

# Emerging Digital Technologies Strategy



# Contents

Minister's foreword	3
Executive summary	4
Emerging digital technologies are critical for the future of the NSW economy	5
Emerging digital technologies of focus	6
The Quantum Terminal	8
Sydney Quantum Academy	9
NSW digital innovation ecosystem	10
Tech Central	11
Our pillars: Fostering the NSW emerging tech ecosystem	12
Pillar 1: Enhance research, development and commercialisation outcomes	14
Case study: NSW Government/CSIRO Innovation Partnership	15
Pillar 2: Strengthen the startup ecosystem and SME capability	17
Case study: Sydney Startup Hub	18
Pillar 3: Boost the adoption of emerging digital technologies	20
Case study: Small Business Innovation and Research (SBIR) program	21
Pillar 4: Grow the tech-ready workforce	23
Case study: TAFE NSW Schools Launchpad	24
Pillar 5: Position Government as a key partner	26
Case study: Digital Restart Fund	27

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# Minister's foreword

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Emerging digital technologies such as artificial intelligence, robotics and automation have the extraordinary potential to change our lives for the better.

Already new digital technologies are driving transformative change across all sectors of our economy from life sciences to financial services, agriculture, space, and communications.

The NSW Liberals and Nationals Government is committed to harnessing the power of new digital technologies to lift NSW's global competitiveness, create new industries and jobs, and increase our productivity.

The potential gains are enormous, with the cyber security industry alone expected to contribute A\$5.3 billion in Gross Value Add to the NSW economy by 2030.

NSW has an early adoption mindset that will assist the rapid uptake and diffusion of new technology, attracting significant global investment in NSW, creating the jobs of the future, and growing and diversifying our export markets.

The impact of technologies such as advanced 5G communications and robotic agriculture will benefit everyone in NSW, from our biggest cities to our farthest regions.

This Strategy will help us to ensure we continue to adapt by upskilling our workforce, facilitating the commercialisation of our world-class research, boosting digital technology adoption and fostering the growth of our startups.

NSW is home to the most advanced innovation ecosystem in Australia. Our outstanding research institutes, skilled and diverse workforce and innovation precincts are advantages that will attract the world's best talent and innovative businesses to help us reap the benefits of this digital revolution.



**The Hon. Alister Henskens**

Minister for Enterprise,  
Investment and Trade,  
Minister for Science,  
Innovation and Technology,  
Minister for Sport,  
Minister for Skills and Training

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## Fast adoption example

“Contactless payment technology provides a striking example of Australia's success as a fast adopter. US researchers invented the technology, yet in 2016 just 3% of US cards were contactless. In Australia, the 2016 figure was 67% – an adoption rate more than 20 times higher.”

A.T. Kearney 2018  
Quoted in *IPCs Adaptive NSW*

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# Executive summary

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Emerging digital technologies, such as artificial intelligence, blockchain and quantum computing, are fundamentally changing how people and businesses work together.

New South Wales' (NSW) ongoing success depends on our ability to harness these technological advances to drive economic growth and raise productivity and living standards for all. Fostering an ecosystem that supports the development and adoption of emerging digital technologies will play a role in boosting NSW's competitiveness on a global stage and achieving greater prosperity for the people of NSW.

This Emerging Digital Technologies Strategy creates a unified and informed direction for the future of emerging digital technologies in NSW. The strategy can be used to support government agencies, industry organisations, academia and businesses in prioritising efforts, effectively allocating resources and aligning stakeholders to stimulate the increased development and adoption of emerging digital technologies in the State.

Targeted interventions optimising the development, adoption and diffusion of emerging digital technologies will promote their widespread uptake across industry, society and the economy. There are enormous opportunities to seize significant economic, social and environmental outcomes as novel and innovative solutions are developed and deployed to mitigate everyday challenges, now and into the future.

This Emerging Digital Technologies Strategy outlines the path forward to realising these benefits and harnessing the broader potential of NSW's innovation ecosystem to better the State's digital innovation outcomes.

Given the evolving nature of emerging digital technologies, this strategy presents high level directions to enhance the State's digital technology ecosystem, and the focus of interventions may shift towards new technologies critical to the future NSW economy as they emerge.

The strategy takes a focus on driving competitiveness in the digital innovation ecosystem across five pillars:

- Enhancing research, development and commercialisation.
- Growing SME capability and the startup ecosystem.
- Boosting the adoption of emerging digital technologies.
- Growing the tech-ready workforce.
- Positioning Government as a key partner.

Across each of these five pillars, recommendations for government interventions are made. These recommendations seek to stimulate increased development and adoption of emerging digital technologies, and thereby accelerate the diffusion of emerging digital technologies across the NSW economy, driving productivity growth, job creation and greater exports.

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# Emerging digital technologies are critical for the future of the NSW economy

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## What are emerging digital technologies?

Emerging digital technologies are novel, fast growing and have the potential for significant impact on society and the economy. They are largely enabled by research and development (R&D) and strong innovation and entrepreneurship ecosystems. Emerging digital technologies have a high propensity to impact the economy by transforming and creating industries.

This strategy identifies the following emerging digital technologies of focus in NSW. They align with our comparative strengths (including research capabilities), stage of maturity, and potential for widespread application across industries and the economy.

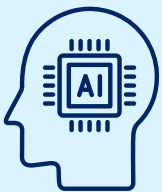


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# Emerging digital technologies of focus

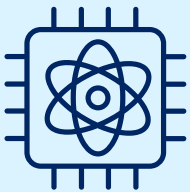
The following eight emerging digital technologies have been identified by both the CSRIO's Data61 and the NSW R&D Roadmap. These key technologies, while not an exhaustive list, are expected to have rapid diffusion and uptake over the coming decades, with the potential to significantly impact the NSW economy.

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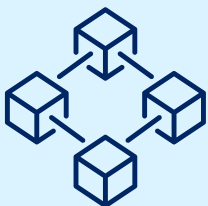
## Artificial intelligence

Artificial intelligence (AI) leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind and encompasses technologies such as machine learning and natural language processing. AI is set to reshape practically every industry and could be worth A\$22.17 trillion to the global economy by the year 2030<sup>1</sup>. NSW is the first State in Australia to publish its AI Strategy, which supports industry-government-academia collaborations and helps to deliver world-class services.



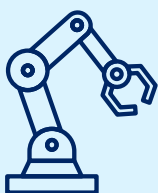
## Quantum

Quantum technology is based on the novel applications of quantum mechanics, such as quantum entanglement and quantum superposition, with enormous potential to be used for quantum computing, communications and sensing. In 2021, quantum computing startups globally raised more than A\$2.35 billion, more than double the amount raised in 2020<sup>2</sup>. NSW boasts a world-leading quantum ecosystem, with startups such as Q-CTRL Silicon Quantum Computing, the Quantum Terminal, and the Sydney Quantum Academy.



## Blockchain

Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. Blockchain has various use cases in cryptocurrencies, payment ledgers and open banking systems. Blockchain is a fast-growing technology which could contribute A\$3.5 billion in revenue and A\$1.6 billion in Gross Value Added (GVA) to the NSW economy by 2030.<sup>3</sup> This technology is a focus for NSW, which has a 50% share of the domestic blockchain market and an excellent supply of skilled workers.



