known, this might provide a reference model for an innovative software tax incentive – or it may not.

We therefore recommend that the government work with industry to develop a tax incentive for innovative software development.

Recommendation:

- That government consider an innovative software development tax incentive or grant to support development of innovative software which does not qualify for the R&D Tax Incentive but has the potential to create innovative products and services that will benefit the Australian economy.

Extending the proposed Patent Box

In its May 2021 Budget, the Federal Government announced it would introduce Australia's first patent box regime. Patent boxes (often called IP boxes as they are not always limited to patents) work by applying a lower tax rate on revenue associated with qualifying patents to the prevailing income tax rate. When patent boxes were first introduced, there was a general trend to move IP to countries that offered the most favourable taxes. To combat this, today's patent boxes require the patent holder to also largely develop the patent in the host country. As a result, patent boxes not only help keep IP in a country, but they also incentivise business to invest in developing patentable innovations in countries with a patent box.

It is therefore not surprising that industry has campaigned for Australia to introduce its own patent box. The May Budget answered this call, but unfortunately as currently proposed, the patent box will be limited to medical and biotechnology patents. We recommend that the patent box be extended to patents within our strategic sectors.

Recommendation:

- That government extend the ambit of the proposed patent box regime to patents relating to all sectors of strategic importance.

Cyber Security

Introduction

It is well recognised that cyber security attacks and public and private maturity in dealing with them is a global issue that needs attention. The last 12 months has seen a series of significant and targeted incidents against high profile Australian organisations, many facing costly extortions. Since 1 July last year, the Australian Cyber Security Centre (ACSC) has responded to over 1,275 cyber security incidents, at an average of more than five incidents per day. Following the establishment of the ACSC's new online cybercrime reporting tool, ReportCyber, on 1 July 2019, over 36,000 reports of cybercrime have been received. That is an average of over 145 reports a day—or more than one report every ten minutes. This trend will continue.

Globally, attacks are also on the rise. In the last five years there have been well over 300 significant cyber incidents and we have witnessed the wholesale theft of data and disruption to major businesses.[70] Despite increased education, awareness and investment from governments, industry and a growing domestic cyber security sector, Australia is still not managing cyber risk effectively.

In Australia, the total spend on cyber security in 2021 is predicted to be $5 billion.[71] Global expenditure on cyber security is expected to top $50 billion.[72]

However, leadership in cyber security is often lacking; nearly one in five board members are indifferent to their security team and view them as an inconvenience, and only half of executives value the security of their organization from a revenue and brand protection perspective.[73] Meanwhile the threat of cyber disruption or attacks is only increasing and becoming more complex.

With the release of the *Australia's Cyber*

Security Strategy 2020[74] and upcoming amendments to critical infrastructure legislation the Australian Government is seeking a step-change in the way the public and private sector respond to cyber threats. The reforms reflect a growing realisation of the impact a compromise or disruption of a critical network would have on Australia's prosperity and national security.

The AIIA has been active in responding to and participating in these significant policy reforms. Our submission to the PJCIS enquiry can be found here.

The proposed changes will require greater private sector cyber security investment and hold boards more accountable for the protection of critical networks. These changes will apply to communications, energy, transport and water/sanitation providers, and extend to non-traditional sectors including:

- financial services and markets;
- data storage or processing;
- defence industry;
- higher education and research;
- food and grocery;
- health care and medical; and
- space technology.

Companies captured by the reforms will be required to report cyber security incidents and maintain risk management programs.

The new rules require a commitment from network owners to understand their security vulnerabilities and adopt a pathway to uplift that is reasonable and proportionate to their network's importance to national wellbeing.

Operations of the most vital infrastructure - 'systems of national significance' - will be required to test their cyber security resilience and cooperate more closely with government.

[70] https://www.csis.org/programs/cybersecurity-and-governance/technology-policy-program/other-projects-cybersecurity

[71] https://www.crn.com.au/news/australian-cybersecurity-spending-to-reach-38-billion-in-2018-gartner-479420>

[72] https://www.gartner.com/en/newsroom/press-releases/2018-08-15-gartner-forecasts-worldwide-information-security-spending-to-exceed-124-billion-in-2019

[73] https://www.darkreading.com/careers-and-people/high-stress-levels-impacting-cisos-physically-mentally/d/d-id/1333888>

[74] https://www.homeaffairs.gov.au/about-us/our-portfolios/cyber-security/strategy

These reforms represent a shift towards greater burden sharing between government and industry in preserving national cyber security. There is a recognition - and in fact expectation in regulation and law - that the private sector will play an increasing role in the preservation of a critical infrastructure provider's cyber security. Government will expect a high level of cooperation from owners of systems of national significance. In some circumstances, government may also provide support during and after an attack but all operators captured by the reforms will have to assess and bolster their own capabilities and will look to industry as they strengthen their cyber security arrangements.

This recognition increases the importance of ensuring the cyber security industry is providing an appropriate standard of service to improve our national defences. Critical infrastructure operators can legitimately expect that the Government's demand for greater cyber security investment will be matched by intervention to increase clarity and protections for consumers of cyber security services. Such an intervention would also carry benefits for the government as a large cyber security procurer and alleviate the burden on the ACSC as a national capability.

Growing Globally Competitive Industries – Critical Technology

Rapid technological advancement has transformed Australia's economy and has made Australia more dependent on interconnected digital technologies. These digital technologies are critical to our current and future security, economy and prosperity, including current and next generation telecommunications, artificial intelligence and smart cities. The Government defines critical technologies as 'current and emerging technologies that have the capacity to significantly enhance or pose a risk to our national interest (prosperity, social cohesion or national security).'

As our dependence has increased, critical technology has become a central element of strategic competition. Nation states have recognised the strategic value of controlling critical technology supply. At the same time, the cyber security threat environment continues to worsen, with state and non-state actors advancing their capabilities and exposing our vulnerabilities.

These conditions present a range of economic and security risks for Australia. Recent technological evolutions, such as 5G telecommunications networks, brought into sharp relief the increasing cyber security complexity associated with critical technologies and reliance on foreign supply. COVID-19 exposed the vulnerabilities in our supply chains, and the need to create greater resilience and indeed domestic capability. And as our competitiveness on the global stage becomes more dependent on our ability to quickly adopt secure technologies, strong action is required to increase our sovereign cyber security capability.

As Australia continues to integrate more of these technologies into our economy, industry and government must act in close partnership to ensure continued access to secure supply chains. We must also work to ensure we have the necessary sovereign cyber security capability to protect those capabilities underpinning our competitiveness, regardless of origin.

The Australian Government has demonstrated the importance of this issue and its intent through the release of the discussion paper: Critical Technology Supply Chain Principles: A call for views[75]. This represents an important first step in addressing this complex challenge. But further action is required. The strength of our economy and ability to compete on the global stage is increasingly dependent on our ability to quickly and securely adopt and adapt to technological evolutions.

