

Performance review of the Australian Innovation, Science and Research System

Innovation is about doing something differently and creating value in the process. We find innovation in every sector of the economy, in enterprises large and small, and in cities as well as regional areas.

Innovation is the key long-term driver of productivity growth and a key enabler of adaptability and renewal across all sectors of society. It is an important determinant of how readily communities can adjust to the realities of different times.

Australia has maintained a sustained period of economic growth and high employment for the past 25 years. For Australians, this growth has delivered jobs and improved living standards. On average, we enjoy some of the longest lives, best-quality services and most liveable communities in the world.

However, as we look to the future, considerable challenges await. Like many other countries, Australia is experiencing a slump in productivity growth. At the same time, the accelerating pace of technological change is causing structural shifts in key industry sectors and employment patterns. Long-term trends, such as the ageing of the population and changes in the climate system, present complex challenges that communities will have to solve together.

The Australian innovation, science and research (ISR) System Review examines the overall strengths and weaknesses of the ISR System's activities in knowledge creation, knowledge transfer, and knowledge application through the lens of innovation enablers. It also considers indicators for the outputs and outcomes that the ISR System generates from these activities. The performance framework for the ISR System Review is in Figure 1.

Innovation Science Australia

Innovation and Science Australia (ISA) was announced as part of the Government's National Innovation and Science Agenda (NISA) which was launched in December 2015.

ISA is an independent statutory board responsible for researching, planning and advising the Government on all innovation, science and research matters. ISA reports to the Innovation and Science Committee of Cabinet, which is chaired by the Prime Minister, through the Minister for Industry, Innovation and Science.

The key objectives of ISA are:

- Inform Australian Government policy on Australian innovation, science and research;
- Oversee legislated programmes to ensure effectiveness and efficiency of delivery;
- Build a national dialogue on Australian innovation, science and research; and
- Support cultural change in Australia reaching its innovation potential.

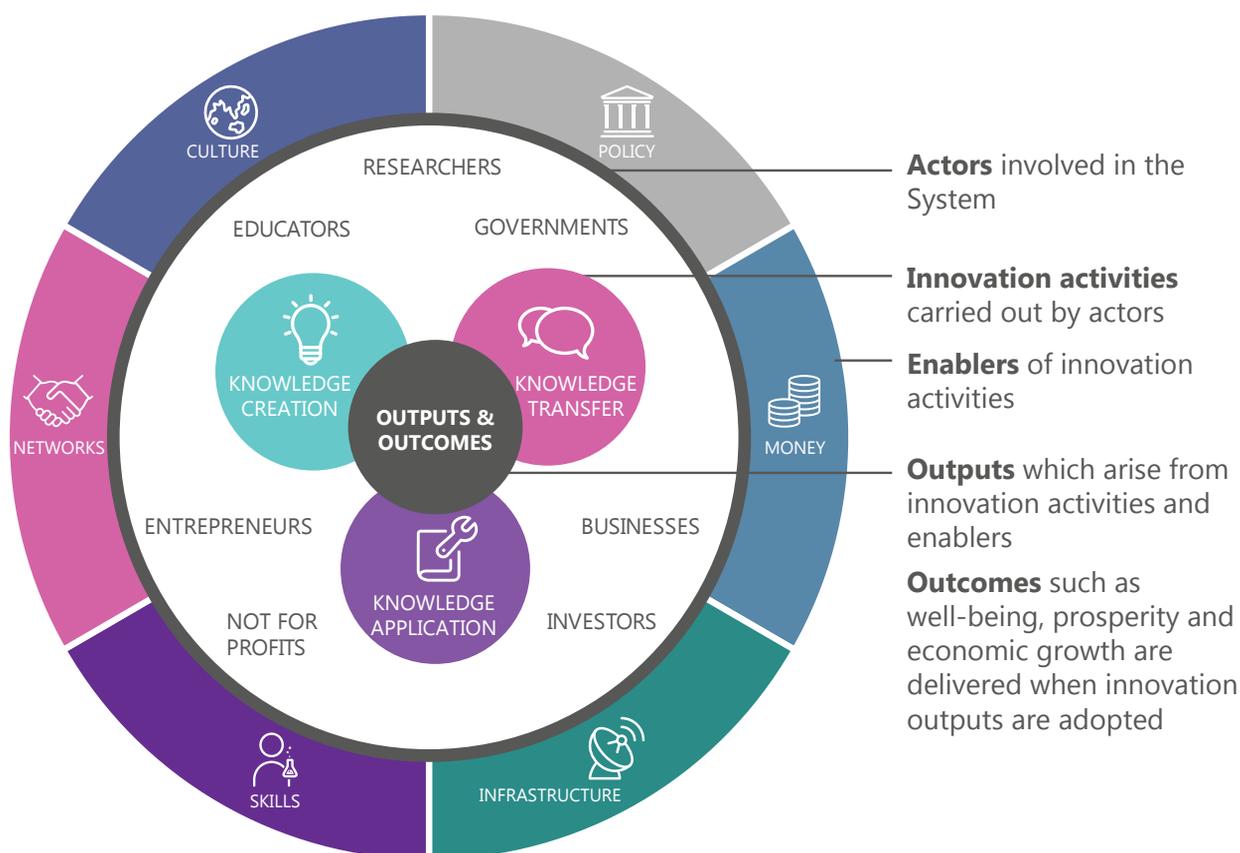
ISA has been tasked with the development of a long term strategic plan for the Australian innovation, science and research (ISR) System to 2030. The first step involved conducting a performance review of the Australian ISR system.

