Accelerating Australian R&D, innovation and industry 2025

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What's inside.

Executive summary

Complacency in the lucky country: underinvestment leading to capability risk and industry loss against a backdrop of rising competition and uncertainty

Australia has often been dubbed the "lucky country", a label synonymous with its exceptional economic resilience. For nearly three decades, Australia has experienced uninterrupted economic growth, a remarkable feat until the pandemic-induced recession of 2020.

While many other nations faltered during the 2008 global financial crisis (GFC), Australia emerged largely unscathed, a testament to the strength of its economic foundations. But it wasn't just sound policies or effective economic management; Australia also found itself in the right place at the right time.

Starting around 2005, China's rapid urbanisation sparked an enormous demand for resources, driving the resources boom. In response to the GFC, China unleashed a series of massive stimulus packages to support its economy, further intensifying its demand for raw materials. With its vast mineral wealth, Australia became a key beneficiary of China's expanding economy.

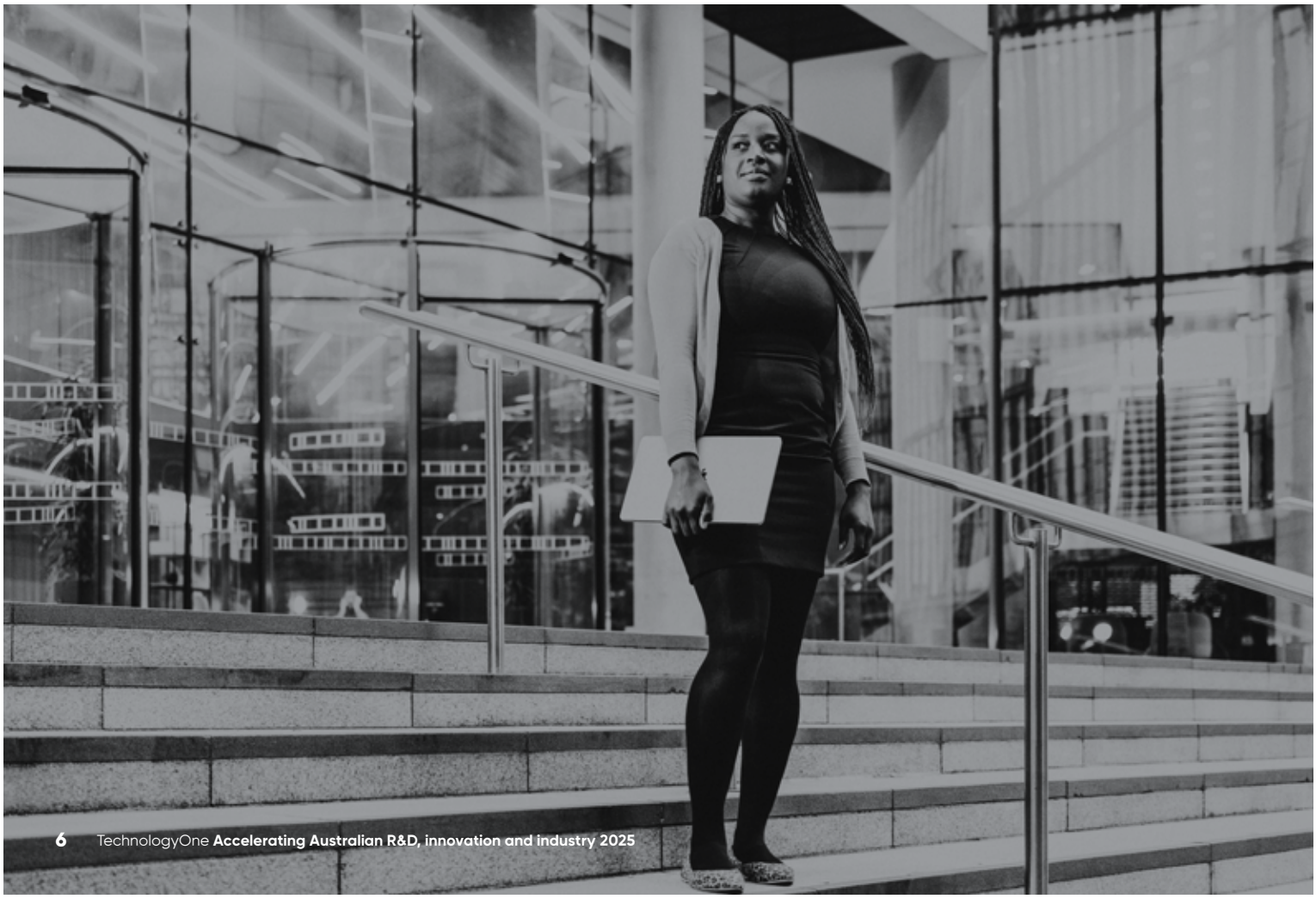
Arguably, however, this period of exceptional growth also sowed the seeds of complacency among industry, government and households.

Masked by the improvement in living standards created by the mining boom, the last two decades have seen the progressive loss of industry diversity and depth in other parts of the economy as investment in R&D and industry growth have been deprioritised.

At the same time, the wider economic landscape has shifted dramatically. The new normal – emerging from the COVID-19 pandemic – has seen heightened global trade uncertainty, including most recently with Trump's tariffs and other protectionist policies, as well as a marked slowdown in China's economic growth.

Emerging structural challenges now evident.

Against this backdrop, Australia's long-neglected structural issues are now coming to the fore, manifest in declining trends in R&D, counts of medium- and large-sized businesses, business investment as a share of GDP, diversity by sector in business investment and export complexity.



Evidence of structural challenges in Australian industry and the urgent need for a new approach: key metrics

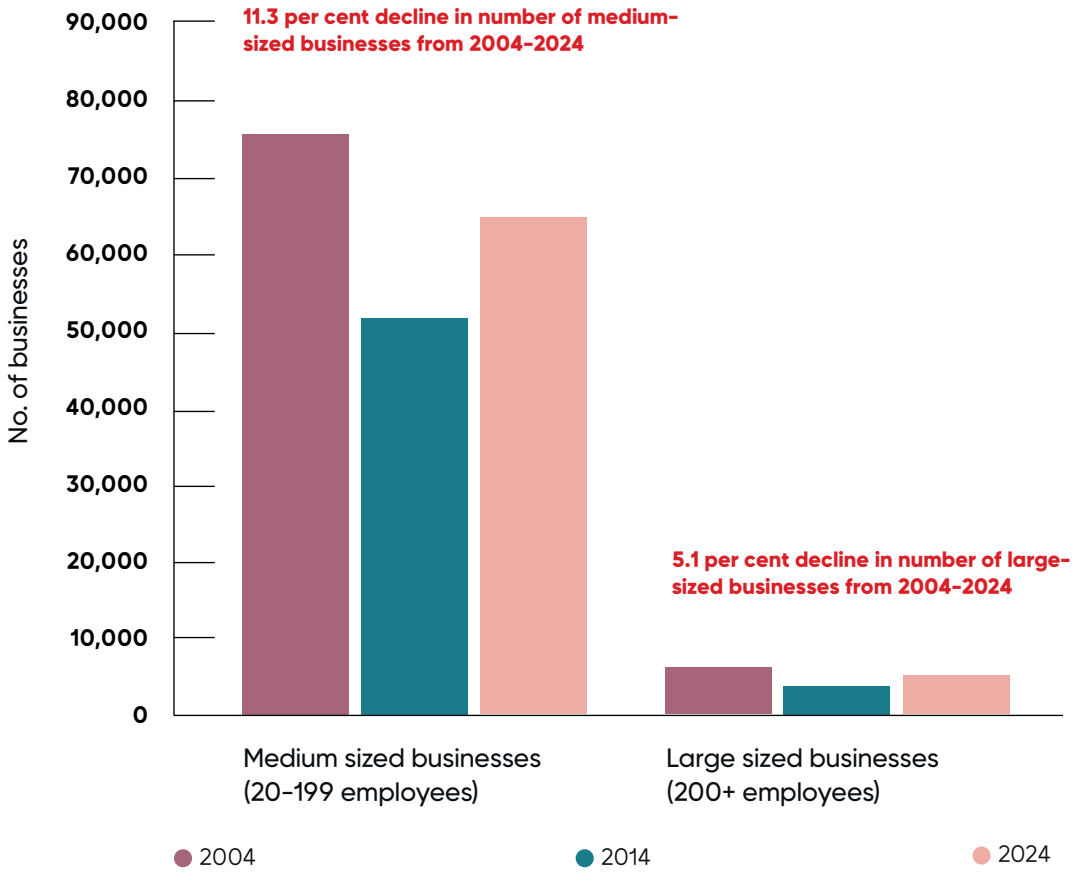
Australia's population in 2024 was roughly 33 per cent larger than 2004, but in 2024 there were 11.3 per cent fewer medium-sized businesses and 5.1 per cent fewer large-sized businesses over that same time period (Figure ES.1).

Business investment as a proportion of GDP is now at 1994 levels (Figure ES.2) and vastly less diverse than was observed at that time (Figure ES.3), with mining and professional services dominating business investment while other industries, including agriculture, construction, manufacturing and financial services account for a substantially smaller proportion of a shrinking pie.

Employment in market sectors outside of mining has also reduced as a share of total employment, with an 11.4 per cent decline in non-mining market-facing industries (Figure ES.4).

Australia's export complexity has also been reducing, with Australia dropping 22 places over the 2002-2022 horizon (Figure ES.5).

Figure ES.1: Counts of medium and large sized Australian businesses, 2004 – 2024



Source: ABS Counts of Australian Business, Jun 2004 – Jun 2024. Note that there is inconsistency in ABS reporting for the count of businesses from Jun 2010 – Jun 2013; the latest reported counts are used for these periods.

Figure ES.2: Trends in Australian business investment as a percentage of GDP, 1988 – 2024

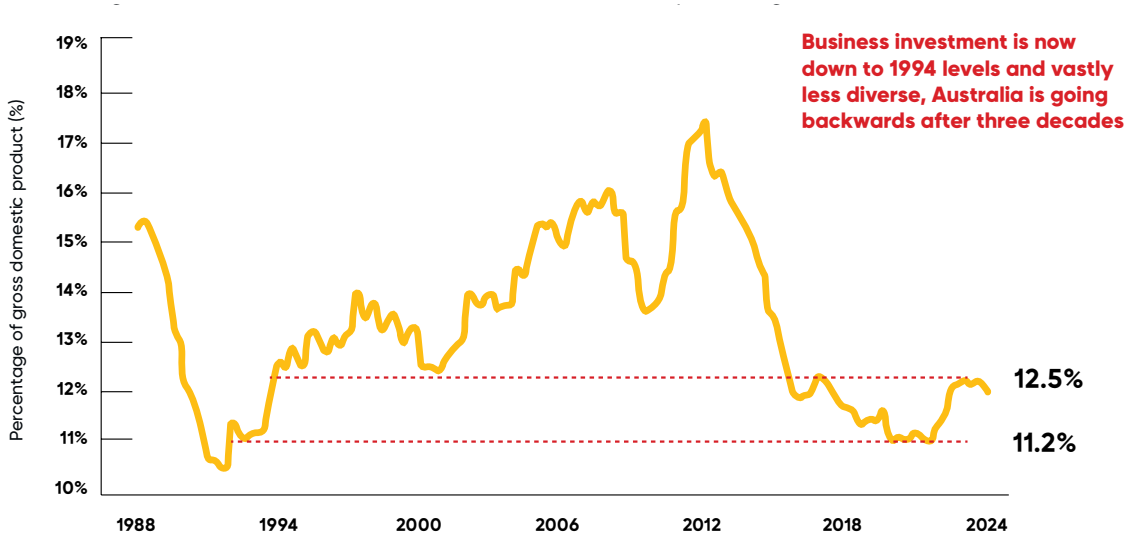
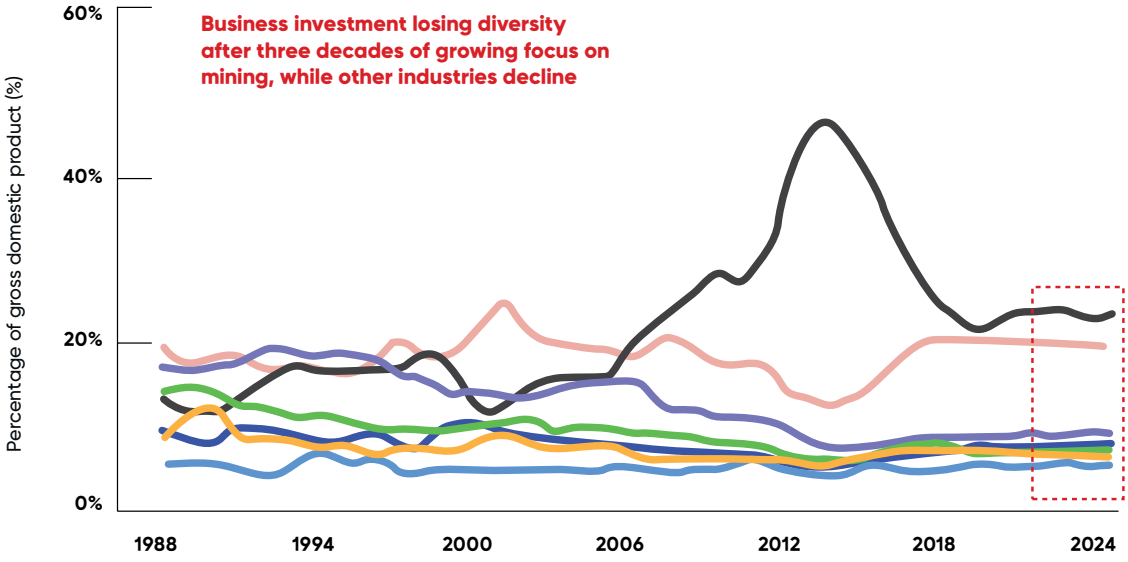


Figure ES.3: Trends in business investment by industry as a percentage of GDP, 1988 – 2024



Source: ABS and RBA Data, 2024 and The Growth Lab at Harvard University, 2022, "Country Complexity Rankings', accessed: https://atlas.hks.harvard.edu/rankings

Figure ES.4: Percentage of total employed workforce in Australia: 2004 vs. 2024

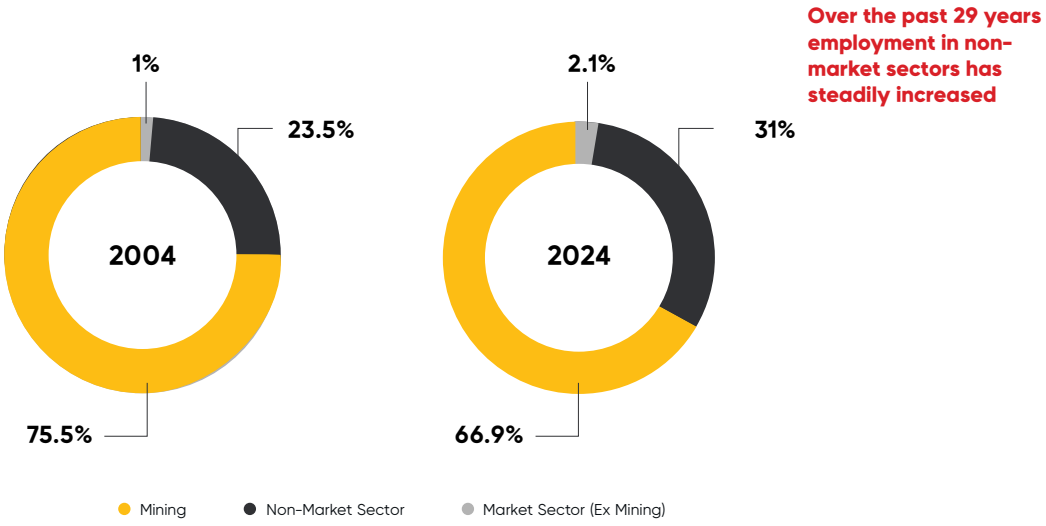
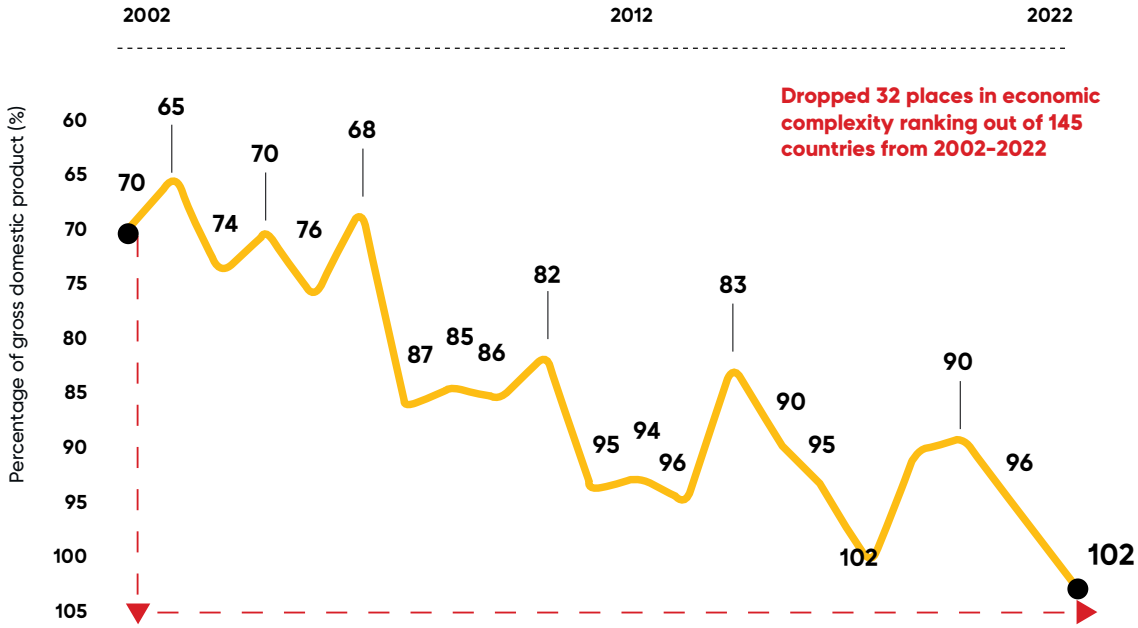


Figure ES.5: Trends in Australia's Economic Complexity Ranking, 2002 – 2022



Source: ABS and RBA Data, 2024 and The Growth Lab at Harvard University, 2022, "Country Complexity Rankings', accessed: https://atlas.hks.harvard.edu/rankings

Addressing declining trends in R&D: The strategic examination of R&D

Alongside these other metrics of structural challenge and risk, Australian investment in R&D is also on the decline and low by international standards.

From a peak of 2.25% of GDP in 2008, Australian R&D expenditure has fallen to 1.68%, falling well below the OECD average of 2.7% of GDP.

This means that, compared to its peers, Australia is collectively under investing in its productivity, growth potential and future standards of living by a factor of 1.6.

Critically, both government expenditure on R&D and business expenditure on R&D are falling (Figures ES.6 and ES.7).

Need for a new approach: the Strategic Examination of R&D

Recognising the importance of investment in R&D, the Australian Government has released the Strategic Examination of R&D (SERD) Discussion Paper (Department of Industry, 2025) as part of a review of policy settings of R&D in Australia.

Figure ES.6: Trends in Australian vs OECD BERD as a percentage of GDP, 2005 – 2022

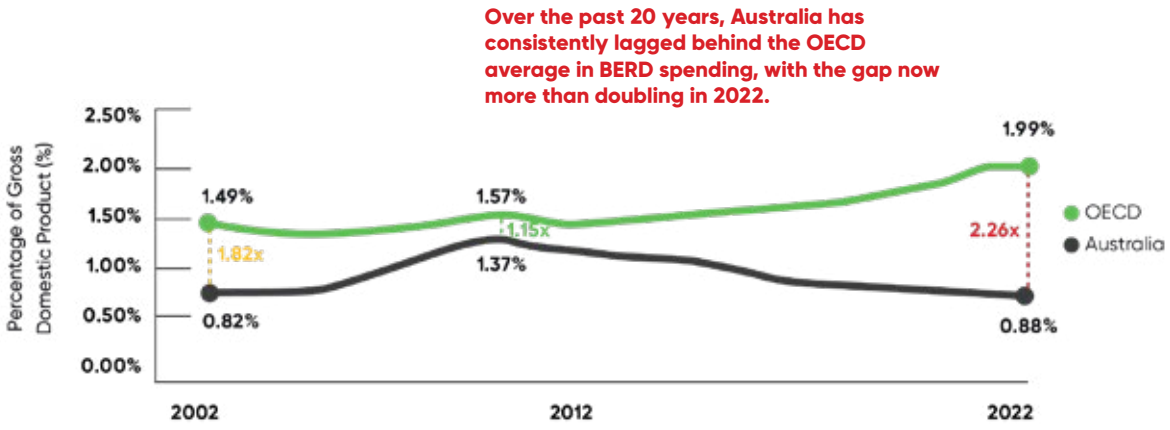


Figure ES.7: Trends in Australian vs OECD GERD as a percentage of GDP, 2005 – 2022

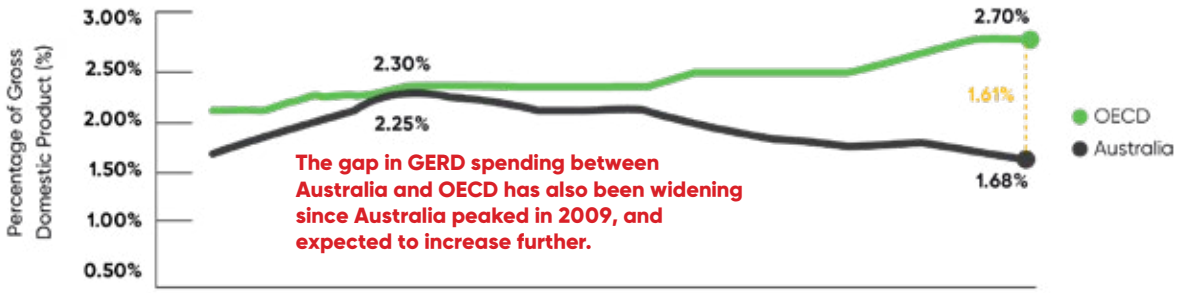


Figure ES.7: Trends in Australian vs OECD GERD as a percentage of GDP, 2005 – 2022

Australia is a world leader in research, but opportunities are missed

Because trends in R&D investment represent both a driver and a product of industry capability, reversing these negative trends in R&D will require a long-term, whole-of-ecosystem approach – one that identifies the fundamental barriers to innovation and industry growth and recognises the centrality of R&D and innovation in economic policy and Australians' quality of life.

Australia enjoys strong innovation and industry potential...

Australia has many components of a world-leading innovation ecosystem that are the foundation of industrial capability, productivity and prosperity for Australian communities. Australian universities are consistently ranked among the best in the world, with 9 of our institutions being ranked in the top 100 universities worldwide (QS Top Universities, 2025).

Australia also accounts for 2.4 per cent of the top 10 per cent of cited publications (Department of Education, 2023) and is ranked 10th in the world for attractiveness to foreign direct investment (Peterson & Toland, 2024) but fails to convert this potential to industry competitiveness and growth.

But in spite of punching above its weight in research quality and investment attractiveness, Australia has consistently failed to translate into Australian broad-based industry competitiveness and economic growth.

Australia ranks 30th for innovation outputs globally, which compares poorly to its:

- 3rd place ranking for quality of its universities
- 6th place ranking for scientific publications
- 9th place ranking for knowledge-intensive employment
- (WIPO, Global Innovation Index 2024).

Benchmarking Australia and Canada's innovation systems for example, highlights that while Australia outperforms Canada on many of the inputs to R&D and innovation, it falls behind on the translation of this potential into industry capability and growth.

Where does Australia break down? A tale of two innovation ecosystems

Global Innovation Index metrics show, for example, that Australia does well in terms of knowledge workers, but poorly in terms of innovation linkages and knowledge absorption.

Breaking the business sophistication and knowledge output metrics down further, it is clear that Australia performs poorly relative to its peers in cluster development, IP formation and its capacity for knowledge absorption, including IP payments and foreign direct investment inflows.

Figure ES.8: Benchmarking Australian and Canadian innovation ecosystems

Rankings:

15	Institutions	14
10	Human capital and research	11
15	Infrastructure	21
20	Market sophistication	4
26	Business sophistication	13
21	Innovation linkages*	3
28	Knowledge and technology outputs	20

23 **Global Innovation Index Ranking:**

14 **Global Innovation Ranking:**

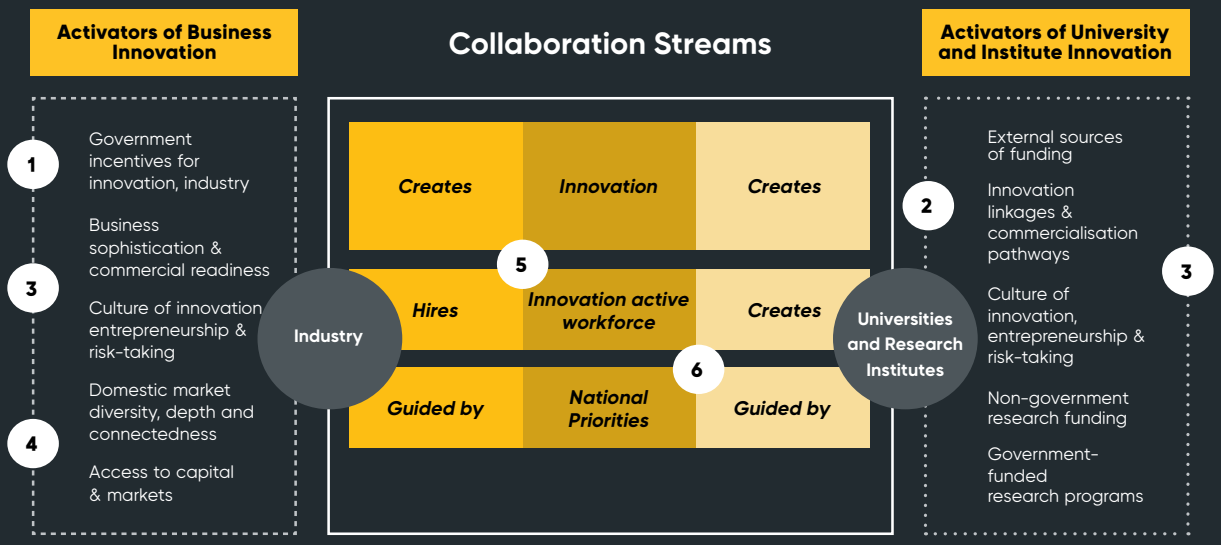
Source: WIPO, 2024, GII ranking, Country comparisons, accessed at: https://www.wipo.int/gii-ranking/en/compare?country1=canada&country2=Australia. Note Innovation Linkages is a dimension of business sophistication. Note: the World Intellectual Property Organisation Global Innovation Index (GII) ranks world economies according to their innovation capabilities based on performance against roughly 80 indicators of innovation inputs and outputs.

Key issues in Australia's innovation ecosystem

lead to missed opportunities and future threats to innovation and productivity

Improving Australia's capacity to translate its advantages in research and infrastructure (upstream innovation capabilities) into downstream innovation and industry growth will require a sophisticated strategy that addresses major weaknesses in Australia's innovation ecosystem.

Figure ES.9 identifies activators of R&D, innovation and growth across Australia's innovation ecosystem.



1. Innovation and industry incentives insufficient to overcome market forces
2. Poor linkages between industry and higher education, with missed opportunities for commercialisation
3. Cultural barriers and risk aversion across innovation pipeline
4. Missed opportunities to build market depth and diversity (capacity for R&D absorption), with varying barriers to scale for different industry sectors
5. Lack of a national strategy for innovation cluster development, critical mass
6. Lack of bi-partisan, long-term policy consistency and vision for growth

Issues and opportunities in R&D, innovation and industry growth: policy settings insufficient to overcome market forces

As shown in Figure ES.9, major issues across Australia's innovation ecosystem include:

1 Policy settings for innovation and industry growth are not fit-for-purpose

Taken together, the negative trends in Australian R&D investment and industry structure indicate that policy settings have been insufficient to overcome wider market forces over the past 20 years.

Beyond the R&D Tax Incentive, which is the largest single component of government investment in R&D and innovation today, programs have become increasingly fragmented, duplicative and short-term in focus. There have been important successes, such as the CRC Program, but increasingly programs often allocate small amounts of funding across sectors (e.g., Industry Growth Cluster Program) often with short-term funding horizons.

Australia's R&D Tax Incentive is generous compared to its international peers, but stakeholder feedback, alongside government reviews by DISR and the ATO, indicates it may not be driving a significant expansion in R&D in all sectors (additionally) compared to what would otherwise be the case.

For example, stakeholders have indicated the incentive may sometimes subsidise activity that would have occurred regardless of the incentive, with parts of industry viewing the incentive as a reward for activity, rather than a policy aimed at driving growth in R&D investment above base case levels.

At the same time, in other sectors, where R&D investment is genuinely footloose, such as the life sciences and mining technology sectors, the scheme is also perceived to be subject to significant uncertainty that companies are unable to invest. This puts the loss of high knowledge spillover activity in Australia at risk Given these issues, there may be opportunities to better target this scheme towards activities and sectors subject to significant global competition for R&D investment and to redirect funding towards other activities with higher additional effects.

A review of international approaches reveals that Australia's peers tend to have more targeted incentives and programs, which are often underpinned by comprehensive, long-term strategies for industry growth and cluster development.

Issues and opportunities in R&D, innovation and industry growth: weak innovation linkages and cultural barriers to risk and entrepreneurship

Expenditure on R&D is also an order of magnitude higher among Australia's peers, improving their chances for building more competitive economies and jobs for the future.

Additionally, and despite being far from global markets – a disadvantage to trade – Australia still maintains one of the highest tax burdens among OECD countries, with any reform recommendations (e.g., from the Henry review) left unimplemented.

Lifting investment in R&D and driving growth in innovation and industry, will require Australian government and industry to recognise it is in a competition that requires strategy and investment to win amid significant economic and technological change.

2 Weak innovation system linkages and pathways for collaboration and commercialisation create missed opportunities for R&D and innovation

Stakeholders identified multiple barriers to collaboration and commercialisation of research, including:

- Poor understanding of the culture, operating models and approach across industry, academia and government
- Misaligned incentive structures, with academics focused on publications and citations with few rewards for industry collaboration—which stands in contrast to highly successful innovation ecosystems in Europe, where achieving leadership roles in university are contingent on industry experience (Germany, Netherlands)
- Incomplete information, with industry often uncertain on how to engage with universities and the lack of a 'front door' and navigation support.
- Subscale commercialisation teams duplicated across 41 universities nationally, and a lack of knowledge brokers as observed in Australia's international peers.

  Stakeholders also noted that Australia lacks the institutional foundations to drive collaboration and innovation across industry and academia that are more often seen in advanced innovation economics like South Korea, Germany, UK, Sweden, Finland and Japan. These countries were noted to often have access to shared infrastructure and systems to identify business needs and match them with providers.

3 Issues and opportunities in R&D, innovation and industry growth: cultural barriers to risk-taking and entrepreneurship in industry and academia

Cultural barriers and risk aversion act as a barrier to investment in R&D and capability development

Both the SERD Discussion paper and stakeholders have raised concerns that Australia lags its peers in terms of a culture of innovation, entrepreneurship, and risk-taking.

This was seen as a major contributing factor to declining trends in R&D, reducing economic complexity and low scale-up of SMEs in Australia.

Issues were identified in both industry and academia alike.

For example, while data are limited, the available evidence suggests that Australian CEOs spearhead fewer innovation initiatives than their international counterparts, and that rates of innovation activity are inconsistent across sectors.

Stakeholders attributed relatively limited competition in Australian markets muting incentives for investment in innovation compared to other markets as well as industry leaders being more risk averse than their international peers.

Stakeholders noted that many large multi-national companies in Australia today are also largely focused on sales, with R&D investments being driven and decided by overseas head offices. Thus, among large businesses, there has been not only a decline in business counts, but also a change in the composition of industry such that there are fewer innovation oriented businesses with R&D teams in operation in Australia compared to previous generations. This was seen as a long term trend towards off-shoring R&D that had commenced in the late 1990s in response to economic growth in Asia and had accelerated as China has continued its economic expansion.

Among medium-sized firms, it was noted there are often different issues at play, with these businesses often being family-owned businesses that are running relatively lean operations with limited capacity and capital to champion R&D initiatives. This resonates to a greater extent with a Department of Industry, Science and Resources (DISR) survey of innovation active firms in 2023, which identified 'poor access to funding' and 'skills' as the major barriers to investment in innovation. Within academia, cultural fears of failure and a 'laser focus' on grants and publishing represented a major barrier to collaboration with industry.

Issues and opportunities in R&D, innovation and industry growth: missed opportunities to build capability and support scale

Some stakeholders also indicated that in academia there was often also a low value placed on industry partnerships and the value that industry or other collaborations could bring. The introduction of incentives in academia to require industry experience for executive roles was raised by multiple stakeholders as a significant opportunity to drive cultural change through higher education.

More fundamentally, stakeholders also identified the need to drive cultural change through the community more widely, with multiple people identifying primary and secondary schools as well as social media as important channels for improving the average Australian's pride in, valuation of and aspirations for Australian innovation and industry growth.

4 Missed opportunities to build industry depth and diversity, with varying barriers to scale by industry sector

Addressing barriers to scale is a core component of a strategy to build the capacity for R&D investment and absorption.

Here, Australian governments have the greatest potential to drive industry growth by improving engagement with Australian businesses as their 'first customer'.

Across a range of sectors, Australia has become an excellent adopter of global technologies, but may be more at risk of assuming Australian products 'must not be as good'.

Government procurement processes in particular have been found to be highly risk averse and fail to take into account the wider economic and social impacts of procurement, which include the potential for industry development.

Recent changes to Commonwealth Procurement Rules to improve procurement officers' understanding of industry and innovation impacts of procurement are an important first step, but more is needed to drive the cultural and process changes to ensure Australian firms are given a fair go within a competitive procurement process.

More broadly, Australian industry faces other barriers to scale, including access to capital, markets, networks and talent. The impact of these factors varies by sector.

Issues and opportunities in R&D, innovation and industry growth: lack of a cohesive nationally coordinated approach to cluster development

The general consensus in sectors with high growth potential, like ICT and biotech, was that good ideas find capital but may ultimately scale overseas to improve access to markets, networks and talent. In other sectors with slower growth trajectories, access to capital was seen to be a major hurdle. Often, grant systems were identified as insufficient to support growth as they could be slow to be awarded and burdened by criteria that could often be hard for a business to meet, depending on its business cycle. Improving system flexibility to support businesses in building critical mass is critical to supporting industry competitiveness and investment in R&D.

5 Lack of a nationally cohesive approach to cluster development

In stark contrast to other innovative economies, Australia lacks a nationally cohesive approach to cluster development.

Case studies highlight top innovators have strong cluster capabilities, supported by comprehensive strategies for their development. Clusters foster knowledge spillovers and improve the productivity of R&D among participants, particularly in clusters with strong anchor tenants, such as major universities and large industry clients.

Countries with strong innovation ecosystems are often underpinned by well-governed clusters that are characterised by the following elements:

- Strong, 'tripartite' leadership and governance – Clusters require an organising capacity to drive activity across other strategy domains. Best practice governance models include the Fraunhofer model and the UK's Catapult model, both of which bring government, industry and academia together to drive cluster activity and growth. A similar, collaborative model has also been implemented in the Cremorne Digital Hub and in the US through the Regional Tech Hubs model
- Proactive investment attraction strategies – Successful clusters often develop a team dedicated to building critical mass in priority sectors
- Access to shared infrastructure – Clusters often facilitate access to shared infrastructure

Issues and opportunities in R&D, innovation and industry growth: the need for nationally coordinated clusters and a long-term, bi-partisan strategy

- Shared investment in programs to support entrepreneurship and networks – Efficiencies can be realised by participating stakeholders in the pooling of resources for shared program delivery, including events strategies to promote networking across sectors. Where clusters involve government funding, growth is also supported by funding for R&D, skills development and investment in quality of place.
- Australia lacks a strong national network of clusters organised around priority growth sectors as observed in the UK, Canada, Germany, the Netherlands and the United States. Providing national leadership around a national network of industry clusters, organised around sectors of long-term strategic importance, could provide the foundations for a long-term strategy for industry growth and be funded in such a way to drive increased innovation linkages, collaboration, entrepreneurship and scale.

Critically, clusters depend on leaders to bring their strategies to life: people not processes and policies are the secret ingredients for success. Within a cluster strategy, the development of Australian cluster champions, with a vision and drive for growth, is a critical element for success.

6 Lack of a long-term, bi-partisan strategy for priority sectors, resulting in constant policy change and uncertainty

Investment in R&D and innovation in Australia is further hindered by perceptions of significant policy churn following each election cycle and a progressive de-prioritisation of industry and innovation policy, contributing to the steady decline in government expenditure in R&D.

Arguably, reviewing successive policies for industry priorities it would appear that there is relatively strong agreement for Australia's areas of competitive advantage, including:

- ICT
- Renewable energy (net zero)
- Agriculture
- Health & life sciences
- Defence
- Value-added mining and metals manufacturing.

Issues and opportunities in R&D, innovation and industry growth: lack of consistent, long term, bi-partisan support for national industry priorities

In practice, however, constant changes are made to emphasis, sector definitions and program criteria with each new government, which can deter companies from investment.

While there have been some initial efforts to improve the nature of investments to catalyse significant industry, there was strong and consistent consensus that a new, long-term, bi-partisan approach, which cements innovation and industry growth as core economic policy, is needed to drive step-change growth in investment.

Priority Sectors	Modern Manufacturing	Industry Growth Centres	Future Made in Australia (Phase 1)	National Reconstruction Fund
Medical technology and pharmaceuticals	✓	✓		✓
Resources and mining	✓	✓	✓	✓
Oil, gas and energy	✓	✓	✓	✓
Food and agribusiness	✓	✓		✓
Defence and aerospace	✓			✓
ICT		✓ Cybersecurity		✓ (Enabling tech)
Other		Advanced manufacturing		Transport

Issues and opportunities in R&D, innovation and industry growth: Australia's technology sector is a critical sector for growth

Australia's ICT sector is a case in point for untapped opportunities and emerging threats in Australia's innovation and industry ecosystem, as well as the need for a national vision and coordinated approach.

Over the past decade, Australia's tech sector has emerged as one of the nation's strongest-performing sectors, and a main source of new growth.

As noted by the SERD Discussion Paper, it is among the highest-performing sectors of R&D of any Australian industry but undersized relative to Australia's OECD peers in terms of contribution to economic growth.