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[75] https://www.homeaffairs.gov.au/reports-and-pubs/files/critical-technology-supply-chain-principles-discussion-paper.pdf

The AIIA's recommendations address two key outcomes - strengthening Australia's approach to critical technology cyber security management; and supporting Australia's competitiveness through technological advancement enabled by security.

Recommendations:

1. Support the growth of our domestic and strategic cyber security capability to ensure Australia has the skills necessary to secure critical technologies.

- Efforts should initially focus on developing standardised cyber security requirements (leveraging the work done by the NSW Cyber Standards Harmonization Taskforce), such as certification and accreditation requirements for industry. These could build on the good work achieved through the NSW Standards Harmonisation Taskforce. In meeting such standards, industry would have to invest in internal and external talent and the technology required to uplift their security.

- Increased investment to grow Australia's cyber workforce pipeline. Investment should seek to strengthen the Cyber Security National Workforce Growth Program and the Cyber Skills Partnerships Innovation Fund detailed in Australia's Cyber Security Strategy 2020. The cyber security industry covers a broad range of skills. A clearer view of the most critical cyber security roles would be welcome.

2. Global partnerships to ensure continued access to secure critical technology supply chains.

- Partnerships should be pursued and deepened within existing structures including the Five Eyes, Quadrilateral Security Dialogue and with broader like-minded nations that play key roles in setting standards for, and the development and manufacturing of, critical technologies.

- Australia should also establish public-private partnerships and consortium models that recognise and support secure industry partners to compete on the global stage – acknowledging that competition is currently skewed with some suppliers receiving significant state support.

3. In recognition of the global demand for secure critical technology solutions, greater investment in Australia's development of critical technologies.

- Government and industry should seek to identify areas of critical technologies where Australia has competitive advantage and economic opportunity exists. Government should provide greater support to our world leading research and development sector to direct their efforts towards critical technologies. Our investment should be bolstered in areas that Australia is already making significant strides such as quantum computing should be bolstered. Australian involvement in developing critical technologies, or elements of their supply chains, would allow us to directly influence the security of critical technologies to Australia's standards.

4. Clear articulation from government of the technologies deemed critical, the applicable security requirements and greater visibility of the threats.

- As the Government rolls out enhanced security requirements for critical infrastructure, clear guidance of how existing legislative and regulatory requirements apply to critical technologies is required. Any such framework should include appropriate checks and balances, that first empower and enable industry to drive security outcomes, then support public-private partnerships in times of crisis.

5. Develop critical technology security standards aligned with international partners to enable trusted trade and engagement, resilient underpinning capabilities and support Australian industry to compete on the global stage.

- The development of standards for Australia's cyber security and critical technology is crucial. Standards will uplift Australian industry and requirements for critical technology from international partners ensure those technologies sourced internationally are secure in an increasingly hostile cyber threat environment.

As the technology sector becomes more complex, including through increasingly interdependent global supply chains, the development of any legislation or regulation applicable to critical technology will of course require significant consideration and consultation. Ultimately, industry is the primary owner of, and has responsibility for, the maintenance and security of critical technology within Australia. Government and industry must work in close partnership to secure our supply chains, create enabling sovereign capability and allow Australia to compete on the global stage.

Ransomware

The past 12 months have seen a continued surge in ransomware campaigns, with a series of high-profile incidents affecting Australian organisations. Ransomware incidents continue to increase in frequency, sophistication and scale. Significantly, there has been a shift in the tactics used by threat actors with a move from encrypting systems for payment to exfiltration of data and extortion. The technology sector, which provides critical modern digital cloud-based platforms to government and company clients, imparts a strong level of cyber security and resilience, but the adoption of modern platforms with the latest controls and good cyber hygiene across the economy is not where it needs to be.

In Australia, we have observed the ransomware strains Netwalker, Nefilim, CL0P, Maze and Egregor to be most prolific. Threat actors are becoming more discerning, clearly studying their victims and crafting attacks to maximise return-on-investment. Ransomware operators are getting bolder and their attacks increasingly targeted. Their modus operandi is moving away from mass volume attacks towards specific targeting based on assessments of potential financial reward. Victim organisations can restore their networks in the majority of ransomware but often at considerable cost and effort in containment, recovery, and mitigation of future incidents.

Government and law enforcement need to do more to drive cost into the business models of cybercrime. In the first half of 2021, governments have shown an increased willingness to cooperate internationally in arresting cyber criminals, to disrupt their operations through sanctions and cyber means, and to target their finances.

However, governments alone will not be able to address the ransom and extortion attack challenge. Organisations need to take more effective steps to prevent ransom and extortion attacks, and to manage them when they occur.

The debate around ransomware and the decision to pay when data are encrypted or exfiltrated is contentious and dynamic. The prevailing advice from governments and industry to organisations that receive an extortion demand is not to pay – victims who pay only encourage more crime.

However, refusing payment is not always simple, particularly when the ransomware incident is coupled with a DDoS attack that impacts business operations, or with the threat of reputational damage following a data leak. Regrettably, in cyber security incidents, victim-blaming is still the norm.

Organisations which reach the decision to pay, and want to be transparent about their choice, risk facing negative reaction from customers, shareholders and the public due to the stigma around disclosing paid extortions.

As ransomware becomes more prolific, public debate centres around how we can make it less lucrative for cyber criminals to pursue this type of activity.

A live discussion on legally banning ransomware payments as a way to address the issue continues in Australia, in New Zealand and in the United Kingdom and United States.

Government-imposed financial penalties for paying a ransom will discourage companies from negotiating with the threat actor, which in turn might discourage criminals from undertaking these activities.

In October 2020, the United States Treasury issued a warning that contractors facilitating ransomware payments to sanctioned cyber criminals are illegal and companies can be prosecuted.

Citing ransomware payments and thefts of virtual currency, in December 2020 the United States Treasury proposed new rules that would require banks and money-service businesses to submit reports and keep records on cryptocurrency transactions along with verifying their customers.

The proposed bill seeks to address the illicit use of convertible virtual currencies through creating a reporting obligation for banks and financial-services providers for transactions in Bitcoin, Ethereum and others.

While a step in the right direction, in the short term, this move is likely to lead to threat actors focusing on victims located in other countries where legislation is still pending or to victim organisations using service in other jurisdictions to negotiate with and pay criminals. This trend is likely to continue in 2021 as more countries look to introduce frameworks to deal with the ransomware problem.

The AIIA welcomes recent reports that the Australian Federal Police Cybercrime Operations group will soon begin work on a new ransomware taskforce to centralise law enforcement efforts.

The AIIA supports a centralised, whole-of -government approach to tackling ransomware including deep cooperation with like-minded overseas law enforcement and intelligence agencies

Recommendation:

- It has been reported that the government is considering a mandatory reporting regime for businesses that pay ransoms to cyber criminals. The AIIA supports a mandatory notification regime to assist the accurate collection of data and to promote a more honest and transparent discussion around ransomware. In developing a scheme, the Government should carefully consider whether the collected data is kept confidential or published and work with industry in developing this policy.