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Figure 1: Performance framework to assess the Australian ISR System.



Measuring Australia's Performance

The ISR System Review introduces a Scorecard to help illustrate how Australia's ISR System is performing (Figure 2). The scorecard is calibrated to meet the needs of Australian decision-makers by using measures of particular relevance to our ISR System. The scorecard compares the performance of the Australian ISR System to those of other OECD+ countries (the 35 OECD member countries in addition to China, Taiwan and Singapore) and provides a baseline to measure progress. The scorecard will be used to annually determine the performance of the ISR System and inform the evaluations of the ISR System every five years.

Next steps—developing the 2030 Strategic Plan

The ISR System Review will inform the development of a 2030 Strategic Plan for the Australian ISR System. The Strategic Plan will provide a vision of the ISR System by 2030, set goals, and outline the actions required to give life to the vision.

ISA will undertake an extensive consultation process to support the development of the Plan.

The plan will identify the emerging trends, challenges and risks that should be considered when determining priorities and provide recommendations to Government, informed by the findings from the ISR System Review, on how to address the underlying impediments to the system's performance.

The plan will also outline how progress against the plan can be evaluated. The 2030 Strategic Plan will be delivered to Government in late 2017.

Figure 2. Scorecard illustrating how Australia's ISR System is performing

	Australia's performance	International comparison (OECD+)	
	Latest score & trend	Average for the top 5 performers	Australia's ranking
Knowledge creation			
Gross expenditure on research and development (GERD), % of GDP	2.12 ▲	3.66	15 of 37
Higher education expenditure on research and development (HERD), % of GDP	0.63 ▲	0.84	10 of 37
Government expenditure on research and development (GOVERD), % of GDP	0.24 ▼	0.40	15 of 37
Academic Ranking of World Universities top 200 universities, per million population	0.33 ▲	0.54	9 of 31
Highly cited publications (top 1% in the world, all disciplines) per million population	48.7 ▲	86.0	8 of 36
Government and higher education researchers (full time equivalent) per thousand total employment	6.48 ▲	6.27	3 of 36
Population aged 25–64 with a doctorate per thousand population	8.21 ▲	16.8	11 of 34
Knowledge transfer			
Population aged 25–64 with tertiary education, %	42.9 ▲	48.7	7 of 36
Universitas 21 national higher education systems ranking	10th ▼	n/a	10 of 34
Percentage of HERD financed by industry, %	4.73 ▼	16.8	18 of 37
Proportion of publications with industry affiliated co-authors, %	1.22 ▼	4.99	27 of 38
Proportion of Patent Cooperation Treaty (PCT) patents with foreign co-inventors, %	16.2 ▲	43.8	27 of 37
Knowledge application			
Total early-stage entrepreneurship activity, %	12.8 ▲	18.7	8 of 38
Venture capital investment, % of GDP	0.02 ▲	0.19	18 of 30
Number of international patent applications filed by residents at the PCT per billion GDP (PPP)	1.5 ▼	8.3	22 of 37
Business researchers, per thousand employed in industry	4.68 ▲	14.7	21 of 36
Business expenditure on research and development (BERD), % of GDP	1.19 ▲	2.78	16 of 37
Outputs			
Percentage of firms that introduced new-to-market product innovation, %	9.23 ▼	21.3	23 of 31
Outcomes			
Multifactor productivity change, five year compound annual growth rate, %	0.40 ▼	1.29	12 of 20
High-growth enterprise rate, measured by employment growth, industry, %	0.80 ▼	13.5	27 of 27