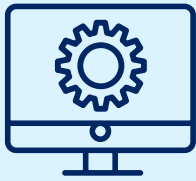
## Robotics and automation

Robotics is the design, creation and use of robotic machines, while automation refers to the use of machines or software to perform tasks usually done by people. Autonomous vehicles, drone systems and robotic agriculture include both robotic and automotive technologies. By 2030, the global robotics market value could be worth up to A\$359 billion.<sup>4</sup> The Sydney Institute for Robotics and Intelligent Systems (SIRIS), incorporating the Australian Centre for Field Robotics (ACFR), is one of the largest robotics research institutes in the world.



## Advanced communications

Advanced communications such as 5G, mobile systems and space communication are secure, reliable, fast and wireless. By the end of 2022, there will be approximately 29 billion connected devices globally, 500 million of which will be connected to 5G wireless networks.<sup>5</sup> Sydney is home to the Optus 5G Innovation Hub, which houses over 550 of Australia's startups in advanced communications.



## Software

Software development creates programs that facilitate business operations or interactions between consumers and businesses. Software encompasses a wide range of products and services such as application software, programming software and digital games design. Australia's Software as a Service (SaaS) market will grow 25% per annum over the next decade.<sup>6</sup> NSW is home to the development and research facilities of major firms like Microsoft and Google, along with a substantial set of startups and Australian unicorns like Atlassian and Canva.



## Internet of Things (IoT)

The Internet of Things (IoT) describes the network of physical 'things', such as sensors and chips, embedded with technology for the purpose of exchanging data with other systems over the internet. The global smart sensor market is growing at a 19% annual rate and is expected to reach A\$83 billion by 2022.<sup>7</sup> NSW universities rank highly in nanotechnology and IoT research. The Sydney Nanoscience Hub is a A\$150 million world-class research facility.



## Cyber security

Cyber security involves the development of software and provision of services such as critical infrastructure security, application security and cloud security. These services provide security to individuals and companies, and help them in response to cyber attacks. The cyber security industry is expected to contribute A\$5.3 billion in GVA and over 27,000 additional jobs to the NSW economy by 2030.<sup>8</sup> This technology is a focus for NSW as it is home to Australia's largest cyber security workforce with 10,600 professionals.

# Harnessing emerging digital technologies is central to unlocking the digital opportunity to drive future economic growth

Stimulating the increased development and adoption of emerging digital technologies across NSW presents critical opportunities to drive a more productive and prosperous economy. As early-adopters of emerging digital technologies, NSW has the opportunity to drive productivity growth and augment existing economic activity with value-adding technologies. As developers of novel digital technologies, NSW also has the opportunity to build global competitive advantages, vibrant new industries and grow and diversify the State's export base.

For businesses, these technologies can help develop new products, access new markets, work more efficiently, improve the bottom-line and deliver safer working environments. For society, emerging digital technologies could offer innovative solutions to the United Nations sustainable development goals, promoting inclusive and sustainable economic growth, employment and decent work for all. Achieving these goals will have a profound impact on our daily lives, work and interactions with each other.

Emerging digital technologies are the drivers of digital innovation. They present opportunities to accelerate the next wave of economic growth for New South Wales. As early-adopters of emerging digital technologies, New South Wales can drive productivity growth and augment existing economic activity with value-adding technologies.

While Australia has captured significant value from digital innovation over the past twenty years, the experience of our global peers shows we can do more.

The total economic value derived from digital innovation in Australia, which reflects improvements in productivity as well as growth of new digital industries and exports, represents 7.4% of the country's total gross domestic product (GDP) over the past two decades. This compares to 11.2% of GDP amongst OECD advanced economies, such as Canada and Germany.<sup>9</sup>

Advancements in digital technology have the potential to boost Australia's economic growth rate by between 0.7% to 1.2% per annum<sup>10</sup> and deliver an increase of A\$315 billion in gross economic value to Australia over the next decade if we just match the performance of our global peers.<sup>11</sup>

## Case study The Quantum Terminal

Located within Sydney's Tech Central innovation ecosystem, The Quantum Terminal boasts over 3,000 square metres of affordable coworking space for organisations within the Quantum Technology, High Performance Computing, Artificial Intelligence, and adjacent technology verticals along with other key enablers.

The Quantum Terminal is the first centralised collaboration space for researchers, developers, engineers and entrepreneurs working to advance quantum technology, high-performance computing and AI in Sydney.

With industry partners such as the Sydney Quantum Academy, Q-CTRL and QuintessenceLabs and university partners, including the University of New South Wales, the University of Sydney and the University of Technology, Sydney, The Quantum Terminal is promising to become a space of innovation and collaboration.





These estimates have been reinforced by global consulting firm McKinsey, who estimate digital technologies could contribute A\$140 to A\$250 billion to Australia's GDP by 2025. The evidence is clear – increasing the deployment of digital technologies across the economy presents a considerable economic opportunity.

Emerging digital technologies drive productivity improvements, business growth, competitive exports and innovations that address real-world problems, and importantly, they are the creators of our future jobs. It is estimated 250,000 new jobs will be created by digitisation by 2025, while technology will augment 4.5 million Australian workers by 2034.<sup>12</sup>

This will bring the continued challenge of ensuring our labour force is ready to adopt the skills of the future, and that government, our education providers, and industry are able to work in partnership to deliver the training and upskilling opportunities needed to support this transition.

Government has a vital role in developing pro-productivity policies to enhance the adoption of emerging digital technologies. The Productivity Commission recommends government move away from largely reactive responses to emerging technologies, to show leadership in enabling the creation and take-up of digital opportunities across the economy.<sup>13</sup> Such pro-productivity interventions will enable firms, households and consumers to benefit from wider product choices, new sources of economic activity and income and even lower prices, enhancing the global competitiveness of New South Wales.

## Case study

### Sydney Quantum Academy

Sydney Quantum Academy (SQA) is a unique partnership between four world-leading universities – Macquarie University, UNSW Sydney, the University of Sydney and University of Technology Sydney. Supported by NSW Government, SQA will harness Sydney's collective quantum expertise to develop diverse talent and a globally recognised quantum ecosystem.

The SQA is based at Tech Central's Quantum Terminal bringing together world-leading startups like Q-Ctrl and Quantum Brilliance as well as quantum technology leaders, specialists, researchers and entrepreneurs. SQA provides programs designed to create a new workforce of quantum technology researchers and entrepreneurs to lead NSW's quantum industry.

With a vision to build Australia's quantum economy, the SQA develops future quantum leaders, partners with industry to understand their needs, attracts global talent and investment and promotes the responsible development and use of quantum technologies.