Privacy and Data

The free and secure flow of data across borders is increasingly critical to the digital economy globally and has allowed unprecedented economic growth and opportunities for both existing and emerging markets. Increasingly it is data about individuals, or 'personal information', that contributes to this growth. Many of the tech titans that dominate global stock markets can attribute their success to the value that can be extracted from personal information and the ability to reach a global market.

While there are many legitimate reasons and requirements for keeping data onshore, governments and businesses across the world have realised the need to balance the undeniable commercial benefits that come with the free cross-border flow of personal information with strong privacy regulations and cyber security practices to ensure the protection of consumers. Such protections keeping pace with emerging risks will be essential for the market to continue to build trust in digital products and services. As trust is an essential ingredient in the success of any new way of doing business, strong, clear and uniform privacy regulations will be both beneficial to consumers and business alike.

Global Regulatory Environment

In the late 1970s, the Organisation for Economic Co-operation and Development (OECD) recognised that conflicting national laws around how data should be handled would be an impediment to future commerce and introduced the Guidelines on the Protection of Privacy and Transborder Flows of Personal Data in 1980. These Guidelines introduced standard principles which were designed to be replicated in legislation of member states. In response to this Australia introduced its privacy law in 1988, largely following these principles. Since the passage of the federal Privacy Act 1988 it has only had two major uplifts, in 2000 and 2014. While Australia was considered a first mover in privacy law in the 1980's, it is now rapidly falling behind as nations around the world pass laws to meet many of the standards set by Europe's General Data Protection Regulation (GDPR). The GDPR imposes privacy and security standards on organisations processing personal information relating to persons in the European Union (EU) and harsh penalties against organisations who violate these standards no matter where in the world they are based.

Under the provisions of EU law, the European Commission (EC) can determine that another jurisdiction has an adequate level of privacy protection commensurate with the GDPR. This 'adequacy decision' permits the free flow of personal information between the EU and the other jurisdiction without further safeguards, reducing the 'red tape' for businesses looking to engage the European market. Australia is yet to be recognised as an adequate jurisdiction but many other nations outside the EU are, including several large trading partners of Australia: Japan, New Zealand and Canada, with South Korea in the final stages of being recognised. The UK is also on this list as part of the transitory Brexit measures and will likely be substantively appointed as an adequate jurisdiction by the EC later this year. Forty years on from the first OECD standard, this 'adequate' network set up under European law has created the most powerful global data transfer standard and network of economies, with many nations seeking to join to more easily facilitate digital trade and commerce.

The GDPR sets a 'high-water mark' for privacy regulation worldwide, and while not all its protections may be appropriate for adoption within the Australian market, there are some key attributes of the GDPR that should be considered for adoption.

Australia's privacy legislation

The Australian Government is currently undertaking a review of the Privacy Act 1988 to consider whether Australia's privacy regulations should be strengthened. In its response to the 2018 Australian Competition and Consumer Commission's Digital Platforms Inquiry, the Government has already supported the uplift of data breach notification requirements and the introduction of higher penalties for breaches of privacy law. In line with the GDPR, the Government has also indicated its support for the strengthened consumer consent requirements and the introduction of a consumer right to the erasure of their data. The Government has also indicated support for a statutory tort for serious invasions of privacy.

As well as uplifts in the consent and individual rights domains, two other key areas will need consideration if Australia were to meet basic global regulatory standards and more readily be considered for recognition as an adequate jurisdiction amongst the growing list of some of its major trading partners: namely, the removal of the exemptions from the Privacy Act for employee records and small business. **In the data age, the argument that a small business or employee records should not be subject to the provisions of the Privacy Act are not as relevant as they were in the last century** (when digital technology was the exception, not the norm). These provisions are no longer in step with community expectations and are a hindrance to participation in global digital markets.

As an example of how easily Australia may be able to join this network, New Zealand has a privacy law that shares most of its DNA with the Australian Privacy Act. Two of the key differences between the two countries are the exemptions for employee records and small business under Australian law. This provides further evidence that the removal of these exemptions would greatly improve Australia's

position to negotiate for recognition as an adequate jurisdiction, and the chance to join a network of like-minded economies to facilitate more efficient digital trade and commerce.

Recommendation:

- That the Australian Government make the necessary changes to the Privacy Act 1988, including removing exemptions for employee records and small business, which will better enable it to seek adequacy status under EU law, and increasingly the law of some of its major OECD trading partners, therefore remove compliance red-tape for Australian business wishing to establish global markets in digital commerce.

Better privacy as a global market opportunity

The global trend is towards stronger privacy regulations, with other international markets potentially adopting similar provisions to the GDPR's adequacy requirements, and this trend shows no sign of slowing down.

Even though the Government is looking to bring our baseline requirements to a level which would bring Australia more into line with standards in key markets, there are no guarantees that this will happen in a timely way or be as comprehensive as is necessary to be meaningful.

Just as Australian business has had to take the lead in clean energy policy to maintain relevance in key markets, it is incumbent on business to do the same when it comes to privacy and personal information protection.

For now, business should take the lead in setting standards and guidelines which will better enable global participation in the digital economy.

Such standards will enable emerging and existing businesses to bake in privacy by design in key processes and help future-proof against regulatory enhancements in both Australia and offshore.

Recommendation:

- That, in consultation with its membership, the AIIA develops a set of industry level privacy guidelines that will enable business to better meet current and emerging regulatory and community requirements for the handling of personal information, and better equip businesses of all sizes to be competitive in the global digital economy.

Business should take the lead in setting standards and guidelines which will better enable global participation in the digital economy.