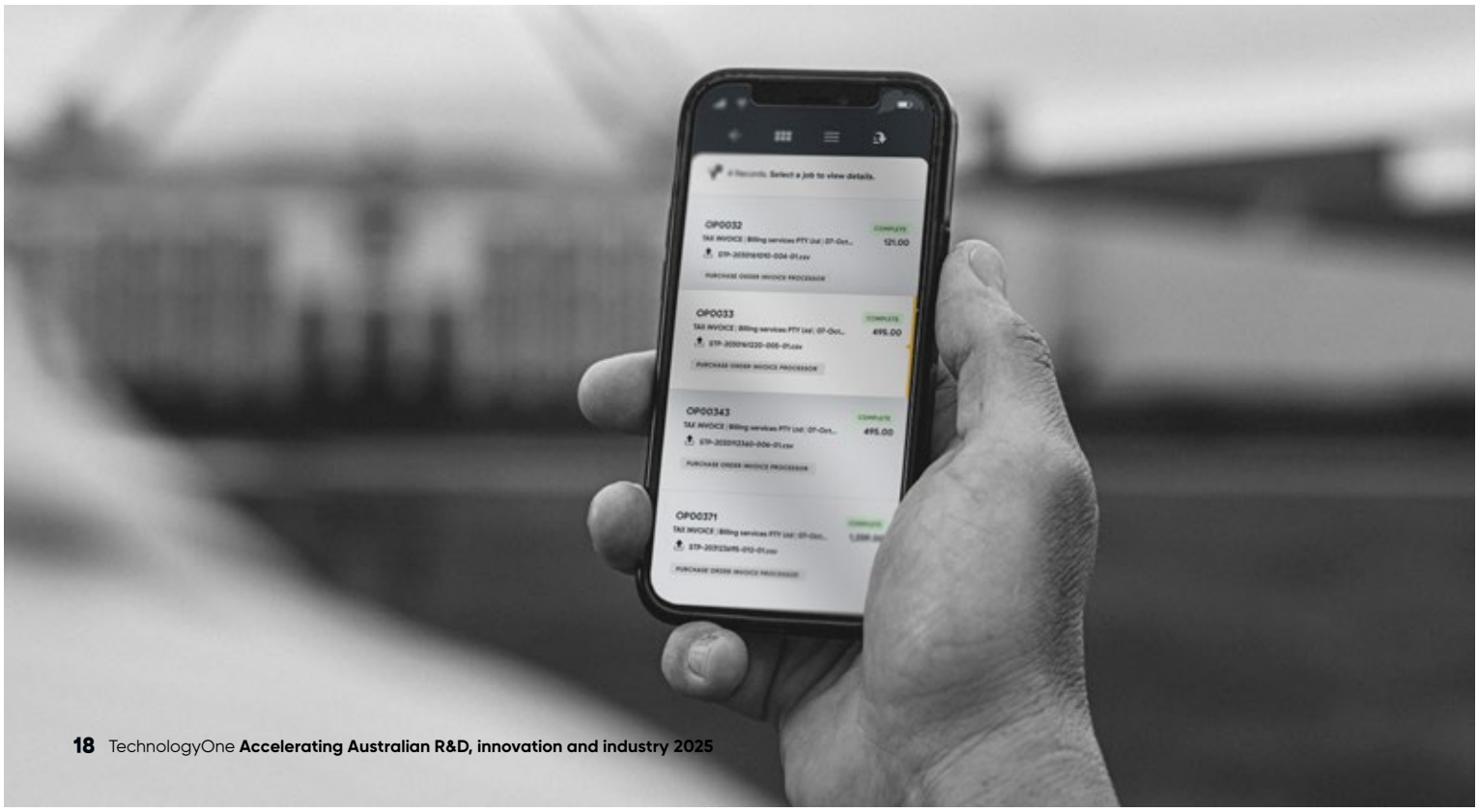
Australia's ICT sector is also globally competitive in many market segments, having produced 21 tech 'unicorns', or companies worth US$1 billion or more, representing 2.2 per cent of the approximately 920 such companies worldwide.

This exceeds Australia's contribution to global GDP of 1.6 per cent. At the same time, Australia does not have a single cluster in the top 10 technology clusters globally and is facing significant challenges arising from market concentration and platform dominance that threaten to frustrate future growth.

According to Startup Genome's Global Startup Ecosystem Report 2024, Sydney was the highest ranked Australian startup ecosystem, at 21. This falls below other major cities with a cohesive cluster strategy, such as Toronto (18), Seoul (9) and Tel Aviv (4). In fact, there are 9 cities in the US alone ranked higher than Sydney. Below Sydney, Melbourne comes in at rank 32.

In addition, Australia's technology sector also represents a critical industry with elements of sovereign capability that to date have been poorly defined. Australia's ICT sector is sometimes represented in national policy priorities, under various definitions including cybersecurity and enabling capability.

Australia is under-investing in critical, future productivity enhancing technologies, which is masked in some ways by its success in other market segments.



Australia's ICT sector is undersized, unfocused and lacks a nationally cohesive strategy for sovereign capability

Between 2017 and 2021, $24.6 billion of venture capital (VC) was invested in the Australian tech sector, comprising a majority of the $29 billion of total Australian VC funding. This funding was allocated disproportionately toward business software and pay tech.

But importantly, in some specialist, high risk or deep tech sectors, such as AI/ML, biotech, energy tech and cybersecurity, Australian startups received comparatively less VC funding than international counterparts. While Australia may be able to 'fast follow' adoption of some technologies, others are more strategic and require urgent, coordinated action. Taken together, this suggests more must be done to define a long-term vision for Australia's technology sector and to invest in the systems that will support its growth.

Figure ES.10: Potential sovereign and strategic capabilities in Australia's ICT sector meriting a differentiated approach

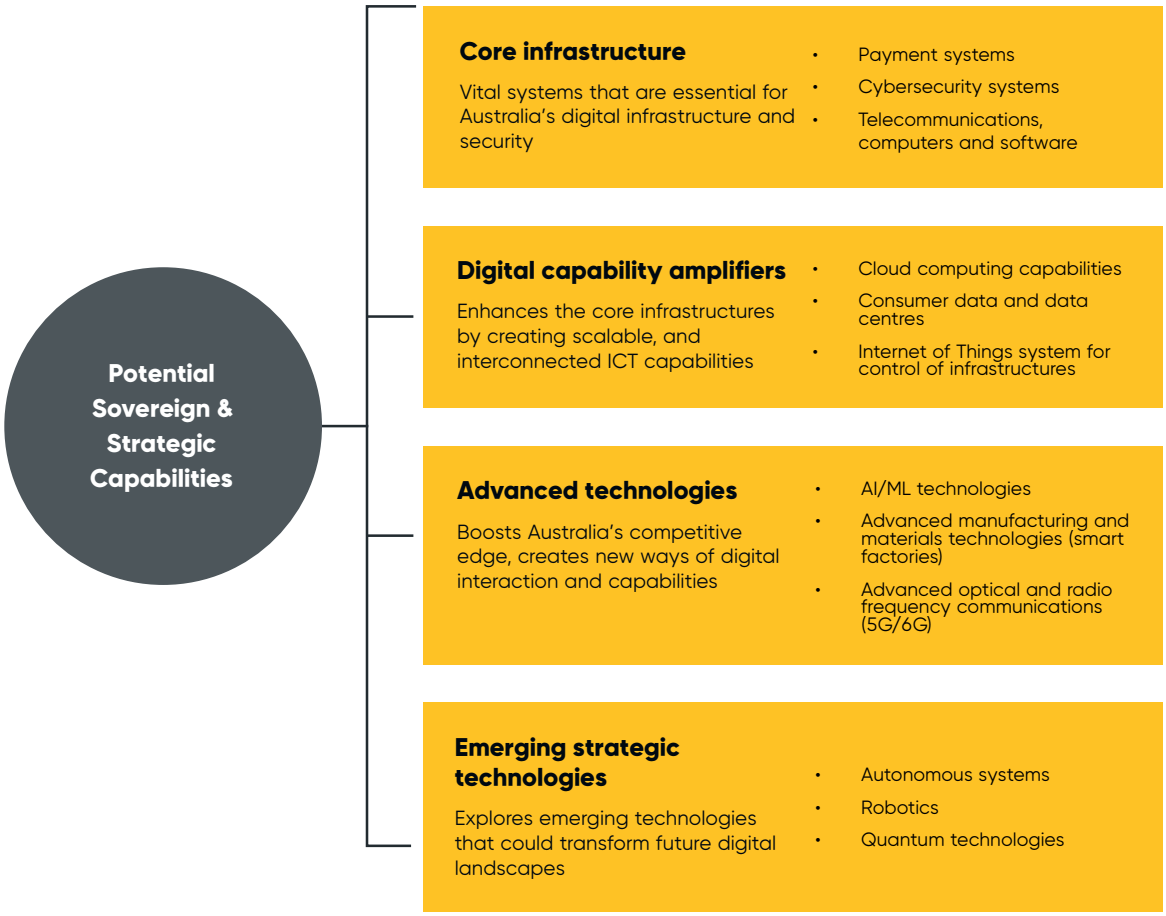
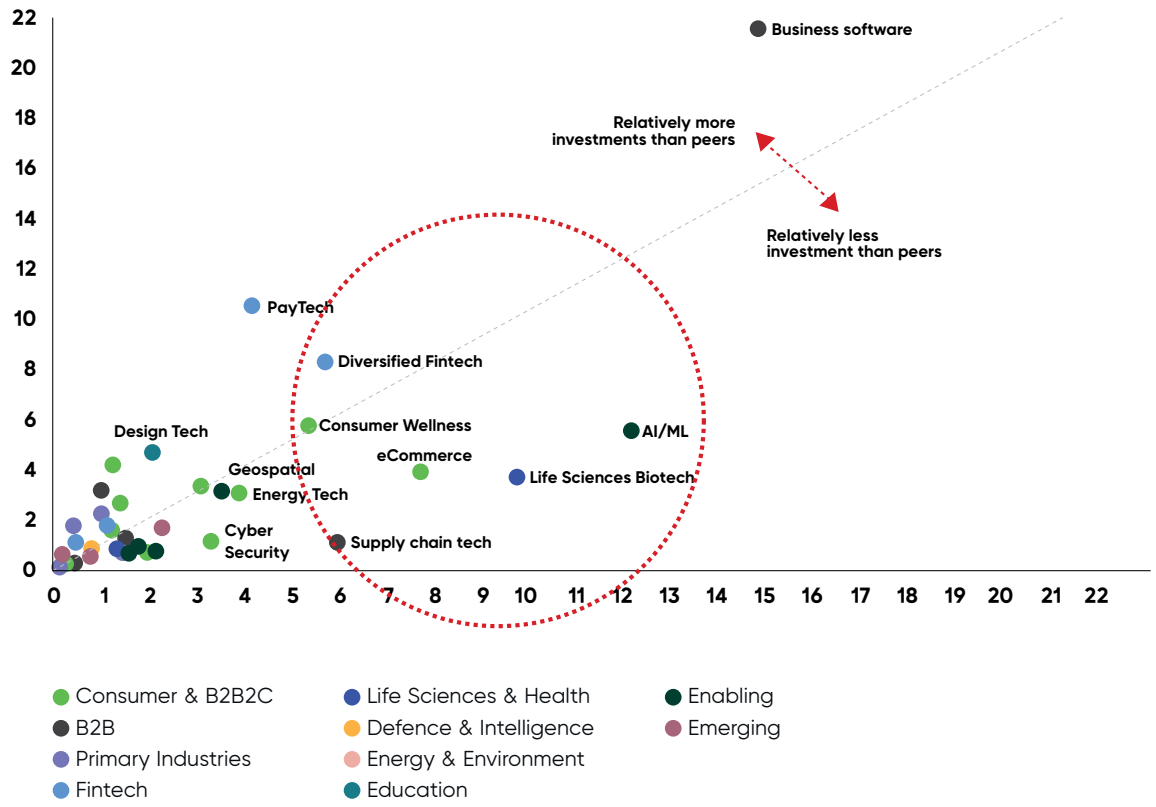


Figure ES.11: Comparison of VC funding in Australia and globally in 2020 - 2021, % of total funding



Source: Tech Council of Australia, 2022, Turning-Australia-into-a-regional-techhub_Report-2022.pdf

An action plan for growth – to secure jobs for the next generation of Australians and improve quality of life

The Strategic Examination of R&D offers a critical, generation-shaping opportunity to finally address the major issues in Australia's innovation and industry ecosystem – to bring together stakeholders from across industry, academia and all levels of government, across all jurisdictions around a nation-building plan for growth.

Now, the strategic threats to Australian industry could not be clearer. Investment in R&D, by industry and government alike, must become an urgent national priority.

Australians highly value their world-leading health, education and social programs; funding for these programs is dependent on a thriving market sector and competitive workforce. The risks are clear, and Australian households, industry leaders and government cannot afford to take this for granted any longer.

Like climate change, this is among the intergenerational equity challenges of our time and what we do today will have a massive impact on the opportunities for our children: what jobs are available, and what standard of living they can enjoy. In rebooting the approach to R&D and innovation, Australia has the opportunity to address important structural elements that have frustrated growth over the past two decades by learning from the best of international models and developing an approach that best suits the Australian context.

Getting the leadership and governance model right is the highest priority for government.

Successful systems, such as those in the UK, Canada, Germany, and the Netherlands all share a common feature: the ecosystem is led by a 'tripartite' model that brings together industry, government and higher education. In developing a national model of technology hubs, the United States has sought to emulate these models and closer to home the Cremorne Digital Hub has enjoyed strong success with a similar approach.

This must be underpinned by adequate, bi-partisan, long-term commitment to investment that enables the stability and attractiveness of Australia as an investment location and place to do business.

Innovation and industry policy no longer be sidelined and shuffled around: it must be prioritised as core economic policy, worthy of leadership by central agencies.

Australia must improve coordination not only across portfolios and programs but across levels of government and jurisdictions.

Australia is too small, geographically dispersed and remote to allow for continued poor coordination across capabilities nationally.

Reducing duplication and fragmentation across policy portfolios to redirect towards priority sectors offers an important opportunity to improve value for money from public expenditure. In bringing together a national approach Australia can work towards the development of a robust and world-leading network of Australian innovation clusters.

Cluster selection provides an opportunity for the market to bring its best ideas together and to leverage private investment into Australia, with funding contingent on private sector investment.

Investment should not be equal across all clusters.

Where clusters can bring together '10x' researchers and industry opportunities, government should secure these strategic opportunities with appropriate support.

The management of clusters can also provide for more agile ongoing approaches to investment, efficiencies in skills development (including entrepreneurial programs) and support for network development. The selection and development of cluster champions to drive the development of the cluster and collaboration is a critical factor for success.

Government should further support the development of innovation and industry capability by building depth and diversity through procurement practices.

Competition and market engagement remain critical principles for ensuring value for money; procurement processes must do a better job of consistently valuing long-run innovation and industry opportunities. This will send a signal to the market that R&D and innovation are valued, fostering a culture of innovation excellence.

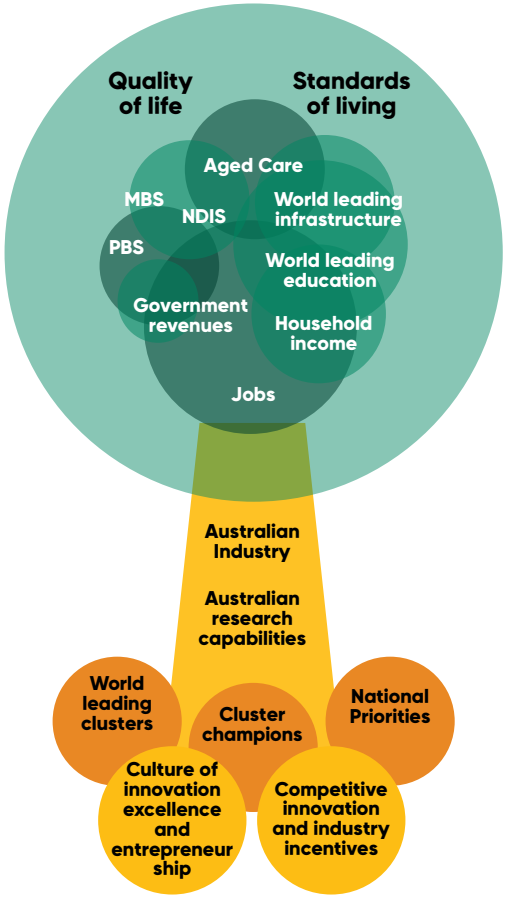
Why it matters: industry and innovation capability sustains the services and infrastructure that contribute to Australians' high quality of life and standards of living

Perhaps more fundamentally, government should evaluate options to improve the valuation of innovation and industry – not only in industry or higher education, but also in households, classrooms and communities more generally.

Australians are rightfully proud of the world-leading services and infrastructure they have developed, but arguably more must be done in Australian culture to better value the role of Australian innovation and industry as critical enablers for Australia's high quality of life and standards of living.

Competitive innovation and industry create the jobs, dividends and government revenues that make possible the world-leading services and infrastructure that are the envy of the world. If Australia does not sustain and grow its competitive capabilities, Australians will be more constrained in its ability to deliver world leading services and job opportunities.

Young people, in particular, need to see themselves as important leaders building the future of Australia.



A plan for action: summary of key opportunities

1 **Fund new national agenda for R&D and innovation organised around priority clusters**

- Define priority sectors and the vision for priority sectors
- Invest in cluster development over 10-year horizon, contingent on industry co-investment
- Through clusters, invest in programs for entrepreneurship and skills development
- Invest in campaign to improve community awareness, value of business innovation and investment

2 **Review incentives for innovation and investment**

- Review effectiveness and efficiency of existing programs, potentially redirecting some funding towards more targeted initiatives, including cluster development
- Minimise duplication nationally
- Revisit wider incentives for innovation and industry investment (e.g., Henry Review)

3 **Increase government expenditure on R&D**

- Match or exceed OECD average

4 **Increase industry depth and diversity**

- Align procurement strategies with innovation and industry growth agenda

What does an integrated, sustainable, dynamic and impactful Australian R&D system look like?

With action, Australia can develop an integrated, sustainable, dynamic and impactful Australian R&D system, underpinned by a national network of Australian innovation clusters, that leverages strong industry investment and fosters collaboration across sectors and disciplines in priority sectors, and is governed by a world-leading tripartite model of governance.

National Network of Australian Innovation Clusters

- Part of wider innovation and industry
- Investment strategy
- Organised around priority sectors
- Clusters selected through competitive
- Selection process of market-led consortia

National entity to lead 10-year bi-partisan strategy for industry growth

Clusters implemented with best practice governance models implemented nationally, with funding for:

- Cluster champions/leaders
- Networking and events
- Investment attraction strategies
- Programs to support entrepreneurship
- Access to shared facilities
- Skills development

Whole-of-government policy alignment, including procurement strategies and campaign for culture change

How do we get there?

An action plan for growth – implications for the technology sector

Applying these actions to Australia's ICT sector has the potential to see Australia's technology sector account for a larger share of Australia's economy in line with our developed nation peers.

In light of the significant sovereign and strategic capability characteristics of the sector, ICT should be identified as one of Australia's national priorities. Sovereign capabilities should be comprehensively defined to enable a differentiated approach to policy and procurement processes.

Beyond this, a vision for the sector should be developed for the industry, not only in software and payment systems, but also other critical, productivity-enhancing capabilities including AI and machine learning, quantum technologies, cybersecurity and robotics.

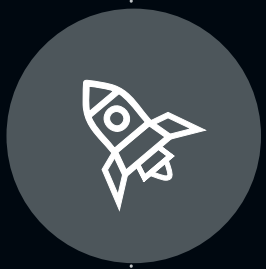
Australia should aspire to the development of world-leading clusters, leveraging the important seed investments and initiatives that have already been made in Tech Central, Cremorne and Fortitude Valley. This will involve not only support for SMEs but also a strong plan for investment attraction.

Consistent with wider economic impact valuation approaches, economic, social and environmental impacts should be measured by:

- Jobs creation, including highly-skilled jobs creation
- Training placement opportunities created
- Australian IP formation (patents and citations)
- Venture capital investment growth
- Leveraged private expenditure
- Leveraged private sector investment
- New business growth
- Cluster composition
- Export market development
- Jobs for priority employment cohorts
- Systems and supply chain resilience in sovereign capability sectors.

Implications for Australia's technology sector

- Bi-partisan support for ICT as a priority sector
- Vision for sector growth established
- Sovereign capabilities defined



- Define and develop world-leading technology clusters around specific areas of competitive advantage nationally
- Fund governance and leadership of clusters, including Australian cluster champions
- Invest in entrepreneurship and skills
- Change management & value campaign

- Align procurement strategies with national priorities
- Government as 'first customer'
- Review innovation and wider industry incentives to ensure Australia is a globally competitive location for investment

Chapter 1

Emerging structural risks


Customer
Service
Centre

Australia could be soon running out of luck

Risks of excess complacency amid rising economic uncertainty

Australia has often been dubbed the "lucky country", a moniker that signifies its exceptional economic resilience. For nearly three decades until the COVID-19 pandemic, Australia experienced uninterrupted economic growth.

While the 2008 global financial crisis hit many other nations particularly hard, Australia emerged largely unscathed, a testament not only to sound policy and effective economic management, but also to the beneficial economic tides with which Australia was well-positioned to rise.

Starting around 2005, China's rapid urbanisation sparked an enormous demand for resources, driving the resources boom. In response to the 2008 global financial crisis, China unleashed a series of massive stimulus packages to support its economy, further intensifying its demand for raw materials. With its vast mineral wealth, Australia became a key beneficiary of China's expanding economy.

Arguably, however, this period of exceptional growth also sowed the seeds of complacency in industry, government and households alike. Heavily reliant on the resources sector, wider strategies for innovation and industry policy have been progressively deprioritised by industry and government alike.

The mining boom has largely underpinned Australia's economic success over the past 20 years. When that boom began to wind down, the country was under-prepared for the following structural changes.

In the years since, the economic landscape has shifted dramatically. The new normal – emerging from the Covid-19 pandemic – has seen heightened global trade uncertainty, including Trump's tariffs and a marked slowdown in China's economic growth. Against this backdrop, Australia's long neglected structural issues are now coming to the forefront.

Australia is working harder, not smarter: output growth driven by hours worked rather than productivity

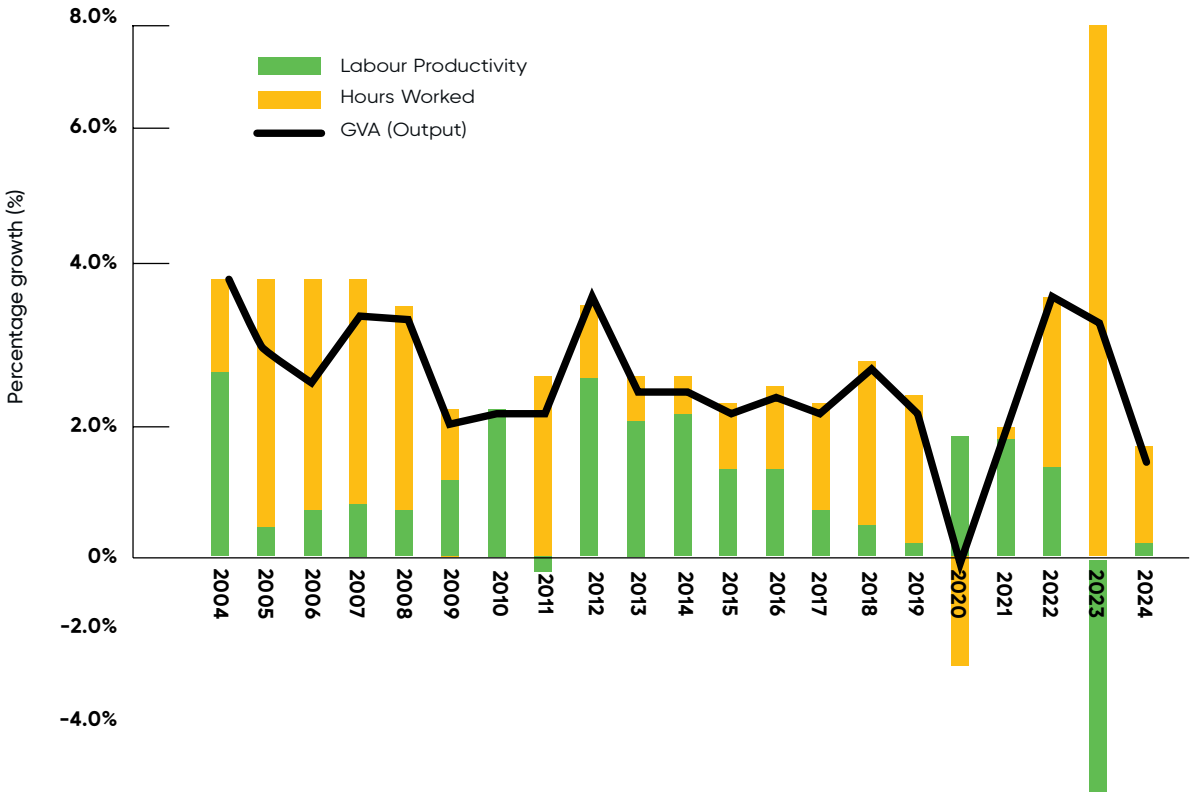
Over the past two decades, Australia's economic growth has been primarily driven by an increase in hours worked, rather than by innovation or productivity improvements.

While real output has risen, labour productivity has lagged behind the growing number of hours worked. This reliance on longer working hours, rather than more efficient or innovative methods, highlights the unsustainability of the current growth

For almost the entire mining boom, from 2004 to 2011, hours worked grew faster than labour productivity year-on-year. Similarly, when commodity prices surged again between 2016 and 2019, this trend persisted, with hours worked continuing to outpace productivity growth annually.

In contrast, productivity improvements have only outpaced the growth in hours worked during downturns, notably between 2012 and 2015, when mining activity slowed, and there was a greater need for efficiency. These productivity gains were largely driven by the immediate need for leaner operations and efficiency, rather than long-term innovation.

Figure 1.1: Trends in real output, labour productivity and hours worked, 2004 – 2024



Source: ABS, 2024, Australian System of National Accounts, Table 1. Key National Accounts Aggregates

Australia's productivity struggles, trapped in a boom-bust cycle of short term growth

This cyclical pattern suggests that Australia's productivity growth has struggled to capitalise on the opportunities presented by the mining boom or periods of economic prosperity. Rather than harnessing the economic windfall to foster long-term, broad-based productivity growth, the economy has relied heavily on the cyclical rise and fall of commodities prices and corresponding shifts in hours worked.

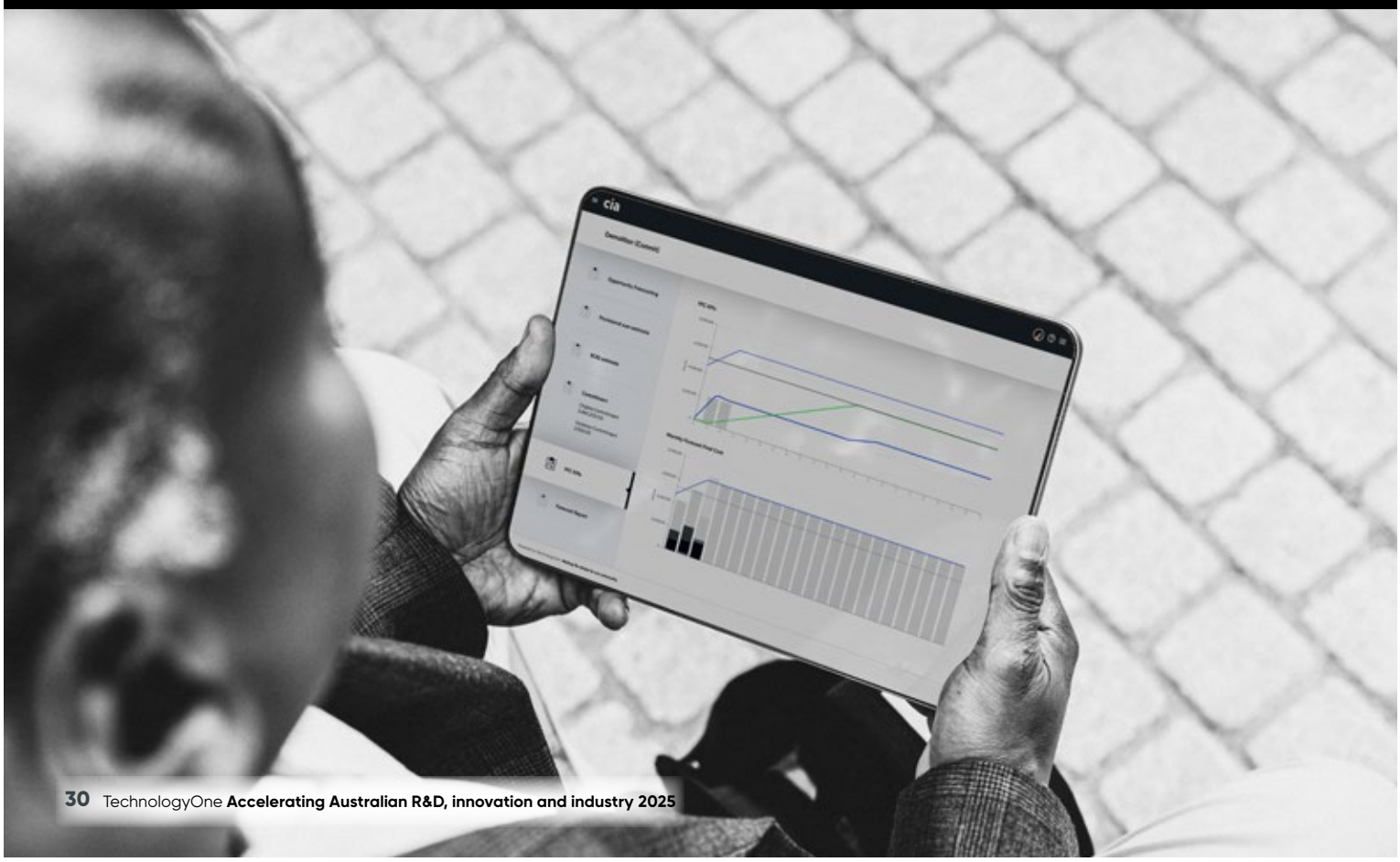
Productivity improvements have largely been reactive, occurring only when the boom subsides and pressure to improve efficiency becomes more acute. As a result, Australia has consistently missed the critical opportunity to build a more sustainable and innovation-driven economic model of growth.

The challenges ahead for Australia are further compounded by China's Belt and Road Initiative (BRI) and its growing investments in West African countries, particularly in mining.

As China diversifies its supply chain, including iron ore, Australia faces declining demand, threatening the mining sector and export revenues.

With iron ore production peaking and global commodity prices fluctuating, Australia's terms of trade are at risk. The need for diversification is urgent, as over-reliance on resource exports jeopardises long-term economic stability. Investing in innovation and other industries is crucial for a sustainable economic future.

Australia urgently needs the productivity boost it has been denied for too long. Without significant investment in innovation, especially in R&D, the nation's future growth prospects appear increasingly uncertain. Without a shift to innovation-driven growth, Australia risks becoming trapped in a cycle of unsustainable growth, reliant on short-term resource booms rather than long-term, structural improvements.



Declining business counts, particularly among medium sized businesses, contributing to declining economic complexity and BERD

Declining business counts, R&D expenditure, business investment and economic complexity

This broader issue of underinvestment in innovation has already contributed to a "hollowing out" of Australian industry.

Over the past two decades, there has been a dramatic contraction in the number of medium and large businesses, with medium-sized businesses decreasing by more than 11 per cent across sectors and large businesses declining by more than 5 per cent. As Australia's economic complexity diminishes, there has been a shift toward non-market sector economic activities, which tend to contribute less to long-term economic growth.

This hollowing out is also mirrored in the decline of business expenditure on R&D (BERD). Today, Australian BERD is disproportionately driven by small and medium-sized enterprises (SMEs), with large companies contributing only 45% of BERD, compared to 88% in the US and 91% in Germany (OECD, 2024).

Figure 1.2: Trends in number of medium and large sized businesses in Australia, 2004 – 2024

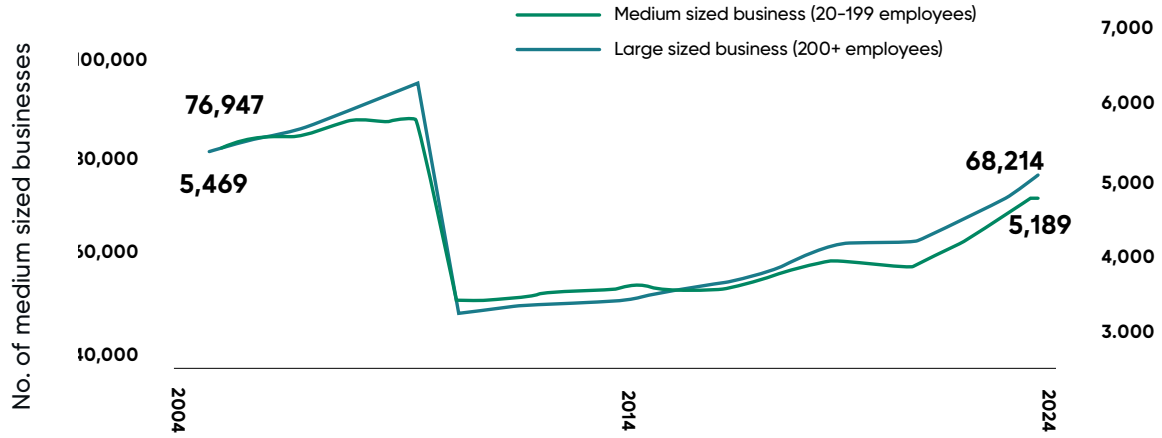
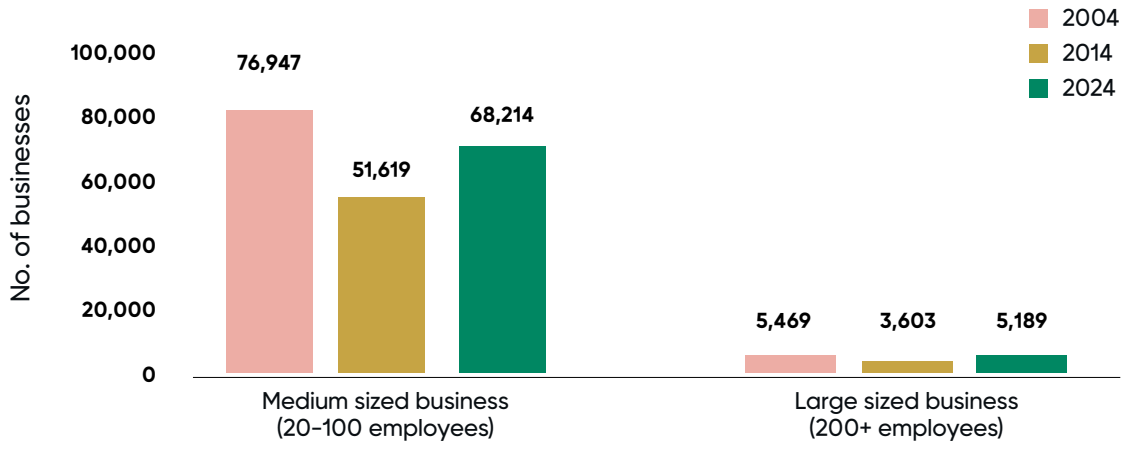


Figure 1.3: Number of medium and large sized businesses in Australia, 2004, 2014 and 2024

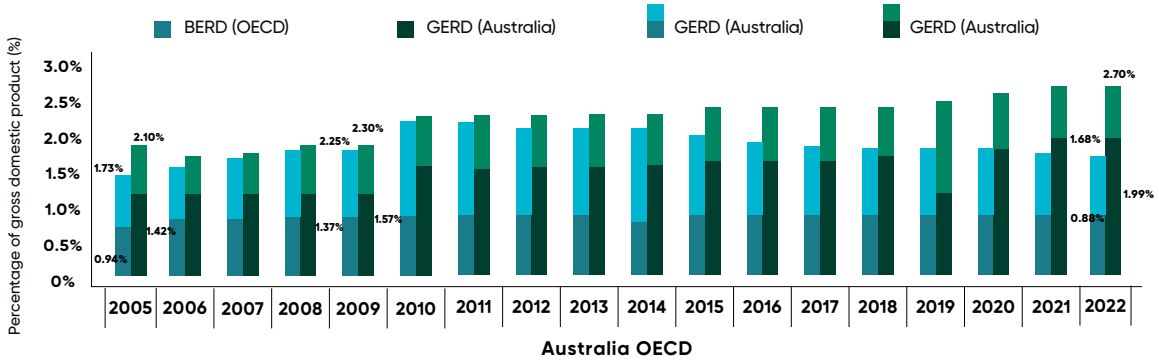


Source: ABS, 2024, Counts of Australian Businesses, including Entries and Exits, Data cube 2: Businesses by main state by industry class by employment size ranges

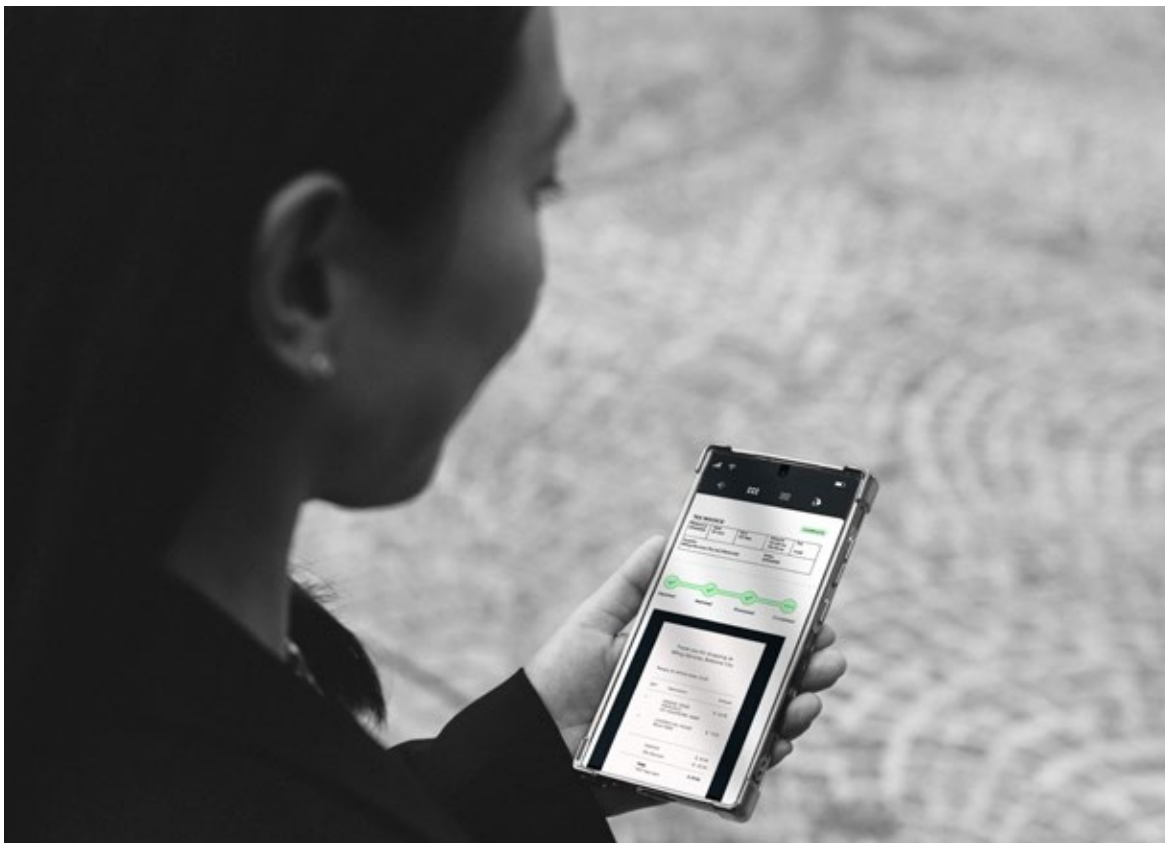
Australia's R&D spending lags further behind the OECD, and the gap continues to widen

Unfortunately, Australia has consistently lagged the OECD average in R&D expenditure as a percentage of GDP over the past two decades. The gap has continued to widen since Australia's peak R&D spending during the mining boom in 2009, when both Australian businesses and the nation as a whole were spending approximately the same on R&D as the OECD average. Since then, however, R&D expenditure has steadily declined year on year, while the OECD average has consistently increased. By 2022, the gap in business expenditure had more than doubled between Australia and the OECD.

Figure 1.4: Trends in Australian vs OECD business enterprise R&D expenditure (BERD) and gross domestic R&D expenditure (GERD) as a percentage of GDP, 2005 – 2022



Source: ABS, 2021-2022, Business expenditure on R&D, summary statistics, EC-OECD STIP Compass Data, 2005-2022



Business investment and financial performance mirror trends in R&D spending, highlighting growing weaknesses in business landscape

The decline in R&D expenditure is not an isolated trend. A similar pattern is evident in business investment, which mirrored the downward trajectory of business expenditures on R&D over the past two decades. Business investment reached its highest relative share of 18.2% of GDP in 2012, during the peak of the mining boom.

Since then, however, it has steadily fallen, now down to 1994 levels and is vastly less diverse, with the focus remaining heavily on mining. This decline in investment reflects broader challenges faced by Australian businesses, which are struggling not only with innovation but also with overall performance. After three decades of growth, Australia is now moving backwards.

More recently, businesses have reported earnings per share falling short of forecasted earnings in nine of the past twelve years. Except for the brief period of the COVID-19 pandemic, businesses only outperformed expectations in 2017. These trends suggest a weakening of the Australian business landscape, where both innovation and financial performance are faltering, further underlining the need for strategic investments in the future of the economy.