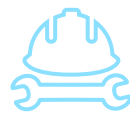


# NSW digital innovation ecosystem



## World leading research capabilities

- NSW is home to 30% of Australia's researchers, more than any other State or Territory.<sup>14</sup> NSW also outperforms all international benchmarked economies in the percentage of researchers at the top of their fields.<sup>15</sup>
- World-class Quantum research institutes with successful home-grown startups including Silicon Quantum Computing and Q-Ctrl.
- 30% of Australian startups were spinoffs from NSW universities and research institutes in 2020.<sup>16</sup>
- Dynamic, world leading research institutions, including six universities in the global top 200 and more top 1% papers than other key international benchmarked economies.<sup>17</sup>
- The NSW Government recently entered into an Innovation Partnerships initiative with CSIRO and all of NSW's 11 public universities, committing to collaborating on 150 research questions and innovations, further contributing to the \$3.8 billion a year that NSW universities spend on research, development and innovation.<sup>18</sup>
- NSW is home to world-class R&D centres operated by firms such as ResMed and Eppendorf.



## Skilled and diverse workforce

- NSW has a significantly larger tech workforce compared to other jurisdictions: 287,000 tech employees vs 114,000 in New Zealand, 219,000 in Victoria, and 225,000 in Singapore.<sup>19</sup>
- 50% of the NSW workforce has a tertiary qualification.<sup>20</sup>
- Of Sydney's 4.7 million residents, almost one-third were born overseas, making Sydney one of the world's most multicultural cities, where more than 200 languages are spoken.
- At current levels, 5,500 ICT graduates will come into the market every year.<sup>21</sup>
- The tech sector has experienced strong growth in the last decade and is now the seventh biggest employing sector in Australia. There are now 861,000 people employed in the sector across Australia today.<sup>22</sup>
- NSW's tech sector employs 342,000 people and contributes A\$67 billion to the NSW economy.<sup>23</sup>
- Australia ranks second in the OECD for adoption of technology in the workplace, and for the prevalence of ICT skills.<sup>24</sup>
- Home to most STEM graduates in Australia.<sup>25</sup>
- NSW has a large and skilled digital technology workforce, with 41% of Australia's software and application programmers and computer network specialists based in NSW.



## Largest startup community

- NSW is the startup capital of Australia, with Sydney home to 60% of Australia's startups and most Australian unicorns.<sup>26</sup>
- Sydney's startup ecosystem is worth US\$67 billion, is ranked 20th globally<sup>27</sup>, and is home to Atlassian, Canva and SafetyCulture.
- Sydney remains the largest startup ecosystem in Oceania, with more than 60% of Australia's tech startups and half of Oceania's early-stage funding and exit value.<sup>28</sup>
- In 2021, NSW startups received more than A\$4 billion in funding – more than any other Australian State or Territory.<sup>29</sup>
- NSW is headquarters for more than 600 global multinationals and tech companies.<sup>30</sup>
- Tech giants Google and Atlassian, which are both headquartered in Sydney, have created their own local cluster of startups, which has spurred the emergence of corporate-backed Venture Capital (VC) funds like Telstra Ventures and NAB Ventures.



## Thriving innovation precincts and innovation infrastructure

- Sydney is the home of Tech Central (including the Scaleup Hub), the Sydney Startup Hub and the Westmead Health and Innovation District.
- The Sydney Startup Hub was an initial A\$35 million government investment in 2018 – it's since generated more than A\$280 million of investment and created over 1,000 jobs.<sup>31</sup>
- Tech Central will be a home for the innovation and technology community to thrive and create the jobs of the future. The NSW Government's initial commitment of \$48.2 million will provide up to 25,000 square metres of affordable space for startups and scaleups



## Burgeoning tech sector

- NSW is home to nearly 40% of the nation's Information and Communication Technology (ICT) businesses, has Australia's largest ICT sector and produces 66% of Australia's total ICT services exports.<sup>32</sup>
- Primary destination in Australia for tech Foreign Direct Investment (FDI) from globally leading centres such as Silicon Valley and Israel.
- NSW businesses rank 2nd for digital capability, with the proportion of firms using technologies associated with higher-growth companies increasing by 93% since 2019.

## Case study Tech Central

Tech Central is Australia's biggest innovation district of its kind, made up of six connected neighbourhoods near the Sydney CBD (Haymarket, Ultimo, Surry Hills, Camperdown, Darlington, North Eveleigh and South Eveleigh).

Tech Central's ambition is to be the world's most sustainable, inclusive, welcoming, and creative precinct for tech companies, talent and investors. It is a place where universities, startups, scaleups, tech giants and local communities collaborate to solve problems, socialise and spark ideas that change our world. It is also where government, the private sector and the community are working together to create low carbon living, green inclusive spaces, access to transport and digital connections that support resilience, inclusivity, vitality and growth.

The NSW Government provides programs and initiatives to support the success of the innovation ecosystem. An area of focus is to ensure there are affordable spaces for researchers, innovators, startups and entrepreneurs to incubate, test and scale their ideas. The NSW Government will facilitate the creation of an additional 250,000 square metres of space for technology companies, including 25,000 square metres at affordable rates for startups and scaleups. A NSW Government funding package of \$48.2 million has kick-started development and tech giant Atlassian is confirmed as the anchor tenant. It will locate its headquarters in the precinct, bringing over 4,000 employees. Additionally, a \$10 million fund to accelerate growth and innovation of the Tech Central ecosystem has been committed. The fund will focus on collaboration and open access to research and innovation infrastructure that supports accelerated product development and commercialisation.



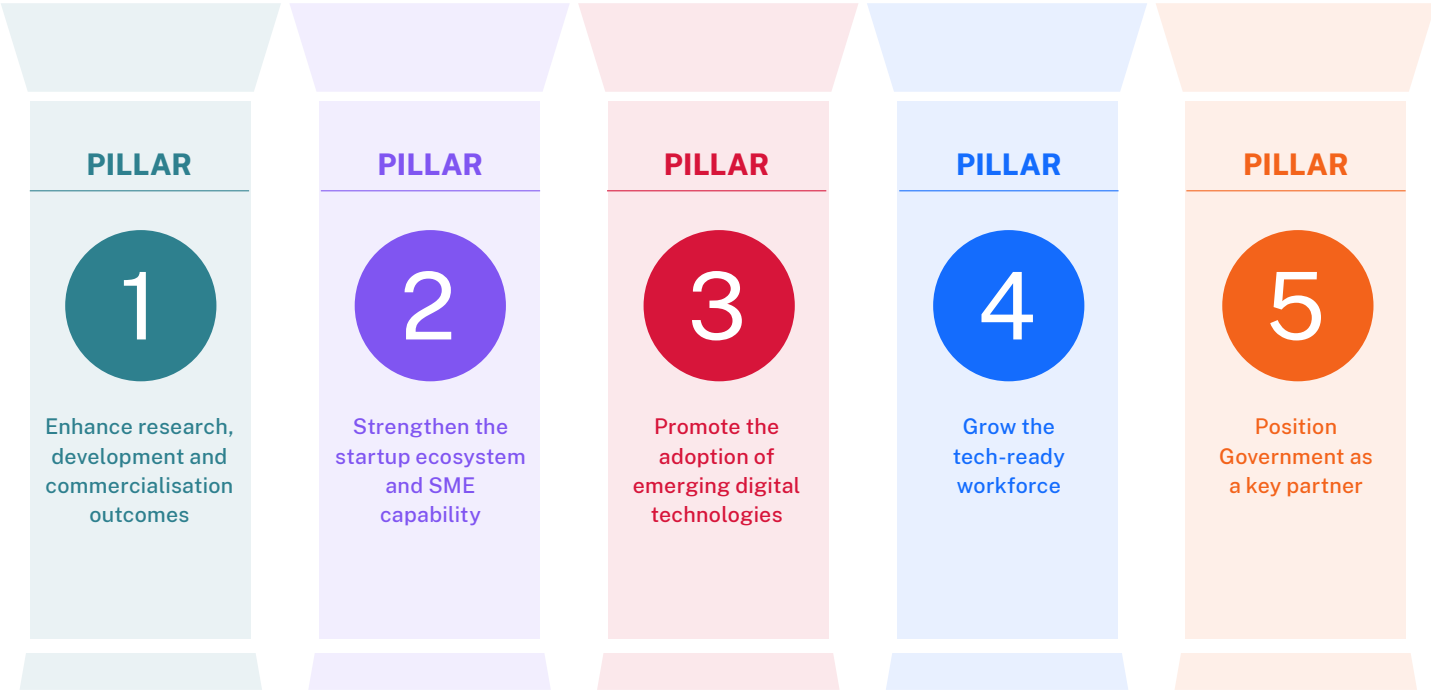
# Our pillars: Fostering the NSW emerging tech ecosystem