AI/Machine Learning
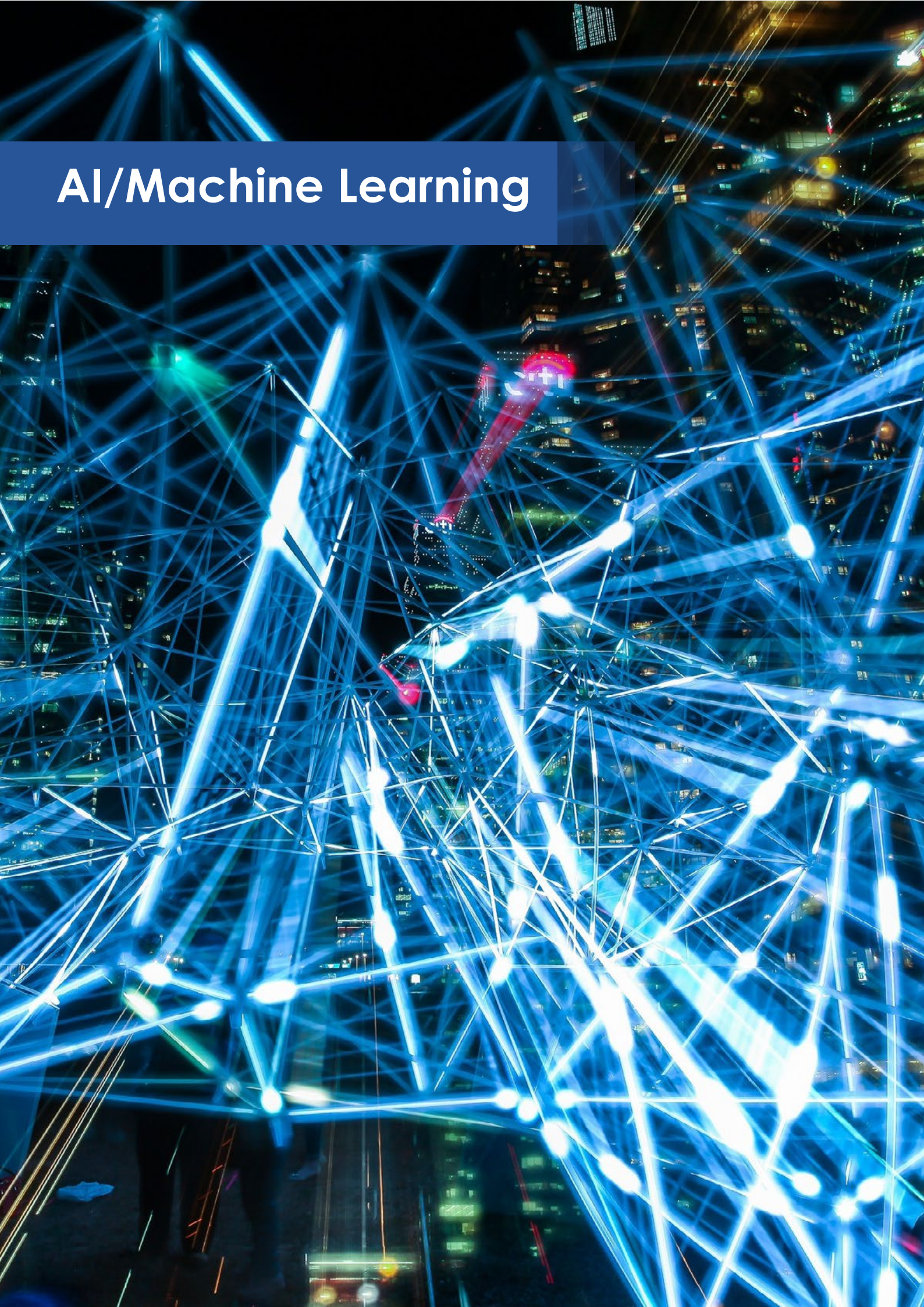
Introduction

Artificial Intelligence (AI), Machine Learning (ML), and Robotics innovations are already transforming the lives and businesses in Australia. The level of investment we are seeing globally will create as much of an opportunity as it will a risk to the Australian economy.

AI will become a dominant and critical part of the Australian economy and society as we move deeper into this decade. It has the potential to transform, educate, save lives and unlock enormous economic value. Whether that technology is Australian or imported and therefore whether we become producers or consumers will depend on the decisions we now make.

For some, AI is complicated science fiction or indeed as intimidating – the reality is however, without realising it, Australians are using and are exposed to AI every day.

From the predictive text function on a smartphone to suggested responses within email, and virtual assistant chatbots on bank or government websites, real-life examples of AI are prevalent in 21st century Australia.

At the other end of the spectrum are sophisticated, task-based machines capable of learning and changing themselves in response to new information or scenarios.

Powered by complex algorithms, these automated processes have the ability to supercharge the problem-solving Australians apply to critical industrial, commercial, sociological and health challenges.

There is not an industry in Australia that will not be impacted significantly through the adoption of AI technology. It creates exciting opportunities, ethical challenges and significant benefits economically, environmentally, scientifically and socially.

The importance of AI: why governments should pay attention

A recent study by AlphaBeta and CSIRO's Data61 estimated that digital technologies, including AI, are potentially worth $315 billion to the Australian economy by 2028.[76] McKinsey estimates that automation technologies, a subset of AI technology, could comprise $30 to $60 billion in economic value to Australia by 2025.[77] This includes opportunities for employment, exciting career paths, exporting products and services and securing Australia's primary industries. Given these levels relative to GDP contribution of other industries in Australia's economy, this means that within a decade, leveraged correctly, the AI industry could become one of Australia's greatest contributors and position us well on the global stage regardless of our size or location.

AI can play a strong role continuing to suppress COVID-19, completing the vaccine rollout and driving Australia's economic recovery. It can also be used to improve citizen service delivery, quality of health, life and education. It can automate the mundane, improve productivity and efficiencies across almost every industry.

Australia can leverage AI to build an economic advantage into the future, both as a new industry providing the jobs of the future and as a national competitive advantage ensuring Australia isn't left behind.

Our government should aspire to be a country in which AI is infused into the understanding and everyday practices of citizens, public servants and industry. South Korea and Finland provide two examples of this kind of advancement on the AI journey; the University of Helsinki provided the Elements of AI fundamentals course to all EU citizens free of charge as a 'Christmas gift' in 2019,[78] while in South Korea, the government released the Digital New Deal in 2020, which envisions state-led industrial and educational efforts on the potential opportunities in AI.[79]

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[76] AlphaBeta. 2019. **Australia's digital opportunity - Growing a $122 billion a year tech industry**. Consulting report prepared for DIGI (www.digi.org.au) by AlphaBeta. Sydney

[77] McKinsey. 2017. **Digital Australia: Seizing the opportunity from the Fourth Industrial Revolution**. McKinsey and Company. Sydney.

[78] https://www.aljazeera.com/news/2019/12/18/finland-offers-artificial-intelligence-course-as-christmas-gift

[79] https://www.privacyshield.gov/article?id=Korea-Artificial-Intelligence

Whilst the Australian Government recently announced funding of $124.1 million to fund its AI Action Plan[80] the AIIA does not believe that this investment meets the requirements of the country to regain its competitive advantage lost to our trading partners in our key critical industries like agriculture, manufacturing, defence, and health where AI will play a key role. To remain competitive, the investment needs to be far more significant and in commercialisation and not research. Further, the investment should be industry-led, supported by Government and recognised research institutions. **Based on the current strategy, it is unclear in the government's funding commitment how it intends to ensure that AI technologies can be commercialised in-country.**

The AIIA proposes a bold and strategic approach on what is needed to advance AI within the Australian economy, namely we propose:

1. Harnessing the power of AI to solve Australia's economic challenges.
2. Empowering governments to become model AI citizens
3. Establishing a National AI Commercialisation Hub
4. Pursuing a National AI skills and jobs agenda
5. Partnering with established entities to develop a National AI Ethics Framework

1. Harnessing the power of AI to help solve Australia's economic challenges

The AIIA does not believe that this is a problem for government to solve but rather to support industry where expertise already exists. Industry and government should join forces to harness the power of AI to help solve one of Australia's big policy problems. Given the potential size of the economic benefits, the industry can build the capacity and capability to fund ongoing research and commercialisation itself, relieving the Government of its current commitments.