Figure 1.5: Trends in Australian business investment as a percentage of GDP, 1988 – 2024

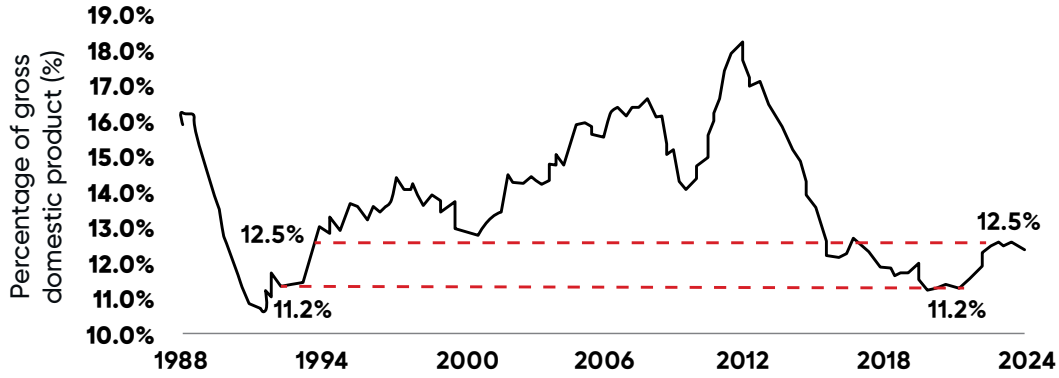
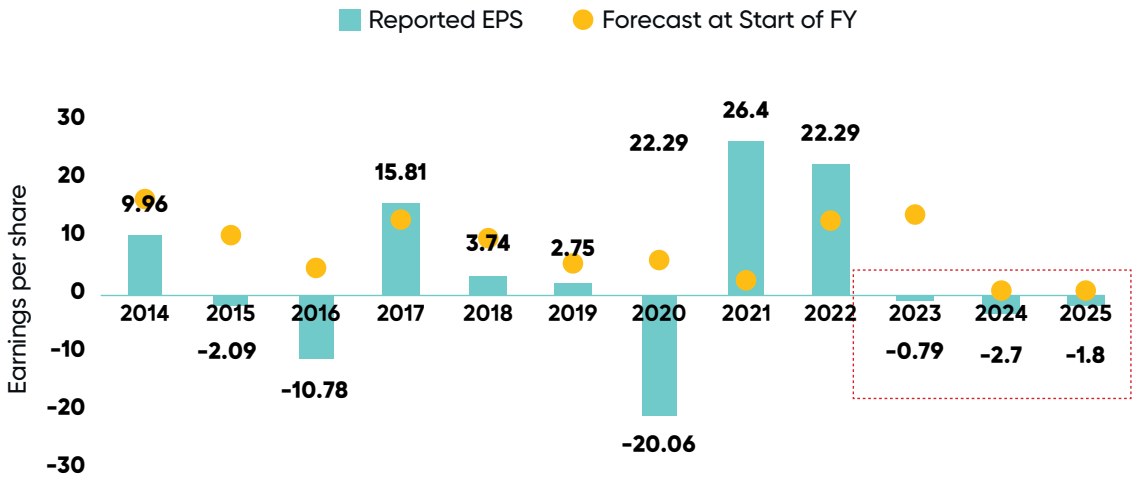
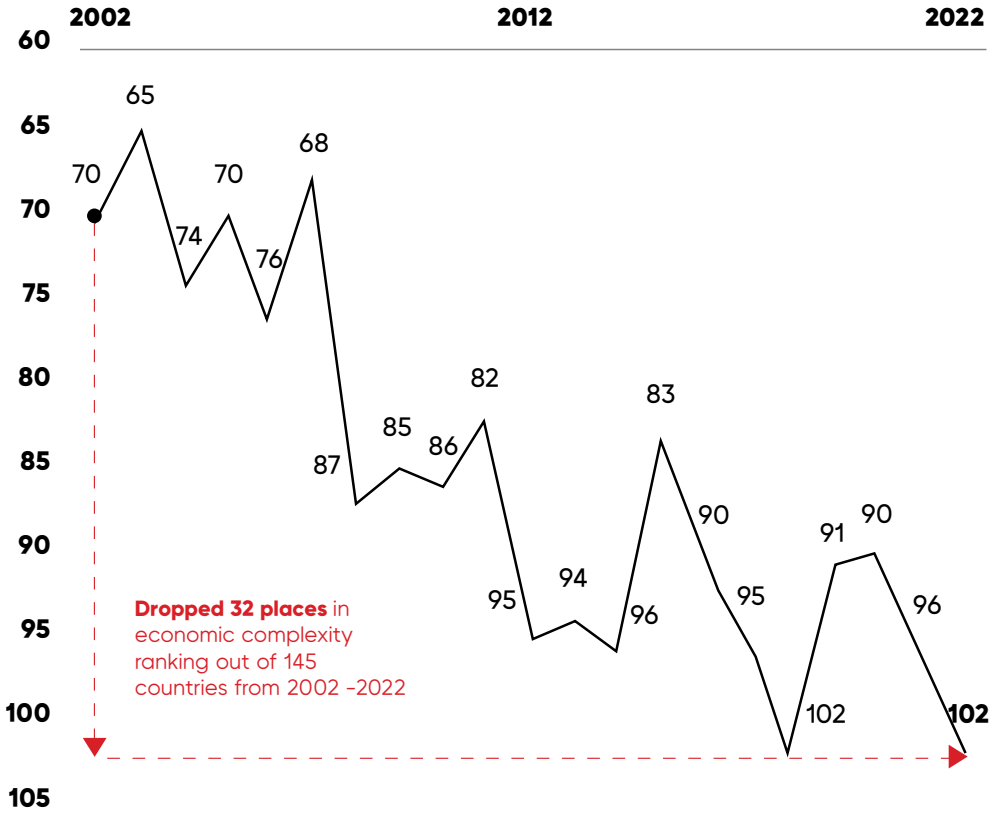


Figure 1.6: Australian company earnings per share, reported vs forecast, 2014 – 2025



Source: ABS, 2024, Australian System of National Accounts, Table 52. Private Gross Fixed Capital Formation, by Industry, Current prices Goldman Sachs, reported in Hirshman, D. 2025, Is Australia becoming the Mediocre Country?, Livewire, accessed: Is Australia becoming the Mediocre Country? - Dion Hershan | Livewire

Figure 1.7: Trends in Australia's Economic Complexity Ranking, 2002 – 2022



Source: The Growth Lab at Harvard University, 2022, "Country Complexity Rankings', accessed: https://atlas.hks.harvard.edu/rankings

Australia is falling places globally in economic complexity...

These challenges are part of a broader, long-term trend where Australia has struggled to convert high-impact research into local industrial capability and economic growth. Often, Australian research is developed and commercialised overseas, reflecting weak R&D investment and a lack of innovation commercialisation at home. This is evident in Australia's declining economic complexity: as its ability to scale research into products and services weakens, the overall sophistication of its economy has diminished.

R&D spending over the last two decades has mirrored the boom-and-bust cycle of the mining sector, highlighting the lack of diversification in Australia's industrial structure. From 2002 to 2022, Australia's position in the Harvard Economic Complexity Index dropped 32 spots, pointing to growing reliance on a narrow range of industries. This over-dependence on resource-based sectors, particularly mining, leaves the economy vulnerable to external shocks, such as fluctuations in commodity prices and raises concerns about long-term sustainability.

Figure 1.8: Percentage of total employed workforce by industry in Australia, 2004 – 2024

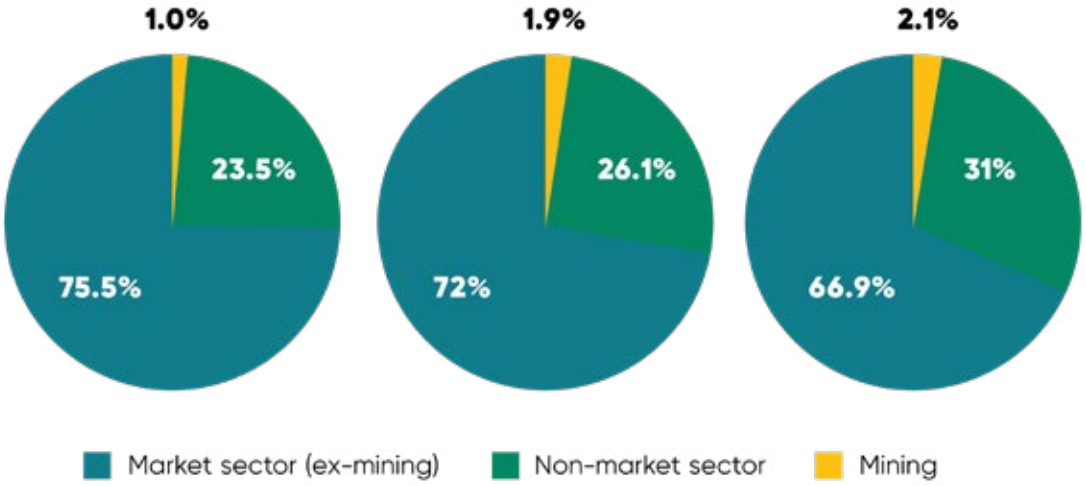
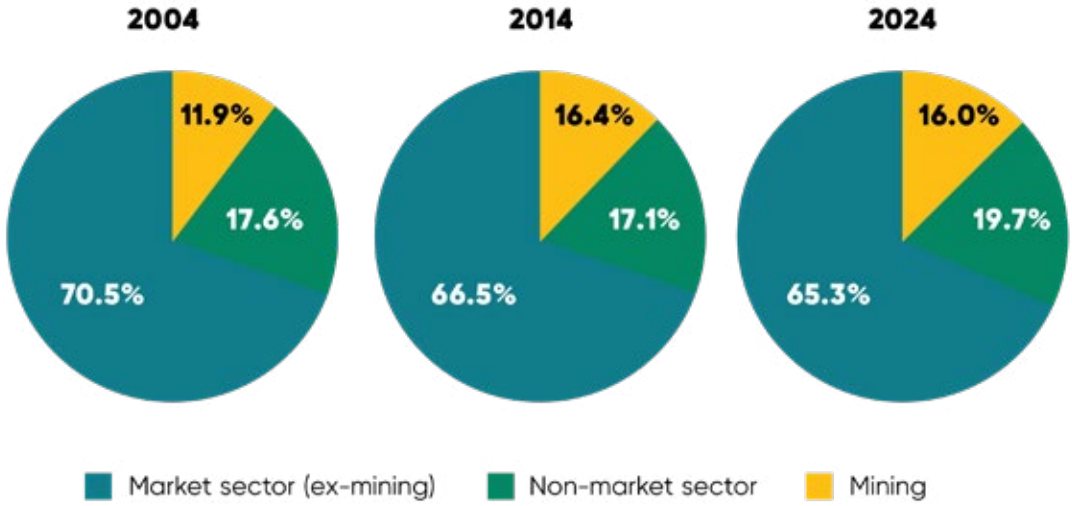


Figure 1.9: Percentage of total gross value added by industry in Australia, 2004 – 2024 Source: ABS



Source: ABS, 2004-2024, Labour Force, Australia ABS, 2004-2024, Australian System of National Accounts, Table 5. Gross Value Added (GVA) by Industry

… with the economy increasingly reliant of non-market sectors

It is not surprising, then, that over the past two decades, Australia's economy has increasingly relied on the expansion of non-market sectors, which now make up a larger share of both total employment and gross value added. This shift reflects a growing dependence on industries that contribute less to economic complexity.

While these sectors are vital for social well-being, their expansion has come at the expense of high-value, innovation-driven industries that have historically fueled economic prosperity. As a result, Australia risks undermining its ability to achieve sustainable, long-term growth and maintain global competitiveness.

Changing industrial composition, erosion of sovereign capability, and the rise of an innovation-averse culture

The challenges facing Australia's innovation system go beyond declining business counts, reduced economic complexity, and lower R&D spending; they also stem from the evolving nature of the industrial base and companies' perceptions of what their Australian operations, which further exacerbates these issues.

Australia's industrial composition is shifting, weakening innovation and R&D capacity and contributing to the rise of an innovation averse culture

Over recent decades, Australia has seen a structural shift not only in the number of business counts of medium-and large-sized businesses, but also a shift in the composition of industry with more businesses off-shoring R&D functions, particularly in response to economic growth in Asia from the late 1990s.

R&D, innovation strategy, and capital allocation decisions tend to be driven out of head office operations. By contrast, stakeholders noted that many large multinational enterprises (MNEs) are organised such that their Australian operations function primarily as regional sales or service offices. These satellite operations are rarely the source of significant innovation ability. In the absence of head office decision-making power, Australia's ability to influence global investment decisions and retain high-value R&D domestically has been substantially weakened. This shift also reinforces the stereotype and contributes to the mindset that Australia is primarily a market for sales, rather than a hub for innovation.

Australia is a world leader in research, but its capabilities have failed to translate into industry growth

Australia has untapped potential for innovation Despite these structural challenges, Australia possesses many of the key ingredients needed for a world-leading innovation system. The foundations for industrial capability, productivity, and prosperity are already in place – especially within its research institutions, skilled workforce, and entrepreneurial spirit.

Australia ranks highly for the quality of its universities (3rd globally), scientific publications (6th globally), and knowledge-intensive employment (9th globally), yet it ranks 30th for knowledge and innovation outputs (WIPO, Global Innovation Index 2024). This discrepancy signals that while Australia excels in generating research, it struggles to convert this knowledge into commercialised products and services that could drive sustained economic growth.

When comparing Australia's innovation system to others, such as Canada's, it becomes clear that Australia outperforms Canada on many of the inputs to R&D and innovation, such as knowledge workers and research quality.

However, it lags behind in translating these inputs into tangible industry capability and growth.

The level of investment, you know that the Discussion Paper paints a woeful picture that we all knew anyway... We can't lift our game unless we get the big end of town involved. We must have large Australian corporations.

We must have multinationals involved. They've got to take a longer-term view and they've got to be more active in terms of how we are engaged in this process as well.
I think that there could be a really good genesis of new configurations of talent and innovation that's more strongly industry-led, and of course co-created with universities. But this is not simply on our agenda.

It always strikes me that we don't have enough absorptive capacity for the R&D that we do. We are well overweight in citation performance, but we have virtually no industry of any scale to absorb this. We have CSL and then daylight.

You can't innovate from a blank page. We can't lose sight of the importance of funding basic science. This is where the breakthroughs come from.

Where does Australia break down? A tale of two innovation ecosystem systems

Global Innovation Index metrics show, for example, that Australia does well in knowledge workers, but poorly in terms of innovation linkages and knowledge absorption. Breaking the business sophistication and knowledge output metrics down further, it is clear that Australia performs poorly relative to its peers in cluster development, IP formation and its capacity for knowledge absorption, including IP payments and foreign direct investment inflows.

Figure ES.8: Benchmarking Australian and Canadian innovation ecosystems

Rankings:

15	Institutions	14
10	Human capital and research	11
15	Infrastructure	21
20	Market sophistication	4
26	Business sophistication	13
21	Innovation linkages*	3
28	Knowledge and technology outputs	20

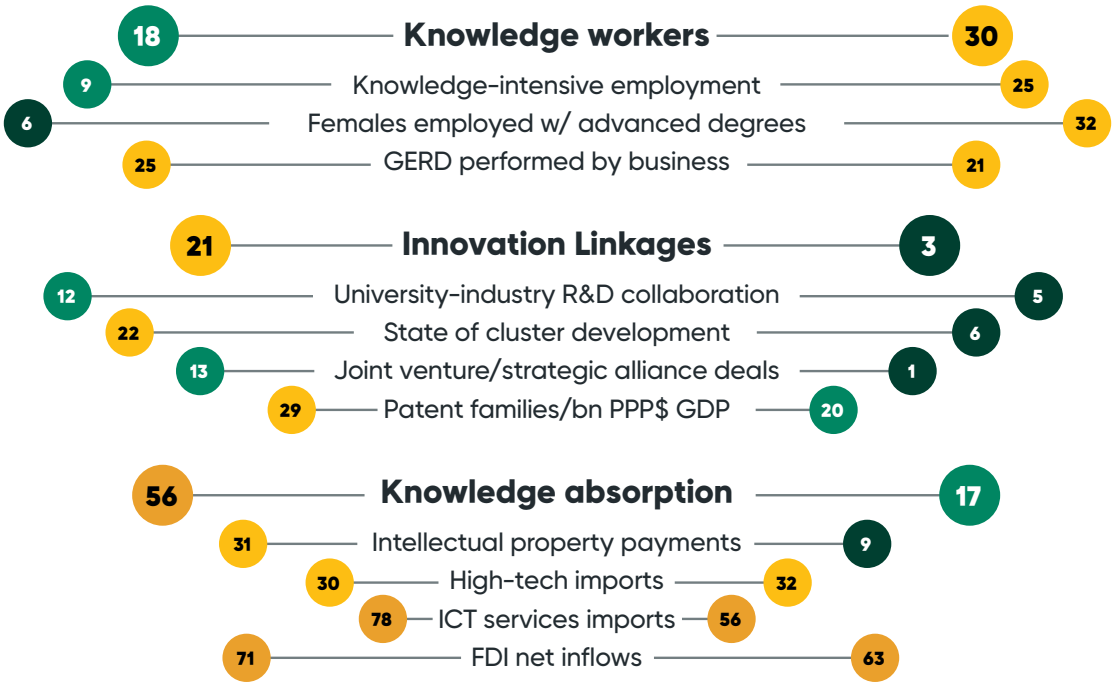
23 **Global Innovation Index Ranking:**

14 **Global Innovation Ranking:**

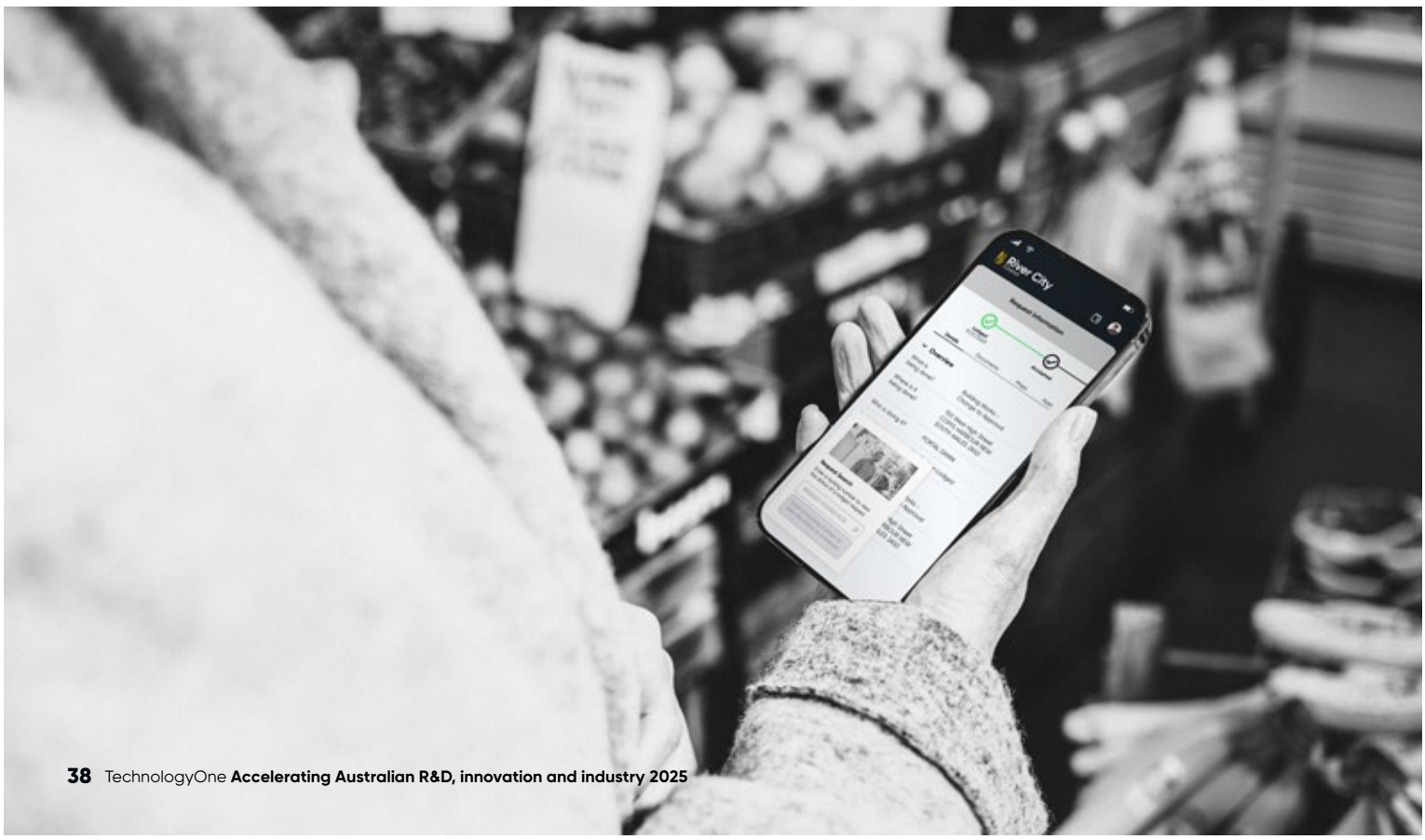
Source: WIPO, 2024, GII ranking, Country comparisons, accessed at: https://www.wipo.int/gii-ranking/en/compare?country1=canada&country2=Australia. Note Innovation Linkages is a dimension of business sophistication. Note: the World Intellectual Property Organisation Global Innovation Index (GII) ranks world economies according to their innovation capabilities based on performance against roughly 80 indicators of innovation inputs and outputs.

In focus: Business sophistication metrics

Australia performs strongly in terms of knowledge workers, but poorly in terms of innovation linkages and knowledge absorption.



Source: WIPO, 2024, GII ranking, Country comparisons, accessed at: https://www.wipo.int/gii-ranking/en/



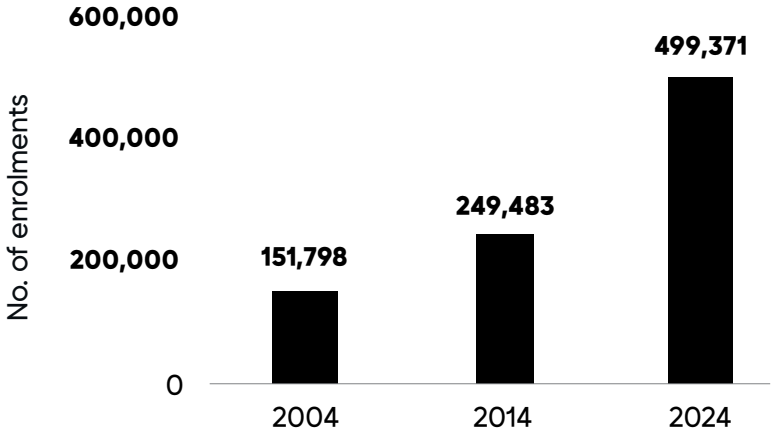
Australia: A global leader in higher education and a top student destination...

Australia boasts 39 public and 5 private universities, with 9 ranked in the top 100 of the world in the 2025 QS or THE World University Rankings, and remains a major destination for international students, with nearly 500,000 students enrolled in December 2024.

The University Of Queensland Australia	The University of Sydney	UTS University of Technology Sydney
QS Rankings 2025: **#40** THE Rankings 2025: **#77**	QS Rankings 2025: **#18** THE Rankings 2025: **#83**	QS Rankings 2025: **#88** THE Rankings 2025: **#154**
UNSW Sydney	Australian National University	The University of Melbourne
QS Rankings 2025: **#19** THE Rankings 2025: **#61**	QS Rankings 2025: **#30** THE Rankings 2025: **#73**	QS Rankings 2025: **#13** THE Rankings 2025: **#39**
The University of Adelaide	The University of Western Australia	Monash University
QS Rankings 2025: **#82** THE Rankings 2025: **#128**	QS Rankings 2025: **#77** THE Rankings 2025: **#149**	QS Rankings 2025: **#37** THE Rankings 2025: **#58**

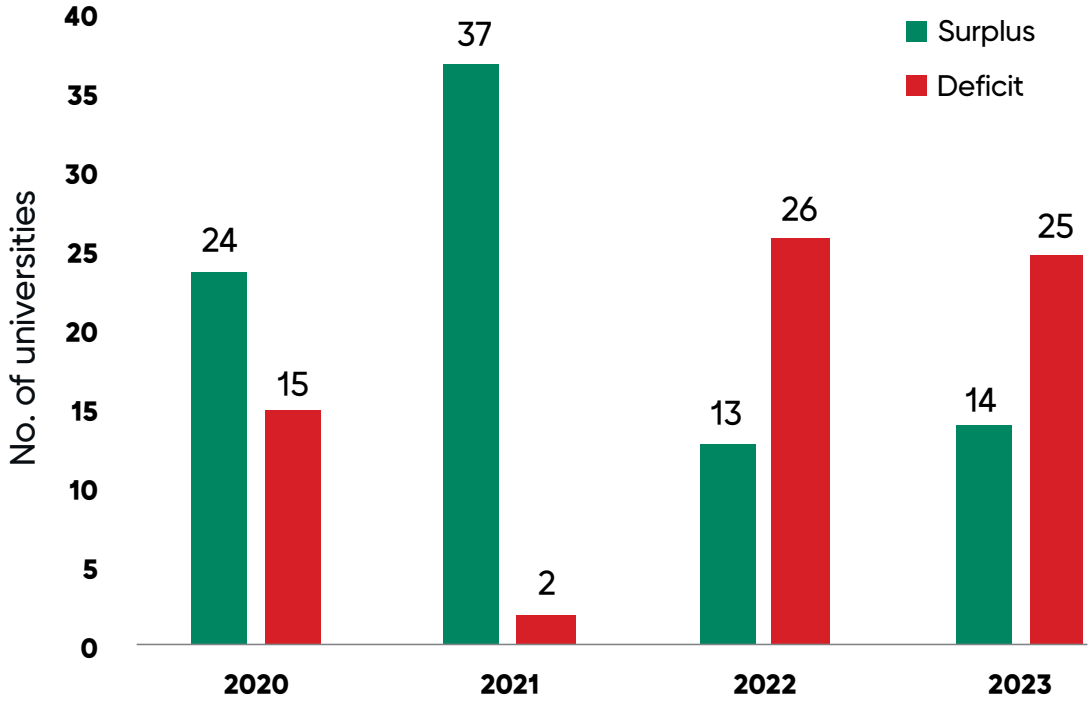
Source: QS World University Rankings 2025, THE World University Rankings 2025 and Australian Department of Education International student numbers by country, by state and territory, 2004, 2014 and 2024

Number of international student enrolments



The number of international students enrolled in Australian higher education has nearly doubled every decade

Figure 1.11: Financial status of public Australian universities, 2020 – 2023



95% of universities were still in surplus in 2021, but this dropped sharply to **64% in deficit by 2023,** exposing the risks of a business model heavily reliant on international student enrolments.

Source: Universities Australia, 2024, UA091-Critical-challenges-in-Australias-university-sector_v2.pdf

Australia at risk of losing key advantages, with Australian universities' business model under pressure

Australia's innovation and research landscape is at risk.

While Australia's research and innovation potential is undeniable, there are growing challenges that threaten to undermine it.

Despite record numbers of international students enrolling in Australian universities – reaching over one million in 2023 – underlying changes in immigration and education policies signal significant risks to Australia's knowledge economy. Offshore student visa applications fell by nearly 40 per cent in 2024, in part due to government policy shifts prioritising low-risk institutions and increasing visa costs and requirements. These policy changes, along with the impacts of the COVID-19 pandemic, have strained the financial health of Australian universities, which now face growing deficits.

The financial position of Australian universities has steadily worsened from 2020 to 2023, with a majority now operating under deficit, rather than surplus.

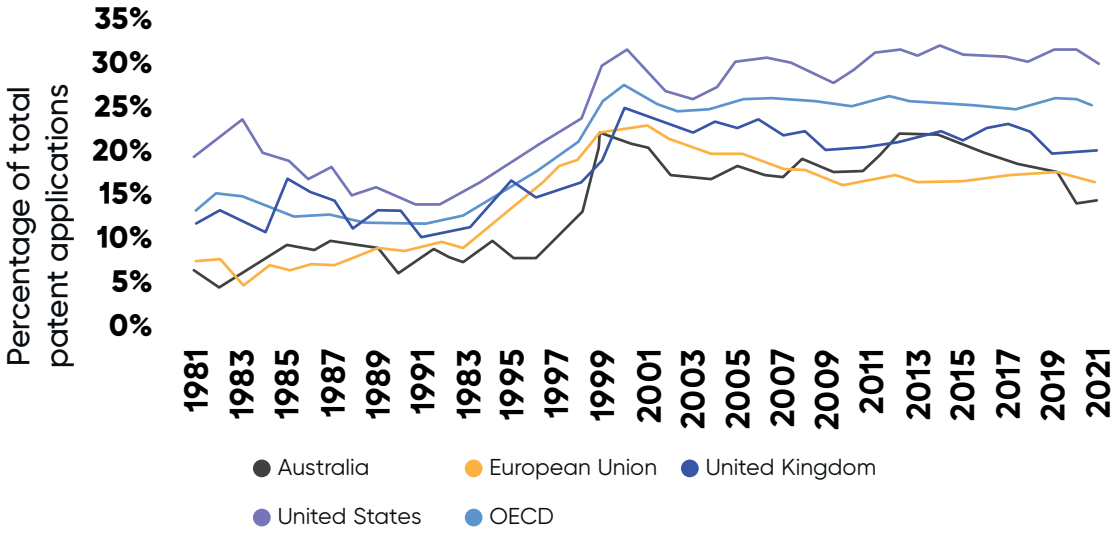
Australia's STEM workforce lags behind most of its OECD peers

At the same time, Australia's STEM workforce – though growing – still lags behind other developed nations, particularly outside of the health and medical sciences.

In 2022, only 19 per cent of Australian graduates completed a STEM degree, which significantly lags behind the rest of the world. By comparison, in the same year, 23 per cent of New Zealand graduates, 26 per cent of Canadian graduates and almost 36 per cent of German graduates completed STEM degrees. This points to a fundamental gap in the number of graduates entering the innovation-driven sectors that are crucial for Australia's economic future.

Australia's health and medical workforce remains strong; in 2021, there were 15.4 medical graduates per 100,000 people, above the OECD average of 14.2, and well above otherwise strong STEM countries like Germany (12.4), Canada (7.5) and South Korea (7.3).

Figure 1.12: Trends in STEM degree attainment among tertiary graduates in Australia and selected OECD countries, 2013 – 2022



Source: OECD Data, 2013 – 2022

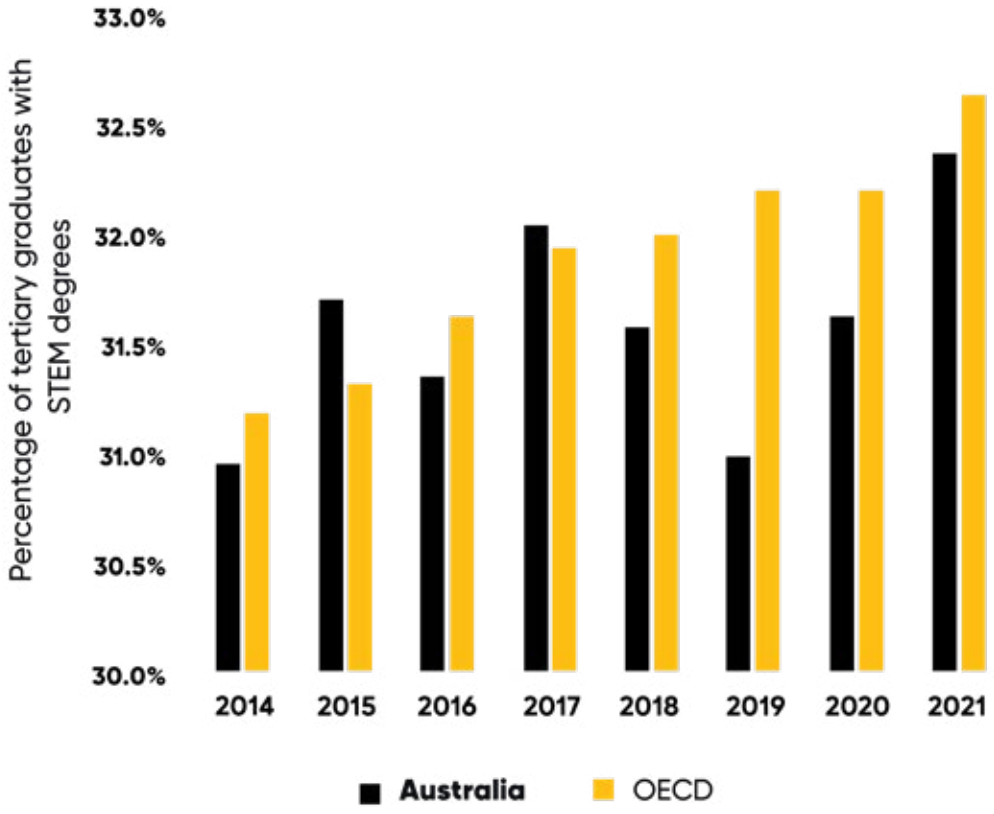
Australian women receive STEM degrees at a lower rate than the OECD

Among the degrees with the highest female representation is health and medical science, with 78 per cent of 2022 bachelor degree graduates were women, and 65 per cent of research postgraduates.

Despite the strong female representation in health and medical science, Australia's STEM graduates are still predominantly male, with only 32.4 per cent of graduates being women, below the OECD average of 32.7%. This gender imbalance, alongside the slower-than-necessary expansion of Australia's STEM workforce, poses additional challenges for fostering a more innovation-driven economy.

In summary, while Australia has immense research and innovation potential, the challenges it faces – from financial pressures on universities to low rates of STEM.

Figure 1.13: Trends in female representation among tertiary STEM graduates: Australia vs OECD average, 2014 – 2021

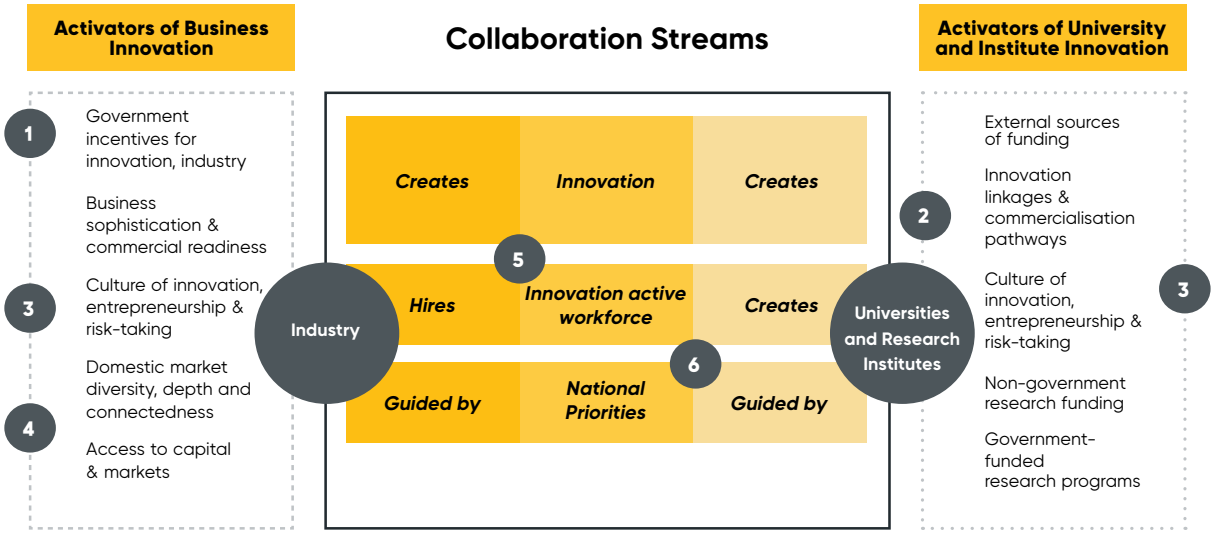


Source: OECD Data, 2013 – 2022

Key issues in Australia's innovation ecosystem leading to missed opportunities and future threats to innovation and productivity

Improving Australia's capacity to translate its advantages in research and infrastructure (upstream innovation capabilities) into downstream innovation and industry growth will require a sophisticated strategy that addresses major weaknesses in Australia's innovation ecosystem.

Figure 1.14: Issues across Australia's innovation ecosystem



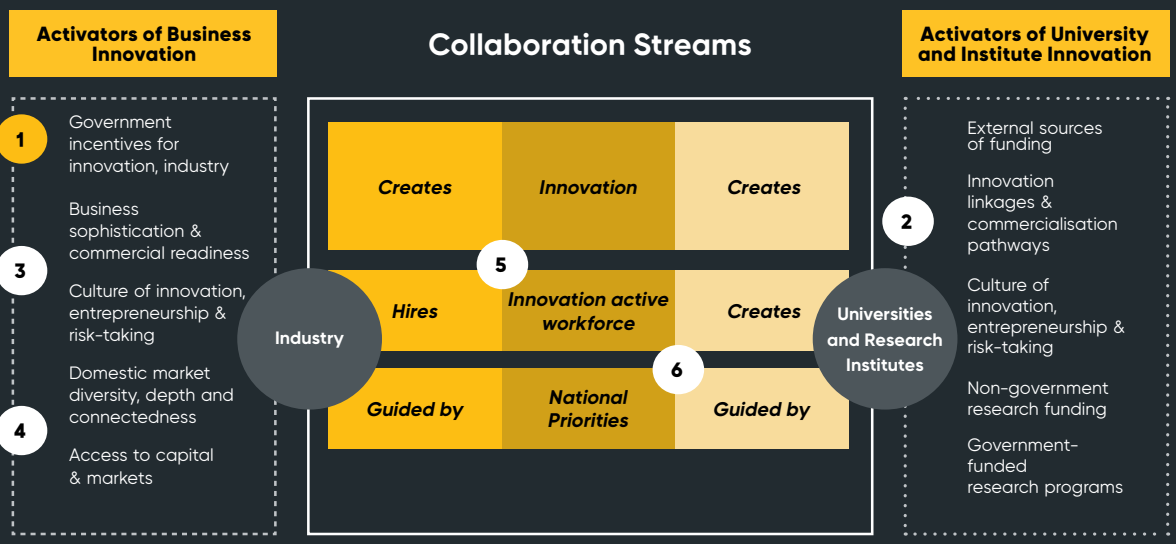
1. Innovation and industry incentives insufficient to overcome market forces
2. Poor linkages between industry and higher education, with missed opportunities for commercialisation
3. Cultural barriers and risk aversion across innovation pipeline
4. Missed opportunities to build market depth and diversity (capacity for R&D absorption), with varying barriers to scale for different industry sectors
5. Lack of a national strategy for innovation cluster development, critical mass
6. Lack of bi-partisan, long-term policy consistency and vision for growth

Chapter 2

A new approach is needed to support R&D and innovation

Key issues in Australia's innovation ecosystem: Australia's mix of innovation and industry policies and incentives

Figure 1.14: Issues across Australia's innovation ecosystem



1. Innovation and industry incentives insufficient to overcome market forces
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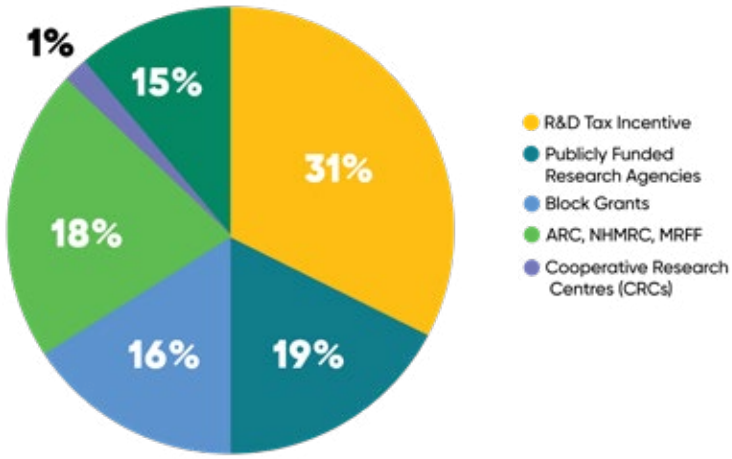
Government R&D expenditure: overview

Government incentives for R&D expenditure can be some of the most powerful ways to activate commercial innovation, and encourage collaboration. However, its effectiveness diminishes when the policy is not coordinated, and incentives aren't provided over long enough time horizons. Today, with multinational commerce more of a force in the world than ever before, it is easier for companies to operate across borders. This force has made it more difficult for midcap Australian firms to compete in a globally connected market. This "hollow middle" has a substantial impact on the efficacy of Government programs in driving R&D spending.

The Australian Government has a range of incentives, policies and programs designed to support business R&D, with an estimated $14.4 billion in expenditure for 2024-25 (DISR 2024) across 14 federal portfolios and 151 programs. Roughly 84% of this funding is not targeted to specific national priorities, including the R&D Tax Incentive (RDTI), research agencies, block grants, and competitive grants from bodies like the Australian Research Council, the National Health and Medical Research Council, and the Medical Research Future Fund.