The NSW Industry Development Framework sets out target industries with the highest potential to drive long-term growth of the NSW economy, as well as the enabling technologies necessary for their success. The technologies listed in this Emerging Digital Technologies strategy align with the sectorial classification in the framework, and importantly, its recommendations are consistent with the framework’s key principles, including fostering collaborative partnerships across government, industry and research institutions to stimulate industry growth.

This strategy also aligns with technology-specific strategies released by the NSW Government, including the Artificial Intelligence Strategy, the Cyber Security Strategy and the Smart Places Strategy.

This Strategy provides recommendations across five key pillars to support development and adoption of emerging technologies within NSW. These pillars were developed through consultation with key NSW emerging technology ecosystem stakeholders across industry, research and government. They reflect the areas of intervention through which the NSW Government can enhance the ecosystem.

## Five key pillars



## 1

# Enhance research, development and commercialisation outcomes

The NSW 20-Year R&D Roadmap has recently been released and identifies four technology themes, including digital technology. The Roadmap highlights the State's significant research strengths and capabilities, and the areas where government and industry should look to focus R&D investment over the coming decades. The Roadmap sets the overarching direction for developing and commercialising emerging digital technologies set out in this Strategy.

Research commercialisation is a key success factor in the innovation economy, driving many ideas and inventions and delivering a commercial return on R&D. Novel products and services can also provide social, environmental and health outcomes and facilitate a better quality of life through their everyday application.

NSW is home to world-class research and researchers. This is reflected in the QS World University Rankings where 6 of the 11 public universities in NSW are now ranked in the top 200. NSW leads the ranking for top 200 universities per million population.<sup>33</sup> NSW researchers outperform international benchmarked economies in the percentage of researchers at the top of their fields.<sup>34</sup>

Australian university-led research, particularly in strong science-based research and development fields such as 'deep tech', ranks highly compared to other nations. NSW research institutes outperform the Australian benchmarks on New and Active Licenses, Options and Assignments (LOAs).<sup>35</sup> However, these LOAs are not translating into research commercialisation income, with NSW underperforming when compared with other Australian States and Territories.<sup>36</sup> The continued uplift in the number of LOAs in NSW compared to our peers highlights the opportunity for higher future commercialisation income through research-industry collaboration.<sup>37,38</sup>

Despite the State's underperformance in commercialisation income, in Startup Genome's Global Startup Ecosystem Report 2021, Sydney received a score of 10 out of 10 for intellectual property (IP) commercialisation – an indicator of how much policy encourages the commercialisation of IP.<sup>39</sup>

The issue of research commercialisation has been persistent at both the national and state level, where our world-class research is not being translated into collaboration with industry or commercialisation outcomes.<sup>40</sup> Australia lags behind in international rankings when it comes to research commercialisation. Australia is ranked 42nd globally for knowledge and technology outputs, and 25th in the Global Innovation Index, behind jurisdictions such as Canada, Ireland and Japan.<sup>41</sup> According to the NSW innovation and Productivity Council's (IPC) 2022 Innovation and Productivity Scorecard, all benchmarked economies, both foreign and Australian, continue to outperform NSW for university-industry co-authored publications.<sup>42</sup>



According to the OECD, Australia compares well in terms of research excellence, yet there is scope for better translation of publicly funded research into commercial outcomes. It recommends Government boost R&D by strengthening the links between research and business sectors.<sup>43</sup>

And there is a lot of work to be done. In Australia, only 30% of researchers are based in industry, compared with 80% in South Korea, 73% in Japan and 71% in the US. Innovation-active businesses collaborating with higher education or government institutions account for only 1.6% of all products and/ or processes in 2016. This is lower than the OECD's average of 14.2%.<sup>44</sup> Australia ranks 40th in the World Economic Forum's ranking of countries for university-research collaboration in R&D.<sup>45</sup>

While NSW's share of research co-authored with industry has grown since 2019, so too has the rest of the world's. Australia's level of research-industry collaboration on innovation projects is the lowest of 27 countries in the OECD. The most recent data shows NSW's percentage of higher education research funded by industry remains at almost the same level as in 2015.

The Federal Government's University Commercialisation Action Plan identifies a difference in priorities, values and culture between sectors as a reason for limited collaboration between industry and universities. Businesses report difficulties in engaging with universities, including cultural and skill set differences, barriers with intellectual property (IP), and regulation.<sup>46</sup>

Given deep tech commercialisation has been found to drive productivity and incomes, there are significant benefits for improving university-industry collaboration in NSW. The IPC's research shows doubling the 2020 rate of collaboration could see a productivity increase worth up to A\$150 million per year for NSW.<sup>47</sup> According to a report from CSIRO, each dollar invested in R&D would earn an average of \$3.50 in economy-wide benefits and a 10% average annual return for Australia.<sup>48</sup> As our economy recovers from the COVID-19 pandemic, collaboration and the translation of research is more critical than ever for our continued prosperity.

## What success looks like

Local and international businesses partner with NSW universities, research institutes and industry to solve problems, develop solutions and commercialise products, services and technologies to stimulate economic growth and social impact. A collaborative culture provides ample opportunities for small-medium enterprises to access research talent, facilities and intellectual property to bolster innovation activities.

## Current initiatives

At present, there are a suite of initiatives from both the Commonwealth and State level aimed at enhancing research and development outcomes. Initiatives from the State Government are often in the form of grant-based funding and include the R&D Fund, Innovation Districts Challenge and Boosting Business Innovation Program. Initiatives from the Commonwealth Government include research-orientated migration policies, tax incentives such as the Research and Development Tax Incentive and grant-based funding including the Medical Research Future Fund.