The overwhelming national imperative to continue to suppress COVID-19, complete the vaccine rollout and drive Australia's ongoing economic recovery from the coronavirus recession provides fertile ground to demonstrate the power of AI and the significant contribution the Australian AI industry can make to advancing the national interest.

We recognise the investment of $33.7 million over four years to support Australian businesses to partner with government to pilot projects for AI-based solutions to national challenges, however the investment has in effect been slated for further research and not full commercialisation which is where the real economic impact and return will be delivered. Failure to invest in and incentivise commercialisation will result in expertise, IP and capability to move off shore.

Tackling a "sector specific" policy challenge affecting, for example, the mining, health, manufacturing, or agriculture industries is a more targeted option and can showcase and accelerate Australian AI leadership.

This joint industry government project, by producing an impactful example of how AI can be used to improve service delivery for citizens or industry step-change, also presents a valuable opportunity to encourage the Australian people to embrace the benefits of AI, through a practical demonstration of AI. Building capability as well as commercialised products and services is where the Australian economy will most benefit. Contemplate the significance of adding an incremental $315B to Australia's GDP within the next decade if we realise the potential of AI as an industry in and of itself.

The flipside is that given the investment already being made globally in areas deemed to be priority industries for Australia, that should they become uncompetitive, the detrimental impact to our economy could be unrecoverable.

In addition to a targeted industry AI initiative, we would encourage government agencies to take accountability for the development of

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80 https://www.industry.gov.au/policies-and-initiatives/artificial-intelligence

solutions partnered with Australian and global firms to solve sector specific problems for which that agency has accountability.

We have made a recommendation in this paper as to a suggested area of focus being disaster resilience but there are other opportunities for exploration such as in mental health. Disaster resilience has been put forward as a target opportunity as Australia is beset with regular impactful weather events, agriculture and manufacturing.

Recommendation:

- That Industry and Government collaborate to harness the power of AI to help solve Australia's economic challenges in a critical industry. See example of disaster resilience further in this chapter.
- That Federal Government investment in the growth of an AI industry be focussed on supporting commercialisation ahead of further investments in research and early-stage development by supporting industry players with a successful track record in commercialisation.

2. Empowering government to become a model AI citizen – building capability

Governments should proactively promote and demonstrate the value of AI to encourage its uptake across the Australian economy.

Governments should take steps to understand and explain the use of AI within their own agencies, how effective government agencies have been in seizing the benefits of AI thus far and identify opportunities to make better use of AI in the future.

This could lead to a single agency becoming the template or exemplar for other Government Departments. This process should involve skilled Australian SME AI businesses to provide industry validation of past performance and to help agencies identify opportunities for the future.

The exemplar agency would set up an AI ethics board to create the guidelines and best practice. This would include members from across the APS and members from industry to include standards and global best practice.

It would create:

- ° Ethical guidelines for the development and use of AI for that Agency to become adopted as whole of government guidelines
- ° an AI register of all current and future solutions that use AI or machine learning to allow for citizen transparency.

Learnings from this work could then be templated by other Government Agencies both at a Federal and State level.

Governments should leverage their "weight" in the marketplace to create the right conditions for the Australian AI industry to flourish.

Procurement rules should be modified to ensure local AI capability is valued and utilised.

The number of local jobs provided now and the economic contribution local AI businesses can make to the AI industry in the future should be relevant considerations in procurement policy. Government should be a leading customer for new locally developed technology and remain open to global best practice.

Government should continue the push to be a model customer when it comes to payment terms.

How can procurement feedback be obtained digitally and have AI analytics applied to it to determine further opportunities or challenges for government suppliers?

Recommendations:

- Consider rolling out targeted education about AI to Senior Executive level staff within government agencies, to foster a better understanding of AI across government and the opportunities it presents.
- Set targets/KPIs for adoption of AI by government agencies.

- Publish a constantly updated portfolio of AI enabled customer service enhancing projects.
- As part of the Secretaries ICT Committee, the federal government should stand up a Government AI Ethics Committee and invite in external members for example, (industry, University sector) to review citizen facing use of AI projects
- Government as a major ICT procurer should support the local AI ecosystem and establish a cross-agency panel process to allow agencies to put problems out to tender and allow companies to come forward with AI enabled solutions.
- That leaders from within the Australian AI industry partner with a government agency and lend their insights and expertise to empower that agency to fully harness the benefits of AI – to become a "model AI citizen".
- Once this agency's journey to becoming a model AI citizen is complete, it will provide a compelling case study of how the Australian AI industry can assist organisations – in both the public and private sectors - to more effectively achieve their strategic objectives and improve the delivery of services to their customers.

3. Establishment of a National AI Commercialisation Hub

Australia has globally significant and recognised research and development leadership expertise in AI:

Australia has established world-leading capabilities in a number of core AI-related fields housed within our universities, research organisations and companies.[81]

The current investments across Federal and State Governments have targeted research and are fragmented, without a commercialisation agenda.

Government investment levels are still well below global standards and without conversion of research investments to a commercialisation of the AI industry, we will become consumers rather than producers, threatening the global competitiveness of key sectors of our economy

Australia needs to be an attractive market to retain and attract AI skills. Therefore, the level, source and nature of investment needs to increase significantly and result in the commercialisation of globally competitive products & services.

The GDP benefit of digital technologies such as AI to the Australian economy is at least $315B over the next seven years.[82]

The development of AI products and services in particular Australian industries will protect local markets, create globally competitive positioning for Australian industry and develop new export opportunities.

To catch up on the head start other countries have made in AI commercialisation, Australia needs a model that rapidly translates AI research and early solution development into commercially ready products & services to take to global markets.

The AIIA posits that Australia needs a national hub focused on AI research translation, investment attraction and support of AI start-ups to scaleups to enterprises.

The hub will provide a national focus for research translation to commercialisation outcomes, capacity development and ethics advisory. It will apply an intensive, supported commercialisation model: business advisory, research collaboration, sector experts and venture capital will de-risk a start-up's journey. A national approach will also ensure that we do not have a duplication of efforts via the various small state AI hubs.

Each State partner will have a focus on investment attraction, capacity building and local sector development in AI in partnership with local universities.

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[81] https://data61.csiro.au/en/Our-Research/Our-Work/AI-Roadmap

[82] Alpha Beta. 2018. Digital Innovation - Australia's $315b Opportunity. AlphaBeta. Sydney.

The hub will be industry-led, operating on a "pay-to-play" model.

A rolling seed fund will support commercialisation, while the centre will use a convertible equity model to be self-sufficient within the initial term.

The NAICH will partner with individual states to build capacity, businesses and jobs in the AI sector, in partnership with universities.