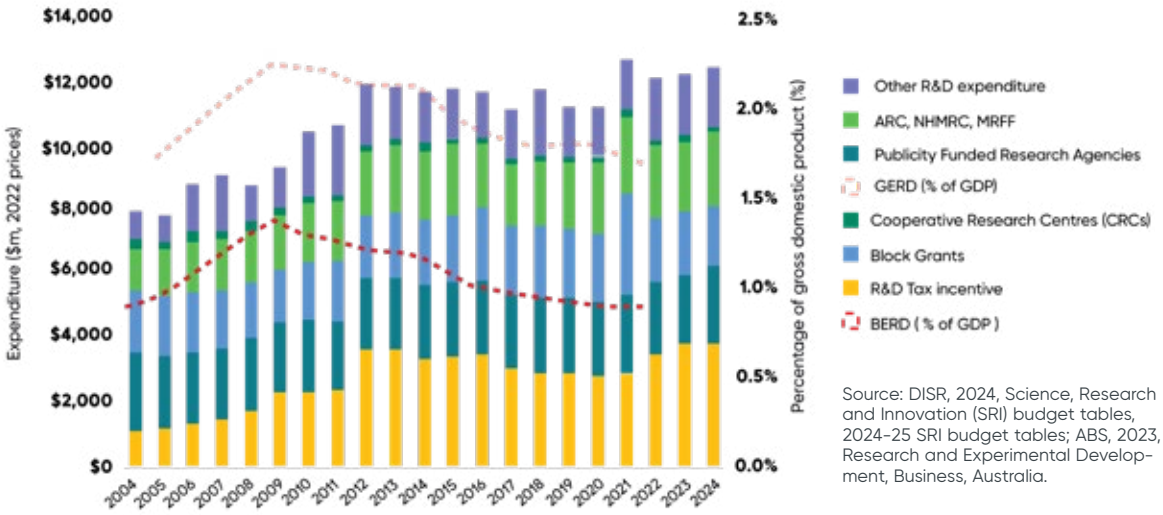
The remaining 16% is allocated to programs aligned with government priorities. Of this, $2 billion supports 25 nationally significant programs such as the National Collaborative Research Infrastructure Strategy (NCRIS), the Cooperative Research Centres (CRC) Program, and the Square Kilometre Array (SKA) Radio Telescope Project, while $315 million is distributed across 102 smaller programs.

Figure 2.1: Forecasted composition of Australian Federal Government R&D expenditure, 2025



Source: DISR, 2024, Science, Research and Innovation (SRI) budget tables, 2024-25 SRI budget tables

Figure 2.2: Australian Federal Government R&D expenditure and trends in BERD and GERD, 2004 – 2024



Source: DISR, 2024, Science, Research and Innovation (SRI) budget tables, 2024-25 SRI budget tables; ABS, 2023, Research and Experimental Development, Business, Australia.

Policy settings insufficient to overcome market forces

The decline in R&D expenditure is not an isolated trend. A similar pattern is evident in business investment, which mirrored the downward trajectory of business expenditures on R&D over the past two decades. Business investment reached its highest relative share of 18.2% of GDP in 2012, during the peak of the mining boom. Since then, however, it has steadily fallen, now down to 1994 levels and is vastly less diverse, with the focus remaining heavily on mining. This decline in investment reflects broader challenges faced by Australian businesses, which are struggling not only with innovation but also with overall performance. After three decades of growth, Australia is now moving backwards.

More recently, businesses have reported earnings per share falling short of forecasted earnings in nine of the past twelve years. Except for the brief period of the COVID-19 pandemic, businesses only outperformed expectations in 2017.

These trends suggest a weakening of the Australian business landscape, where both innovation and financial performance are faltering, further underlining the need for strategic investments in the future of the economy.

An opportunity to review settings to improve effectiveness and efficiency

Incentives for investment: wider taxation settings and regulatory burden

Innovation policy settings and R&D incentives are of course, only a component of the incentives for investment and industry growth

Previous reviews (e.g., the Australia's Future Tax System Review (2010)) have recommended that Australia revisit its taxation settings and move to more competitive settings to drive growth. Additionally, Australia is among the most highly regulated places to do business globally. Stakeholders noted that the high costs of doing business in Australia further impede investment.

The need for a review

These concerns all point to the need for a broader review of how R&D initiatives and incentives are structured in Australia. To truly foster long-term, high-impact innovation, there must be greater consideration of how programs and incentives work together to support the right kind of activities, ensure funding reaches the most deserving projects, and create a more sustainable innovation ecosystem for the future.

Other peer countries tend to have more targeted incentives and programs relative to Australia. For Australia, the available programs are often short-term and poorly coordinated across jurisdictions and departments. This highlights the opportunity for Australia to optimise its R&D incentives and programs, ensuring it supports the right activities for long-term, impactful innovation.

International benchmarking, for example, shows that a competitive R&D ecosystem doesn't require excessive tax incentives. For example, the United States, ranked 3rd globally in innovation, offers just a 3% R&D tax credit for both profitable and loss-making businesses, lower than many competitors. This suggests that innovation can thrive without relying heavily on tax incentives.

Israel, with negative R&D tax incentives (-1%), still ranks 15th globally, proving that direct subsidies are not the sole driver of innovation. Similarly, South Korea, offering just 2% tax credits for profitable companies, ranks 6th, while France, with 36% tax credits, ranks 12th. This shows that higher tax incentives don't necessarily lead to better innovation outcomes.

Australia, with higher corporate tax rates (25% for SMEs, 30% for large businesses) and moderate R&D incentives (10% for SMEs, 7% for large companies), ranks 23rd globally. This indicates that tax incentives alone may not boost Australia's innovation standing. However, international examples suggest that reform could improve Australia's innovation ecosystem without significantly increasing R&D costs.

One area where immediate efficiency gains could be realised is in reforming the application process for government R&D programs. While a robust method of triaging applicants and allocating funds can ensure money is allocated to the most impactful areas, the additional cost incurred by a business for a burdensome application process may outweigh the potential gains of participating in such a process, given the uncertainty of the outcome. Moreover, a more complex application process requires more people to manage it, which acts both as a cost to government as well as a potential source of delay.

On the whole, the evidence points to a more balanced approach, one that strengthens the broader innovation ecosystem through strong cooperation between research institutions, government, and industry, alongside a skilled workforce and efficient commercialisation pathways. This approach can drive superior innovation outcomes without adding fiscal burdens.

An opportunity to review existing government R&D incentives, for example, the RDTI, and questioning 'additionality'

It's part of the tax regime... if you look at, say, a life sciences company, they will be evaluating projects on the basis of the expected costs that a partner company can claim [which factor this in]. If that can't be claimed, the project economics may not work [and the project could fall over].

Even though very large companies represent [a small proportion of] the industry base, they account for whatever it is, 60 or 70% of the R&D tax concession. And if you looked at the actual innovation they're doing... It's [can be] a big subsidy for large companies to do what they were going to do anyway....

And then we underfund genuine innovation, and make it harder and harder to get a fraction of what you asked for and then we wonder why there's no big breakthrough. We'll only fund things for, like, in three-year increments or five year increments, even though we know it'll take 15 years. But let's not give you any funding certainty. Let's take our best scientists and get them to spend a third of their time writing grants.

The $20 million threshold may be a bit arbitrary: should it be $50 million or $100 million. It could vary by sector [as to where a firm becomes a 'fundamentally different entity'.]

The R&D Tax Incentive can get used to subsidise what I call 'brushing your teeth' activity, things that they need to do regardless.

Companies still think of the R&D Tax Incentive as a grant, but we know a grant is quite different than a tax offset.

If you're willing to genuinely reform the R&D tax concession to make it that you only get it for doing genuine R&D and you could then dramatically increase the rate of it because fewer companies would actually qualify if you if you ruled out all the incremental system upgrade type of work.

We've had very little political courage when it comes to tax reform. That's probably another example of regular reviews that never get enacted. There are strong parallels here [to our OECD peers]. I think tax reform is part and parcel of what we need to do, but it's a very hard political sell.

An opportunity to review existing government R&D incentives, for example, the RDTI, and questioning 'additionality'

Australia is seen to be an unstable market for conducting R&D. When companies lodge they often don't know if the application will be accepted or clawed back. This has a chilling effect on investment.

Australia should invest in the defence industry where we can get innovation trickle down over time.

This is similar to the car industry that developed anti-skid brakes or airbags in prestige cars initially, then over time these innovations trickled down through the car industry to be standard in most cars.

Australia is trying to improve the targeting of the R&D incentive but there is important activity that we are at risk of losing because the funding is becoming too uncertain. We have FDI inflows of $3 billion in clinical trials but we will lose this to Canada and Japan because these may now be deemed too high risk, and companies can get surprised by nuances.

I think the incentives need to be around the structure. We just have to make it attractive and minimize bureaucracy as much as possible, because that's a real Australian secret to getting it wrong.

We often announce something that sounds fantastic, but then make it so complicated that taking the first step becomes a challenge— especially when it comes to multi-party cooperation. And these initiatives will have to involve multiple parties. So, we also need to manage projects in a businesslike way, ensuring low opportunity costs for those involved. Unfortunately, we're really poor at that.

ATO has done a good job of making individual tax returns easier to complete, now they need to simplify the R&D Tax incentive.

Innovation is driven by business need rather than incentives such as R&D Tax incentive – particularly in large corporates. We should prioritise and allocate incentives selectively focus on engineering and IT, biomed and similar industries but not mining and banking. We should also support smaller industries that move more quickly.

We need to look across the whole of government, at all programs and identify where there is duplication, what is effective and what isn't and use this to free up money to put this into a new national approach.

Policy uncertainty in Australia is a real problem. There is constant change, a lack of consistency in priorities and unrealistic expectations. There has been a proliferation of programs, and every program is short term, and there is an expectation that every organisation will become self-funding after 4 years.

Policy is so hot and cold. We have moved from a principle-based approach for how we grow industry to a burdensome, rules-based approach underpinned by various programs with all these little regulatory tweaks that make [industry growth and doing business hard]. The approach needs to be more flexible, and fit-for-purpose.

We are a high-cost country. We have high taxes, we have high wages, we have high regulatory costs... the burden of regulation in this country has grown exponentially since I started my career. Given our distance to markets, we can't really afford to continue in this way. We really need to be looking at these barriers and making Australia as competitive as possible.

Australia is a long way away from many places, so that doesn't help. Fundamentally, it is a huge landmass with everything around the outside. That in itself is an interesting challenge. So, if you look at Finland, Singapore, Germany, what do they have in common?

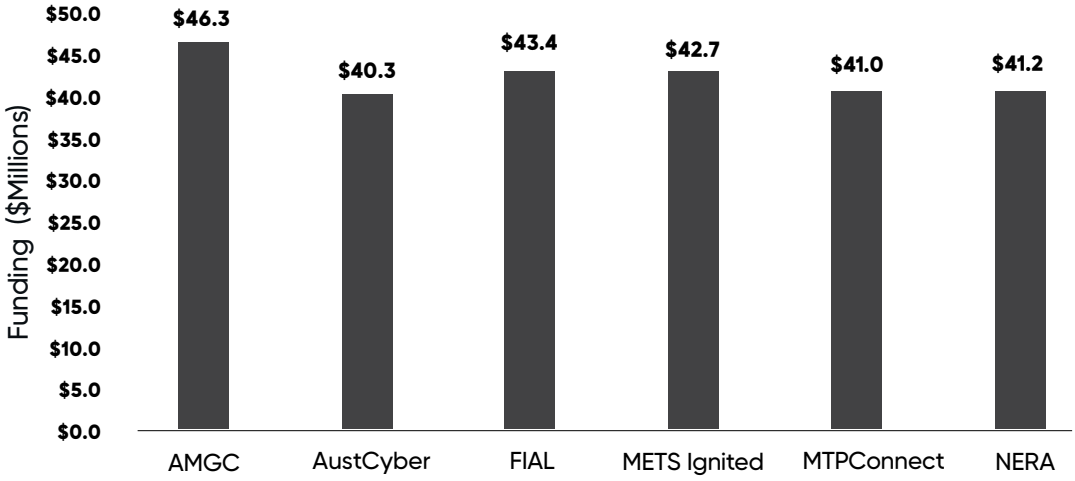
The answer is about 5 million people. And when you have clusters of about 5 million people, you can generate an ecosystem which works very well together. You can get have enough people in enough proximity that they can actually meet and talk and engage and establish an ecosystem which is, you know, the universities, the industry, the regional politics that the whole thing that comes together.

Australians might want to look at this and in sort of a cluster around a catapult (like those in the UK Catapult Network) around a discipline or an area of potential industrial growth that you might be able to react to.

Case study: Industry Growth Centres and the challenge of the 'Vegemite approach'

Industry Growth Centres program is indicative of advances and limitations in innovation and industry policy settings: every sector receives an allocation of roughly $40 million over the life of the program, reflecting a 'Vegemite approach' of giving a little bit to every sector and lacking in the scale required to drive the development of world-leading capabilities.

Figure 2.3: Total funding allocation by Industry Growth Centre Initiative over 2014-2022



Source: ACIL Allen, 2020, Industry Growth Centres Initiative: Initial Impact Evaluation, report to Department of Industry, Science, Energy and Resources, accessed at: https://acilallen.com.au/projects/research-development/industry-growth-centres-initiative-initial-impact-evaluation-1

We've got a whole bunch of good researchers, whether they're in CSIRO or universities or whatever... Look at the Cooperative Research Centre programme. But the thing is we fund it at such a risible level like, 'it's a seven-year thing and it'll get $20 million.' It's just we seem to go the Vegemite approach of just let's give everyone a tiny little bit and it's never enough to move the needle. We need to add a zero and make it a long-term approach.

Case study: ARENA – How strategically focused initiatives can yield significant results

The Australian Renewable Energy Agency (ARENA) is an example of a long-running R&D-focused initiative that has yielded sizeable benefits for the Australian energy sector.

ARENA was created in 2012 with the dual objectives of improving the competitiveness of renewable energy technologies, and increasing the supply of renewable energy. One crucial role ARENA has played in the market is of de-risking the higher-risk aspects of larger projects by providing financial support for the construction of battery storage, renewable hydrogen generation and low-emissions iron & steel manufacturing.

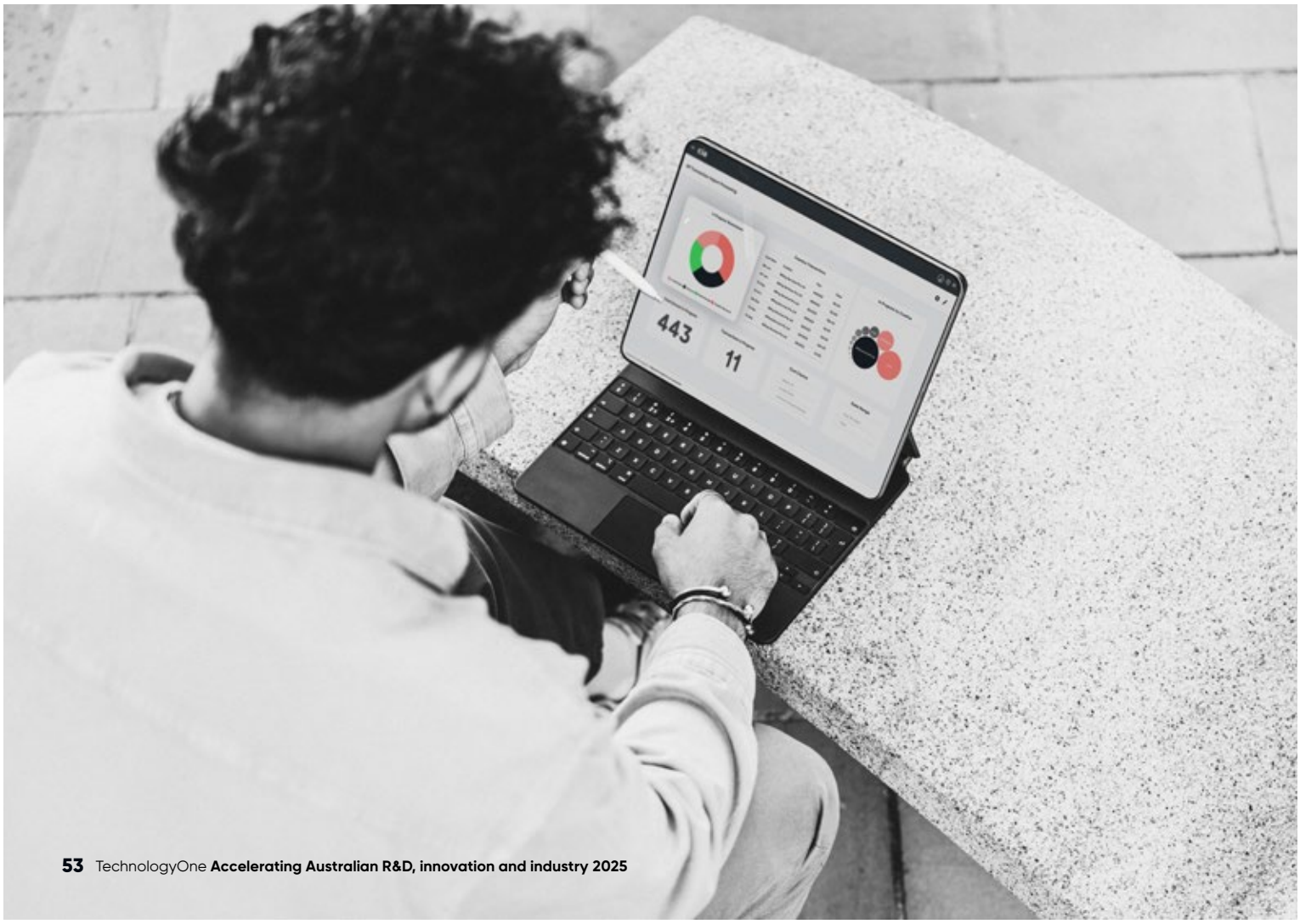
As an example, in May 2024, ARENA and ANU began a 3-year project to de-risk the process of hydrogen direct reduced iron manufacturing for Australian Pilbara ores, furthering Australia's technological capability for low-emission and cost-effective iron and steel production.

ARENA works alongside the Clean Energy Finance Corporation (CEFC) to advance Australia's clean energy transition. Where ARENA focuses on pre-commercial innovation through grants, CEFC provides debt and equity finance for clean energy projects, often in conjunction with private lenders.

ARENA and CEFC also jointly manage the Clean Energy Innovation Fund, which invests in pre-seed to growth-stage technology companies focused on decarbonisation.

Since its inception, ARENA has supported more than 700 projects with $2.6 billion in grant funding, unlocking a total investment of $12.6 billion in Australia's renewable energy industry.

Australian Government
Australian Renewable Energy Agency
ARENA



International approaches to supporting R&D and innovation

	Australia	Canada	United Kingdom
WIPO GII	**23**	**14**	**5**
Inputs	**18**	**8**	**10**
Outputs	**30**	**20**	**3**
Policy Overview	A mixture of indirect tax credits, as well as research grants provided to academia.	The Tri-Agency Research Integrity Policy coordinates the three Canadian research institutions.	UKRI funds research through a dual support system: one allocated by the 7 Research Councils, the other as block grants to Higher Education.
Key programs	• Research & Development Tax Incentive • Australian Research Council	• Scientific Research and Experimental Development • Grant and loan programs • Research funding for critical sectors	• UK Research & Innovation • Higher Education and Innovation Fund
Key clusters		• Western Research Park • MaRS Discovery District	• UK Catapult Network SetSquared Oxford Cluster Cambridge Cluster (Innovation • Corridor)

Source: Insight Economics analysis of publicly available program and policy summaries, World Intellectual Property Organisation (2024), Global Innovation Index Rankings, accessed at: https://www.wipo.int/en/web/global-innovation-index

	Netherlands	Israel	Singapore
WIPO GII	**8**	**15**	**4**
Inputs	**11**	**22**	**1**
Outputs	**8**	**13**	**11**
Policy Overview	The Netherlands uses a combination of tax credits, targeted programs, and innovation clusters	The Israel Innovation Authority coordinates the country's innovation policy, with an emphasis on global R&D cooperation.	Singapore publishes five-yearly Research, Innovation and Enterprise plans.
Key programs	• WBSO (tax credits) • Dutch Venture Initiative II • Seed Capital Scheme	• Technological Incubators Funding Program	• Singapore Economic Development • Board Research Innovation Scheme. • Productivity and Innovation Credit
Key clusters	• Kennispark Twente • Innovation Exchange Amsterdam • BrightMove Eindhoven	• Tel Aviv-Jerusalem "silicon wadi"	

Source: Insight Economics analysis of publicly available program and policy summaries, World Intellectual Property Organisation (2024), Global Innovation Index Rankings, accessed at: https://www.wipo.int/en/web/global-innovation-index

Benchmarking R&D incentives

GII Ranking: 14

	SME		Large	
	Profit	Loss	Profit	Loss
R&D	13%	31%	13%	10%
Corp	9% - 14%		23% - 31%	

GII Ranking: 5

	SME		Large	
	Profit	Loss	Profit	Loss
R&D	18%	26%	18%	33%
Corp	19%		25%	

GII Ranking: 3

	SME		Large	
	Profit	Loss	Profit	Loss
R&D	3%	3%	3%	2%
Corp	21%		21$	

GII Ranking: 12

	SME		Large	
	Profit	Loss	Profit	Loss
R&D	36%	36%	36%	29%
Corp	15% - 25%		25%	

GII Ranking: 6

	SME		Large	
	Profit	Loss	Profit	Loss
R&D	2%	22%	2%	2%
Corp	9% - 20%		20% - 24%	

GII Ranking: 15

	SME		Large	
	Profit	Loss	Profit	Loss
R&D	-1%	-1%	-1%	-1%
Corp	23%		23%	

An internationally competitive R&D ecosystem can be built with limited R&D tax incentives...

...Australia taxes its local corporations more highly than its peers.

GII Ranking: 23

	SME		Large	
	Profit	Loss	Profit	Loss
R&D	10%	22%	7%	11%
Corp	25%		30%	

Source: OECD INNOTAX data 2024, effective corporate tax rates, R&D tax credits

Benchmarking: Other incentives for investment

Australia's taxation policy settings exceed OCED average for most taxes with the exception of interest.

Benchmarking tax rates against selected peer nations

Withholding tax obligation	Corporate tax	Dividends	Interest	Royalties
Australia	30%	30%	10%	30%
Canada	25%	25%	25%	25%
Singapore	17%	0%	15%	10%
United Kingdom	25%	0%	20%	20%
United States	21%	30%	30%	30%
OECD average	21%	20%	16%	19%

Source: Australian Investment Council, 2024 and OECD INNOTAX data

Australia's Future Tax System (2010)

Company Tax

- Reduce statutory company income tax rate to **25%**.
- Introduce a system of **loss carry-back.**
- Shift to taxation of **full return to capital (debt and equity).**

Resources Rent Tax

- Increase the royalties payable on non-renewable resources to a combined (company income tax plus resources rent tax) statutory rate of 55%.
- Avoid **asymmetric concessions** for exploration and production.

Payroll Taxes

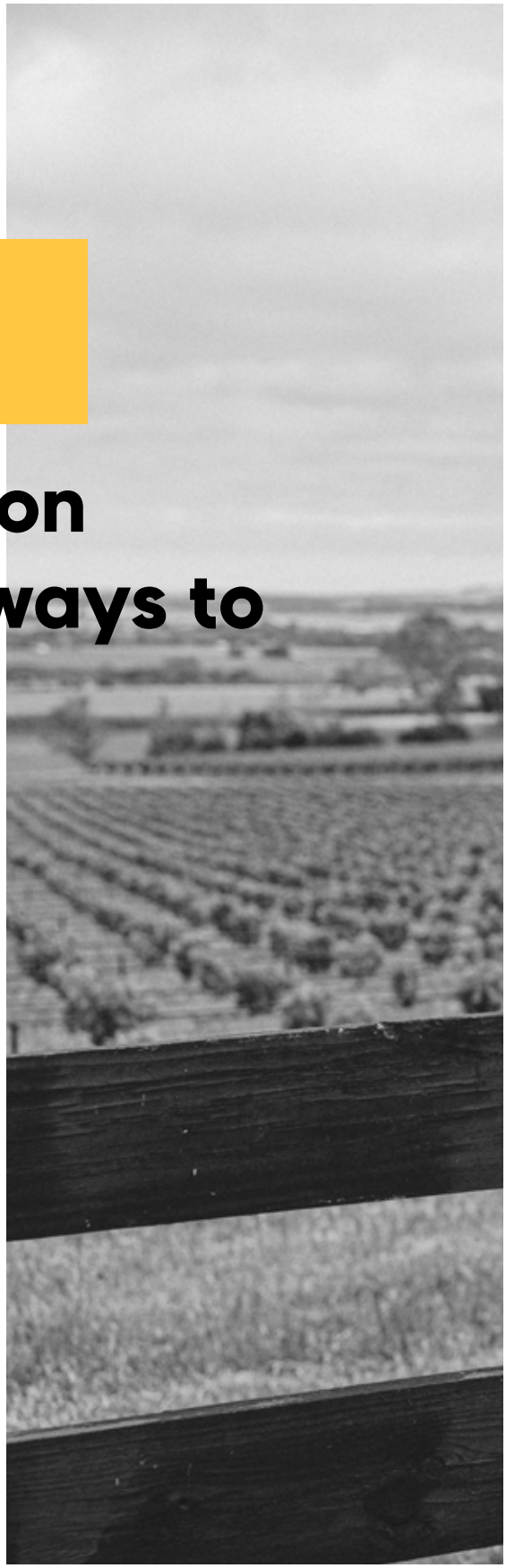
- Payroll taxes should be phased out and replaced with revenue from more efficient broad-based taxes that capture the value-add of labour, such as a **cash flow tax.**

Other taxation reforms

- In the short term, Government should retain its system of **dividend imputation,** while considering alternatives.
- A **national charities commission** should be established to streamline the non-profit tax concessions.

Chapter 3

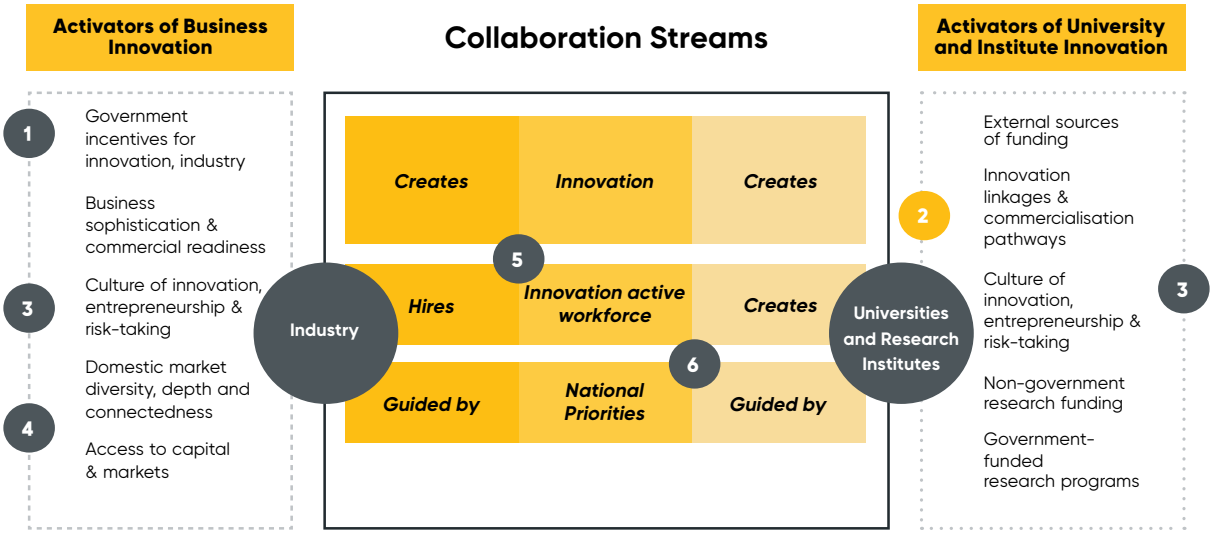
Improving innovation linkages and pathways to commercialisation



Key issues in Australia's innovation ecosystem leading to missed opportunities and future threats to innovation and productivity

Improving Australia's capacity to translate its advantages in research and infrastructure (upstream innovation capabilities) into downstream innovation and industry growth will require a sophisticated strategy that addresses major weaknesses in Australia's innovation ecosystem.

Figure 1.14: Issues across Australia's innovation ecosystem



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Australia lacks porous boundaries between industry and academia, driven by institutional and cultural barriers

In high-performing innovation ecosystems innovation linkages are robust and underpinned by institutional structures and incentives for collaboration.

While Australia enjoys a world-leading higher education sector that outperforms its peers across many metrics, Australia's performance against metrics for innovation linkages and commercialisation of knowledge inputs is considerably poorer.

Stakeholders identified multiple barriers to collaboration and commercialisation of research, including:

Australia is not good at creating porous boundaries between industry and universities. In Germany, for example, you can't have a professorial position without at least 5 years industry experience.

If you're a company, and you want to work with a university, where is the front door? How do you negotiate with it. It is incredibly hard.

- Poor understanding of the culture, operating models and approach across industry, academia and government
- Misaligned incentive structures, with academics focused on publications and citations with few rewards for industry collaboration, which stands in contrast to highly successful innovation ecosystems in Europe, where achieving leadership roles in university are contingent on industry experience (Germany, Netherlands).
- Incomplete information, with industry often uncertain on how to engage with universities and the lack of a 'front door' and navigation support
- Subscale commercialisation teams duplicated across universities nationally and a lack of knowledge brokers as observed in Australia's international peers.

Stakeholders also noted that Australia lacks the institutional foundations to drive collaboration and innovation across industry and academia that are more often seen in advanced innovation economics like South Korea, Germany, UK, Sweden, Finland and Japan. These countries were noted to have access to shared infrastructure and systems often to identify business needs and match them with providers.

Australia lacks porous boundaries between industry and academia, driven by institutional and cultural barriers (cont.)

In spite of the cultural challenges preventing truly robust Australian university-industry linkages, the Federal Government has started implementing programs designed to promote collaboration, to varying degrees of success.

Initiatives like Australia's Economic Accelerator (AEA) and CSIRO's Main Sequence Ventures are designed to support the commercialisation efforts of researchers. AEA offers grants to universities (who must partner with industry) to support projects aligned with national research priorities with high commercial opportunity. Main Sequence Ventures provides capital raising options from Seed to Series B for priority-aligned enterprises, including those that have completed the AEA program. The Clean Energy Finance Corporation (CEFC) and the National Reconstruction Fund

Corporation (NRFC) may also serve as a source of investment for AEA participants.

These policies have been in effect only briefly, with Main Sequence Ventures being founded in 2019, AEA launching in 2022 and NRFC in 2023.

Universities can be difficult to navigate, especially for businesses that are so busy just working in the business.

Universities are terrible at commercialising research and we waste a lot of money as a sector chasing the idea that they're going to create a unicorn that is going to feed back into the university revenues. We need to focus on [performing well with] the ARC grants and work with others to commercialise ideas.

Businesses often pursue incremental tech adoption rather than high risk R&D. Collaboration with universities remains low. Universities produce high-impact basic research but do not always address user needs (such as the needs of industry and government). We have strong investment in basic and applied research, albeit mostly in universities but weak later stage development. Countries like South Korea, Germany and the US show how much late stage investment can amplify returns.

Australia lacks porous boundaries between industry and academia, driven by institutional and cultural barriers (cont.)

Other Government policies are aimed at addressing other issues present in research commercialisation, albeit in an adhoc way.

The Higher Education Research Commercialisation (HERC) IP Framework provides guidance documents and contract templates for IP management in university-industry collaborative research.

Under the National Industry PhD program, PhD candidates and high performing industry professionals are financially supported in university-industry partnerships to undertake industry-focused research projects.

The CSIRO ON program supports researchers in developing entrepreneurial and business management skills, and understanding the commercial pathways for their projects.

Finally, the Trailblazer Universities program sees the Commonwealth Government provide substantial support to select universities to develop world-class research infrastructure.

While these policies have not been in place long enough to have had their full impact, the cultural barriers still in place in Australian universities and industry remain unchallenged.

Culture and language of academia is completely different to the culture and language of industry, which is completely different from the culture and language of government.

We need innovation by design, underpinned by a model that can bring these groups together. Because the three groups don't understand each other.

When you look at Australian universities and industry, there are just fundamentally different drivers at play, with different reward and recognition structures that impede collaboration.

It is important to be driven by outcomes that make a difference to the Australian economy and society. While there's a role for general research, most of it needs to be focused on what matters most.

For example; most universities measure the effectiveness of their research activities based on the number of published articles which is not an indicator of their impact on society or the economy.

Well, I think industry is much better at bringing people together. I believe we need to place more responsibility on industry-led collaboration efforts, giving them more authority and power to decide how these assets can be configured in the most effective way.

Often, the dialogue has gone the other way, with universities identifying a pre-existing need and then trying to find industries that can meet that need.

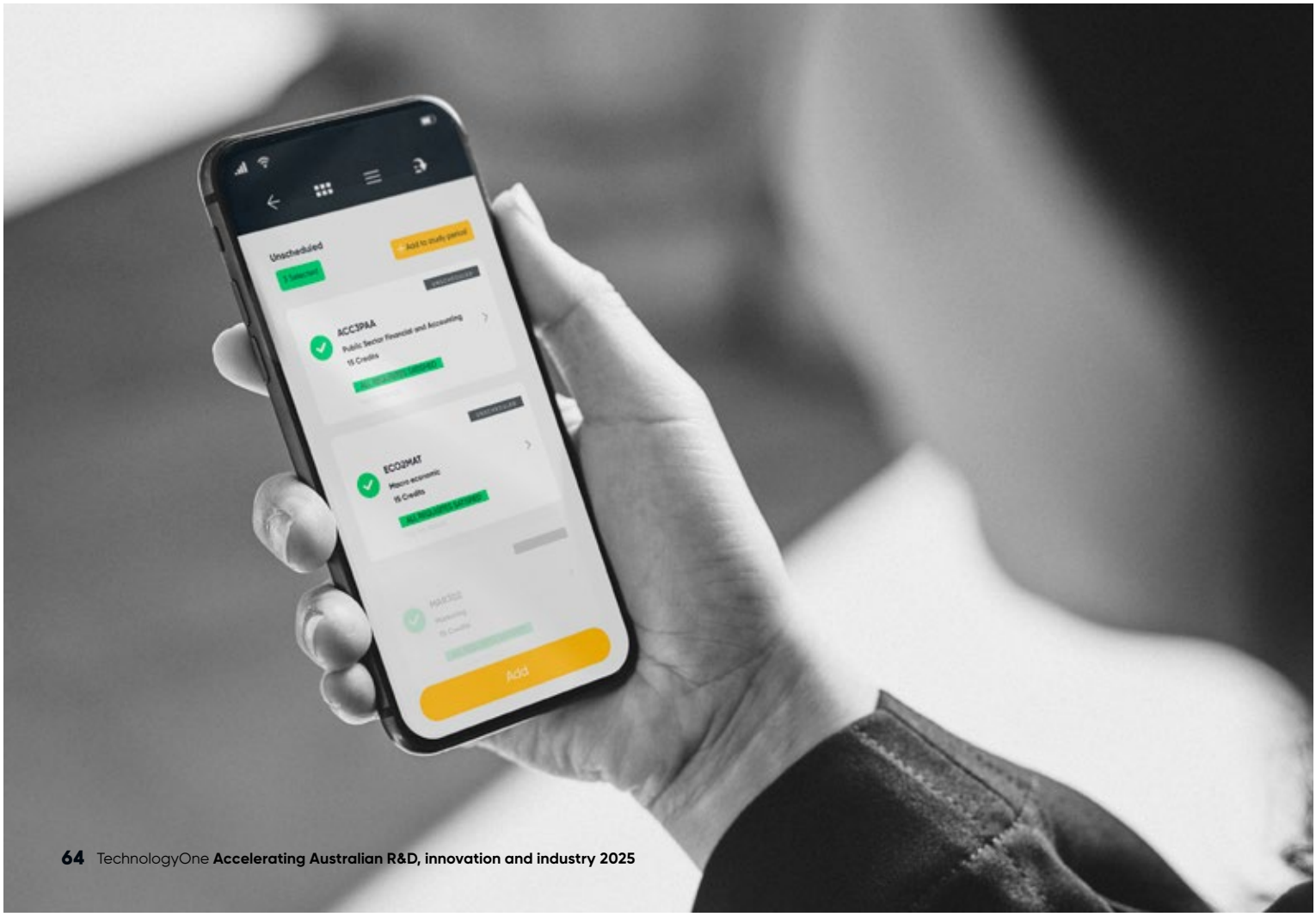
But I think we need to turn that approach on its head.

We [as universities] have entered these kinds of discussions out of self-interest, rather than focusing on the collective interest that can be achieved by multiple groups coming together.

When this works best, it's often the traditional players, like small universities, that are more nimble and better prepared to undertake projects with higher risks. These projects may start smaller but have the potential to scale over time.

So, when we talk about networks, it's about deploying the diversity of our talents across industry, universities, and government in a much more integrated way.

My first point is that these networks should be focused on challenges that add real value, both to our nation and to the globe. It's about thinking bigger and combining assets in a much more systematic way than we've done in the past.



Programs aimed at supporting collaboration and commercialisation between industry and academia

Are we doing enough to support linkages?

Australia's Economic Accelerator

- **$1.6 billion investment by Government in supporting translation & commercialisation.**
- **Priority-driven grant program for universities partnering with industry.**

Trailblazer Universities program

- **$370 million across six universities to develop leadership in research commercialisation.**
- **Includes $45 million for universities to partner with CSIRO**

National Industry PhD program

- **$296 million to foster talent skilled in university-industry collaboration.**
- **Part of Government's commitment to add 1,800 Industry PhDs over 10 years.**

CSIRO Main Sequence Ventures

- **Over $1 billion of assets under management, from seed to Series B.**
- **Underpinned by six challenge areas related to some of the world's largest problems**

HERC IP framework

- **The Higher Education Research Commercialisation IP Framework supports industry and academia in managing the IP rights emerging from collaborative R&D**

CSIRO ON program

- **The ON program helps researchers understand pathways to commercialise and grow breakthroughs.**
- **Over 7,800 people, 700 jobs created, and $415 million capital raised**

Opportunities to improve linkages and commercialisation: Voucher schemes

Alongside tax incentives and other measures, innovation vouchers can be used as a tool to encourage investment by business in R&D activities. Innovation vouchers are a tool used frequently by European countries:

Italy's Voucher 31 – Investing in Innovation provides small loans (1,000 to 4,000 euros) to startups and micro-enterprises to pay for professional services for the patenting industrial inventions. This assistance helps bridge the commercialisation gap by easing the transition out of the R&D phase.

Sweden's system offers a more substantial set of R&D vouchers, with eligible Swedish SMEs being able to apply for loans of up to 100,000 SEK ($16,000) for business development or IP strategy, and up to 400,000 SEK ($65,000) for infrastructure, such as labs, testbeds and demo facilities necessary for validation and scaling.

The Netherlands offers knowledge vouchers to a total value of up to 15,750 euros, aimed at SMEs looking to work with defined "knowledge institutions" like universities and academic hospitals. These vouchers cover up to 70 per cent of the invoice associated with that work.

Finland has one of the most extensive voucher schemes, notably covering R&D by large companies, as well as SMEs and midcaps. Business Finland offers grants covering 40–60 per cent of R&D project costs, as well as loans that can cover up to 50 per cent of development and piloting projects.

Outside Europe, other highly innovative countries like Canada and South Korea have also made use of innovation vouchers.

Since 2015, for example, the South Korean Government has operated a system of R&D vouchers that provides both funding and vouchers to SMEs and other high-potential enterprises engaging in certain R&D activities.

Additionally, this system offers vouchers to other organisations, such as universities and non-profit research institutions that provide services to leading institutes. More recently, in 2021, South Korea launched a parallel series of vouchers aimed at 6G commercialisation. This policy is designed to secure 6G international standards and core patents through large-scale R&D in preparation for commercialisation in 2028.

Australian state governments have also started to integrate an innovation voucher system into their broader innovation strategy.

For example, first launched in 2011, the WA Government's Innovation Booster Grant (previously Innovation Vouchers Program) offers SMEs funding of up to $40,000 to undertake research, development and commercialisation activities. The purpose of this policy is to assist WA-based founders and teams in the development and commercialisation of new technologies, as well as growing new industries that assist in diversifying the WA economy. These vouchers have a strong additionality requirement, with applicants needing to argue why they need State Government funding.