## Recommendations

- Enhance relationships with universities (such as through existing Memorandums of Understanding) to boost collaboration and continue to foster opportunities for investment and innovation partnerships.
- Leverage our international network to attract research and development focussed investment to NSW.
- Encourage greater research-industry collaboration through proactive policies that focus on, and incentivise, research commercialisation outcomes. This could include expanding Research, Development and Commercialisation focussed incentive programs that focus on emerging digital technologies, reduce costs and risk for businesses and stimulate greater investment in R&D.
- Liaise with and support Commonwealth Government initiatives such as the University Research Commercialisation Plan, and schemes for industry-focused PhDs and fellowships, to encourage mobility and collaboration between university researchers and industry.

# Case study

## NSW Government/CSIRO Innovation Partnership

On April 30 2021, the NSW Government signed a historic five-year Innovation Partnership agreement with Australia's national science agency, Commonwealth Scientific and Industrial Research Organisation (CSIRO), to drive digital technology, manufacturing and health excellence across NSW-based innovation precincts.

The partnership is focused on accelerating innovation and commercialisation, creating new jobs in growth industries and recovering from the COVID-19 pandemic. Through the partnership, CSIRO will focus on advanced manufacturing, quantum technologies, aerospace, defence and agribusiness at the future Bradfield Aerotropolis, digital technologies at Tech Central in Eveleigh, and health capabilities in the Westmead Health and Innovation District.

This historic partnership emphasises NSW's global reputation as a base for technological innovation and expertise, while creating new opportunities for businesses of all sizes to grow, invest or export their novel inventions.



## 2

# Strengthen the startup ecosystem and SME capability

Small and medium enterprises (SMEs), particularly startups and scaleups, are an important driver in the development of emerging technologies and creative destruction. These high-growth potential, tech-enabled firms are often at the forefront of research & development and innovation; leading government and businesses in the development and adoption of new technologies. Startups, scaleups and SMEs significantly contribute to the growth of productivity, employment and social development in NSW.

Sydney is the nucleus of NSW's startup ecosystem with a tight knit community centred around innovation precincts spread across the harbour city. It is home to the most Australian unicorns and more than 60% of Australia's startups.<sup>49</sup> This is reflected in Startup Genome's Global Startup Ecosystem Report 2022 where Sydney is ranked 20th globally and 1st in Oceania in the startup economy. The report also ranked Sydney 1st in Oceania for Ecosystem Talent and Experience. In 2021, NSW startups received more than A\$10 billion in funding, cementing NSW as a legitimate global innovation hub.<sup>50</sup>

NSW is home to world leading startup hubs for sectors like Fintech, renewable energy, transport technologies and Agritech. Sydney's fintech hub is ranked 11th in the 2021 Global Fintech Rankings and is home to 60% of fintech startups in Australia.<sup>51</sup> This reflects a vibrant fintech culture in NSW where Australian businesses, governments and citizens are early adopters and avid users of financial technologies. Fintech is a prominent example of where the startup community can develop and refine emerging digital technologies that build upon existing industry strengths in the NSW economy. The recent purchase of Sydney-founded Afterpay by US-based Square Inc. for A\$39 billion showcases the success of the Australian fintech and startup sector.

However, there are opportunities for improvement, particularly in entrepreneurial capabilities and seed and early stage funding. Both are needed to ensure a healthy pipeline of innovative enterprises continue into the future.

Sydney's rating of 5 out of 10 for Infrastructure in Startup Genome's Global Startup Ecosystem Report 2022 reflects that there is a lack of support for startups, including incubators and accelerators.

While overall investment by venture capital firms in NSW is growing in aggregate terms, pre-seed and seed levels of venture capital funding have been declining – which may limit the future pipeline of startups and scaleups in NSW.<sup>52</sup> This was further confirmed in a study of 400 Australian technology start-up founders that found many believe there is a gap in the country's venture capital sector for early-stage investment.<sup>53</sup>

The OECD recommends Government provides adequate incentives through conducive market conditions; robust and inclusive innovation ecosystems, local networks and infrastructure; and appropriate targeted measures.<sup>54</sup>

There are significant economic benefits in supporting entrepreneurs and startups in NSW. While SMEs contribute to only 28% of NSW's turnover, they provide 48% of jobs, 59% of profits and 42% of exports.<sup>55</sup>



SMEs also account for a disproportionately large share of new jobs.<sup>56</sup> Analysis by PwC shows technology startups could contribute over A\$100 billion of additional Gross Domestic Product (GDP) by 2033, but only if we increase the number of high-impact entrepreneurs by a factor of 20 and improve the supportiveness of the ecosystem in which they operate.<sup>57</sup>

### What success looks like

A deep pipeline of high-growth startups is consistently created through the State's sophisticated startup ecosystem characterised by extensive support networks, creating the future industries and unicorns of NSW. Scaleups and innovative enterprises have access to the capital and resources required to grow their businesses globally.



### What we are doing

The NSW Government has undertaken a number of initiatives to help startups grow and become engines and future economic growth and job creation. This includes establishing and strengthening innovation hubs and precincts around NSW, including the Sydney Startup Hub and Tech Central. The Sydney Startup Hub has created nearly 6,000 jobs since its inception in 2018 and has hosted more than 1,500 events supporting the State's budding entrepreneurs and startups. Startups based out of the Sydney Startup Hub have also raised a combined A\$740 million in investment funding.

The NSW Government also offers financial support in the form of grants, including the Minimum Viable Product grant designed to support pre-revenue startups. There is also specialised support for regional startups with the Local Innovation Network, a A\$2.1 million commitment by NSW government aimed at developing regional entrepreneurship.

Sydney School of Entrepreneurship (SSE) is Australia's first and only government-initiated School of Entrepreneurship. SSE was established to enhance and grow entrepreneurial skills and innovative thinking in students. So far, it has supported over 600 students and enabled the creation of over 70 startups in NSW.

### Recommendations

- Establish a dedicated function within the NSW Government to strengthen and support the startup ecosystem promoting innovation, entrepreneurship, and disruptive technologies as a leverage for inclusive and sustainable economic growth. This would enable a clear interface between the start-up ecosystem and Government, and a better coordinated effort to support the ecosystem.
- Coordinate financing and address the funding needs for early-stage tech startups to ensure entrepreneurs have adequate access to capital to establish and grow.
- Support entrepreneurial capability programs such as targeted incubators and accelerators to enhance the commercial strength and entrepreneurial capabilities of early-stage NSW companies and startups.
- Create opportunities to attract high growth startups into NSW through initiatives such as inbound landing pad programs, to supplement the pipeline of innovative, early-stage companies in NSW.