This solution creates an ecosystem that grows, funds and supports the continued development of AI solutions and our domestic capability, attractiveness and competitiveness.

The Hub is estimated to facilitate nationally over its 4-year term:
- 200+ ideas
- 72 angel round investments funded
- 27 seed round investments funded
- 10 series A investments facilitated
- An estimated $1B in capital value created in start-up entities.
- Direct job creation via these start-ups.
- Estimated 2,500+ jobs created/attracted to the home state.

Recommendation:
- That government and industry come together to establish a national AI commercialisation hub that is focused on AI research translation to commercialisation, investment attraction and support of AI start-ups to scaleups to enterprises to realise the $315bn potential dividends for the Australian economy of digital technologies including AI.

To ensure the future workforce has the skills necessary to support the growth of the Australian AI industry into the future, Industry, Government and the education sector should work together to develop a National AI Skills and Jobs Agenda.

Governments should continue to invest in education in STEM subjects at all levels of education (primary, secondary, tertiary and VET) to ensure the future workforce has the skills

necessary to work in the AI industry.

Governments should foster collaboration between tertiary institutions, research institutes and employers, to upskill the existing workforce to work with AI.

National AI Skills and Jobs Agenda

Governments should establish a national AI training program and universal certification of AI skills.

To understand the current level of AI skills in the Australian workforce, governments need to ensure they are collecting high quality data, the right range of data and making that data accessible to industry.

Governments should make their resources and expertise available to support workforce planning by organisations working in the AI space.

Governments should also educate their C-suite and director-level executives about the value of AI, support SMEs to embrace AI by providing incentives and help the broader community understand how AI can create jobs as part of a job creation narrative.

Importantly, the Agenda will specifically address how a flourishing future Australian AI industry will mean more jobs for Australian workers – not less.

Recommendations:

- That Industry, Government and the education sector work together to develop a National AI Skills and Jobs Agenda to ensure the future workforce has the skills necessary to support the growth of the Australian AI industry into the future.
- That the National AI Skills and Jobs Agenda consider the establishment of a universal, nationally recognised qualification standard in relation to AI, to ensure the Australian AI workforce continues to demonstrate consistently high standards of competency and professionalism.

5. An AI ethics framework

The AIIA recognises that the matter of developing ethical standards and codes of conduct sit across industries and are already in motion by other recognised authorities.

Given the development of algorithms that form the basis of decision making, the collection and use of data and the impact on matters of privacy and national security, these ethical issues need a set of standards and codes for regulation.

The AIIA will work with the federal government and other recognised authorities already in existence to develop and comply with an AI ethics 'model code of conduct' which will document ethical standards expected of the local AI industry and articulate a principles-based framework for regulating the conduct of industry participants to ensure it remains consistent with those ethical standards.

In complying with the model code developed, the AIIA will have regard to the Australian Government's **AI Ethics Principles**, Standards Australia's **AI Standards Roadmap**, the NSW Government's **AI Ethics Policy** and similar standards developed by State and Territory Governments. The AIIA will also consider established norms within the industry and, importantly, the interests of consumers.

It is expected models will be designed to operate as self-regulating industry codes supported and endorsed by government and adopted by industry.

The model codes are expected to lay the foundations for a set of commonly accepted ethical standards appropriate for the local AI industry. They are also intended to perform an educative function by familiarising consumers with AI and informing them about standards of conduct they should and should not accept in relation to AI.

Establishing an effective ethical framework is critical to support the local AI industry to reach its full potential. It is only when consumers can confidently and comfortably engage with AI that it will be able to flourish as an entrenched

part of national life in the future. Trust is central to the proposition.

To further familiarise consumers with AI and build their trust in the industry, the AIIA will work with authorities to adopt a mechanism to certify that AI products meet the ethical standards identified in the model code.

As noted above, in supporting the development of the 'model code', the AIIA will have regard to, among other things, the Australian Government's AI Ethics Framework. The AI Ethics Framework is administered by the Department of Industry, Science, Energy and Resources. The preamble to the Framework acknowledges that 'for Australia to realise the benefits of AI the public needs to be able to trust it is safe, secure and reliable'. To help build that critical public trust, the Government has committed to developing the AI Ethics Framework to 'guide businesses and governments looking to design, develop and implement AI in Australia.

The AI Ethics Framework is a work in progress and further development is expected over time. At the time of writing, the Government has, in consultation with industry, academia, government and consumer stakeholders, published a set of 8 AI Ethics Principles to be consider when designing, developing, integrating or using AI to achieve better outcomes, reduce the risk of negative impact and practice the highest stands or ethical business and good governance. The AIIA is a member of Standards Australia who are also developing codes.

Recommendation:

- With the support of the AIIA, that Industry and Government work together to develop an AI ethics framework, to ensure Australians can confidently and comfortably engage with AI in their day to day lives.
- That, once established, the framework operates as a self-regulating industry Code of Practice.

Harnessing the power of AI to help solve Australia's economic challenges - disaster resilience

This paper submits that the government should make a tactical investment in harnessing AI capability to solve a major economic and or social issue facing Australia. This will in effect be a large-scale pilot project to a uniquely Australian problem. We have identified one area below but could be applied to other large challenges in Australia such as mental health, cyber security or biosecurity and public health.

Disaster Resilience

Australia has always been a continent subject to natural disasters – particularly fire and flood. The impacts of the recent bushfires over the summer of 2019-20 and the subsequent royal commission led the Australian Government to restructure its national approach to natural disasters and a spend of $1.2 Billion over 5 years to better respond to and recover from natural disasters. They are collating and separating natural disaster response between:

- **Emergency Management Australia** (EMA) in the Department of Home Affairs to co-ordinate responses to national emergencies and
- a new **National Recovery and Resilience Agency** (NRRA) to lead resilience to and recovery from hazards and disasters.

As a policy issue of national significance, how can Australian governments (both Federal and State) and industry invest in the utilisation of AI to support national and state responses?

Natural disasters are an area in which there are large relevant data sets including but not limited to:

- Geospatial
- People
- Assets
- Climatological
- Urban

AI could be applied to generate insights across this data from disaster prevention to mitigation and recovery. In an example of flood disaster, AI could be used to probabilistically forecast when and where the next flood will occur, thereby enabling advance preparation for the disaster. When floods occur, AI can leverage large data sets such as satellite images and weather forecasts to instantaneously assess their impact including damage to roads, buildings and other infrastructure, allowing emergency responses to distribute aid and resources more effectively to minimise economic and human loss.

Recommendation:

- The Federal Government as part of the EMA's operational enhancements and strengthening of the Australian Government Crisis Coordination Centre ensure that this work explicitly includes world leading applications of AI. We also recommend that this is extended to other phases of disaster management e.g. preparedness and recovery phases.

Image by Gabriella Clare Marino on Unsplash

Tackling a sector-specific policy challenge affecting, for example, the mining, health, manufacturing, or agriculture industries can showcase and accelerate Australian AI leadership.