Similarly, in NSW, the Government's Boosting Business Innovation Program (including TechVouchers) builds innovation partnerships between Publicly Funded Research

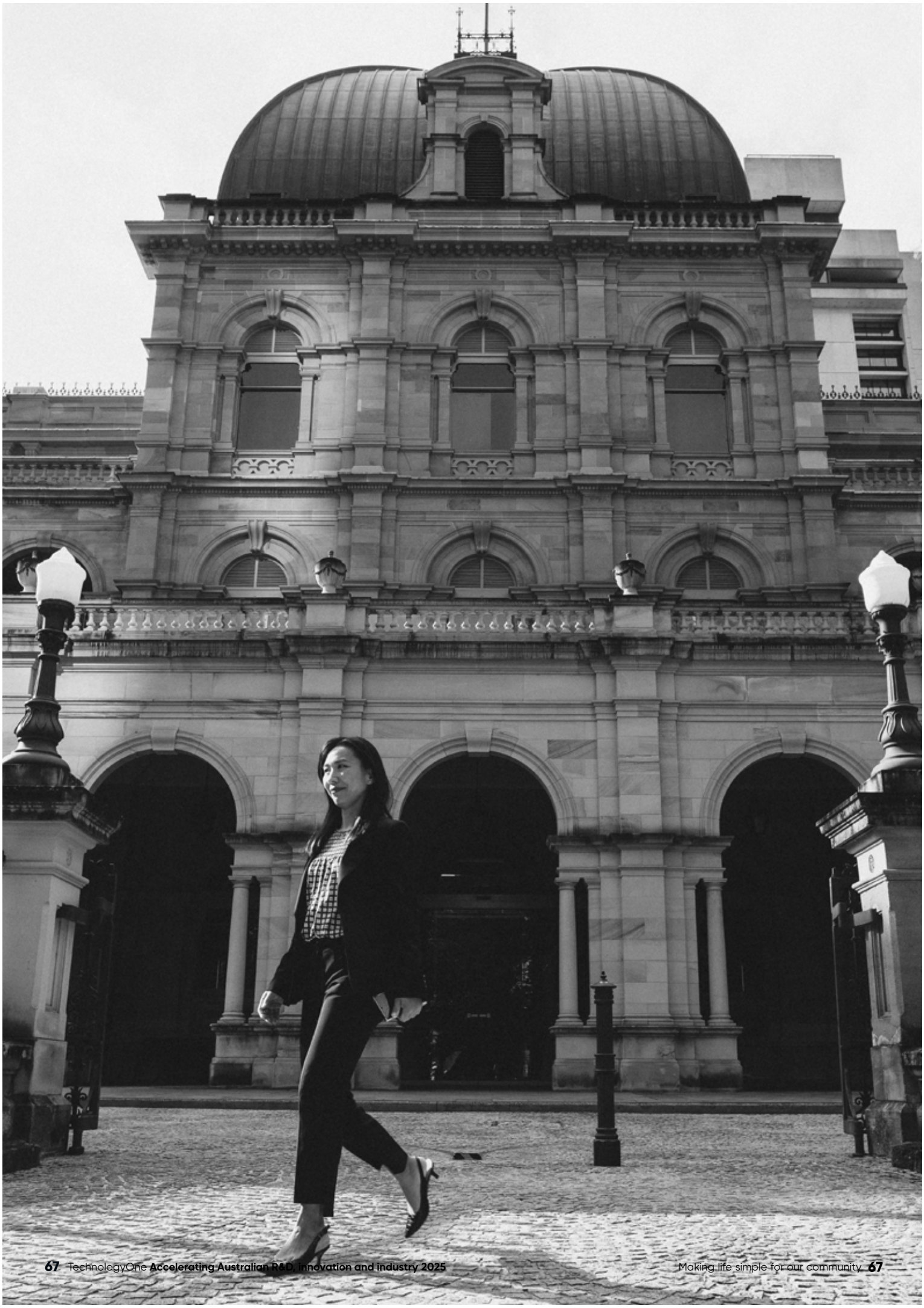
Organisations and SMEs, with improved access to researchers, training, and facilities.

The program targets three main outcomes: Increased collaboration between researchers in PFROs and SMEs through funding support for activities that build connections.

Develop innovation and entrepreneurship skills and capacity for knowledge translation for business owners, SME employees and researchers. Support commercialisation processes for university research and innovative SMEs.

$3.85 million in TechVoucher grant funding is available to fund collaborative research projects between SMEs and researchers, with approved projects awarded 50% of the total eligible project costs in match-funding, up to a maximum of $50,000.

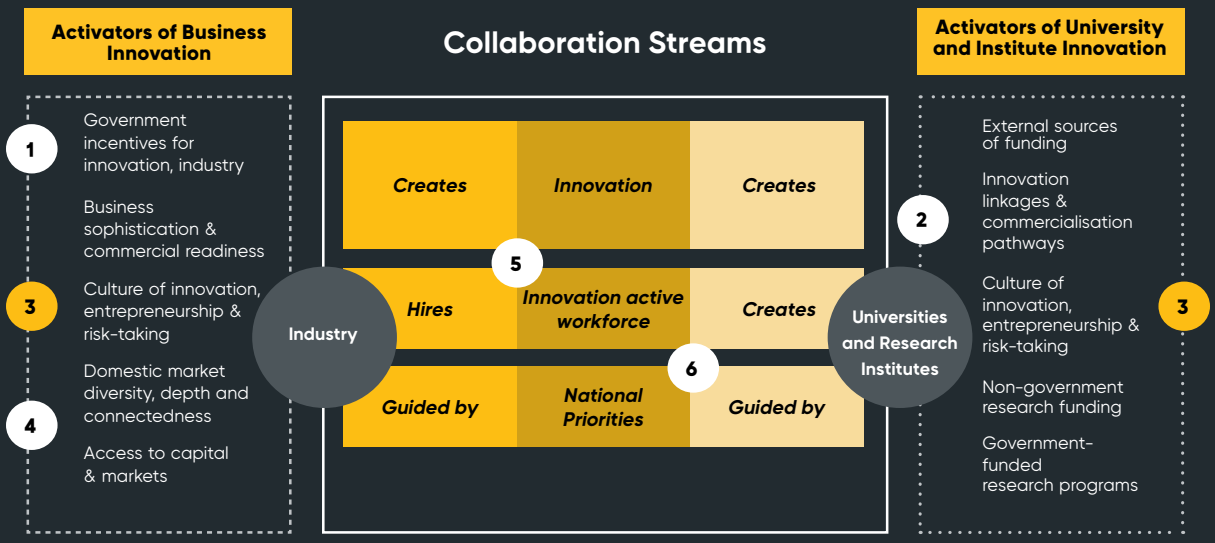
TechVouchers, and other innovation voucher systems, work to reduce the risk borne by innovation-active companies, by covering some portion of their R&D expenses. Compared to tax incentives, the competitive nature of voucher systems allows public money to be spent on promoting the most impactful R&D activity.



Chapter 4

Building a culture of innovation, entrepreneurship and risk-taking

Key issues in Australia's innovation ecosystem: Building a national culture of innovation excellence, entrepreneurship, and risk-taking



Cultural barriers impede investment in R&D, innovation and entrepreneurship

Ensuring Australian universities and companies have adequate channels for collaborative innovation is only one part of the puzzle. Both DISR's SERD discussion paper as well as other stakeholders, have raised concerns that Australia does not have a culture of innovation, entrepreneurship and risk tolerance to the same degree as its peers. This contributes to declining R&D, as investors seek a safe return, reduced economic complexity, as stable firms consolidate market share, and a low scale-up of SMEs.

While limited, the available data suggests Australian CEOs spearhead fewer innovation initiatives than their international counterparts. For example, PwC's most recent CEO survey found only 23 per cent of surveyed companies had developed new innovative products in the past five years, compared to 38 per cent globally (see Figure 4.1).

This gap between Australian and global corporate innovation holds true for other innovative activities, such as university collaborations, the development of new routes to market, or the attraction of a new customer base. The reasons for this vary by sector and business size. Overall, stakeholders suggested a lack of competition in Australian markets can weaken the incentives to invest in R&D compared to other economies.

At an industry level, sectors like ICT, wholesale trade and manufacturing tend to have a greater proportion of innovation active companies than the average (see figure 4.2).

Conversely, in the agriculture, construction and logistics sectors, there are fewer innovation-active companies.

This heterogeneity of R&D activity reinforces the value of promoting economic diversity in Australia, with a robust manufacturing sector. It was suggested that better identifying innovation-active companies was a further opportunity to improve the effectiveness of government grants programs.

A DISR survey of innovation active firms in 2023 identified poor access to funding and skills as the major barriers to investment in innovation. While these barriers do not immediately suggest culture as a primary barrier to investment, the willingness of Australian investors to place their capital in innovation active companies, as well as the desire of Australian students and professionals to seek to work with them, is downstream of an innovation culture that must be built from the ground up.

Within academia, similarly, cultural fears of failure and laser focus on grants and publishing were identified to be a major barrier to collaboration with industry.

Some stakeholders indicated that in academia, there was also a low value placed on industry partnerships and the value that industry or other collaborations could bring.

The introduction of incentives in academia to require industry experience for executive roles was raised by multiple stakeholders as a significant opportunity to drive cultural change.

More fundamentally, stakeholders identified the need to drive cultural change through the community more widely, with multiple people identifying primary and secondary schools as well as social media as important channels for improving the average Australian's pride in, valuation of and aspirations for Australian innovation and industry growth.

Providing avenues for industry and academia to collaborate is only useful insofar as these organisations have the capability and desire to invest in innovation. This desire must be a direct product of an entrenched culture of innovation, in which everyone from students to C-suite executives participate

We need everyone to understand that we can't rely on coal/iron ore mining or sheep/wool farming in the future.

A shift will be slow and difficult, but it starts with parents/teachers encouraging children to take up careers in science/engineering/R&D.... There needs to be more recognition for successful innovation and those who achieved it.

We can't improve unless we get the big end of town involved. So, we must have large Australian corporations and multinationals engaged. They need to take a longer-term view and be more active in terms of how we engage in this process.

I believe this could be a great starting point for new configurations of talent and innovation that are more strongly industry-led, co-created with universities, but not solely driven by our agenda.

Cultural barriers in industry

Does Australia have a strong culture for innovation? I think it is a mixed bag.

There has always been a lesser value placed on IP than international markets. The US is probably the high-water mark for respect for IP value. But just fundamentally, in my experience, even very sophisticated business leaders have a poor understanding of IP – was it is and why it is valuable.

Australia's big MNEs are really all sales offices trying to cut a deal with the government. Companies that are really trying to crack R&D have to prove themselves overseas.

Our markets lack competition, so less drive to innovate aggressively. Consumers don't switch between banks, super companies, insurers, utility companies... it means there's less competition and less drive to innovate.

Risk aversion is a serious issue. Australian boards are highly regulated, but is not a bad thing, but it can have a chilling effect on risk. We don't have any build-in capacity for failure.

Government bureaucracy slows things down – too much regulation makes it slow and costly to innovate here.

No culture of R&D unlike Japan, South Korea or Germany. R&D Tax incentive is an afterthought for many companies, not a driver.

There is a lower risk appetite in Australia. We are not prepared to take the same level of risks as others overseas, so it forces some startups to go overseas looking for money.

Cultural barriers in higher education

Late-stage academics, they get it and they are often confident in their path. But early to mid-career researchers don't respect industry and what they can do in Australia. They are focused only on grant money, the publish or perish model holds us back. They see it as 'MY work' as opposed to 'THE work'. Each researcher operates as its own small business.

In Australia, if you don't get a grant, you are out. If you fail, you are out. But in Israel, in the US, if you fail you're going to get more money, because you're understood to be learning from the failures. There is a greater appetite for failure. To solve high-risk, high reward problems, we need a system that can cope with failures.

Australia is risk averse, I think that's true. The culture is reasonably similar in the UK, where actually people don't want to fail because if you fail, you get, you know, a badge stuck on you: "You failed." And therefore it's not particularly a positive thing. ... I think there is something around enabling people to fail safe and not to worry about it too much... every grant is not necessarily going to deliver the outcome.

Fostering a culture that truly values translational research and commercialisation requires focused leadership at an executive level, someone who can advocate revised promotion criteria, highlight success stories of real-world impact and encourage interdisciplinary collaboration.

One of my big observations around Australian universities, is if you get five Australian universities in a room, it needs to have five corners for them to stand in, because they don't actually talk to each other.

All of the examples [of innovation in Australia are] at the university. There is very little that didn't happen at the university, so it was like the university is the Holy Grail and you had to come to them. Whereas if you look at a lot of really good examples around the world, where innovation or innovation policy is done well, is quite often that it doesn't have to be at the university. Entities have been created in neutral ground or [directly within] the industry itself.

On generational cultural barriers

The other critical issue is generational change. There are children of the 60s and the 70s, the 80s... By the time you got to the 90s, you're either a child of the 'early 90s' or the 'late 90s'. And now, if you look at university, the kids who are coming in the first year are a generation apart from the ones who are leaving in their third and 4th year. So, we're seeing significant generational change, and we are really having to deal with, you know, eight or nine different generations of individuals [as universities].

And so are companies. The staff that work for you fundamentally work, think, develop in different ways. If you're just trying to create a generic policy, it's not going to fit everyone.

Young people see themselves as global citizens. They'll go wherever it is the best place for them to go that they can find on their mobile phone today. So, you're competing within a very different space. And there is still the effect of COVID, of course, which took a lot of capacity out of the system, everywhere around the world, and in young people in particular, particularly those that were, you know, going through school and then into university during the COVID period. There are some strains there. They have suffered a lot that they're not as social or sociable (as previous generations).

I think that [culture] is part of it, and at least it brings the issue into the realm of public accountability and community engagement. A long-term view is needed, as this is a multi-generational task. Education is a powerful driver of those long-term changes.

How do we embed this thinking within primary and secondary schools? This is more than just STEM education. How do we connect the dots for future aspiring entrepreneurs? How do we develop the robust skills they'll need and show them the exciting problem solving opportunities that lie ahead by bringing everyone together to solve big problems?
I think we can embed this into skills development within the curriculum, with interdisciplinary learning that links STEM and social sciences.

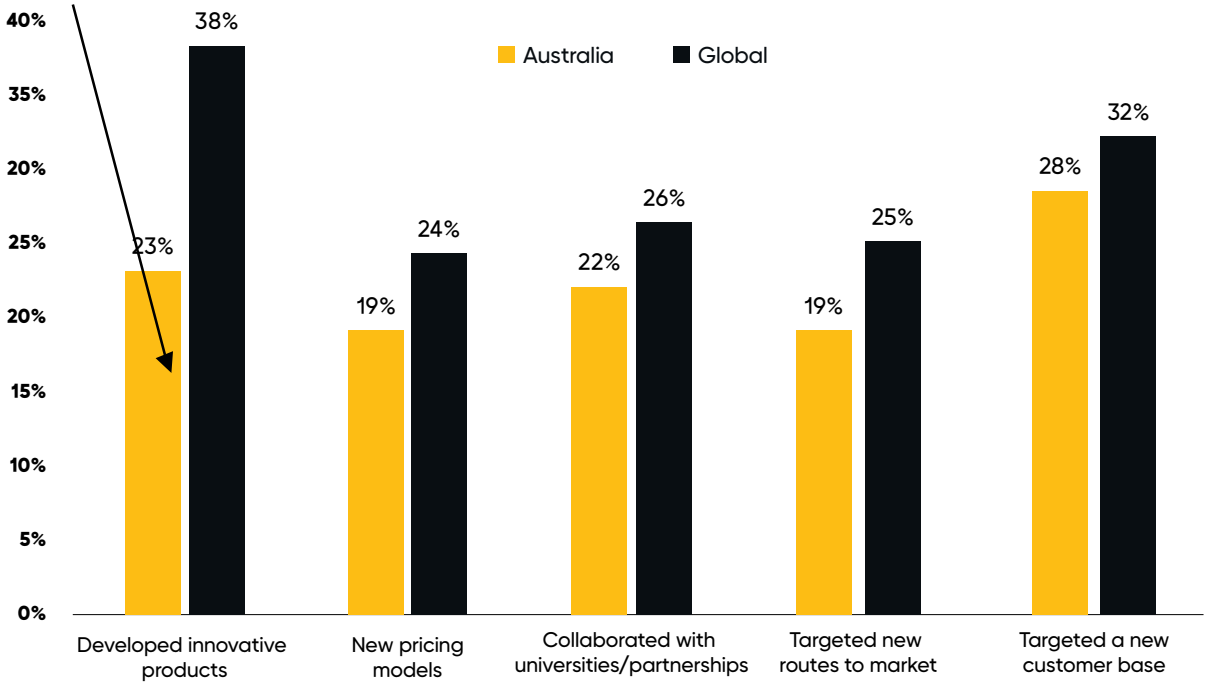
There's a lot we can do to make this real. This isn't just an abstract discussion; it's about positioning our country and engaging our population in a meaningful way. There's no political advocacy for this right now—it's not in this paper, and it's not in any policy leading up to the election.

We need to grow that advocacy through the power of democracy, and that's a huge task. It will take decades, but let's not focus on what we can change in the next 12 months. Let's talk about what we can change over the next 20, 40, or 60 years.

Benchmarking business innovation activities

Figure 4.1: CEO perspectives: To what extent has your company undertaken the following activities in the past 5 years?

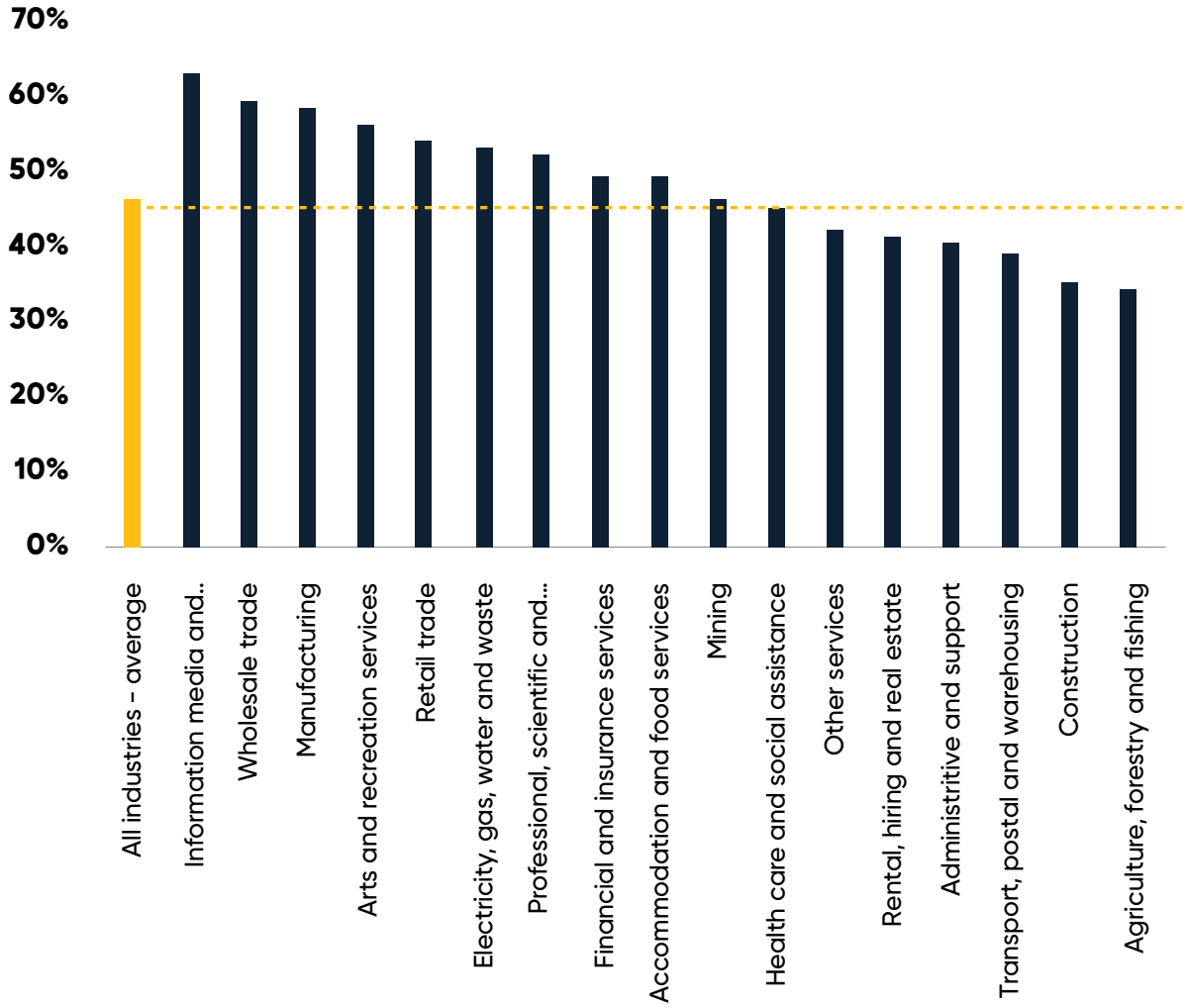
PwC data show Australian businesses embark on innovative activities less frequently than the global average



Source: 28th CEO Survey | PwC Australia

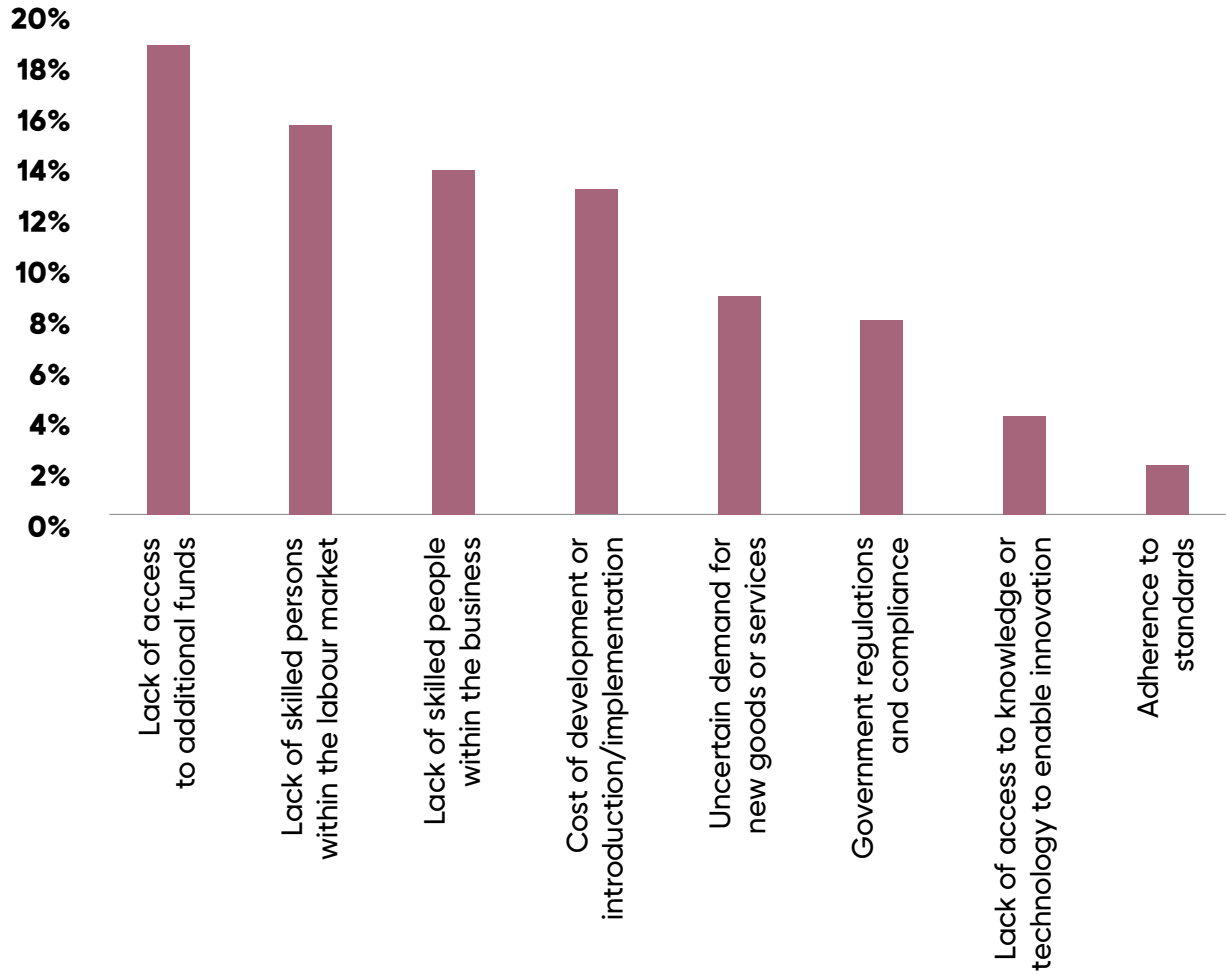
Proportion of innovation active companies vary substantially by sector, with access to funding and skills identified as the major barriers

Figure 4.2: Innovative active companies as a proportion of all companies



Source: ABS, Innovation in Australian Business, 2022-23 financial year | Australian Bureau of Statistics

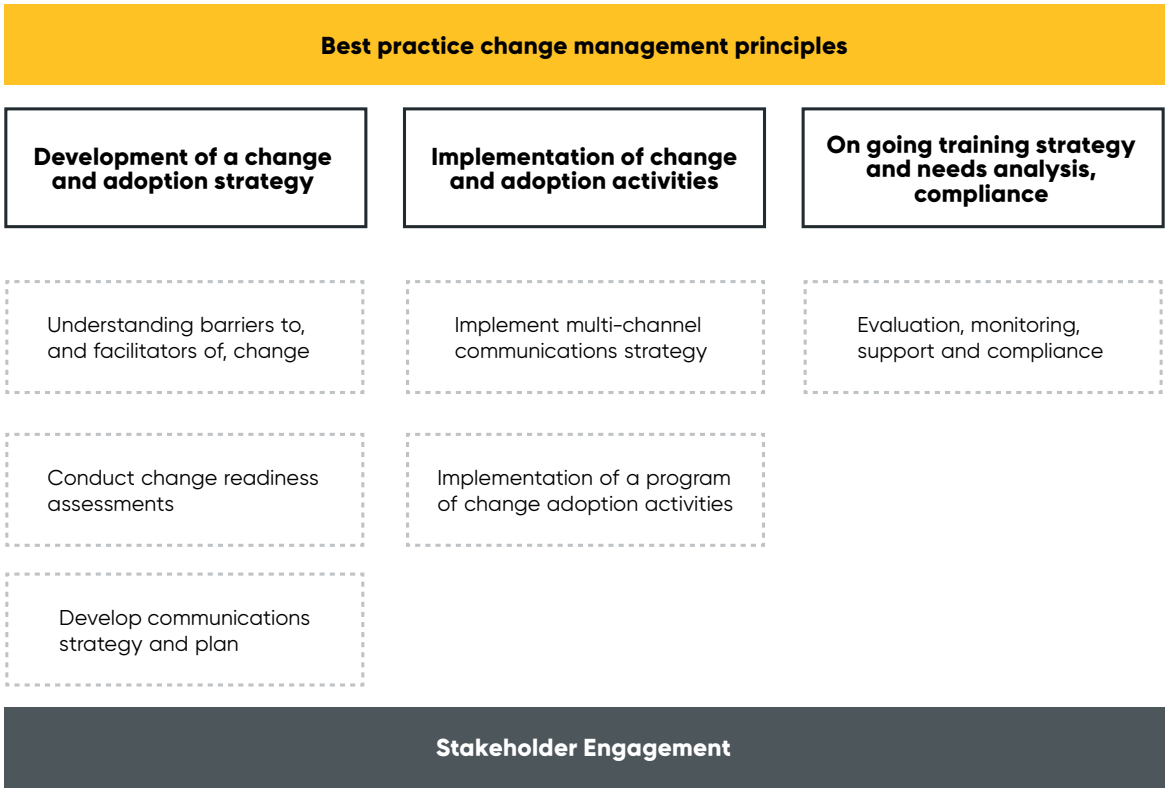
Figure 4.3: Barriers to innovation faced by companies



Source: ABS, Innovation in Australian Business, 2022-23 financial year | Australian Bureau of Statistics

Culture change: Explore a national campaign to improve awareness and understanding of the value of higher ed, business innovation and investment

Implementing a best practice approach to change management – key elements



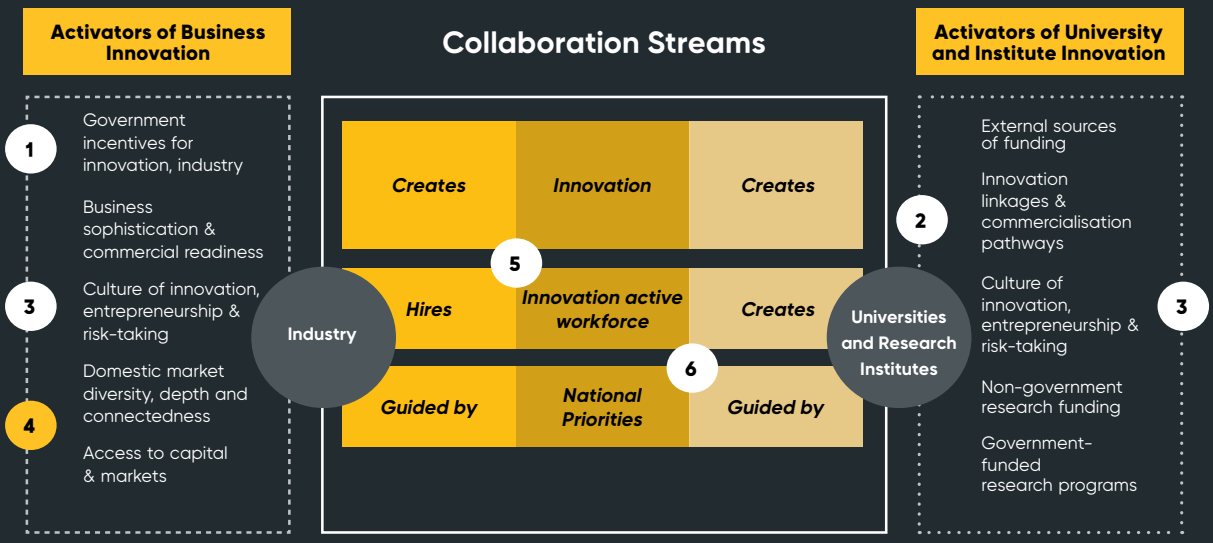
Exploring opportunities for a whole-of-government strategy to improve the average Australian's valuation of business innovation and ingenuity was identified by stakeholders


cia
Outstanding Amounts
Revenue Type

Chapter 5

Improving industry scale and diversity

Key issues in Australia's innovation ecosystem: Improving industry scale and diversity



Building critical mass for capability and competitiveness

The ability for innovation-active small and medium businesses to scale up is key to unlocking R&D investment and absorption throughout the economy.

The first step in creating this environment can come from Australian state and federal governments, who can drive industry growth by engaging with Australian businesses as their "first customer". Australia has become an excellent adopter of best-practice technologies from overseas; however, this has come at the expense of the perceived quality of similar Australian products.

Government is particularly prone to this mindset, with a highly risk-averse procurement approach that fails to account for wider economic and social impacts, including potential industry development.

Recent changes to Commonwealth Procurement Rules to improve procurement officers' understanding of industry and innovation impacts of procurement are an important first step, but more is needed to be done to drive the cultural and process changes to ensure Australian firms are given a fair go within a competitive procurement process.

More broadly, Australian industry faces other barriers to scale, including access to capital, markets, networks and talent.

The impact of these factors varies by sector. In sectors with high growth potential, like ICT and biotech, the general consensus was that good ideas find capital, but may ultimately scale overseas to improve access to markets, networks and talent. In other sectors with slower growth trajectories, access to capital was seen to be a major hurdle. Often, grants systems were identified as insufficient to support growth as they could be slow to be awarded and burdened by criteria that could often be hard for a business to meet depending on its business cycle. Improving system flexibility to support businesses in building critical mass is critical to helping industry competitiveness and investment in R&D.

In some cases, Australian firms are being crowded out of domestic markets by strong global players. However, these multinational companies do not reinvest in the country's R&D sector in the same way as large domestic enterprises.

Access to capital has improved significantly, but remains low and early-stage relative to our peers

Figure 5.1: Venture capital deals in Australia, 2010 – 2023

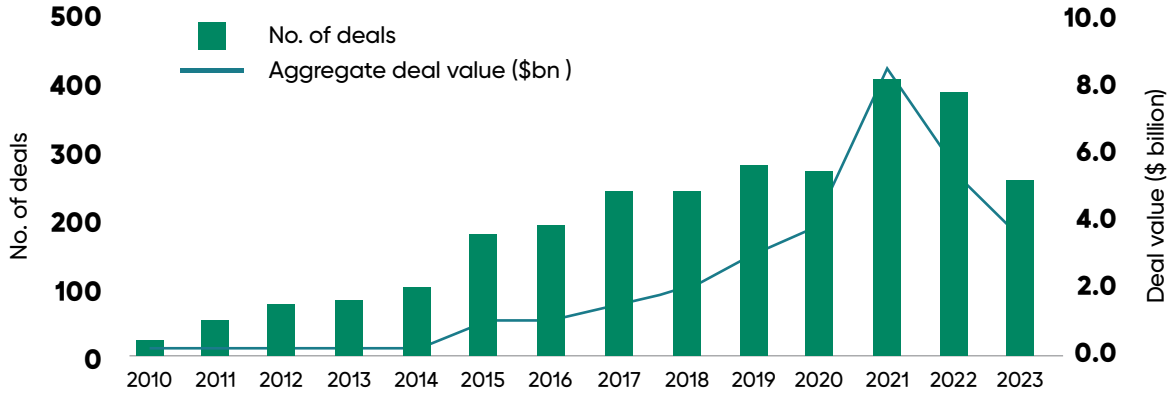


Figure 5.2: Venture capital as a % of GDP, 2010 – 2023

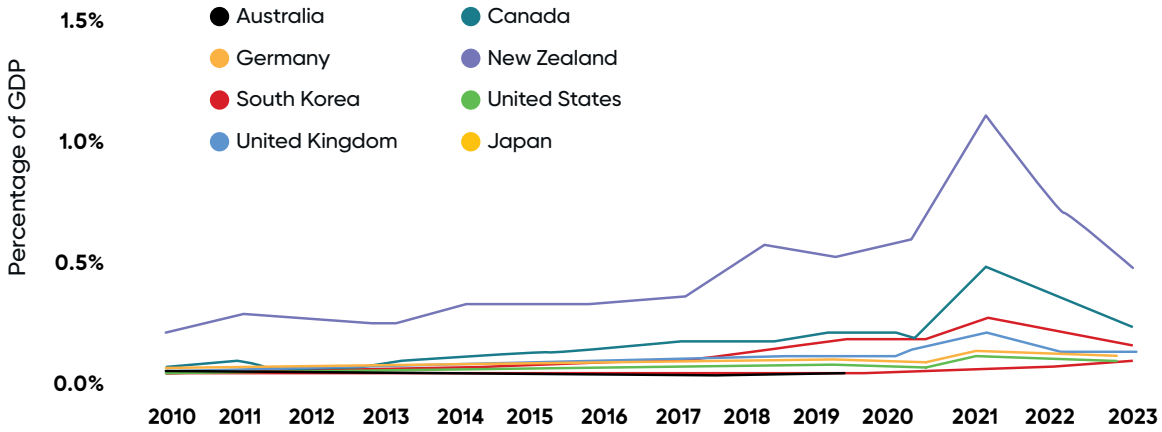
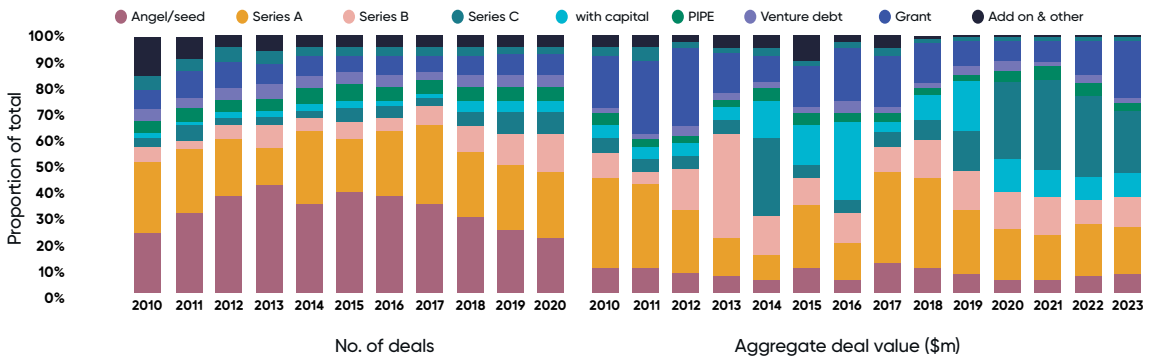


Figure 5.3: Venture capital deals in Australia by stage, 2010 – 2023



Stakeholder perspectives on barriers to industry scale

We are too far away from major funding sources, but money is available both locally and globally for the "right" opportunities.

Most good ideas will find capital. Capability is part of the problem.

We lack the scale necessary for cost effective R&D. 90% of Australian manufacturing businesses employ less than 20 staff.

We are a high-cost country. We have high taxes, we have high wages, we have high regulatory costs... the burden of regulation in this country has grown exponentially since I started my career.

Given our distance to markets, we can't really afford to continue in this way. We really need to be looking at these barriers and making Australia as competitive as possible.

Our VC capabilities are maturing but we're still a long way from what is possible from international funding sources.

In life sciences, for example, Australian VCs quickly run out of runway if you are looking at scaling something that needs $50 million or $75 million... not many Australian funds can do that. And then international VCs also have connections into markets that are critical.

A key issue is translation of ideas into scalable operations. We have lots of startups, but many struggle to know how to commercialise their ideas or how to scale them. Often, we develop "bench scale" but find it difficult to get to "manufacturability scale". This differs across industries and needs industry-specific solutions.
For example, some industries need massive capital expenditure to create appropriate manufacturing facilities.

Education can help to bridge knowledge/skill gaps. Currently, Australia is better at low volume, high-value R&D eg Defence. SMEs find it difficult to know how to engage with universities and research sector organisations that can help them.

Cultural barriers in higher education

You have to learn how to be part of the start-up world. So every university has its own 'boot camp', but so what? If you are any good at being a CEO, why are you working for a uni? You should be off doing your own thing. When the US VCs invest, they put a person being paid $500k, not $150k… it's about getting the right people involved.

A challenge is that the person or people involved in the technical solution are not the same as those that can develop the business model, which are not the same as those that understand distribution. Having programs in place to identify companies that have run out of ideas and help them connect to the right skills helps them to scale or exit.

A challenge is that the person or people involved in the technical solution are not the same as those that can develop the business model, which are not the same as those that understand distribution. Having programs in place to identify companies that have run out of ideas and helping them to connect to the right skills then helps them to scale or exit.

The other thing that we are seeing across most of Europe and the UK at the moment is what we're calling sort of 'next generation takeover' of businesses. Quite often, a lot of our medium-sized businesses are failing because either the founder, or the child of the founder, quite often has decided to flog the business off because it's now just too difficult to keep it going. And that's partly because sometimes they've run out of steam… they often haven't quite, you know, moved on to the new product or quite moved things forward.

But these companies often have a really good balance sheet, they've got money, they've got everything they need. They just don't necessarily have a new management structure. Germany's been extremely good at supporting those types of businesses [to continue and to scale].