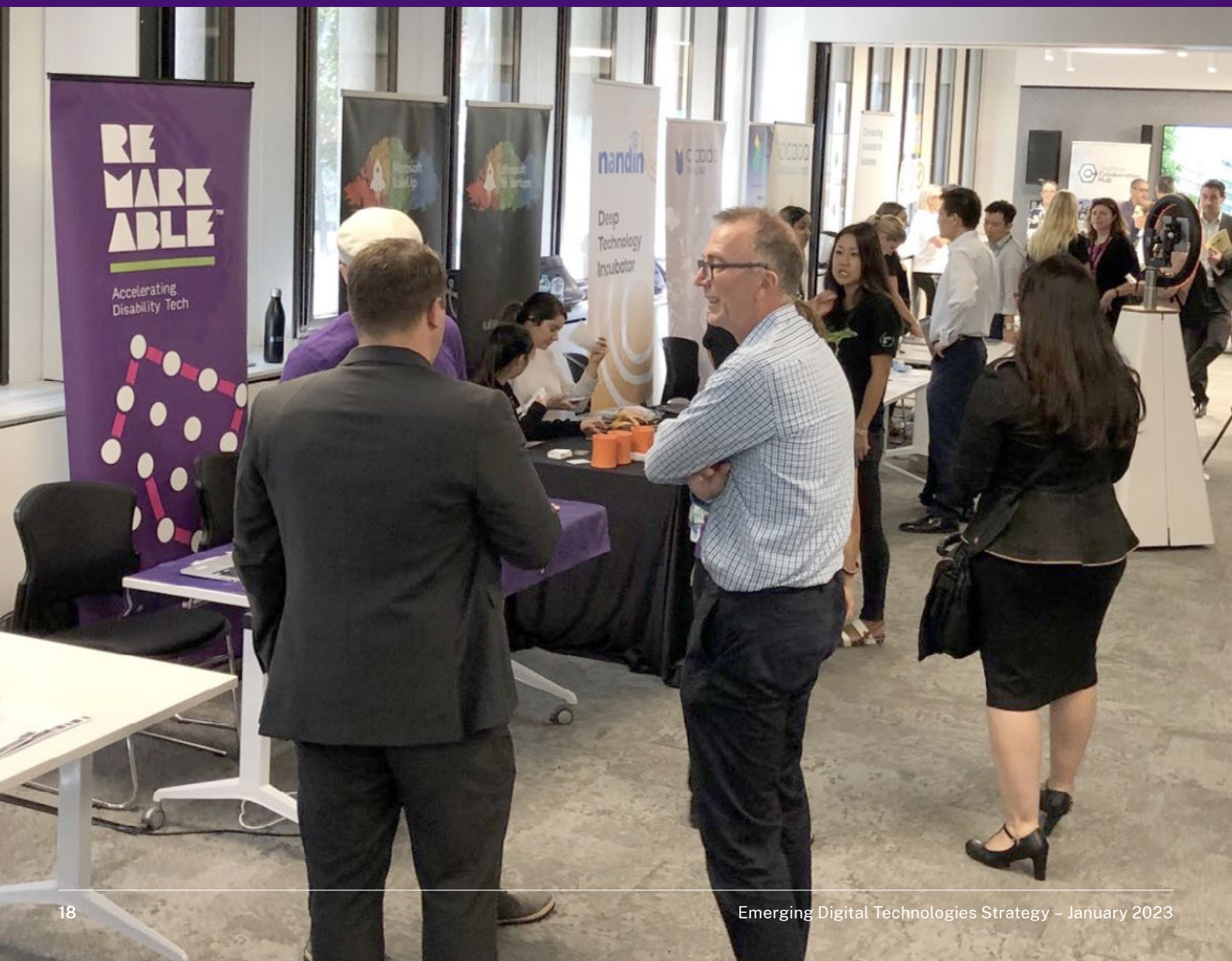
# Case study

## Sydney Startup Hub

Established by the NSW Government in February 2018, the Sydney Startup Hub offers more than 17,000 square metres of office space to accelerate state-wide startup growth to maximise innovation and job creation. Its role is to connect, grow, educate, create partnerships and help to build a culture that enables those in the NSW innovation ecosystem.

The Sydney Startup Hub operates out of a single location in the CBD because high-density clustering of innovative businesses drives innovation. The Hub brings together a diversity of organisations and talent to ignite collaboration and provide easier and superior access to networks, skills, funding and leadership.

To date, over 450 startups have been based out of the Sydney Startup Hub and have raised more than \$740 million of investment collectively. The Hub has also hosted more than 835 events and offered workspaces to over 3,289 regional entrepreneurs.



## 3

# Boost the adoption of emerging digital technologies

Small and medium enterprises (SMEs) are the backbone of the NSW economy comprising 99.8% of all NSW businesses, 29% of which are in regional NSW. NSW is home to 34% of all SMEs in Australia, employing 1.6 million people and paying more than A\$53.6 billion in annual wages in NSW alone. However, Australian and international research has shown SMEs often lag behind in the adoption of new technologies.<sup>58</sup> According to the 2022 Productivity Council's Innovation Scorecard, the proportion of NSW businesses using digital 'growth technologies' has increased by 93% since 2019. NSW is ahead of international jurisdictions like New Zealand and the US in terms of widespread diffusion of online technologies associated with high growth. As a result of the COVID-19 pandemic, Australian businesses rapidly accelerated technology adoption – implementing some technologies in 2020 by as much as they had in the past 10 years. Almost nine out of ten firms adopted some new digital technologies through the pandemic, helping them cushion the impact of COVID on their sales, employment and productivity.<sup>59</sup>

However, there are still significant opportunities to tap into unrealised productivity and economic gains as 34% of Australian SMEs do not have an online presence, 87% are not taking full advantage of digital tools and 31% are struggling to keep up with technological changes critical to their success.<sup>60,61</sup> In 2021, the Global Innovation Index ranked Australia 78th for diffusion of technology, which is weaker than advanced economies. Despite our world class research institutes and ability to produce ground-breaking technologies, we struggle to commercialise and diffuse technology effectively throughout the business ecosystem.<sup>62</sup>

The World Economic Forum recommends financial assistance to accelerate the diffusion of emerging technologies, particularly where perceived risk, financial burden and information gaps are negatively impacting the current levels of technology diffusion.

Government can help SMEs adopt emerging digital technologies by removing barriers. Those barriers include a lack of awareness, prohibitive development and implementation costs, a culture of risk aversion, and a lack of ability and capability to adopt new ideas. Boosting digital literacy across the NSW workforce will be a critical component to enable greater adoption of emerging digital technologies. Government should also ensure enabling infrastructure, such as telecommunications, is consistently improved State-wide to facilitate the uptake of emerging digital technologies across metropolitan and regional areas.



## What success looks like

NSW businesses and public entities are early adopters of emerging digital technologies, driving productivity and comparative advantages through augmentation and automation. A knowledge-sharing and innovative culture sees firms adopt and refine emerging technologies to best suit domestic market conditions. NSW Government plays a key role as partner, connector and enabler for SMEs, assisting them in overcoming existing barriers and unlocking economic and productivity gains through emerging digital technology adoption.

## What we are doing

Existing Government initiatives seek to enhance the adoption of emerging technologies throughout the business ecosystem. Programs such as the Building Partnerships Grant, R&D Fund, COVID TechVouchers and Boosting Business Innovation Program focus on offering startups and SMEs financial support to develop innovative products or services. These initiatives can benefit from continued support by the NSW Government and alongside new initiatives, which in tandem can continue to stimulate technology diffusion among NSW businesses.

## Recommendations

- Develop voucher programs or other forms of financial support, including technology or sector specific programs, to stimulate greater adoption of emerging digital technologies in NSW.
- Support capability development to enable greater awareness and adoption of emerging digital technologies, through interventions such as educational programs targeted at SMEs to drive organisational productivity through the increased deployment of digital technologies.
- Facilitate knowledge sharing opportunities on the benefits of adopting emerging technologies, including workshops, information sessions and networking events to increase knowledge and boost the uptake of key emerging technologies among SMEs.