1. Australia's score is the latest available data point for the given metric.
 2. Australia's trend in each metric is shown by the upwards and downwards arrows.
 3. International comparisons are made between Australia and other OECD+ countries. OECD+ countries include all countries in the OECD, as well as China, Taiwan and Singapore (where data is available). If country data from the given reference period is unavailable, the nearest available data has been included in the analysis.
 4. The average for the top five OECD+ countries represents the simple average of the scores for the top five OECD+ countries in the given metric

■ First quartile
 ■ Second quartile
 ■ Third or fourth quartile

Findings from the ISR System Review

The ISR System Review makes findings on the performance of the Australian Innovation, Science and Research System (Table 1). It aims to identify aspects of the ISR System needing greater effort, and to propose metrics that can be used to track the performance of the ISR System over time.

Table 1. Summary of Findings from the ISR Review

 Knowledge creation: Australia is above average
<ul style="list-style-type: none">• Australia has higher relative levels of funding for R&D activities in higher education and not-for-profit organisations compared to other nations.• Australia has world-class research infrastructure assets although there is a need for overarching governance and ongoing, whole-of-life funding.• Australia's research workforce is world class in a number of fields. Australia achieves much better research outputs than would be expected from the number of people engaged in research. Australia ranks 8th out of 36 OECD+ countries in its contribution to the top 1 per cent of highly cited research publications per capita.• Australia has good levels of research-to-research collaboration.• Despite a strong and internationally competitive university system, no Australian university is ranked in the global top 20.
 Knowledge transfer: needs to be improved
<ul style="list-style-type: none">• Data sharing is improving and there is an increase in the availability of government data sets.• Australia has a highly educated population and sufficient levels of basic skills, however there are some concerning trends. Emerging data on STEM education in particular is a cause for concern.• There is an increasing focus on networks to facilitate relationships and support collaboration across institutions and businesses.• There are few direct mechanisms in Australia to support knowledge transfer and collaboration between researchers and businesses appears limited.• Compared to other countries, Australia under-utilises vocational education and training to build skills for innovation.• Australia's multicultural society is an important asset, but diaspora could be leveraged more. Australia's uniquely multicultural society is a strength, and our diverse population, including our diaspora, has the potential to contribute more to innovation.
 Knowledge application: not yet matching the strength in knowledge creation
<ul style="list-style-type: none">• Australia has strong regulatory frameworks and sound banking, legal and corporate sectors; however, there are regulatory restrictions in some specific areas.• Financial markets generally function well, although access to risk capital has been a constraint.• Skilled migration contributes significantly to Australia's skills base.• A number of vibrant start-up ecosystems are flourishing around the country.• Relative to other countries, government procurement could do more to foster innovation.• Australian business expenditure on R&D is low relative to expenditure in other countries.• There are ongoing business, management and leadership skills gaps and the current supply of ICT graduates is not meeting industry needs.• Australian businesses rank poorly on international collaboration.
 System-wide
<ul style="list-style-type: none">• New statistical methods will better inform decision-making and allow for the proper evaluation of programme impact.• Australia's multicultural society is an important asset, but Australia's diaspora could be better leveraged.• Australia's short-term oriented culture may affect innovation in different ways and Australia remains a gender-unequal society.
Outputs
<ul style="list-style-type: none">• Australia has innovative SMEs and some highly innovative sectors, however Australia's innovations are not that novel. In many sectors innovations introduced by Australian businesses are new to the business only and reflect a low degree of novelty.
Outcomes
<ul style="list-style-type: none">• Australia's economic performance has been strong compared to other nations and Australia has performed well on a number of well-known indices of social outcomes, however there has been a slowdown in productivity growth.