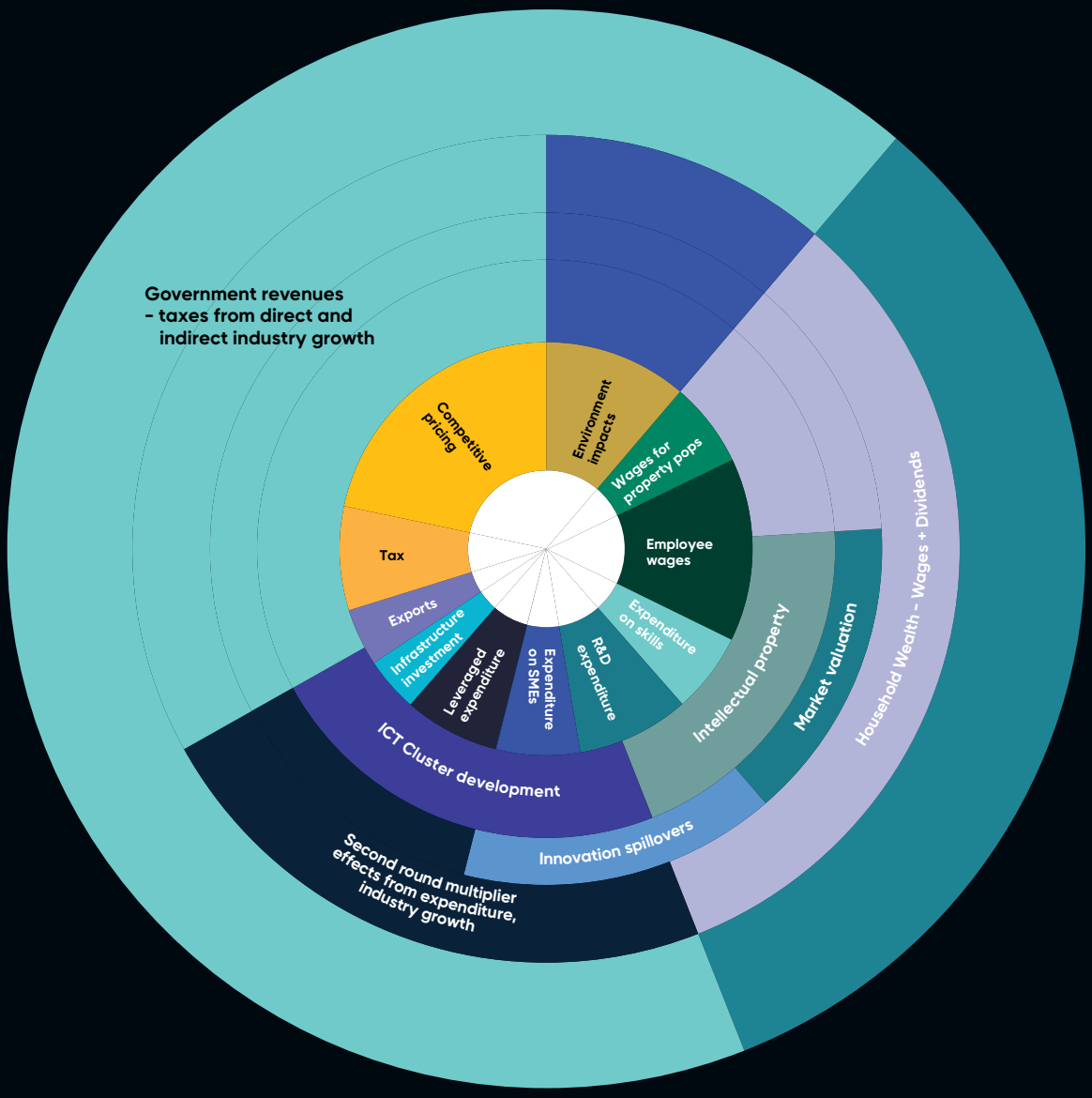
Valuing innovation in procurement is important to building a national culture of innovation excellence

The Australian Government has a critical role to play in signalling the value of innovation (and, in turn, in improving the depth and diversity of innovation-active companies in Australia) through procurement.

By valuing R&D, innovation and industry development in procurement processes, companies will be incentivised to invest and innovate. As shown in the figure, where a project involves expenditure on R&D this can support capability development with second-round economic effects on household income and government revenues.

Recent changes to the Commonwealth Procurement Rules, for example, to encourage procurement officers to more consistently value the impacts of offers on long-run innovation outcomes are an important first step. More can be done to educate procurement officers on the importance of these impacts and to equip them with tools for valuation.

Australia's developed nation peers have similarly increased their focus on the wider economic, social and environmental impacts of procurement (see page 88w).



There is an increased focus globally on mission-led procurement economic resilience, reducing barriers to participation

International and local innovations in ICT procurement

Canada

Agile Procurement Process 3.0 (APP 3.0) reforms and Scale Up social procurement

- Innovation in ICT procurement to reduce barriers for local SMEs to federal procurement
- Focus on improving opportunities for people from disadvantaged backgrounds
- Digital marketplace to improve transparency

United Kingdom

Mission-led procurement, focused on key priorities:

- Creating resilient businesses and opportunities for quality employment and skills development.
- Improving innovation, supply chain resilience and security of supply.
- Tackling climate change and reducing waste.
- Differentiated approach depending on deal size (light touch pathway)
- Requirement to value economic and social impacts aligned to National Procurement Priorities

United States

Multi-faceted procurement reform aimed at developing US capability

- The establishment of a Made in America Office
- Domestic content requirements for federal procurement
- Definition of critical industries and supply chains
- Guidance on enhanced pricing preferences for critical and non-critical industries
- Direction to review and remove any barriers to the application of the Made in America laws to the commercial ICT sector
- Establishment of TechHubs (outside of existing 'coastal' technology clusters)
- Policies to improve procurement among disadvantaged and/or priority groups (SMEs).

New South Wales

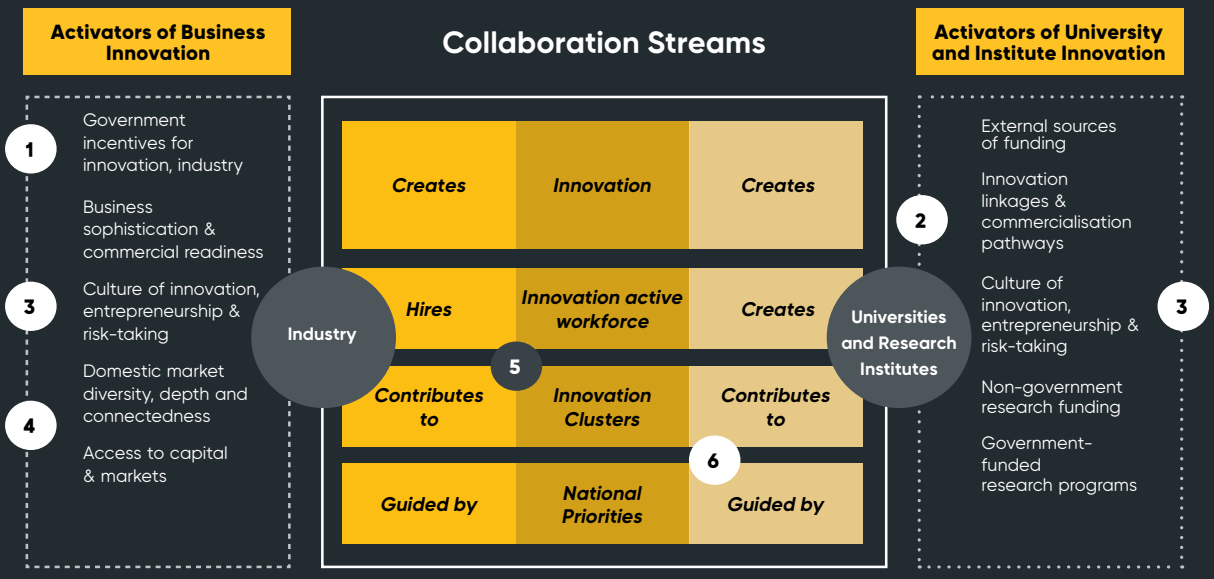
'If not, why not?' policy

- Applies to all procurements > $7.5 million

Chapter 6

The role of clusters in innovation and industry growth

Key issues in Australia's innovation ecosystem: the role of clusters in innovation and industry growth



Innovation clusters: a core component of 21st century innovation

Throughout OECD nations, innovation is increasingly concentrated within clusters of enterprises and research/training institutions that work on complementary activities. These clusters create an environment conducive to productivity gains, which are a factor of growth, and so form a structure that helps enterprises meet the challenges of international competition.

For policymakers, cluster development may be associated with productivity increases resulting from a range of localised external economic benefits. This higher productivity environment can create a virtuous cycle of growth as new firm entrants and expansions are incentivised, increasing the size of the cluster and strengthening productivity benefits. Local growth may therefore be realised in terms of wages paid to labour and job creation.

The rationale for policy intervention in clusters is to facilitate the exploitation of potential local external economic benefits from input-output linkages and knowledge spillovers. Policy may contribute to the positive externalities generated by clusters by increasing the number of innovation-active organisations within a cluster, as well as by encouraging collaboration between agents in clusters.

Innovation clusters have been employed by developed nations worldwide to encourage commercial collaboration and knowledge sharing, often to great effect. California's Silicon Valley or the Tel Aviv-Yafo metropolitan area in Israel are prime examples of place-based innovation leading to long-term investment in R&D and structured collaboration between academia, established multinational corporations and entrepreneurs.

International approaches to supporting cluster development

National policies recognise that 'clusters matter', with clusters organised around priority sectors

Canada

GII state of cluster development: 6

University-Industry R&D collaboration: 5

- National network of 26 clusters
- MaRS Discovery District

United Kingdom

GII state of cluster development: 18

University-Industry R&D collaboration: 11

- Home to a series of mature cluster networks, including Catapult Network and SETSquared.
- There are major clusters around Oxford and Cambridge Universities.

United States

GII state of cluster development: 3

University-Industry R&D collaboration: 3

- Beyond world-leading clusters (e.g., Silicon Valley), also a national network of clusters in mid-West (AURP)
- Commitment of $500 million to develop

New South Wales

GII state of cluster development: 22

University-Industry R&D collaboration: 12

- **Sydney, Melbourne and Brisbane in top 100 clusters, but well below peer rankings.**
- No national approach to clusters, devolved to State-level strategies

Clusters: the drivers of innovation, investment, and concentration

Tech clusters, such as **San Francisco, New York, and Boston,** are engines of innovation, with a **disproportionate share of national tech activity** in terms of granted patents and venture capital investment. For example, **San Francisco accounts for 48 per cent of venture capital and 18 per cent of patents, despite having only 2.5 per cent of the national population. Similarly, New York and Boston also show significant concentrations of tech activity, with venture capital and patents far exceeding their population share.**

Data reveals a strong correlation between venture capital investment and patents (0.98), showing that regions with more investment produce more patents. Additionally, areas with high VC investment attract skilled workers in R&D and STEM fields, further fuelling innovation.

Table 6.1: Spatial concentration of US tech activity

Consolidated metro area	VG Investment	Granted patents	Employment in the top 10 R&D industries, high skilled	Employment in top 20 R&D industries, all workers	Employment in computer and digital connected occupations high-skilled	Employment in STEM connected occupations all workers	Population
San Francisco	48.1%	18.4%	11.7%	4.9%	8.6%	5.5%	2.5%
New York	15.3%	6.0%	6.3%	6.1%	8.0%	6.0%	6.4%
Boston	10.5%	4.5%	5.5%	2.4%	3.5%	2.7%	1.6%
Los Angeles	6.5%	5.3%	5.5%	5.7%	3.9%	3.9%	5.8%
Seattle	2.1%	4.0%	4.2%	2.4%	3.5%	2.5%	1.2%
San Diego	1.9%	3.6%	3.2%	1.6%	1.5%	1.5%	1.0%
Chicago	1.7%	2.5%	3.2%	3.2%	3.9%	3.2%	2.9%
Washington DC	1.5%	1.7%	4.4%	1.8%	6.6%	4.6%	1.8%
Miami	1.5%	0.7%	0.9%	1.1%	1.0%	1.2%	1.4%
Denver	1.1%	1.5%	1.5%	0.9%	1.7%	1.5%	1.0%
Austin	1.0%	2.1%	1.8%	1.0%	1.5%	1.2%	0.5%
Philadelphia	0.8%	1.8%	3.3%	2.1%	2.4%	2.2%	2.0%
Atlanta	0.7%	1.5%	1.4%	1.6%	2.8%	2.3%	1.7%
Minneapolis - St Paul	0.7%	2.0%	1.3%	1.7%	2.0%	1.9%	1.0%
Raleigh-Durham	0.5%	1.4%	1.7%	0.8%	1.2%	1.0%	0.5%
Share in top 15 VC MSAs	**03.8%**	**57.0%**	**55.0%**	**36%**	**52.1%**	**41.2%**	**31.3%**
Share in other MSAs	5.9%	37.3%	38.3%	49.3%	41.8%	47.9%	48.0%
Share in non metro areas	0.3%	5.7%	5.9%	14.6%	6.1%	10.9%	20.7%
Correlation to VC share	-	0.98	0.94	0.53	0.73	0.66	0.31
Correlation to patent share	-	-	0.98	0.93	0.67	0.71	0.65

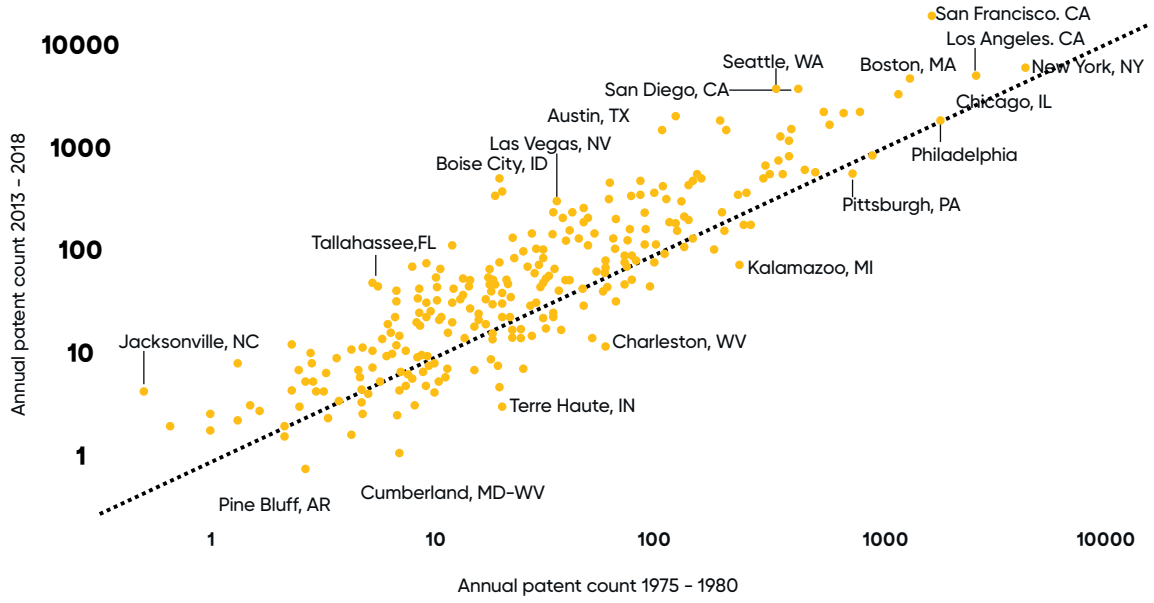
Source: Kerr, W. R., & Robert-Nicoud, F. (2020). Tech clusters.

Clusters: the drivers of innovation, investment, and concentration (cont'd)

Over time, the largest clusters, like San Francisco, have seen explosive growth in patenting, from thousands in the late '80s to over 10,000 annually between 2013-2018. This growth highlights how early investment and ecosystem development create self-reinforcing innovation environments. Early technological momentum is often a strong predictor of future potential, with top cities consistently outperforming and building concentrated ecosystems that attract talent, capital, and cutting-edge research, allowing for knowledge transfer.

Cluster formation fosters a virtuous cycle where innovation, investment, and concentration feed into each other, making tech clusters increasingly self-sustaining and driving continued growth and global influence.

Figure 6.1: Growth in annual patenting in the United States by metropolitan statistical area, 1975 – 1980 and 2013 – 2018



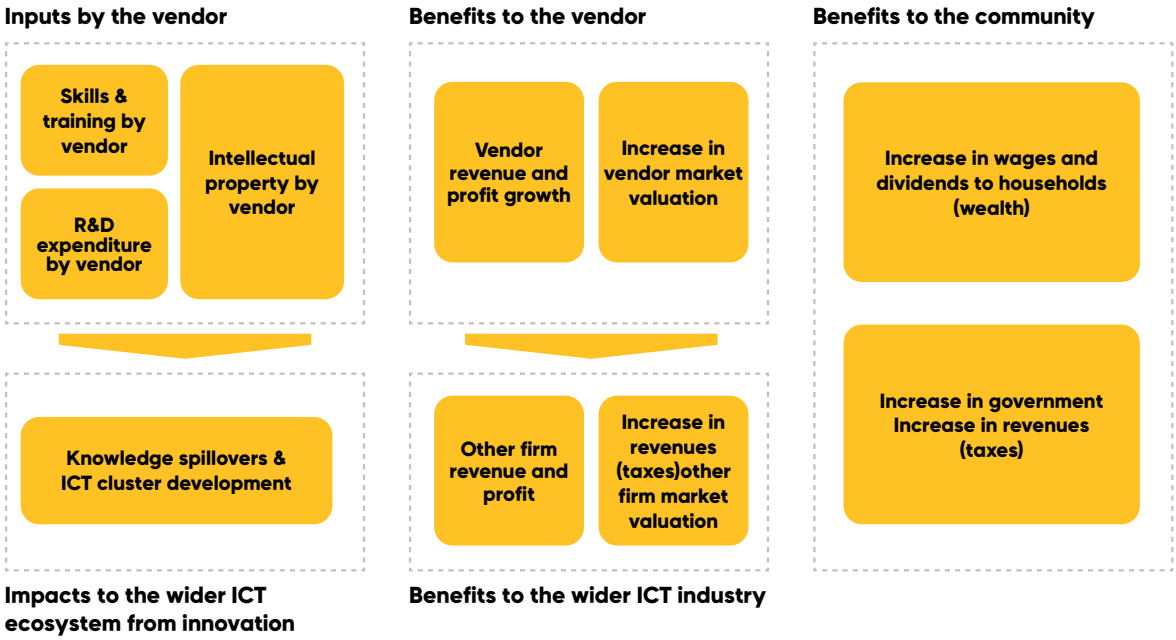
Source: Kerr, W. R., & Robert-Nicoud, F. (2020). Tech clusters.

Composition of clusters matters: local diversity and global integration

Anchor tenants and the composition of firms in tech ecosystems are crucial for fostering innovation (Agrawal and Cockburn, 2003). Large, established firms, or anchor tenants, play a pivotal role by anchoring the cluster, generating ideas that often lead to spin-offs. Small firms play an equally important role by lowering entry barriers, encouraging competition, and providing specialised services that stimulate innovation. Optimal industrial composition and firm size diversity are important (Glaeser and Kerr, 2009). **This balance between large and small firms creates a dynamic environment, exemplified by clusters like Silicon Valley and Detroit** (Klepper 2010), that fosters both growth and new ideas.

Successful clusters also thrive through integration with global networks. Proximity to suppliers, partners, and collaborators enhances communication, enabling the quick exchange of ideas and seamless production integration. Global connections, such as high-skilled migrants, cross-border patent teams, and international venture capital, facilitate knowledge transfer and enables clusters to scale. These global ties provide the necessary resources for innovation to expand across borders, further strengthening the cluster's influence and growth potential.

Clusters drive R&D intensity and knowledge spillovers through economy



International approaches to supporting cluster development

Innovation clusters have been an integral part of R&D policy in several highly innovation-active countries. These countries are world leaders in cluster development and university-industry R&D collaboration.

The United Kingdom operates a dynamic and robust innovation policy, which includes a series of mature cluster networks, including the Catapult Network and SETSquared. National-level policy coordination is headed by UK Research & Innovation (UKRI), who are responsible for organising the seven research councils, Innovate UK and Research England.

The United States has long been a world leader in innovation clusters, from the world-renowned Silicon Valley, CA, to globally competitive innovation ecosystems in New York City, Boston and Los Angeles. Additionally, the US Federal Government has committed $500 million of funding to develop technology and innovation hubs outside of existing "coastal clusters", with an emphasis on locations in the Midwest.

Relative to its size, Canada's innovation clusters are among the most globally competitive. The nation is ranked 6th in the world in terms of cluster development, and 5th in terms of university-industry R&D collaboration, based on the Global Innovation Index 2024 rankings. One example of cluster leadership is in the MaRS Discovery District, which is funded through a partnership between the province of Ontario, Government of Canada and charitable donations. This cluster is host to a wide variety of firms, with over 1,200 startups at various stages of growth, and 120 more mature permanent tenants, focused on technology transfer and commercialisation.

Best practice elements to cluster development

Supporting strong cluster development involves a multi-faceted strategy for:

- Leadership and governance – Clusters require an organising capacity to drive activity across other strategy domains
- Investment attraction – Successful clusters often develop a team dedicated to building critical mass in priority sectors
- R&D investment – Incentives for R&D investment and collaboration
- Entrepreneurship & networks – Efficiencies can be realised by participating stakeholders in the pooling of resources for shared program delivery
- Skills and training – Align national skills strategies to priority sectors and cluster development
- Infrastructure and quality of place – Clusters often facilitate access to shared infrastructure and invest in quality of place

Stakeholder perspectives on critical success factors for clusters

Building a consistent ecosystem that lasts for a long time, it might evolve, [is essential for success]. Companies know how to engage with it, they understand it, they know how to apply to it and [this supports investment and growth].

Cremorne Tech Hub provides a good example of a model, it brings in industry. [Other examples] are fast becoming a [problem], because the leadership drifted into a public service mentality.

We need strong cross-sector collaboration and strategic vision. We need to deepen relationships with large enterprises, collaborate on top-down missions, like Net Zero, and focus on last-stage R&D. To do this, we need more co-creation hubs and shared lab spaces that create physical space for innovation and enterprise. We also need more joint appointments and secondments to facilitate knowledge exchange between academia, industry and government.

We need senior champion[s] to coordinate with existing Pro-Vice Chancellors and Directors, leveraging their expertise but tying it to large-scale, mission driven, national initiatives, such as advanced manufacturing, net zero and health innovation.

By bridging the gap between strategy and execution, [these] leaders can align university capabilities with opportunities for major external funding and high impact industry partnerships.

When you look at major innovation ecosystems that have long term success, like the Catapult network in the UK, the Fraunhofer in Germany, these systems are a success because they have strong cluster leaders. We don't have that in the Australian landscape.

Stakeholder perspectives on critical success factors for clusters (cont'd)

Australia is too small to have so much duplication across states and institutions... everyone's got an innovation hub.

We maybe need to think about this in terms of tiers. Like a Tier 1 cluster would offer the potential to be a national critical mass precinct. It would need to have access to land, world-leading researchers. You just can't replicate that everywhere.

It is important in thinking about clusters to understand why some have failed. [One university] was seeking to establish itself as an innovation hub, but the artificial creation of a hub in this [suburban centre] was extremely problematic. There was no spare land, no one could park, it was unworkable [and ultimately failed as an endeavour].

I'd like to focus on technology because in many of those hubs it's actually agnostic to field, so it's providing flexibility over time as drivers of the economy change.

So application of technology in different fields is then also attractive because we're bouncing ideas off each other and all the disciplines that are involved and as we know any of these complex multi layered problems are requiring number of different inputs so.

They are great at FDI, so we started an operation in Singapore. They really greet you well. The other side of this conversation is: is anybody coming to Australia and setting up and driving things forward?

I'm not too sure what Australia's inward investment function is. If I'm being honest, if you turn up in Singapore you get everything from the Economic Development Board. The Economic Development Board of Singapore is world leading. And their tax system's really good and everything.

Some of the Catapults have worked well, some less so. But some Catapults, like the gene therapy and bioscience clusters, have made a difference because companies couldn't afford the sort of physical infrastructure that is necessary to take drug therapies forward. So that has made a difference and a wise investment. And there's commitment for a long period of time.

Stakeholder perspectives on critical success factors for clusters (cont'd)

We need the knowledge brokers that can bring the system together.

We need the knowledge brokers that can bring the system together.

Cremorne Tech Hub provides a good example of a model, it brings in industry. [Other examples] are fast becoming a [problem], because the leadership drifted into a public service mentality.

If you look at the major pharma investment, it might have liked to have been in Parkville, but it needed access to land and so it went to Monash.

I've got to be careful not to get on any high horse; otherwise, I'll end up talking for the rest of the week. But the place-based model is a useful one, and there's also complementarity in bringing places together. We've also seen great manifestations of ego, where monuments have been built in one state that look exactly like monuments built in another state. But for the nation, we only needed one of those monuments.

We also need inter-jurisdictional cooperation on this as well. Sometimes the incentives or motives behind place-based precincts aren't as pure as they should be, and so the network needs to transcend our states, as well as industry, universities, and government.

I think that the incentives would actually be around the structure, I think there's we've just got to make it attractive and as minimal in terms of bureaucracy as possible because that that's a real Australian secret to getting it wrong.

You know we will we'll announce something that sounds fantastic and then we'll make it so complicated to even take the first step and that's particularly the case for multi party cooperation.

Best practice clusters: UK Research & Innovation (UKRI)

Leadership & Governance

The UK presents an effective model for coordinating and governing a national R&D strategy. UKRI is an umbrella organisation that began operation in 2018, bringing together the seven Research Councils, Innovate UK and Research England. UKRI funds research through two channels: allocation through the Research Councils to their respective disciplines; and blocking grants to higher education institutions.

The seven Research Councils are divided by scientific discipline, and provide grant funding and access to research facilities, as well as investing in infrastructure and institutions. Innovate UK works with companies to de-risk, enable and support innovation through direct grants and by funding the Catapult Network.

Each devolved nation within the UK has its own Government-funded body responsible for funding knowledge exchange through block grants to higher education institutions. In addition, the UK's four National Academies receive funding for key programs that deliver Government priorities, while Departments within HM Government also conduct their own R&D activities. UKRI directly supports cluster organisations such as the Catapult Network, which represents nine world-leading technology and innovation centres across over 65 locations across the UK.

Best practice clusters: Catapult Network

The Catapult Network was established in 2012 based on the recommendations of physicist and entrepreneur Dr Hermann Hauser, who called for the establishment of a network of technology and innovation centres in areas where the UK had the potential to gain substantial economic benefit.

Each Catapult operates as a private, not-for-profit organisation, with grant arrangements contingent on governance, business plans, target outputs and measured outcomes. These requirements notwithstanding, each centre operates relatively autonomously in achieving its goals.

Stakeholders suggest that, while the network has successfully created some powerful clusters, not all Catapults can generate the same impact as the highest performers. The Catapults receive core grant funding from Innovate UK. They aim to be funded in the long term through a "thirds" model: one-third of the funding comes from core grant funding, one-third from commercial funding, and one-third from collaborative (public and private) R&D funding.

This desired split reduces the Catapults' reliance on any one part of the innovation ecosystem, promoting neutrality and independence. The nine high-tech sectors in which Catapult conducts R&D cover a wide range of growth industries, including: energy systems and offshore generation, medical technology, including cell therapy, and high-value manufacturing, including semiconductors.

Over the nine years from 2013 to 2022, the Catapult Network supported almost 12,000 SMEs, and more than 5,500 academics. The Catapult Network has over £1.4 billion of R&D facilities under management.

Source: Kerr, W. R., & Robert-Nicoud, F. (2020). Tech clusters.

Best practice clusters: Fraunhofer Institute

Based in Germany, **the Fraunhofer Institute** operates 76 institutes and research units throughout Germany and employs almost 32,000 people. Fraunhofer is organised under a tripartite governance model, where Government, industry and academia all contribute to the organisation's strategy and works.

Fraunhofer is funded through a combination of industry and license-fee revenue, publicly-funded research projects, and direct funding by German federal and state governments, generating business of 3.4 billion euros per annum.

Fraunhofer generates 836 million euros from industry and license-fee revenue, which gives the institute a unique selling point in the German research landscape. The level of direct collaboration with industry required to maintain this revenue source also ensures a constant push for economic innovation.

For years, Fraunhofer has been one of the most active patent applicants in Germany and Europe, and is leveraging this to develop an extensive, international patent portfolio in various technology sectors, primarily as a basis for technology transfer through research projects, spin-offs and licensing. Fraunhofer also tries to get ahead of market trends by promoting research into key technologies that are vital for society as a whole.

Fraunhofer

Best practice clusters: US Regional Tech clusters

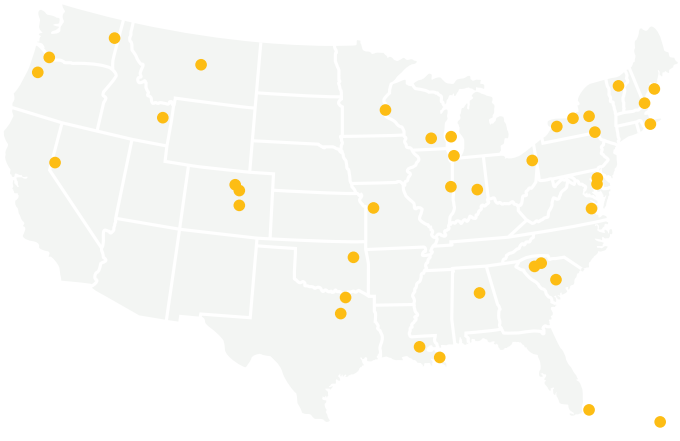
In 2022, the United States introduced a new funding program as part of its US$278.2 billion CHIPS and Science Act called the Regional Technology and Innovation Hubs, or Tech Hubs.

The program is seeking to grow a new generation of technology clusters across the regional United States. Over five years, the US will invest $10 billion in the establishment and development of regional technology and innovation clusters. The technology clusters are organised around advanced technology industries – including quantum computing, semiconductor manufacturing and clean energy – and aim to support innovation and business ventures, stimulate economic growth, and create jobs in these industries. Thirty-one (31) clusters were selected from a national pool of 379 applications from consortia comprised of industry and academia, as well as 18 other regions that were eligible for smaller grants.

Each Tech Hub will follow governance model involving the designation of a Lead Entity, Regional Innovation Officers, Steering Committees, Working Groups and Advisors. Delivery of the Tech Hubs also involve external communications strategies and reporting requirements.

US $10 billion to establish national Regional Technology cluster network

Part of US $287 billion R&D and innovation investment (US $680 billion if green energy transition included)



Source: What the new Tech Hubs designations mean for boosting innovation across the US

Best practice clusters: Cremorne Digital Hub

Entrepreneurship & Networks

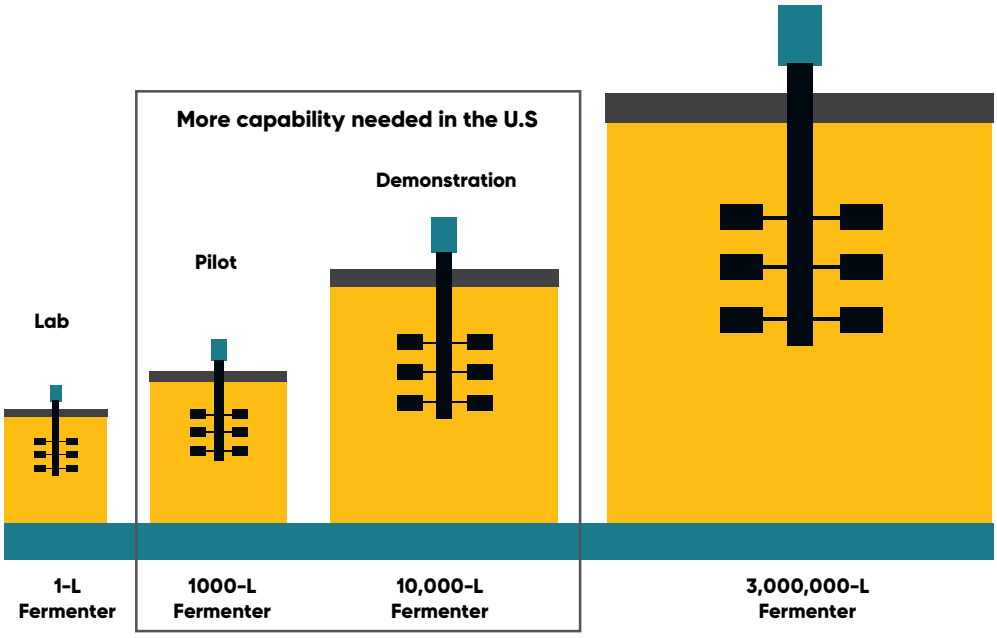
Leadership & Governance

Established in 2022 as a consortium between the Victorian Government, Artesian Venture Partners, the University of Melbourne, RMIT University and La Trobe University, the Cremorne Digital Hub (CDH) is a for-profit organisation that supports founders of late-stage digital startups in scaling up their businesses.

After an initial $10 million Government investment, the CDH expanded its circle by partnering with the Kangan Institute, as well as leading Australian technology-active companies (REA Group, Car Group). CDH's strategic relationship with Artesian Venture Partners allows both organisations to use their relative strengths to promote Victoria's tech ecosystem. CDH's access to some of Melbourne's most talented entrepreneurs, combined with Artesian's ability to mobilise capital, allows CDH to offer "VC as a Service", providing a full suite innovation venturing solution. Artesian is also charged with managing

CDH's $50 million Cremorne Venture Fund, which can help promising Victorian early-stage companies scale up their operations. CDH maintains a strong commercial partnership with Boab.

AI, a subsidiary of Artesian focused on strategic VC investment in AI and deep tech startups. CDH's scale-up program is funded by the Cremorne Venture Fund and is run in partnership with Boab AI. This program received 40 applications in 2024 and provided four successful businesses $50,000 worth of services. Alongside the direct financial support and VC advisory, CDH runs events to foster network building between academia, industry and the startup ecosystem, such as their NEXT [ ] series of events. Furthermore, CDH also operates courses and programs designed to help up-skill founders and industry professionals in key digital and IT-related competencies.

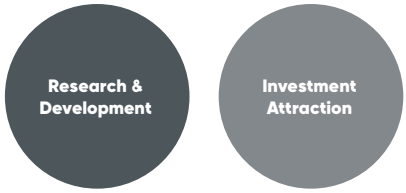


Source: Why biomanufacturing? https://ifabtechhub.research.illinois.edu/

Best practice clusters: iFAB Tech Hub

The iFAB Tech Hub was one of the applicants selected to be a Regional Tech Hub. Led by the University of Illinois Urbana-Champaign, the iFAB Tech Hub comprises a consortium of 31 education institutions, companies, government agencies and community groups in the biomanufacturing industry. The tech hub focuses on precision fermentation, a tool within biomanufacturing that utilises biological processes similar to beer brewing to produce food proteins or textiles, cosmetic ingredients and chemicals traditionally made through petroleum processing iFAB is set to receive around $51 million in implementation funding, contingent on new investment commitments of $680 million from consortium partners. Funding will mostly go to facility expansion and modernisation at UIUC and other consortium members, where companies will be able to conduct larger-scale testing and early manufacturing of new precision fermentation technologies without needing to go elsewhere or overseas. iFAB estimates the market growth potential for precision fermentation is $10 billion over the next 25 years, with one million jobs to be created in Illinois by 2030.

Best practice clusters: Tel Aviv-Yafo



Tel Aviv is a world leader in startup innovation. The Israeli high-tech sector accounts for 18% of the nation's GDP, 48% of exports and 11% of its workforce. Between 2021 and 2023, the value of Tel Aviv's startup ecosystem was estimated at $253 billion, substantially larger than the global average of $29.4 billion.

The **Israel Innovation Authority** has positioned the Tel Aviv-Yafo cluster as an attractive location among foreign companies for R&D, with 115 foreign R&D centres from across 16 countries within Tel Aviv. Through a combination of Government incentives for foreign investors and existing innovation infrastructure, the Tel Aviv-Yafo cluster allows Israel to compete globally on place-based innovation, in spite of the country's small size.

Tel Aviv is also able to attract foreign capital to invest in domestic Israeli industry, with 68% of investors in Tel Aviv companies coming from overseas.

As multi-national corporations maintain long-term ties to Israel, more of these companies have started actively enabling startups to scale up globally, investing in late-stage rounds, forming joint ventures and helping Israeli firms expand into new markets.

Foregoing broad-based R&D tax incentive, the Israel Innovation Authority operates a mixture of competitive grants and programs targeting specific sectors of national importance or competitive advantage, narrow tax incentives for specific businesses and investors, and an emphasis on attracting foreign talent and investment to Israel.

רשות החדשנות
Israel Innovation Authority

Best practice clusters: Kennispark Trente

Kennispark is an innovation cluster attached to the University of Twente in the Netherlands, which serves as a key anchor tenant. Kennispark is also home to Novel-T, an organisation that bridges the gap between academia and business, helping startups and SMEs research breakthroughs, while allowing researchers to commercialise their own findings.

The cluster focuses on R&D in four key sectors: Medtech, Microchips, Robotics and Advanced Manufacturing, and invests in building institutional diversity and depth in these sectors.

Kennispark now accommodates over 100 Medtech companies, and works with companies from across the semiconductor supply chain, from design and production to system integration. Additionally, the cluster contains two world-class robotics clusters: TValley, specialising in robots, mechatronics and artificial intelligence; and Space53, specialising in drone technology.

Kennispark also works with the **Fraunhofer Institute**, a German publicly-funded research organisation. Together, they run the Fraunhofer Innovation Platform for Advanced Manufacturing at the University of Trente, which is an ongoing partnership supporting innovation in advanced manufacturing.

Critically, a key element of Kennispark's strategy and success has been its focus on people rather than processes and policies. Kennispark has focused on the development of cluster leaders and knowledge brokers to overcome information barriers and identify opportunities for industry investment. In support of this, it also invests significantly in industry networking and events to drive collaboration and entrepreneurship across cluster partners.

Best practice clusters: Vector Institute

Ontario's Vector Institute is a globally-renowned AI research institute located in the University of Toronto's Schwartz-Reisman Innovation Campus. Launched in 2017, the Vector Institute is home to 860 members of its research community, which comprises current undergraduate and postgraduate students, postdoctoral fellows, faculty members and affiliates, and chairs of CIFAR, a Canadian AI-focused research organisation.

The Vector Institute is invested in AI research, with an emphasis on AI technology applied to health problems. The institute supports the GEMINI project, one of Canada's largest hospital data and analytics networks that collects clinical data from over 1.6 billion hospitalisations from more than 30 hospitals across Ontario. Vector also developed a Health AI Implementation Toolkit, designed for individuals who have developed a robust, mature health AI model or application and are looking to deploy their solution in a clinical environment.

In addition to their research offerings, Vector operates a series of programs designed to boost AI literacy. These include programs aimed at businesses and professionals looking to diversify their skillset, as well as programs aimed at academics, researchers and students looking to be more involved in Vector's research.

The Vector Institute is at the forefront of Ontario's burgeoning AI ecosystem. Between April 2023 and April 2024, more than 8,500 AI-related jobs were created within the Ontario ecosystem, more than 1,100 people graduated from a Vector-recognised AI master's program, and 384 companies invested in the ecosystem. This generated over $1.5 billion of venture capital investment in Ontario AI firms, $869 million in AI-related R&D and 221 new AI-related patents.

Best practice clusters: MaRS Discovery District

Quality of place

Infrastructure

Skills & Training

The **MaRS Discovery District** is North America's largest urban innovation hub. Founded in 2000, opened in 2005, the district is host to over 1,200 technology and science startups at various stages of growth, with 120 tenants and global tech companies focusing on technology transfer and commercialisation.

The MaRS Discovery District operates as a charity and is funded through a partnership model between the province of Ontario and the Government of Canada, and charitable donations. This governance model allows MaRS to operate autonomously, while its non-profit design allows the organisation to focus its efforts on technologies of national priority.

The MaRS Discovery District focuses on four priority areas of R&D: clean-tech, digital health, SaaS and AI.

The district focuses on funding shared facilities and programs, including:

- Research labs and an incubator for startups and scale-ups
- Access to 7 million square feet of partner tech facilities, 30 healthcare centres, the University of Toronto, Ontario Government, Toronto's financial district and numerous startups the MaRS Momentum program that specialises in helping Canadian entrepreneurs and C-suite executives scale their ventures. The MaRS Discovery District has created over 33,000 jobs, generated $15.5 billion in cumulative revenue, and raised $19 billion since 2010. Between 2010 and 2021, MaRS-supported companies contributed $29.6 billion to Canadian GDP.

By generating buy-in from industry, government, and academia, MaRS has generated a world-class technology cluster and elevated the greater Toronto innovation ecosystem. This is born out in Startup Genome's Global Startup Ecosystem Ranking, which ranks Toronto 18th, higher than every Australian city. The closest competitor is Sydney in 21st.