# Case study

## Small Business Innovation and Research (SBIR) program

A \$24 million initiative of the NSW Government, the SBIR Program provides competitive grants to SMEs to find and commercialise innovative solutions to well-defined problems for NSW Government agencies.

The SBIR Program supports innovation and technology commercialisation to solve real problems by offering a pathway to test, trial and purchase innovative solutions outside the standard procurement process. It provides the NSW Government with the opportunity to work directly with SMEs, inventors, researchers and entrepreneurs to develop cutting-edge technologies.

Zetifi, a specialist in advanced communications, was a recipient of the 2021 SBIR grant program. By using a network of off-grid small cells that can be rapidly deployed on existing power poles or as standalone poles, Zetifi was able to complete a feasibility study providing resilient and long range Wi-Fi communications to remote communities and emergency services.



## 4

# Grow the tech-ready workforce

Growing the tech ready workforce is not just about training new generations of workers, it is also a lifelong task for people of all ages. As a result of disruption, existing industries and jobs will be displaced. The skills of the workforce today may become less relevant in the future, and there will be an enduring need for government to facilitate upskilling and re-training opportunities. Equipping the workforce with technology skills required for current and future jobs is a critical factor in facilitating economic growth and the diffusion of emerging digital technologies.

NSW has a highly educated and skilled workforce, with over half of the State's workers tertiary educated and qualified.<sup>63</sup> NSW is home to 41% of Australia's software engineers and computer network specialists and 287,000 tech employees. NSW also has the highest number of domestic graduates in IT. By 2026, it is forecasted that there will be over 1.1 million technology workers in Australia, representing an average annual growth rate of 5.4%. This exceeds the forecast growth rate for the overall Australian workforce, which is expected to increase by 1.2% per annum over the same period.<sup>64</sup> NSW continues to lead Australian benchmarks on the rate of managers and professionals on Australian skilled worker visas. This reflects Sydney's and NSW's position as a place with the best of both worlds – world-leading economic strength and an envious lifestyle, making it the best place to live, work and grow a business.

According to a recent report from AlphaBeta,<sup>65</sup> the Australian economy is forecasted to require 6.5 million newly skilled and reskilled digital workers by 2025, which is effectively 79% more than current figures. As the labour market in the technology sector tightens and global competition for tech-talent becomes more intense, a greater emphasis on upskilling will be vital to ensure future technology workforce needs are met.

Government can be the vital co-ordinator between institutions, employers, and social partners, to ensure education and training is more responsive to changing needs and better targets those who need learning opportunities the most. Government support for skills development can contribute to structural transformation and economic growth by enhancing employability and labour productivity, thereby strengthening the competitiveness of the NSW economy. To grow a tech enabled workforce across NSW, the Government plays an important role, including through the school system, as well as through increased attainment of tertiary and Vocational Education and Training (VET) qualifications. Government can also continue to support skill migration into the State. NSW attracts significant talent in Information Technologies occupations, which are consistently represented in the top 10 professions granted Temporary Skills Shortage Visas for entry to NSW.

Education is an important determinant of sustained economic growth. Higher levels of educational attainment lead to a more skilled and productive workforce, producing higher-value goods and services more efficiently, forming the basis of faster economic growth and rising living standards. A country's capacity to pick up new technologies and turn them to economic advantage is greater if its education and training system creates a broad base of adequately educated individuals able to continue learning throughout their careers.<sup>66</sup>

## What success looks like

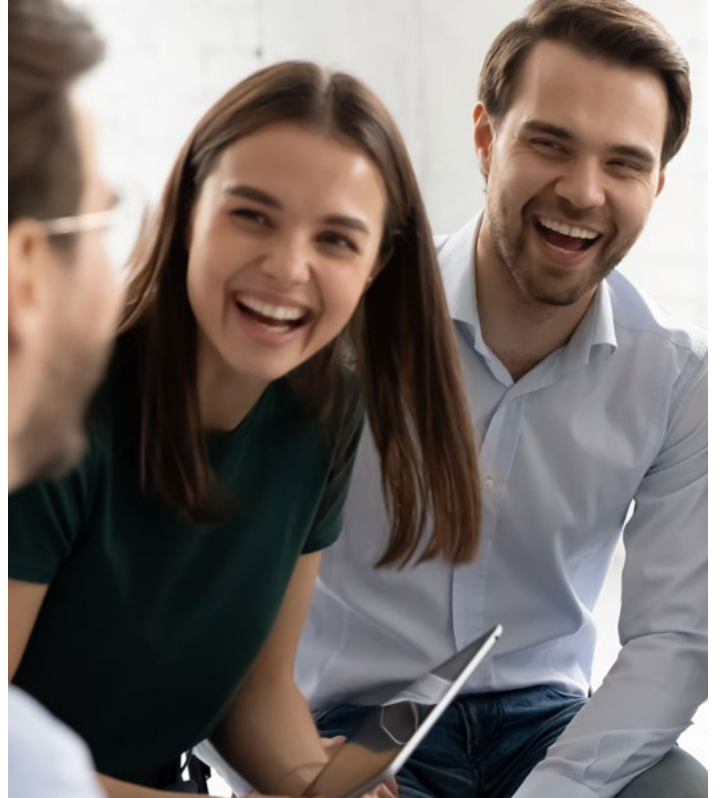
NSW is globally recognised for its tech talent – providing the confidence for tech firms to establish, invest, and expand in NSW. A highly experienced baseline of technology professionals is continuously supplemented by a strong pipeline of digital technology graduates and targeted skilled migration. Knowledge serves as a critical competitive advantage for NSW in emerging digital technologies and industries – such as cyber security, quantum and blockchain.

## What we are doing

Developing technology skills in the workforce, and industry-led and co-designed education programs continues to be a priority policy focus. TAFE NSW and NSW Department of Education, through Skills NSW and Training NSW, have developed technology skills and training programs to upgrade skills and future proof companies in a rapidly evolving digital world. The Western Parklands City Authority (WPCA) have implemented the New Education and Training Model (NETM), that facilitates partnerships between industry, universities and VET providers to design micro-credentials that meet immediate industry skill requirements.

## Recommendations

- Increase emerging digital technologies skills development by facilitating greater industry-led/ co-designed education programs across schools, TAFE and tertiary institutions, with a focus on future skills delivery methods.
- Collaborate more closely with key bodies, such as the Tech Council of Australia, to advocate and provide support for new initiatives that increase student participation in STEM and related emerging technology education fields.
- Further investigate the potential to partner with the Commonwealth Government to boost attraction of global tech talent in the coming years, as aligned with the IPC's Global Talent Wars report.



# Case study

## TAFE NSW Schools Launchpad

The TAFE NSW Schools Launchpad is a program for secondary education students in Years 11 and 12, focused on equipping future generations with the skills employers want in emerging technologies and industries.