Appendices

aiia
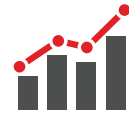## australian information industry association

Australia's tech sector
2019-20

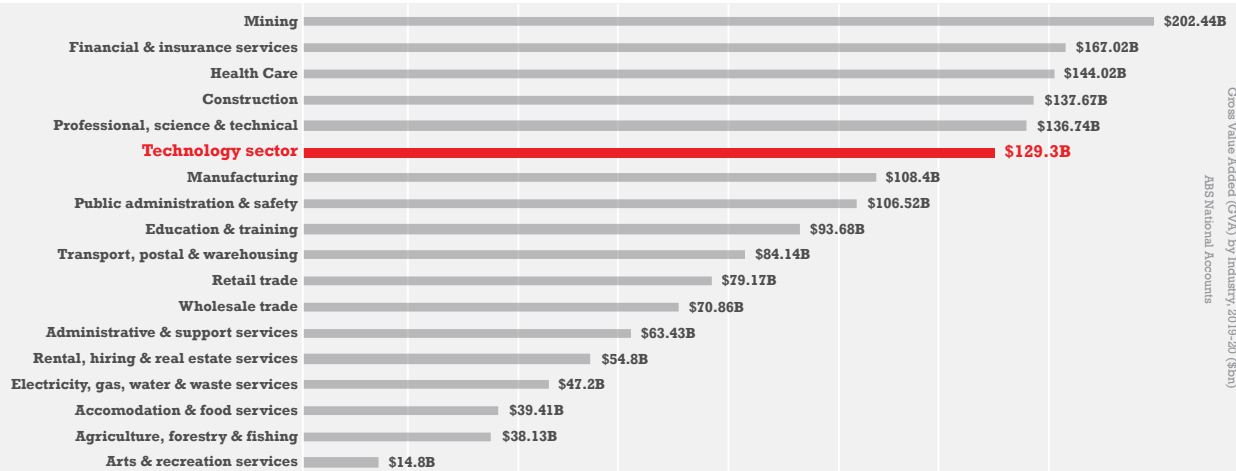**Technology contributed $129.3bn to the economy[2]**

6% Growth[1]
Australian ICT sector grew 6%, going against the 0.3% contraction in the Australian economy.

6th largest sector in the economy
The tech sector was the 6th largest contributor to Australia's GDP, contributing an estimated 7.6% of our national GDP in 2020[3]

Sector	GVA
Mining	$202.44B
Financial & insurance services	$167.02B
Health Care	$144.02B
Construction	$137.67B
Professional, science & technical	$136.74B
Technology sector	**$129.3B**
Manufacturing	$108.4B
Public administration & safety	$106.52B
Education & training	$93.68B
Transport, postal & warehousing	$84.14B
Retail trade	$79.17B
Wholesale trade	$70.86B
Administrative & support services	$63.43B
Rental, hiring & real estate services	$54.8B
Electricity, gas, water & waste services	$47.2B
Accomodation & food services	$39.41B
Agriculture, forestry & fishing	$38.13B
Arts & recreation services	$14.8B

Gross Value Added (GVA) by Industry 2019-20 ($bn)
ABS National Accounts

14% rise in exports
2019-20 ICT exports totalled $4.99bn, increasing by over 14% year-on-year[4].

805,525 workers[5]
- With 805,525 workers, Australia's technology workforce now accounts for 6.16% of the total workforce.
- This represents a 4.3% increase year-on-year.
- Meanwhile, the total workforce shrank by 6.7% between March and May 2020 and 1.7% between March and October 2020[6].

Visit **www.aiia.com.au** for the latest in policy and advocacy in innovation technology

Sources:
[1] p.6 ACS/Deloitte Digital Pulse Report; ABS Australian System of National Accounts 2020
[2] Applying 6% ITC sector growth to AlphaBeta's 2018-19 estimate of the tech sector's $122bn contribution to the Australian economy, the technology sector had an estimated $129.3bn direct and indirect contribution to our economy in 2019-20.
[3] Using projected GDP figure of AUD$1701bn for 2020, https://tradingeconomics.com/australia/gdp#:~:text=GDP%20in%20Australia%20is%20expected,according%20to%20our%20econometric%20models
[4] Chart 3.4, ACS/Deloitte Pulse Report
[5] Labour Force, Australia, March 2021 | Australian Bureau of Statistics (abs.gov.au), p.6 ACS/Deloitte Digital Pulse – actual percentage figure 0.0615957821006913
[6] https://www.nationalskillscommission.gov.au/11-impact-covid-19-australian-labour-market

The AIIA first surveyed members in February 2020, in an economic climate still operating in a pre-COVID setting.

In March 2021, a follow-up survey was conducted, with results reflecting both the historic impact of the pandemic, as well as the transition throughout Australia towards recover, both economic and social.

Both surveys were nationwide, and both covered the full scope and breadth of the Australian technology sector.

Skills

When asked about the focus on new hiring in 2021 and the skill sets required for the future, Cyber Security topped the list, with 65% of respondents nominating the skillset, followed by Cloud-specific skills.

The rise in interest in cyber security is particularly strong (up nearly 10 percentage points from 2020) and reflects a growing interest in the segment throughout the public policy debate, the emerging interest in sovereign data capabilities and the continuing migration to Cloud based computing and data storage.

Question: *In terms of specific skills of the future, what skills will you look to be hiring in 2021? Please choose up to four.*
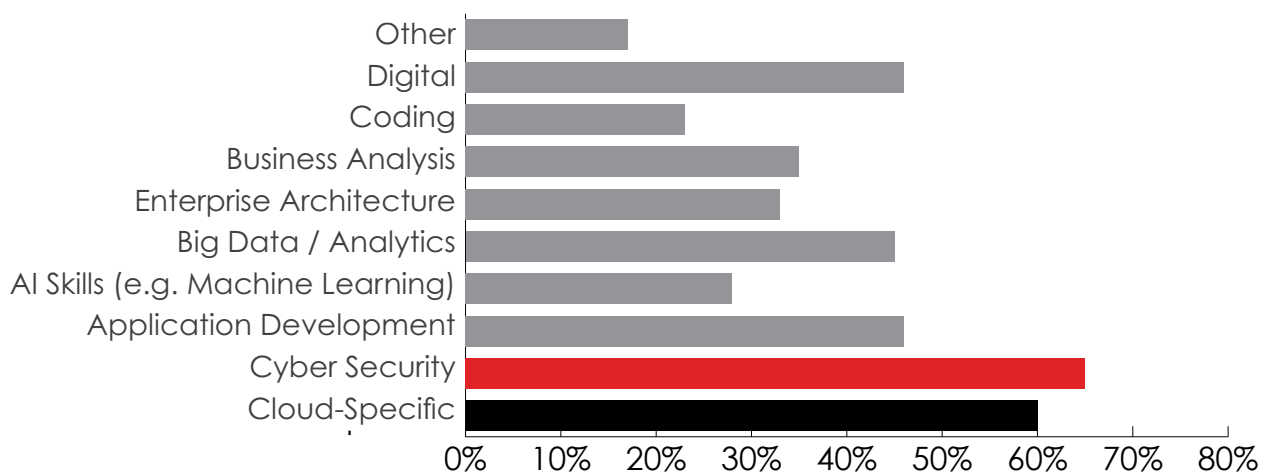
When asked about the barriers to expansion, Skills shortages were nominated as the major reason. Most firms are still focused on hiring staff locally from within Australia, a trend that will only be further reinforced with the COVID restrictions, and some 73% of respondents said they expect to be actively growing and hiring in 2021.