Best practice clusters: Parkville NEIC

Quality of place

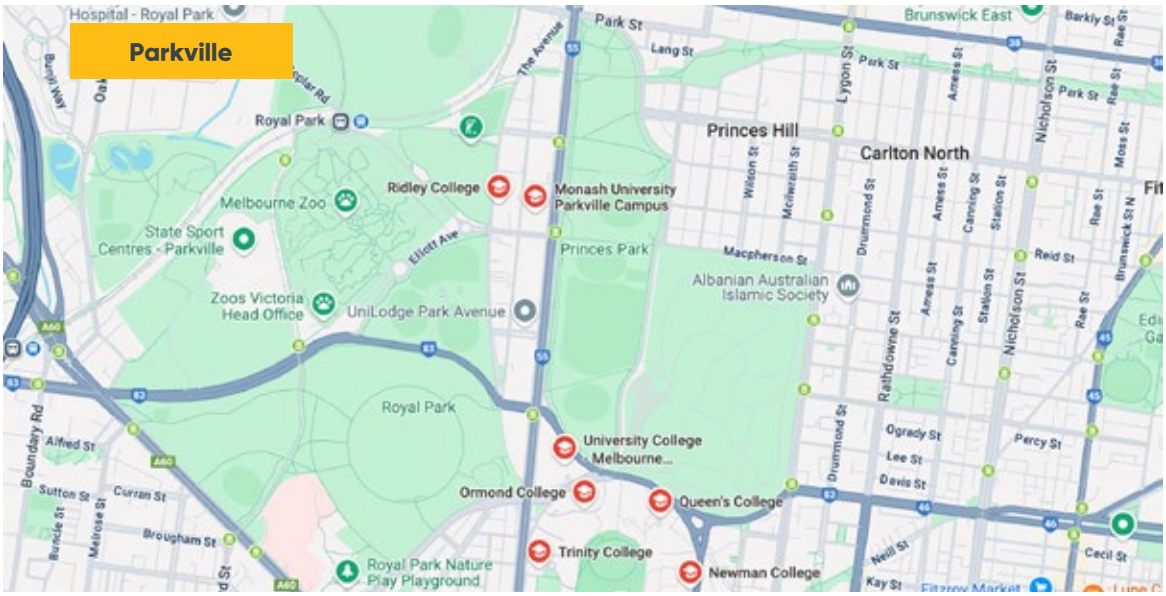
Infrastructure

Parkville is one of 15 Victorian National Employment and Innovation Clusters (NEICs), due to its location near the University of Melbourne, RMIT and the Monash Parkville campus.

Additionally, the presence of hospitals, non-profit organisations and the headquarters of CSL strengthen the ability for place-based innovation and coordination with industry.

However, the large number of NEICs across Melbourne dilutes the efficacy of any one cluster. Indeed, there is a risk that these priority precincts might cannibalise each other's output potential.

To 2023, the Parkville created close to 73,000 jobs, with an estimated 80,000 jobs created by the mid-2030s. Additionally, over the past decade, the precinct has received over $2.8 billion of investment capital and produces 20 per cent of Australia's patent citations.



Opportunities to improve linkages and commercialisation: case studies

Case study: SETSquared Partnership

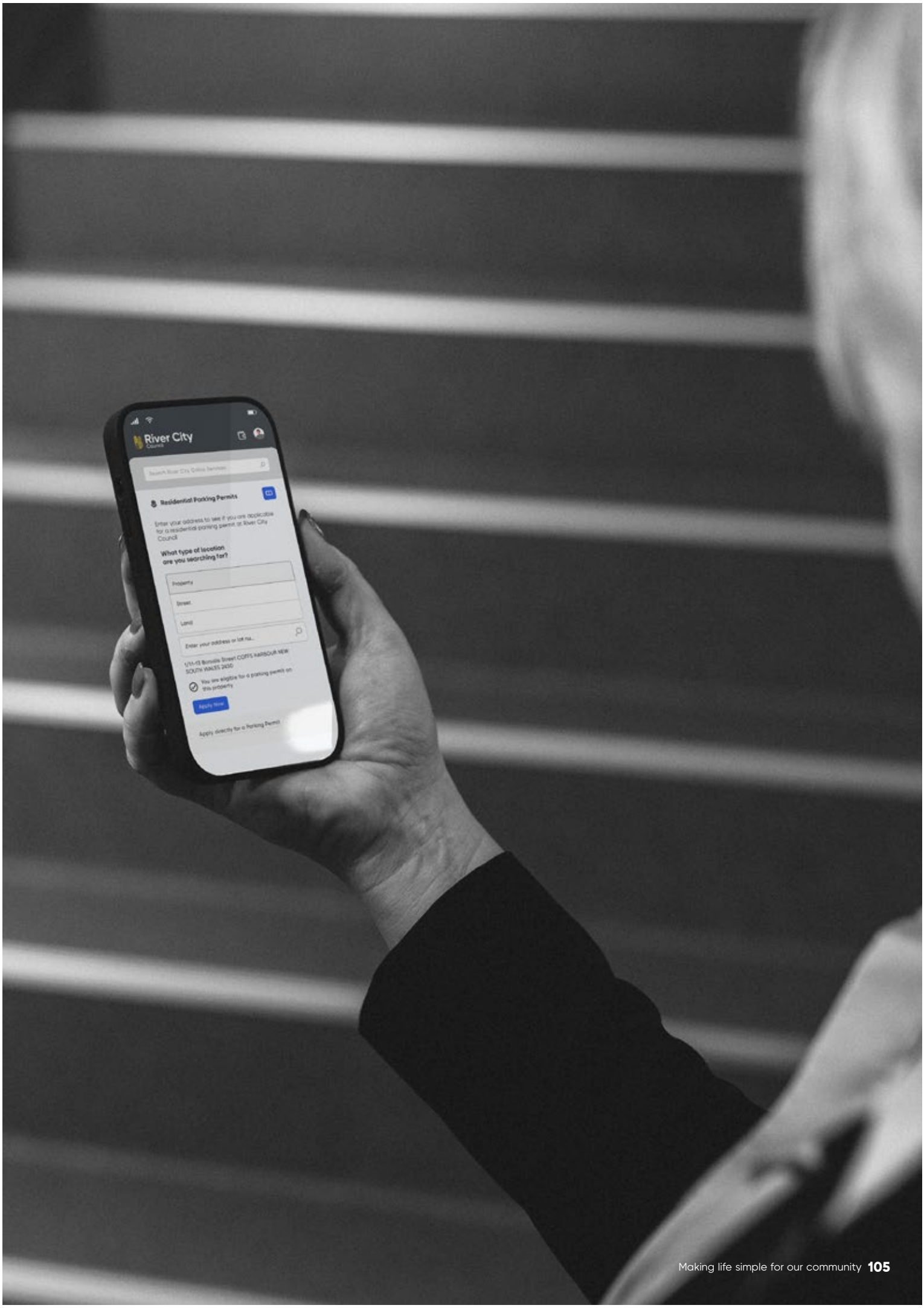
- SETSquared is a business incubator that partners with six universities across the south of England and Wales.
- Since launching in 2002, SETSquared has supported more than 5,000 entrepreneurs to raise £5 billion. The economic impact of these supported companies was estimated to be £15.7 billion, with the creation of 15,600 jobs.
- SETSquared acts as a pre-accelerator and accelerator for existing startups and scale-ups, providing them access to researchers to undertake cutting-edge R&D.
- Similarly, SETSquared also supports existing students, by helping them develop the skills necessary to commercialise an idea and build a startup.
- SETSquared operates programmes that support R&D in certain key sectors, including telecoms, clean transportation and health technology.

SETsquared PARTNERSHIP
Universities of Bath, Bristol, Cardiff, Exeter, Southampton & Surrey

Case study: LaunchVic

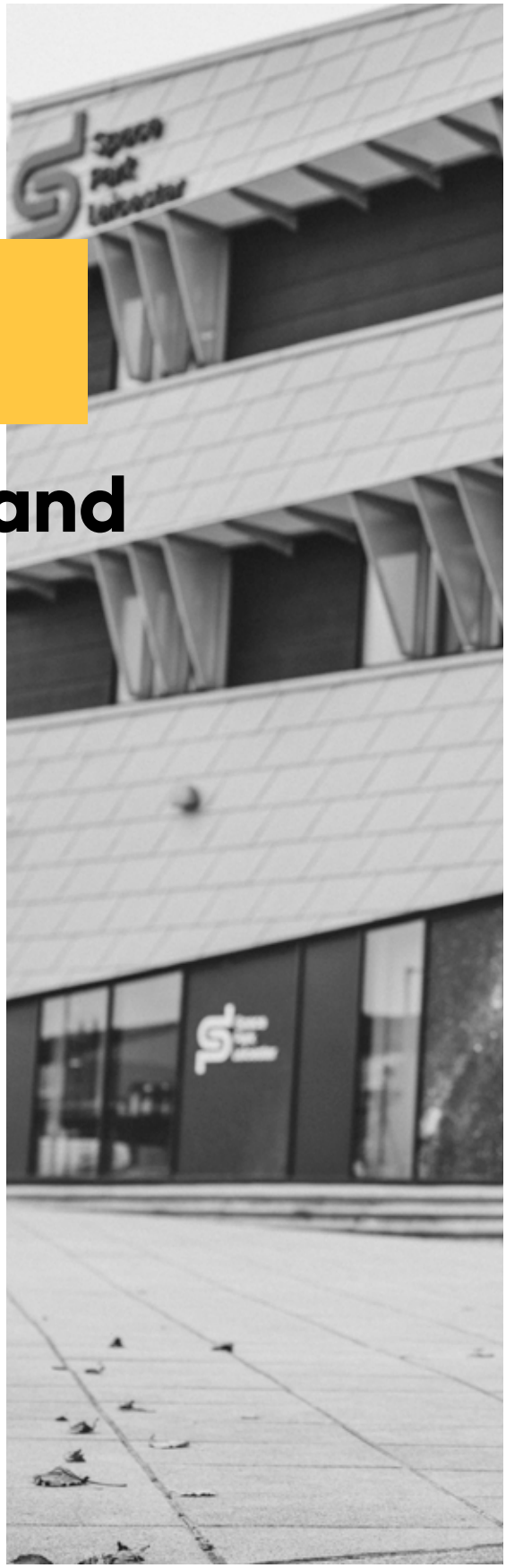
- LaunchVic was formed by the Victorian Government in 2016; since its launch, Victoria's startup sector has increased in total value from $5.6 billion to $103 billion.
- LaunchVic funds pre-accelerators and accelerators throughout Victoria, which support entrepreneurs in commercialising their ideas and scaling up their companies. In total, LaunchVic has funded 14 pre-accelerators, 15 accelerators, upskilled more than 11,000 entrepreneurs and supported the growth of more than 1,000 startups.
- As well as providing financial support to activators of innovation, LaunchVic also runs programs designed to improve founders' education, including its flagship 30X30 program, empowering them to make the best choices to scale up their businesses.
- Additionally, LaunchVic runs programs aimed at high-net-worth individuals, to empower them to engage strategically and with confidence in Victoria's startup ecosystem.
- Since its formation, LaunchVic has established nine new angel investor networks and five new VC funds.

launchvic

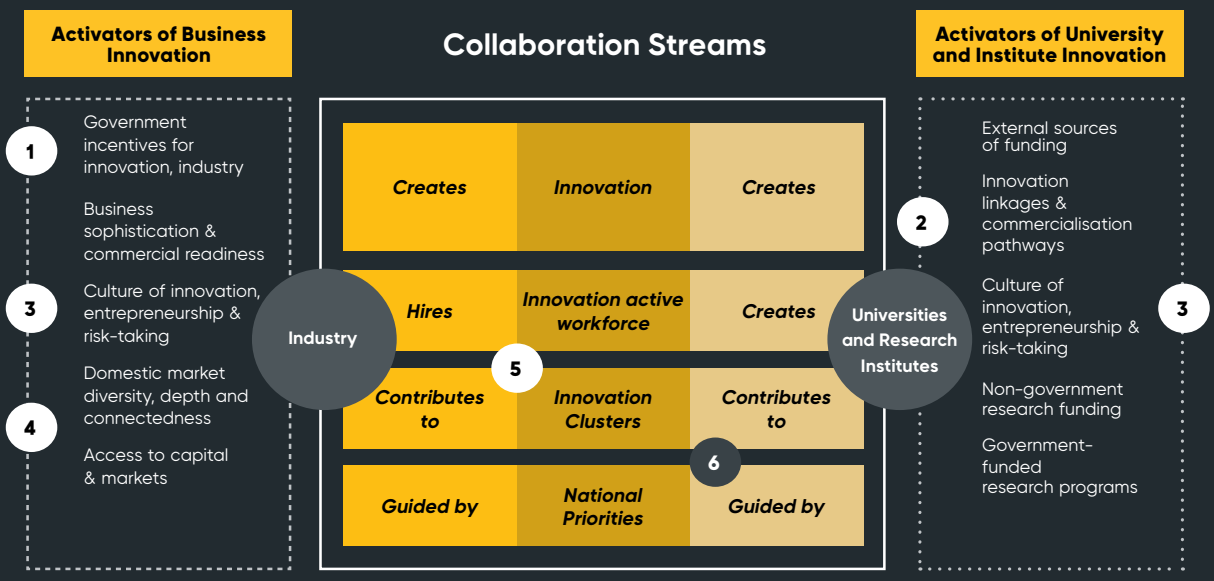

River City
Residential Parking Permits
Enter your address to see if you are applicable for a residential parking permit at River City Council
What type of location are you searching for?
Property
Street
Land
Enter your address or lot nu...
You are eligible for a parking permits on this property
Apply Now
Apply directly for a Parking Permit

Chapter 7

National priorities and a long-term vision



Key issues in Australia's innovation ecosystem: national priorities and a long-term vision



Issues in strategies around national priorities

A review of national strategies to support industry development reveals strong agreement on Australia's core areas of competitive advantage, There is also increasing recognition of the need for longer-term strategies to realise impact.

However, Australian policies for priority sectors and innovation clusters have been limited in scale and funding. A new long-term partnership approach is needed to drive step-change growth in investment.

Stakeholders consistently voiced concerns about policy churn following each election cycle and a progressive de-prioritisation of industry and innovation policy. Arguably, when one reviews successive policies for industry priorities there is relatively strong agreement for Australia's areas of competitive advantage, including:

- ICT
- Renewable energy
- Agriculture
- Health & life sciences
  Defence
- Value-added mining and metals manufacturing.

While there have been some initial efforts to improve the nature of investments to catalyse significant industry, there was strong and consistent consensus that a new, long-term, bi-partisanship approach, which cements innovation and industry growth as core economic policy, is needed that drives step-change growth in investment.


Total Value by Month YTD
Top 10 Groups by Qty YTD

Stakeholder perspectives on issues in national priorities

Our priorities change with each government. Not massively, but the emphasis shifts, and you lose the consistency and predictability for industry.

If you're trying to build a world leading innovation ecosystem, what you don't want, you don't want another government coming in four or five months later, deciding "I didn't invent this, so getting rid of it", which happens a lot in our type of democracy, I think.

When you look at successful systems, like in the Netherlands or Sweden, they have set a 10-year strategy and they have put real government support behind it. We need to get out of election cycles and get out of 'which Department' is running it today.

If you look at some of the markets, I mean, you know cyber protection around the world is Israeli, most of the good systems are out of Israel and because they've got a strength in that space. If you're looking at wind energy generation, it's Germany.
When you look around the world you can see, you know, certain countries are very much leading.

I have no idea what Australia is leading in? Mining? Well, I mean, you do a lot of mining, but, lots of people do a lot of mining.

Reliance on international student revenue for research funding poses risks and there is often a disconnect between university research and societal or industry needs.
We need to balance bottom-up, curiosity driven research with top-down, mission focused funding.

Government needs to set clear priorities, openly support success and improve/ strengthen the culture.

We lack certainty in policy priorities, they are always changing. Med tech is consistent, but transport is a labour priority, defence is more of a coalition priority... every time we get a new government it changes.

Future Made in Australia is a good start, but we need it to include more industries.

We need a larger, long-term vision where we are not concerned by 3-year goals and there is more stability in the system.

Industry and innovation policy needs to be seen as core economic policy, driven out of central agencies. When the CRC program was launched 30 years ago, it was launched by a Prime Minister.

We need a new agency, but that could actually be the kiss of death.

I know this sounds like a bit of a throwaway line, but I think we really need an attractive figurehead—someone who can galvanize and energise people.

Essentially, we need a national champion for this cause, probably someone who is well politically connected but comes from industry.

I think we end up falling short of realising the benefits that we could have if we had a longer-term view. And just rearranging [existing funding], It's not gonna do it.

I know that that's a sort of subtext of the Discussion Paper. It's about how do we use what we've got from government more effectively and bring in more from industry. But that really won't cut it [when you look at investment and competition from other countries]. It can't just be about redistributing what we've got because we're substantially under investing. And that needs to be a national priority – to increase that investment.

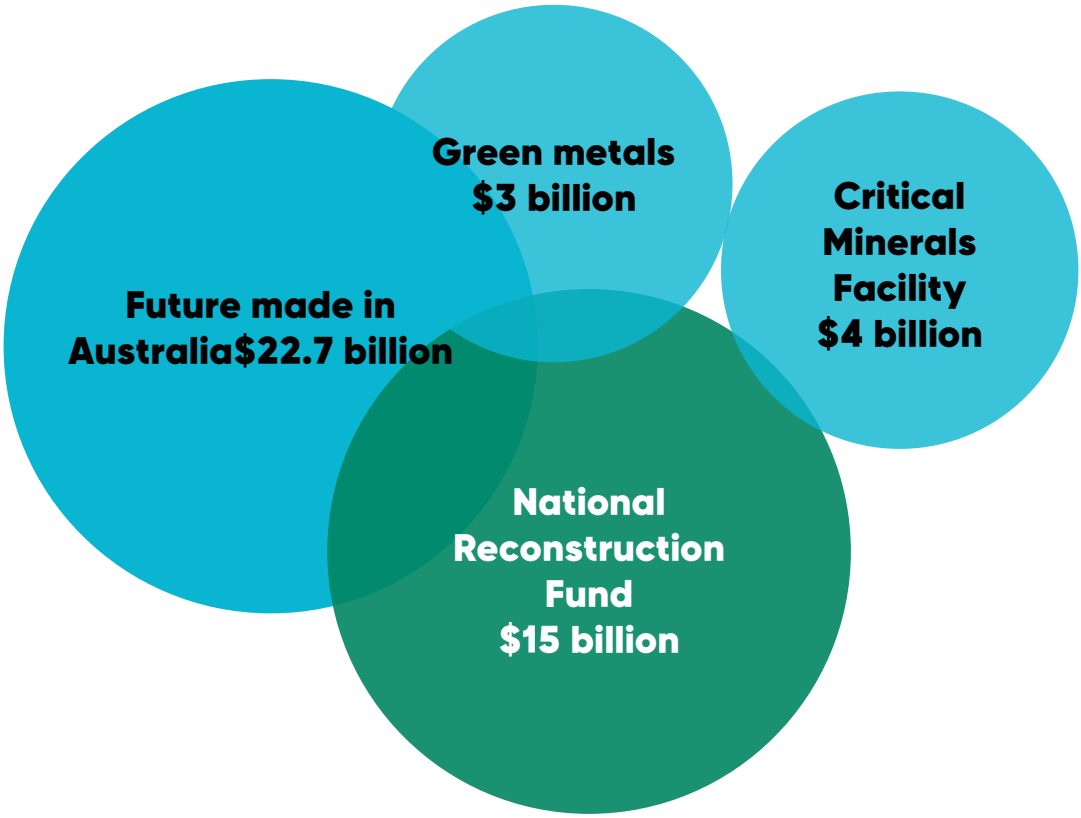
Strong alignment across initiatives of what are key areas of competitive advantage for Australia...

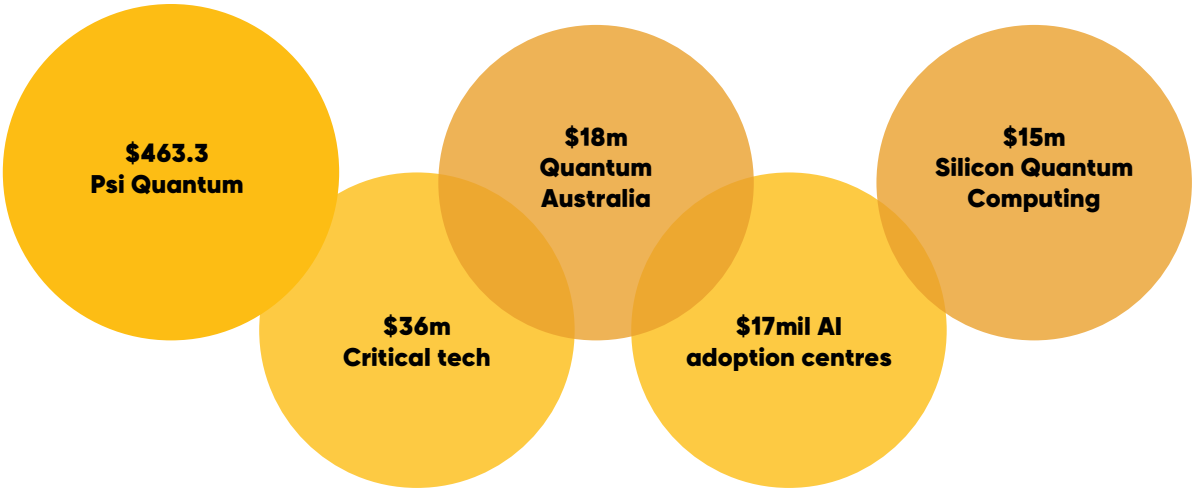
Priority Sectors	Modern Manufacturing	Industry Growth Centres	Future Made in Australia (Phase 1)	National Reconstruction Fund
Medical technology and pharmaceuticals	✓	✓		✓
Resources and mining	✓	✓	✓	✓
Oil, gas and energy	✓	✓	✓	✓
Food and agribusiness	✓	✓		✓
Defence and aerospace	✓			✓
ICT		✓ Cybersecurity		✓ (Enabling tech)
Other		Advanced Manufacturing		Transport

...with increasing recognition that strategies need to be longer-term, but approaches remain sub-scale with limited-to-no support for cluster development

National-level initiatives	Timing commitments	Coordination and clusters	Funding arrangements
Modern Manufacturing	Defines goals over 2, 5 and 10 years to establish a renewed Australian manufacturing sector.	Does not provide pathways for coordination between industry and academia.	$1.3 billion Modern Manufacturing Initiative$160 million in other initiatives.
Industry Growth Centres	Operated over nine years; each IGC provided a 10-year sector strategy.	Each IGC operates independently, some with a focus on building industry connections.	Funding of $3.5 million per GC per annum was provided, not contingent on sector need.
Future Made in Australia	Funding provided over the next 10 years for ongoing initiatives	Provides funding for industry and education recipients, but streams are independent.	A mixture of tax incentives and direct funding provided to program operators.
National Reconstruction Find	Provides financing in a way that guarantees long-term involvement from NRFC.	Does not provide pathways for coordination between industry and academia.	Uses a mixture of debt, equity and guarantee-based financing to industry.

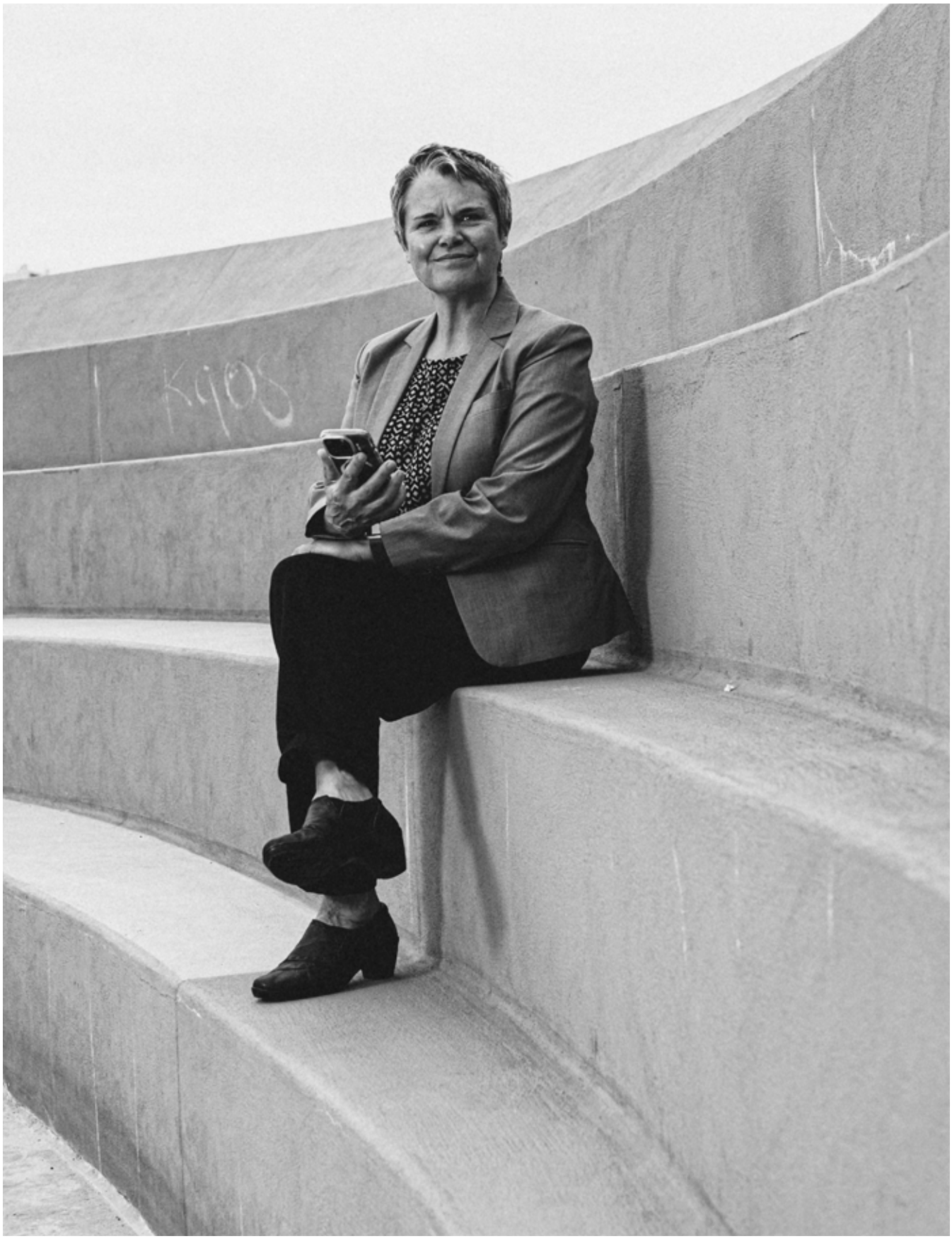
Current commitments good start, but highly concentrated and more is needed to support industry depth and diversity, clarity on sovereign supply





Chapter 8

Issues and opportunities for Australia's ICT sector



Australia has grown a strong ICT sector

Over the past decade, Australia's tech sector has emerged as one of the nation's strongest-performing sectors and a main source of new growth.

In 2020, it contributed almost $167 billion in value-added, or 8.5% of GDP. The sector boasts more than 860,000 jobs, both directly (within tech companies) and indirectly (through the tech-related activities of non-tech companies).

Our ICT sector is also globally competitive; Australia has produced 21 (2.2 per cent) of the world's around 920 tech "unicorns", or companies worth US$1 billion or more. This exceeds Australia's contribution to global GDP of 1.6 per cent.

Around 100 companies with a valuation of $100 million or greater have been founded in the past three decades, 67 of them since 2010. The value of publicly listed tech companies is now $570 billion, while the value of companies funded by Australia's venture capital market has risen more than 120-fold over the past 10 years, from $0.58 billion in 2010-11 to $70.1 billion in 2020-21.

Significant domestic players in the Australian ICT sector began to emerge in the dotcom boom of the 1990s, and grew steadily until a rapid acceleration from 2010. This coincided with strong foreign investment in Australian ICT, with Google opening its second office outside the US in Australia in 2002, and AWS entering the Australian market in 2010.

The rapid growth of ICT in Australia has brought with it foundational investment in cloud infrastructure, enabling the emergence of Australian-based SaaS platforms and supporting Australian software companies to scale globally.

The industry is comprised of three segments, as shown in Figure 8.1. The first accounts for ICT solutions for horizontal segments of the market, such as broad B2B or B2C technologies. The second outlines ICT solutions for specific industries, such as mining, agriculture & food, and health & life sciences. The third covers enabling and emerging technologies powering all applied ICT solutions.

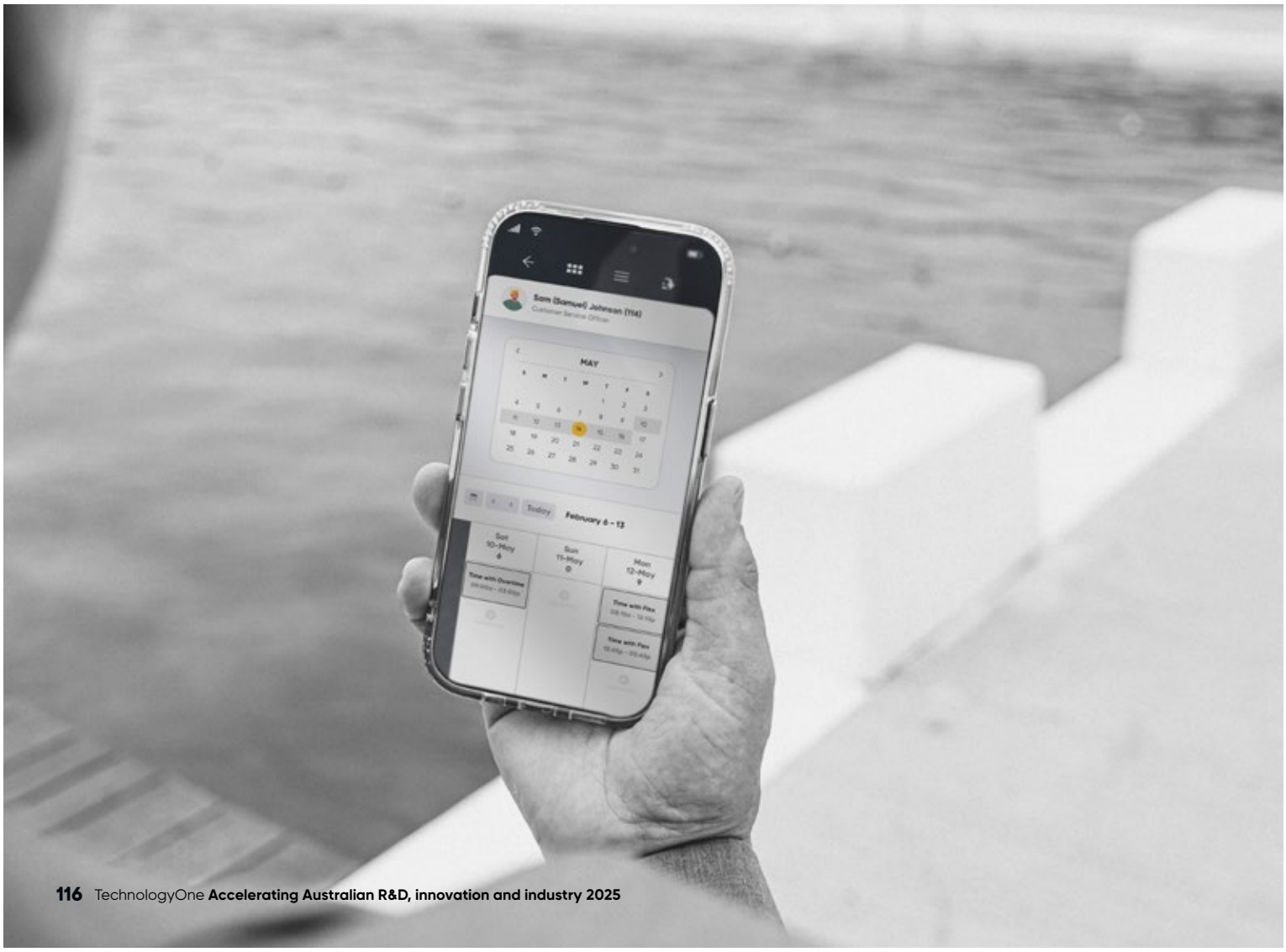


Figure 8.1: ICT sector breakdown by service, customer and industry

Source: Adapted from Tech Council of Australia, 2022, Turning-Australia-into-a-regional-tech-hub_Report-2022.pdf

Australia's ICT sector is strong and growing

Australia's ICT sector is a mature and growing industry that delivers significant economic benefits to the Australian economy, diversifies Australia's income base, generates highly skilled job opportunities, attracts foreign investment, and leads Australian innovation across a range of sectors.

From 2016 to 2021, the ICT sector has grown almost 80 per cent, generating $167 billion for the Australian economy in 2021 (8.5 per cent of GDP), and is projected to grow further to $250 billion by 2030, further solidifying its crucial role in the national economy.

Furthermore, in 2024, the sector was estimated to have employed 823,500 people, with an average advertised salary in FY23 of $132,000. This is 50 per cent higher than advertised jobs in other industries, reinforcing the fact that ICT jobs are highly skilled and well paid.

Source: Tech Council of Australia, ABS, Labour Force Survey, Detailed, February 2024, Jobs and Skills Australia (JSA) trend data based on ANZSCO codes identified as tech jobs by the Tech Council of Australia, Austrade, Digital Technology Report

$167B
or 8.5% of GDP

823,500
jobs Highly skilled Highly paid

41%
growth in investment 2019 - 2021

$16B
in exports

$3.7B
spent on R&D, 16% patents

ICT capabilities are strong and growing (continued)

Between 2003 and 2020, Australia was ranked 4th in attracting foreign direct investment (FDI) in ICT services globally. FDI activities are also growing rapidly, with almost 39,000 employees being hired by the top 10 foreign investors in Australia. FDI projects have been growing in scale over the past few years, with a 41 per cent increase in average capital expenditure between 2019 to 2021 and a 72 per cent increase in average jobs per project, delivering significant economic benefits to the Australian economy. Furthermore, the ICT sector is a leader in R&D, representing about 18 per cent of total BERD in 2022, second only to manufacturing, by industry.

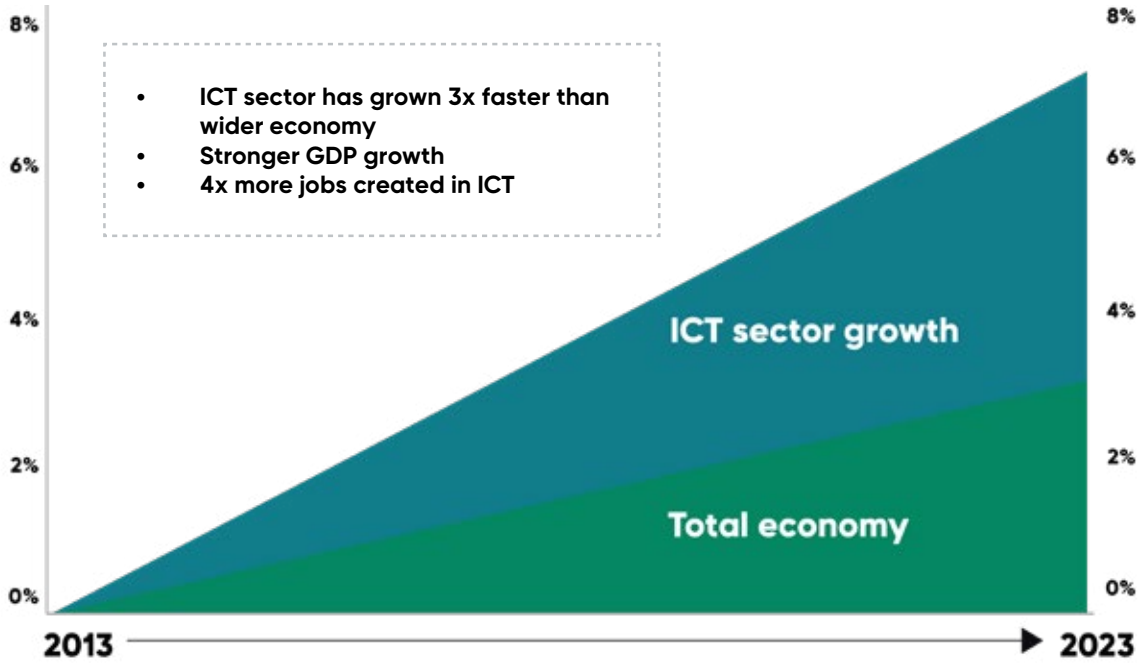
The ICT sector is a major contributor to Australia's export profile. In 2023, the industry generated $16.8 billion in exports, making it the largest non-commodity export industry behind the education sector.

Finally, ICT technologies have remained a significant source of patent applications in Australia, accounting for an average of 16 per cent of all Australian applications filed under the Patent Cooperation Treaty. Even considering other types of patents, technology plays an indirect role across many other industries, influencing innovation activity beyond simply ICT.

As technology becomes more embedded in industrial capability across all sectors of the economy, Australia must foster its domestic technology sector.

OECD data shows that, between 2013 and 2023, the ICT sector grew almost three times faster than the wider economy. Moreover, ABS data reported by the Tech Council of Australia showed the ICT sector created four times more jobs from 1986 to 2022, and grew three times faster than the wider economy between 2013 and 2022.

ICT sector growth outpacing the wider economy



Source: OECD, 2024, OECD Digital Economy Outlook 2024 (Volume 1) and Tech Council of Australia

ICT capabilities are inherently linked to larger issues of sovereign capability

Historically, while issues of self-reliance and sovereign capability have been confined to the defence sector, the ICT sector's growing entwinement with almost every other part of the economy has ensured more systems and critical infrastructure that are "mission critical" to service delivery by government. The security of the supply of ICT capability is increasingly core to the competitiveness and resilience of wider Australian industry. Key examples include:

- **Payment systems**
- **Consumer data, especially financial and health data**
- **Cloud capabilities**
- **Cybersecurity systems**
- **Internet of Things (IoT) systems for the control of infrastructure.**

As an example, data protection concerns have prompted a number of reviews and recommendations for a "whole of economy data security uplift" by the Department of Home Affairs.

Moreover, some ICT technologies are also classified as "critical technologies" by Australia's Critical Technologies Hub, which advises the government on critical technology opportunities, developments and risks.

Critical technologies are "current and emerging technologies with the capacity to impact our national interest". These fields are:

- **Advanced manufacturing and materials technologies**
- **Artificial intelligence (AI) technologies**
- **Quantum technologies**
- **Autonomous systems, robotics, positioning, timing and sensing**
- **Advanced information and communication technologies.**

Australia's existing strengths in ICT are underpinned by a few highly successful companies

Australia has a natural strength in creating and growing startups in dominant areas of the traditional economy. As a result, understanding the areas of the tech sector where Australia has local and global comparative advantage is critical in designing a strategy to grow the sector.

The value of the Australian ICT sector is concentrated in five key segments, which are:

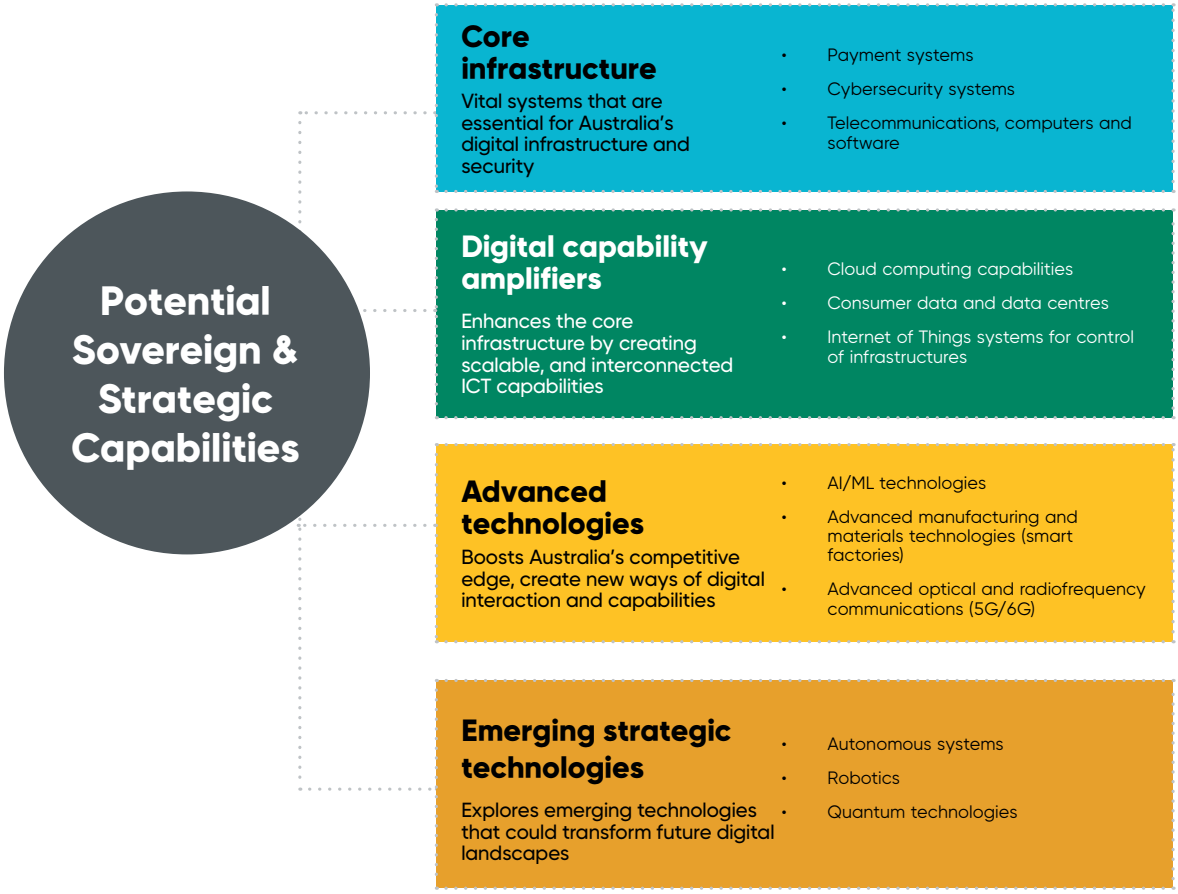
- **Business software (25 per cent of the tech sector)**
- **Biotech (21 per cent of the tech sector)**
- **Medical devices (11 per cent of the tech sector)**
- **Media & design (9 per cent of the tech sector)**
- **Pay tech (5 per cent of the tech sector**

Each of these sub-sectors is anchored by one or two significant companies with a global footprint, around which ecosystems can be built. For example, the biotech sector is dominated by CSL, while manufacturers ResMed and Cochlear represent more than 95 per cent of the medical devices sub-sector.