The program gives students real-world skills that can help them get ahead in their careers and fill the jobs of the future. The Launchpad prioritises 20 key real-world skills, ranging from game design, cyber security and entrepreneurship to cloud computing, robotics and horticulture.

The Launchpad prepares our future generations with the appropriate skills through teacher-led structured virtual classrooms, tutorials, workshops and industry placements. It offers them access to industry, software, tools and content across a range of exciting career areas and growth industries.





## 5

# Position Government as a key partner

Government can play a more active role in harnessing synergies between industry and the public sector to boost the development and adoption of emerging digital technologies. While the regulatory role of government in relation to emerging technologies aligns with the fundamental purpose of government, proactive non-regulatory policies can extend the role of government to become an enabler, adopter and promoter of emerging digital technologies, accelerating industrial and societal acceptance to capture greater economic benefits.

The World Economic Forum notes the vital role governments can play in the innovation process by directing the development of new technologies through government-supported programmes and creating environments for innovation.<sup>67</sup>

#### Key areas of influence include:

- Driving collaborative innovation ecosystems that signal intent to the market and enable collaboration between industry and research partners.
- Supporting domestic digital innovation activity via strategic procurement and smart regulation.
- Coordinating and partnering with all levels of government to ensure conducive settings are in place for encouraging greater development and adoption of technologies.
- Increasing awareness of emerging digital technologies and their industrial applications.

The NSW Government's investments in innovation precincts and research infrastructure continue to be a significant driver of investments in research and innovation in NSW. A\$48.2 million investment in TechCentral provides up to 250,000 square metres of space and will bring over 4,000 technology jobs, while the Westmead Health and Innovation District has the potential to deliver 50,000 new jobs and an additional A\$2.8 billion per annum of economic output for the NSW economy by 2036.

A\$1 billion has been set aside by the NSW Government to investigate and deliver Special Activation Precincts in Parkes, Wagga Wagga, Moree, Snowy Mountains, Williamtown and Narrabi, to attract investment and jobs to regional areas.

To highlight, evidence from 80 government-led innovation precincts across the OECD member countries has shown that job growth stimulated by the precincts was as high as 24.4% in knowledge-intensive industries.<sup>68</sup> The government development of such precincts – in particular, where access to shared research infrastructure can be facilitated – is a prime example of government acting as an innovation partner and extending the role of government beyond being a regulator.

The NSW Government has taken proactive measures to accelerate the uptake of emerging technologies and support local, innovative enterprises, with a target of 30% of NSW Government's total addressable direct ICT spend to be with SMEs.

Despite proactive policies seeking to accelerate innovation and digitalisation, there are still opportunities for government to achieve further benefits from harnessing emerging digital technologies. Statistics from NSW Government procurement indicate more than 90% of spend is concentrated with 10% of suppliers, with many startups and SMEs who can provide innovative solutions missing out.<sup>69</sup> Unsurprisingly, the World Bank ranks Australia 63rd globally for the extent government purchasing decisions foster innovation.<sup>70</sup> There are obvious complexities in ensuring Government procurement balances a number of core objectives such as delivering value for money and ensuring fair and open processes, while also being extended to operate as an effective economic development lever.

The NSW Government continues to seek ways to enhance and refine government processes, including those associated with procurement, to better support the emerging technologies sector and further accelerate the diffusion of technologies.

Government also plays a key role as a customer. NSW Government consumption accounts for around 20% of Gross State Product (GSP)<sup>71</sup> – strategic procurement that also seeks innovation outcomes can be a significant driver of growth in emerging industries and technologies and enhance the commercialisation prospects of domestic startups.

The delivery of the Government's Beyond Digital Strategy continues to enhance the role of NSW Government as a customer, with a focus on digitalisation of services including education, health care, and transportation. NSW Government also seeks to support easier and more seamless engagement with industry, including digital technology providers, in order to uncover new solutions.

There is a key role for government to ensure regulation keeps pace with technology development and diffusion. Regulations can quickly become redundant, and the impacts of new technologies and business models can be particularly difficult to forecast. A survey from CSIRO's Data61 found that 50% of businesses identified the biggest barrier to businesses adopting or developing emerging technologies was regulatory barriers.

Small improvements to the regulatory framework have the potential to drive significant economic benefits. Past studies show compliance costs in NSW range between A\$11 billion and A\$87 billion every year. A saving of just 5% in compliance costs could result in a net benefit of between A\$0.6 billion and A\$4 billion.<sup>72</sup> More broadly, a favourable regulatory environment has been shown to lead to greater foreign direct investment, boost productivity and increase our innovation capabilities.<sup>73</sup>

Therefore, it is of utmost importance that NSW's regulatory systems are fit for purpose and promote digital innovation while safeguarding the community.

### What success looks like

Proactive and targeted government policies seek to enhance, diversify and grow the State's digital technology capabilities. Government, through partnering and acting as a first customer, provides commercial pathways for innovative startups and small-to-medium enterprises (SMEs) to flourish, while priority precincts and research infrastructure enhance the State's digital innovation outcomes.

### What we are doing

At present, the NSW Government has several programs, in addition to non-programmatic government services, that seek to partner with industry to support the growth of emerging digital technologies. The NSW Productivity Commission's paper on Regulating Emerging Technologies has established a set of principles broadly applicable to a range of current and future emerging technologies that will seek to drive agility and proactiveness, primarily in legislative reform, to support better outcomes in the diffusion of technologies. The NSW Government is creating and supporting innovation procurement pathways to find and develop solutions for government and the NSW community, while stimulating growth and diversity in the innovation and emerging technology sector. Programs such as the Minimum Viable Product grants seek to drive commercialisation outcomes for innovative NSW startups and SMEs. The NSW Government has taken a number of steps to harness innovation to better address key challenges in our community. An example of this is the Connectivity Innovation Network (CIN) which brings together the research community, industry and government agencies to solve connectivity challenges and deliver improved outcomes for the people of NSW.

### Recommendations

- Crowd-in Commonwealth funding to invest in collaborative research and innovation infrastructure, such as the National Collaborative Research Infrastructure Strategy (NCRIS).
- Promote and develop technology and innovation priority precincts (including Tech Central) to attract greater investment, establish new jobs and enhance NSW capabilities in emerging digital technology areas.
- Position NSW Government as a 'first customer' of innovative emerging technologies, facilitating pathways to commercialisation for domestic startups and scaleups.
- Advocate for and regularly review regulation and legislation to be outcome-focused, such as through regulatory sandboxes in priority emerging digital technologies in NSW.

# Case study

## Digital Restart Fund

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A world-first, the Digital Restart Fund has helped pave the way for funding the planning, designing and development of digital products and services in NSW. Through the Fund, NSW Government has prioritised projects that develop reusable platforms and solutions and deliver benefits for citizens across multiple touchpoints within the NSW Government.

Starting in June 2019 with a budget of A\$100 million, the Fund has been increased significantly in recent state budgets and now stands at \$2.1 billion. Over the past two years, NSW Government has invested in projects that have transformed customer experience in education, health, and the justice system, creating a more liveable and safer environment for our communities.

Projects funded by the Digital Restart Fund have already saved 3,220 working days of customer time and identified \$2.3 billion in economic returns for NSW.



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