On the question of respondents' use of AI in their business, there was a significant adoption of AI technologies, with 55% currently using this technology as either a core function or some use in their business and only 5.4% saying they have no interest in using AI within their businesses.

Anticipated Industry Adoption of ICT Services

The ICT sector's application and reach extend to all parts of the economy. When the AIIA asked specifically which industry sectors are expected to have the greatest level of adoption of ICT services.

Government and Infrastructure topped the list with nearly 85% of respondents nominating this sector.
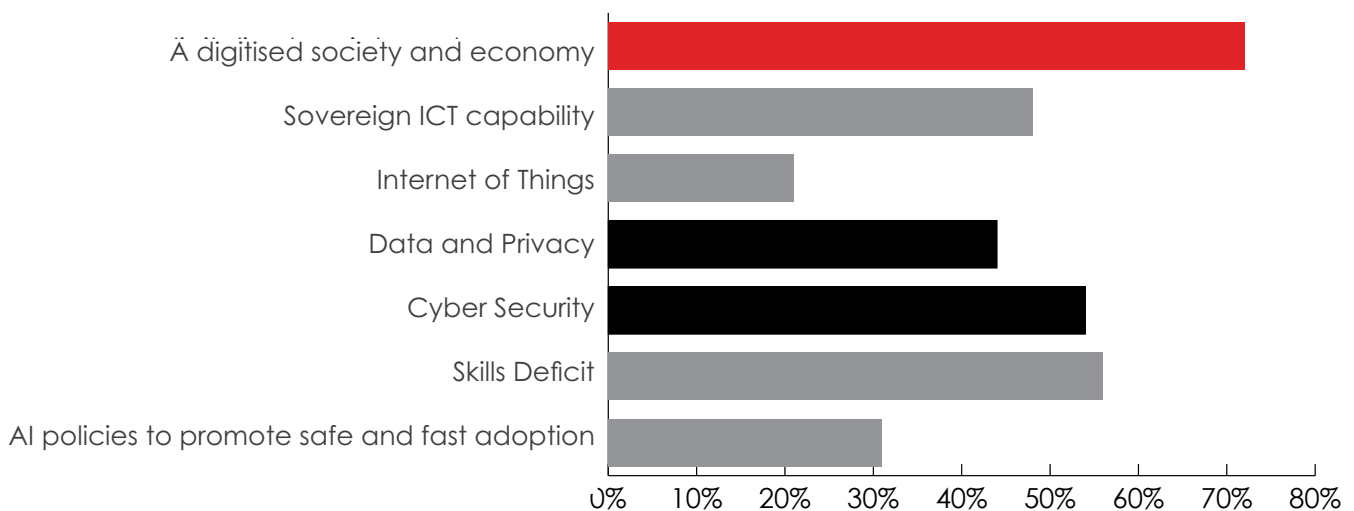
The spending capacity and strong focus many firms adopt in servicing the government sector is likely reflected in this response. Amongst other sectors to attract attention are Health, Financial Services and the Mining and Energy sector.

Question: *Which industry sectors do you expect will have the greatest adoption and growth (buyers) of ICT in 2021? Please choose up to four.*
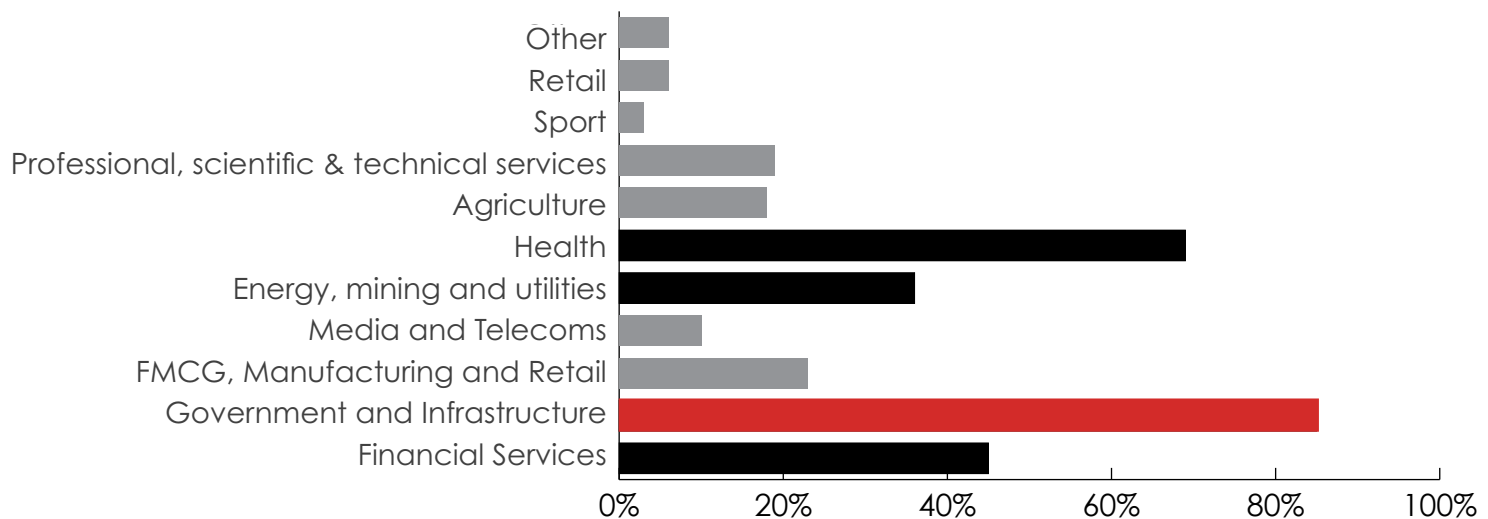
Policy focus

When asked about which areas of policy governments should focus on, there was not a marked change in views and opinions over the 12 months. There is though a growing awareness about the capacity for the digitisation of more and more information, to enable data analysis and improved decision making. This is likely to be reflected in the 70% of respondents nominating a focus on "a digitised society and economy". This focus is also complemented by an awareness of the issues of integrity and security, e.g. Cyber Security and Data Privacy. The AIIA is also keenly aware of the interest and application of AI technology as an extension of growing capability within a digital society.