The dominance of these successful companies doesn't necessarily translate into startup activity in these sub-sectors, however. Australia's share of global startups in the medical devices and biotech subsectors (1.4 per cent and 1.3 per cent, respectively) is less than Australia's share of all global ICT startups (1.7 per cent).

Conversely, Australia holds a relatively larger share of global primary industries technology startups, such as mining tech (8.2 per cent), ag tech & food tech (2.8 per cent) and construction tech (2.7 per cent). This suggests that Australia is good at creating startups that are adjacent to and enable dominant areas of the traditional economy.

Key capabilities in the ICT sector go to larger issues of self-reliance: cybersecurity, cloud technologies, payment systems, data security



Source: Insight Economics analysis

The global ICT market is changing rapidly, with market consolidation and global trade practices threatening future market growth

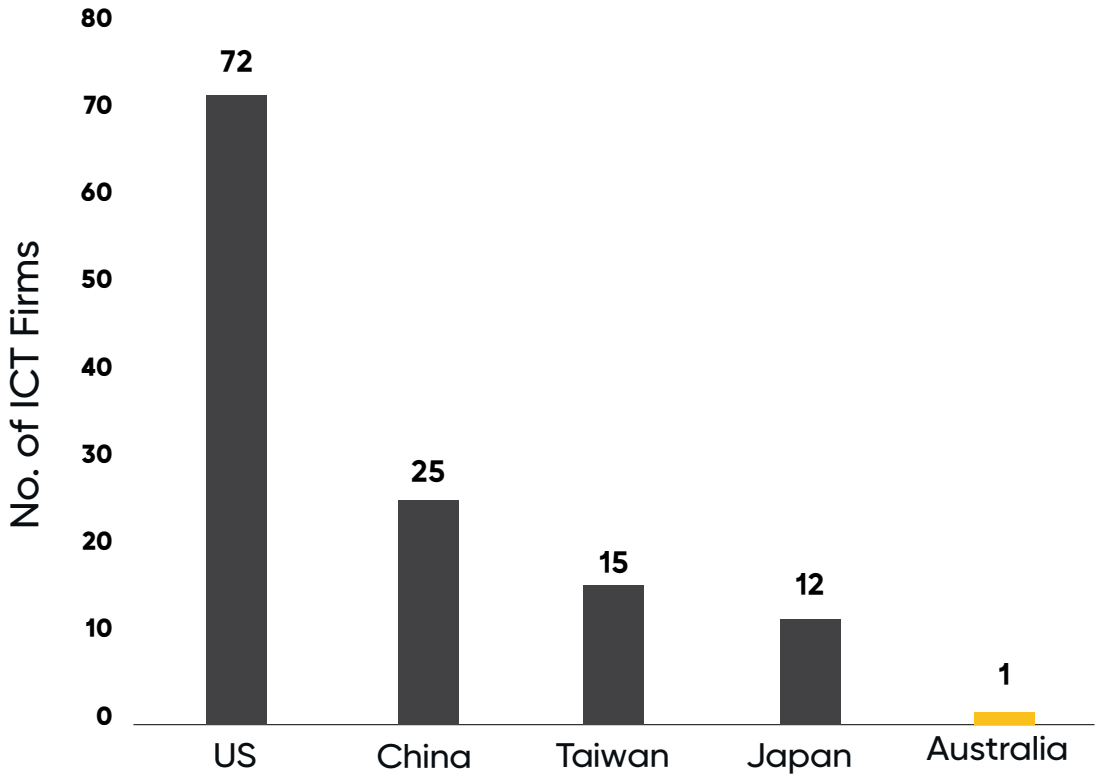
While, on the whole, Australia's ICT sector has enjoyed strong growth, there are new challenges emerging, with market consolidation in the global ICT sector accelerating in the last 10 years. Forbes' Global 2000 ranking of the world's largest publicly-held companies in 2024 was shown to be the "most US-centric" it had been since prior to the 2008 financial crisis.

This is a direct product of the meteoric rise of the

"Magnificent 7" technology stocks, which, combined, now account for more than 22 per cent of the S&P 500.

72 of the world's largest tech companies are based in the US, with the next largest markets being China (25), Taiwan (15) and Japan (12). Conversely, Australia had only one company on this list (Wisetech Global). This market consolidation was predicated by a small number of very large firms exercising their significant market power. These firms enjoy cost advantages made possible by complex corporate structuring not available to Australian-domiciled firms.

Figure 8.2: ICT firms on the Forbes Global 2000 ranking by country



Source: Forbes, 2024, Forbes' Global 2000 ranking, technology companies.

In spite of Australia's strong performance, the sector is undersized relative to our peers and lacks a world-leading cluster

Time has demonstrated the efficacy of a place-based innovation strategy, with technology and innovation clusters often leading the charge for national R&D efforts. Some of the top tech clusters in the world, such as San Francisco, Tokyo and Beijing are able to mobilise industry and academia to spur innovation and grow burgeoning companies. However, Australia has failed to support the growth of tech clusters in major cities, leading the rest of the world to outpace Australia.

According to Startup Genome's Global Startup Ecosystem Report 2024, Sydney was the highest ranked Australian startup ecosystem, at 21. This falls below other major cities with a cohesive cluster strategy, such as Toronto (18), Seoul (9) and Tel Aviv (4). In fact, there are 9 cities in the US alone ranked higher than Sydney. Below Sydney, Melbourne comes in at rank 32.

Top 10 Tech Clusters		
By VC Investment	**By Unicorn Start-ups**	**By Patent Filings**
San Francisco	San Francisco	Tokyo - Yokohama
Beijing	Beijing	Shenzhen-Hong Kong
Shanghai	New York	San Francisco
New York	Los Angeles	Seoul
Boston	Shanghai	Osaka-Kobe-Kyoto
Los Angeles	Boston	San Diego
London	London	Beijing
Shenzhen	Seattle	Boston
San Diego	Hangzhou	Nagoya
Seattle	Chicago	Paris

Source: Kerr, W.R. and Robert-Nicoud, F., 2020. Tech Clusters, Havard Business Review, accessed at: 20-063_97e5ef89-c027-4e95-a462-21238104e0c8.pdf

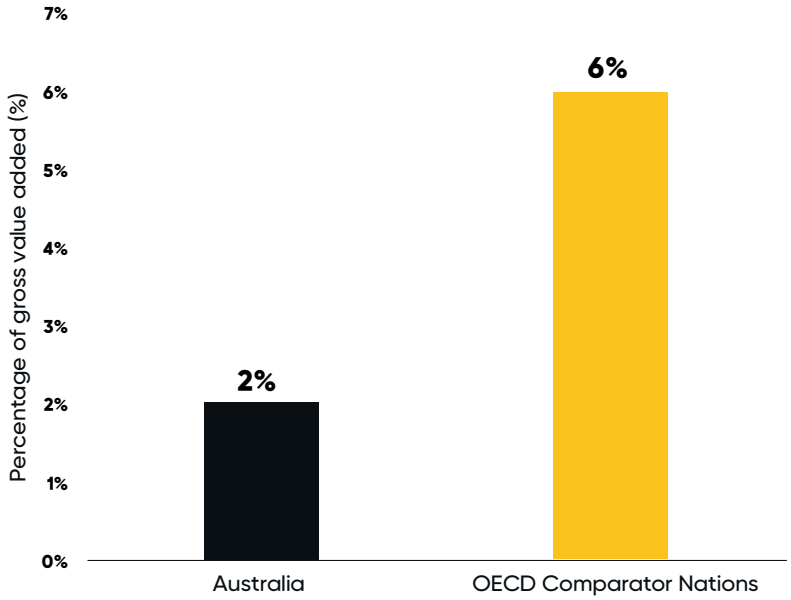
Australia's ICT sector is undersized, unfocused and lacks a nationally cohesive strategy for sovereign capability

In spite of Australia's strong performance in some areas of ICT, the size of the sector as a whole is small, relative to other developed nations. Concretely, the ICT industry accounted for 2 per cent of gross value added to Australian GDP in 2024, compared to 6 per cent among OECD comparator nations. However, Australian ICT firms have higher rates of R&D intensity compared to global peers, cementing the fact that the Australian ICT sector is a driver of innovation.

In spite of this, the Australian Government has so far avoided implementing a long-term strategy for sovereign capability. In June 2024, the Australian Senate recommended the Government develop a clear and operational definition of sovereign capability as part of the broader Future Made in Australia agenda, to be used to inform future procurement decisions.

Moreover, Australia's innovation cluster strategy has lacked direction and cohesion, with the federal Government not taking a hands-on role in cluster development and ICT sovereign capability.

Figure 8.3: ICT sector share of Gross Value Added (2024)



Source: ABS and comparator nation Gross Value Added data (2024) reported DISR, 2025, Strategic Examination of R&D Discussion Paper, p 25.

No vision for Australia's technology sector, or coordinated approach across its clusters... with no clear definition of sovereign capabilities in ICT.

Potential Sovereign & Strategic Capabilities

Core infrastructure

Vital systems that are essential for Australia's digital infrastructure and security

- **Payment systems**
- **Cybersecurity systems**
- **Telecommunications, computers and software**

Digital capability amplifiers

Enhances the core infrastructure by creating scalable, and interconnected ICT capabilities

- **Cloud computing capabilities**
- **Consumer data and data centres**
- **Internet of Things systems for control of infrastructures**

Advanced technologies

Boosts Australia's competitive edge, create new ways of digital interaction and capabilities

- **AI/ML technologies**
- **Advanced manufacturing and materials technologies (smart factories)**
- **Advanced optical and radiofrequency communications (5G/6G)**

Emerging strategic technologies

Explores emerging technologies that could transform future digital landscapes

- **Autonomous systems**
- **Robotics**
- **Quantum technologies**

The Sydney Arc

The Sydney super-cluster forms an arc extending over North Ryde, Chatswood, Lavender Bay, Millers Point and Redfern. It contains 119,636 workers in digital occupations (20.1% of the national total) and B1 ASX listed digital technology companies worth $52 billion. This cluster contains the Australian-HQ for many international tech companies such as Google, Microsoft, Amazon and LinkedIn

The Melbourne Diamond

With its crown in Parkville and culet in St Kilda the Melbourne diamond super-cluster covers the Docklands to the west and Richmond to the East. It contains 95,122 workers in digital occupations (16% of the national total and 62 ASX-listed digital technology companies worth $203 billion. A number of international tech companies have their Australian HQ in this cluster.

The Brisbane Corridor

A trip from Bowen Hills to Toowong along Ann Street and Coronation Drive past the city centre will take you through the Brisbane corridor. This super-cluster employs 33,534 workers in digital occupations (5.6% of the national total) and contains 19ASX-listed digital companies worth $13.29 billion.

The Canberra Triangle

Centred on the city at Civic the Canberra super-cluster employs 19,362 workers in digital occupations (3.3% of the national total) and contains 2 ASX-listed digital companies wirth $60.14 million.

Basemap sources: Esri,HERE, Garmin, Intermaps, increment

The global tech sector rewards domestic specialisation over broad service delivery

The increasingly important role of ICT services in modern economies is only beginning to be properly understood. Because of growing interconnectedness in global markets, Australia must work to retain world-leading capabilities in order to stay globally relevant.
In the past, domestic industry has been still able to survive in spite of global competition and increasing market concentration. While the global car market has been dominated by US, Japanese and European companies, until recently, Australian manufacturers were still able to operate and compete in the domestic market.

With ICT services, this is no longer the case. With fewer barriers to international commerce than other industries, as well as growing market concentration, domestic ICT providers are often being crowded out by more cost-effective, more innovation-active global firms. To compete in this new environment, ICT firms must invest in depth, rather than breadth. Australia must lean into its strengths and build our deep tech knowledge base.

One example of Australian ICT specialisation is in quantum computing. ANU has invested in research on quantum computing over the past decade, with the university recently announcing a partnership with Fujitsu to build a quantum research centre on campus at ANU. Australia's global "head start" on quantum technology has yielded some promising initial results. Australian quantum technology startups account for 3.2 per cent of all global quantum startups, almost double Australia's total share of startups (1.6 per cent).

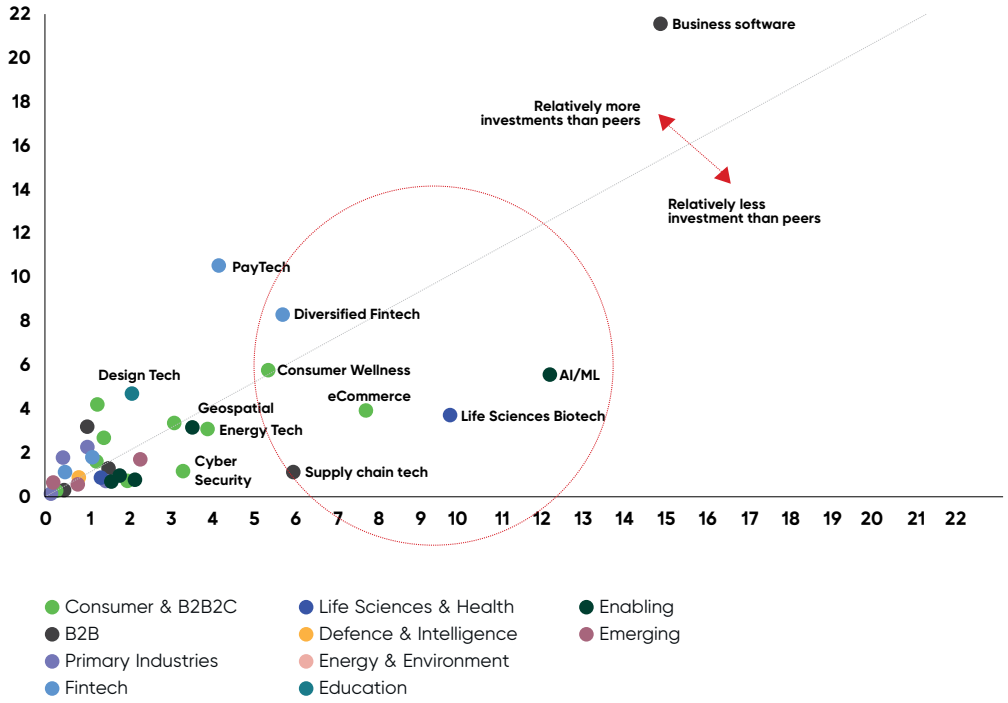
However, a lack of direction and commercialisation pathways for new quantum technologies means that Australia is being outpaced by economies with more resources and greater national direction. For example, China recently announced that it had broken RSA security algorithms using quantum decryption. Given the cybersecurity implications of this technological progress, we cannot afford to be left behind in quantum computing.

Some aspects of ICT dominate the Australian VC market, while important enabling technologies are left behind.

Australian tech companies grew by an average of 35 per cent year-on-year between 2016 and 2021, a result of both continued success of well-established companies, and the successful transition of smaller companies from their startup phase. Between 2017 and 2021, $24.6 billion of venture capital (VC) was invested in the Australian tech sector, comprising a majority of the $29 billion of total Australian VC funding.

However, this money was allocated disproportionately toward easily scalable technologies like business software and fintech, and areas where Australia has a competitive advantage, such as pay tech. Smaller and more specialised segments, such as quantum tech, media/design and energy tech also drew a competitive share of funding in Australia. Conversely, in some specialist or deep tech sectors, such as AI/ML, biotech and cybersecurity, Australian startups received comparatively less VC funding than international counterparts.

Figure 8.4: Comparison of VC funding in Australia and globally in 2020-2021, % of total funding



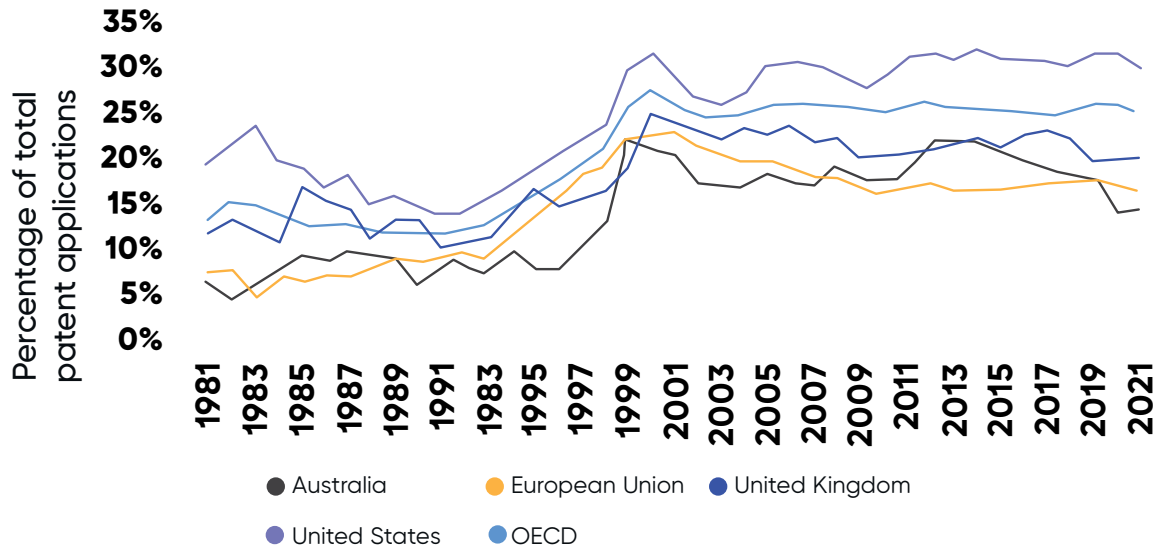
Source: Tech Council of Australia, 2022, Turning-Australia-into-a-regional-tech-hub_Report-2022.pdf

Australia's ICT sector faces potential risks to its growth potential and competitiveness

Combined, these factors impose barriers to market entry and reduce the ability of Australian firms to compete internationally. Limited US anti-trust action, as well as global tax reform efforts, have done little to counteract the steady erosion of competition in the ICT sector. This leaves an unequal playing field for local firms, which disadvantages Australian companies and, over time, can have potentially wide-ranging second order impacts on Australian ICT firms, the people they employ, and the potential knowledge spillovers these firms generate for the broader economy.

Made in Australia program, and $15 billion to the National Reconstruction Fund Corporation, both of which are focused on improving Australian sovereign capability.
Figure 8.5: ICT as a proportion of total patent applications through PCT.

Figure 8.5: ICT as a proportion of total patent applications through PCT



Source: OECD, MSTI Database, accessed October 9, 2024.

Chapter 9

Putting it all together – a road map for change

A plan for action: summary of key opportunities

1 **Fund new national agenda for R&D and innovation organised around priority clusters**

- Define priority sectors and the vision for priority sectors
- Invest in cluster development over 10-year horizon, contingent on industry co-investment
- Through clusters, invest in programs for entrepreneurship and skills development
- Invest in campaign to improve community awareness, value of business innovation and investment

2 **Review incentives for innovation and investment**

- Review effectiveness and efficiency of existing programs, potentially redirecting some funding towards more targeted initiatives, including cluster development
- Minimise duplication nationally
- Revisit wider incentives for innovation and industry investment (e.g., Henry Review)

3 **Increase government expenditure on R&D**

- Match or exceed OECD average

4 **Increase industry depth and diversity**

- Align procurement strategies with innovation and industry growth agenda

What does an integrated, sustainable, dynamic and impactful Australian R&D system look like?

With action, Australia can develop an integrated, sustainable, dynamic and impactful Australian R&D system, underpinned by a national network of Australian innovation clusters, that leverages strong industry investment and fosters collaboration across sectors and disciplines in priority sectors, and is governed by a world-leading tripartite model of governance.

National Network of Australian Innovation Clusters

- Part of wider innovation and industry investment strategy
- Organised around priority sectors
- Clusters selected through competitive selection process of market-led consortia

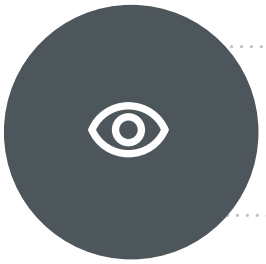
National entity to lead 10-year bi-partisan strategy for industry growth

Clusters implemented with best practice governance models implemented nationally, with funding for:

- Cluster champions/leaders
- Networking and events
- Investment attraction strategies
- Programs to support entrepreneurship
- Access to shared facilities
- Skills development

Whole-of-government policy alignment, including procurement strategies and campaign for culture change

An action plan for growth – implications for the technology sector



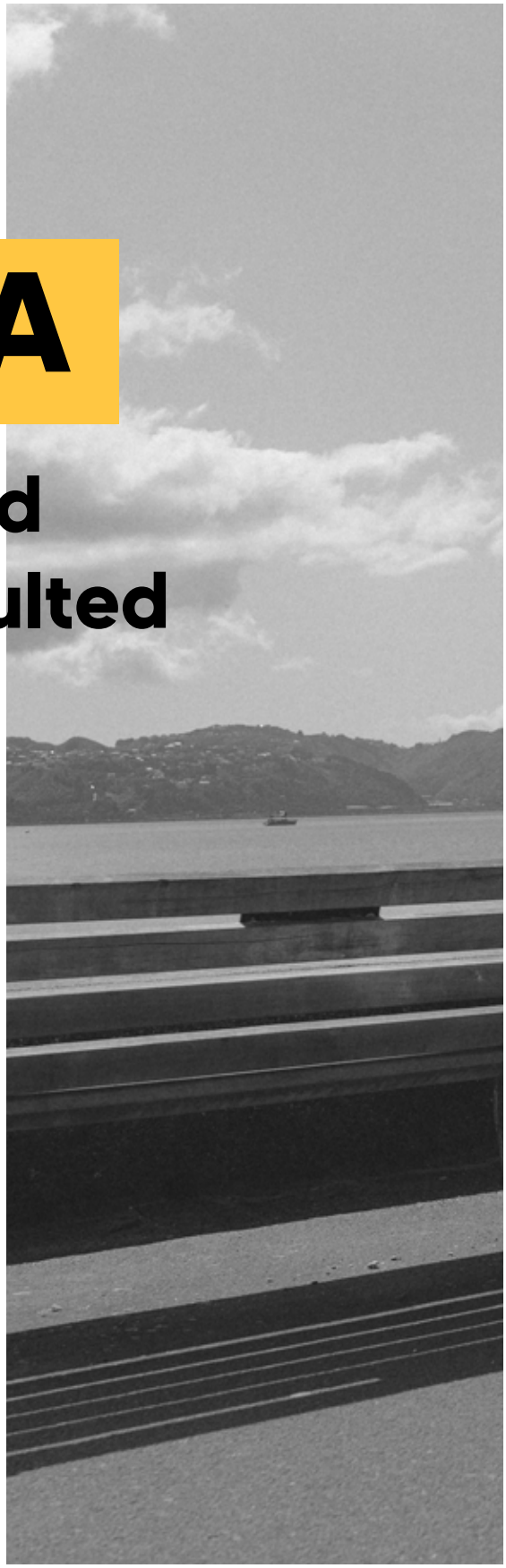
- Bi-partisan support for ICT as a priority sector
- Vision for sector growth established
- Sovereign capabilities defined

- Define and develop world-leading technology clusters around specific areas of competitive advantage nationally
- Fund governance and leadership of clusters, including Australian cluster champions
- Invest in entrepreneurship and skills
- Change management & value campaign

- Align procurement strategies with national priorities
- Government as 'first customer'
- Review innovation and wider industry incentives to ensure Australia is a globally competitive location for investment

Appendix A

Expert advisors and stakeholders consulted



Expert advisory panel

Prof Ian Smith

Ian is a research academic and former Vice-Provost (Research and Research Infrastructure) at Monash University, where he led research infrastructure, strategy, and alliances. An accomplished medical researcher, Ian has applied proteomics technologies to study brain and cardiovascular function, resulting in over 250 publications and numerous patents, with direct impact on clinical practice.

He co-founded a proteomics-based biotechnology company and continues to collaborate with the pharmaceutical and biotech industries. Ian serves on six international editorial boards and has held leadership roles in various national and international societies. He is an experienced board member, chairing the Queensland Cyber Infrastructure Foundation (QCIF), the National Foundation for Medical Research and Innovation (NFMRI) Research Advisory Committee, the NCRIS-supported Population Health Research Network (PHRN), and the European Molecular Biology Laboratories Australia (EMBLA) Council. Ian also chairs the International Scientific Advisory Board for Euro-Bioimaging and plays a significant leadership role in the European Strategy Forum for Research Infrastructures (ESFRI).

Dr Leonie Walsh

Leonie has an extensive international career spanning innovation, technology commercialisation, and supporting the growth of start-ups, scale-ups, and technology-led business models at the interface of industry, academia, and government. She was the Inaugural Lead Scientist for the Victorian Government.

Her current roles include Independent Board Director at RayGen Resources, Industry Growth Program Committee member, Board Chair for the Solving Plastic Waste CRC, Independent Director of the Australian Institute of Nuclear Science and Engineering, Swinburne University Council member, and Advisory Council Chair for the Defence DST OCE STaR Shot.

Leonie holds a BSc and MSc from Swinburne University, an MBA (Exec) from the Australian Graduate School of Management, and a Graduate Diploma from the Australian Institute of Company Directors. She is a Fellow of the Australian Academy of Technology and Engineering and was awarded an Honorary Doctorate

(HonDUniv) from Swinburne University in 2014 for her leadership in scientific enterprises, innovation, and the community.

Branko Panich

Branko Panich is a senior executive with a broad experience base developed over 30+ years with a range of blue-chip organisations globally. He has a passion for building strong teams, developing strategy with stakeholder buy-in, and leading a program of change that delivers tangible benefits for the business, its customers and its staff.

Branko has extensive experience across all areas of technology management and consulting from IT strategy to digital transformation, application development, operations management, sales, and outsourcing. Branko has a proven track record of strong strategic engagement, operational delivery, and sales management. He has had various senior executive roles including NED, CEO, CIO, and Managing Partner - Consulting.

Branko has worked in Australia, USA, South Korea and New Zealand mainly in financial services, public sector/Defence, professional services, telecommunications and industrials. Branko has also served as Honorary Fellow & Chairman of the Industry Advisory Group at the School of Computing & Information Systems for the University of Melbourne.

Dr David Charles

Dr Charles has had experience at the highest levels of decision making in the Commonwealth Government having been a Divisional Head in PM&C, Deputy Secretary in the Department of Employment and Industrial Relations and head of the Department of Industry.

During the time he was Head of the Industry Department, David was closely involved in a series of initiatives to restructure existing industries and to create the conditions for new industries to emerge. The latter work generally aimed to create a climate favourable to innovation and the attraction of direct investment by world leading companies. It generally involved dealing with complex groups of stakeholders at senior decision-making levels.

After leaving the Commonwealth Public Service, Dr Charles held senior positions in the Allen Consulting Group, of which he was one of the three founders, as well as Insight Economics and founding Deloitte's economic practice in partnership with Melanie Kelly. During this time, he worked on a number of complex consulting projects for Commonwealth and State Governments, industry associations, and companies across the manufacturing sector.

Stakeholders consulted

Name	Organisation
Professor John Lathan CBE	Coventry University
Ross Young	University of the Sunshine Coast
Andrew Woolnaugh	University of Melbourne
Adrian Pearce	Cremorne Digital Hub, University of Melbourne
Duncan Buckeridge	University of Tasmania
Jane O'Dwyer	Cooperative Research Australia
Innes Willox	Australian Industry Group
Sukvinder Heyer	Grant Thornton
Rita Choueiri	RSM
Julian Lincoln	Herbert Smith Freehills
Rosalyn Hore	Formerly Department of Education, CSIRO
Bruce Bayley	SPP
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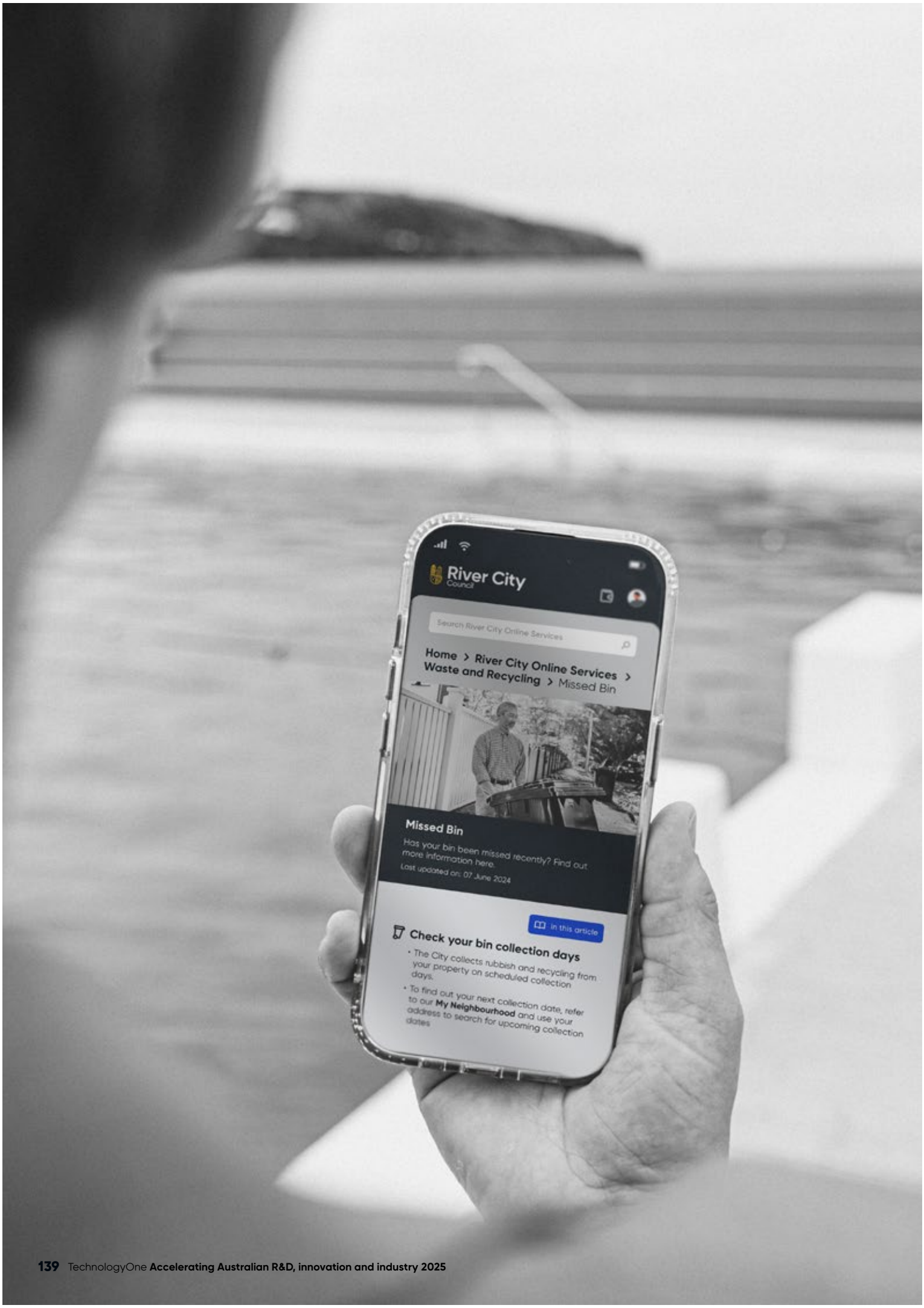
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Appendix B

References

References

ACIL Allen Consulting. (2020). Industry Growth Centres Initiative: Initial impact evaluation. Australian Government Department of Industry, Science, Energy and Resources. *https://acilallen.com.au/uploads/projects/589/ACIL-*

Agrawal, A., & Cockburn, I. (2003). The anchor tenant hypothesis: Exploring the role of large, local, R&D-intensive firms in regional innovation systems. International Journal of Industrial Organization, 21(9), 1227–1253 *https://doi.org/10.1016/S0167-7187(03)00081-X*

Australian Bureau of Statistics. (2023). Research and Experimental Development Businesses, Australia: 2021–22 financial year. *https://www.abs.gov.au/statistics/industry/technology-and-innovation/research-and-experimental-development-businesses-australia/latest-release*

Australian Bureau of Statistics. (2024). Australian National Accounts: National Income, Expenditure and Product. ABS *https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-national-income-expenditure-and-product/latest-release*

Australian Bureau of Statistics. (2024). Counts of Australian Businesses, including Entries and Exits, July 2020 - June 2024. Australian Bureau of Statistics. *https://www.abs.gov.au/statistics/economy/business-indicators/counts-australian-businesses-including-entries-and-exits/jul2020-jun2024*

Australian Bureau of Statistics. (2024). Innovation in Australian Business, 2022-23 financial year. Australian Bureau of Statistics. *https://www.abs.gov.au/statistics/industry/technology-and-innovation/innovation-australian-business/2022-23*

Business Finland. (n.d.). Funding for research and development. *https://www.businessfinland.fi/en/for-finnish-customers/services/funding/research-and-development*

Education. (2023). Department of Education Annual Report 2022–23: Our performance. Australian Government Department of Education. *https://www.transparency.gov.au/publications/education-i/department-of-education-i/department-of-education-annual-report-2022-23/performance-statements/our-performance*

Department of Education. (2024). International student numbers by country, by state and territory. Australian Government Department of Education.

Department of Industry, Science and Resources. (2024). Science, research and innovation (SRI) budget tables. Australian Government Department of Industry, Science and Resources. *https://www.industry.gov.au/publications/science-research-and-innovation-sri-budget-tables*

Department of Industry, Science and Resources. (2025). Strategic Examination of R&D discussion paper. Australian Government. *https://storage.googleapis.com/converlens-au- w/p/prj31a02fa37c9ece8370e29/page/SERD_Discussion_Paper.pdf*

Forbes. (2024). The Global 2000 2024. Forbes. *https://www.forbes.com/lists/global2000/*

Glaeser, E. L., & Kerr, W. R. (2009). Local industrial conditions and entrepreneurship: How much of the spatial distribution can we explain? Journal of Economics & Management Strategy, 18(3), 623–663. *https://doi.org/10.1111/j.1530-9134.2009.00225.x*

Harvard Growth Lab. (2022). Country & Product Complexity Rankings. The Atlas of Economic Complexity. *https://atlas.hks.harvard.edu/rankings*

Henry, K. (2010). Australia's future tax system: Report to the Treasurer, December 2009, Part One. Commonwealth of Australia. *https://treasury.gov.au/sites/default/files/2019-10/afts_final_report_part_1_consolidated.pdf*

Hershan, D. (2025). Is Australia becoming the Mediocre Country? Livewire Markets.
https://www.livewiremarkets.com/wires/is-australia-becoming-the-mediocre-country

Illinois Fermentation and Agriculture Biomanufacturing (iFAB) Tech Hub. (2025). Why biomanufacturing? University of Illinois Urbana-Champaign.
https://ifabtechhub.research.illinois.edu/why-biomanufacturing/

Kerr, W. R., & Robert-Nicoud, F. (2020). Tech clusters. Journal of Economic Perspectives, 34(3), 50–76.
https://doi.org/10.1257/jep.34.3.50

Klepper, S. (2010). The origin and growth of industry clusters: The making of Silicon Valley and Detroit. Journal of Urban Economics, 67(1), 15–32.
https://doi.org/10.1016/j.jue.2009.09.004

Ministero delle Imprese e del Made in Italy. (2025). Voucher 3I – Investire in innovazione.
https://www.mimit.gov.it/it/incentivi/voucher-3i-investire-in-innovazione

Muro, M., Parilla, J., & Ioffreda, F. (2023). What the new Tech Hubs designations mean for boosting innovation across the US. Brookings Institution.
https://www.brookings.edu/articles/what-the-new-tech-hubs-designations-mean-for-boosting-innovation-across-the-us/

OECD. (2022). OECD Statistics: BERD as a percentage of GDP.
https://stip.oecd.org/stats/SB-StatTrends.html

OECD. (2022). OECD Statistics: GERD as a percentage of GDP.
https://stip.oecd.org/stats/SB-StatTrends.html

OECD. (2024). Going Digital: Indicator 43 - New tertiary graduates in STEM fields.
https://goingdigital.oecd.org/en/indicator/43

OECD. (2024). Monitoring Tax Support for R&D and Innovation. INNOTAX Portal.
https://stip.oecd.org/innotax/

OECD. (2024). OECD Digital Economy Outlook 2024 (Volume 1): Embracing the technology frontier. OECD Publishing.
https://doi.org/10.1787/a1689dc5-en

Organisation for Economic Co-operation and Development. (2024). OECD Digital Economy Outlook 2024 (Volume 1): Embracing the technology frontier. OECD Publishing.
https://doi.org/10.1787/a1689dc5-en Peterson, E., & Toland, T. (2024).

Continued optimism in the face of instability: 2024 FDI Confidence Index – Executive Summary
https://www.kearney.com/documents/291362523/300828061/Continued+optimism+in+the+face+of+instability-2024+FDI+Confidence+Index%E2%80%93Executive+Summary.pdf/5ce25c3d-3c15-9a8d-b7bd-2a59db4eba16?t=1711576280000

PricewaterhouseCoopers. (2025). 28th Annual Global CEO Survey: Australian insights.
https://www.pwc.com.au/ceo-agenda/ceo-survey.html

QS TopUniversities. (2025). World University Rankings 2025.
https://www.topuniversities.com/world-university-rankings

Reserve Bank of Australia. (2025). Chart Pack: Graphs on the Australian Economy and Financial Markets.
https://www.rba.gov.au/chart-pack/pdf/chart-pack.pdf?v=2025-04-09-09-46-38

Rijksdienst voor Ondernemend Nederland. (2025). MIT: Kennisvouchers.
https://www.rvo.nl/subsidies-financiering/mit/kennisvouchers

Sting. (n.d.). Innovation Voucher.
https://www.sting.co/innovation-voucher

Tech Council of Australia. (2022). Turning Australia into a regional tech hub.
https://techcouncil.com.au/wp-content/uploads/2022/08/Turning-Australia-into-a-regional-tech-hub_Report-2022.pdf

Tech Council of Australia. (2023). Tech jobs update: May 2023.
https://techcouncil.com.au/wp-content/uploads/2023/05/TechCouncil-Tech-Jobs-Update-May-2023_final-1.pdf

Times Higher Education. (2025). World University Rankings 2025.
https://www.timeshighereducation.com/world-university-rankings/latest/world-ranking

The Catapult Network. (2025). Why the Catapult network? Innovate UK.
https://catapult.org.uk/about-us/why-the-catapult-network/

Universities Australia. (2024). Critical challenges in Australia's university sector: Securing a sustainable future.
https://universitiesaustralia.edu.au/wp-content/uploads/2024/11/UA091-Critical-challenges-in-Australias-university-sector_v2.pdf

World Bank. (2024). OECD Main Science and Technology Indicators. Prosperity Data360.
https://prosperitydata360.worldbank.org/en/dataset/OECD+MSTI

World Intellectual Property Organization. (2024). Global Innovation Index 2024.
https://www.wipo.int/gii-ranking/en/

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