



# Creating A Better World Together

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## Researching National Innovation Ecosystems

The Australian Situation

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# Australian innovation performance is generally reported as being among the lowest in the world—

- **Australia is now—**
  - Ranked 23rd among the 131 economies in the Global Innovation Index, 2020.
  - Ranked 18th globally for innovation according to Bloomberg
  - Ranked 27th out of 27 OECD countries for high-growth enterprise
- **But—some good news—**
  - Ranked 6th on the quality of universities metric
  - Seven universities (out of 43) in the top 100 across three global ranking systems
- **Current policy focus**
  - “Australia must get better at research commercialisation”
  - Rebuild the manufacturing sector around “Advanced Manufacturing”
  - Grow the very large number of small to medium enterprises (SMEs) into innovation powerhouses
- **The real opportunities**
  - In terms of research impact, Australia has major comparative strengths in Clinical and life sciences and Physics
  - Strength in Food and Agriculture – particularly around Plant biology, Agricultural biotechnology and the humanities
  - Also, strengths in Engineering and material sciences, Mathematics, and Arts and the humanities



# Innovation Outputs

- **Intellectual Property: In 2020 Australians filed**
  - 2,399 new patent applications in Australia—out of a total of 29,293 (8.2%)
  - 51,662 new trademark applications—out of 81,702 (63.2%)
  - 2,581 new design applications—out of 7,165 (36.0%)
- **New knowledge**
  - Very high level of global research output from Australian researchers
  - International researcher collaborations are strong
  - Citation impact metrics are *very high*—even when compared to the USA
  - There is an apparent “mismatch” between what universities research and what Australian businesses might need
- **Products, methods, services**
  - Very low numbers of Licenses, Options and Assignments (LOAs) granted
  - Very small LOA income received
  - Research contracts and consultancy does raise significant income
- **Some iconic new technologies produced over the years**
  - Principally in medical devices, immunology and wireless technologies
  - Reflects Australian research strengths in Clinical and life Sciences, and Physics



# National Innovation Policy

- **Highly fragmented**
  - A national “Entrepreneurs” program—grants for expert advisory and facilitation services
  - Otherwise, distributed across multiple agencies—manufacturing, health, education, agriculture, defence, energy
  - No national leadership or vision—despite continuous policy reviews, statements, agendas, and strategies
- **Piecemeal**
  - Hundreds of small programs with short timeframes and small amounts of money that change when Governments/Ministers change
  - The public research system is “chaotic”—some large programs, but many small ones across multiple agencies
  - But a unified higher education system was established in 1993
- **Additive**
  - Lacks synergy and many “systems failures”
  - Take wins where you can in political contests of power
- **Tactical**
  - Internal government/media opposition to industrial/innovation strategy
  - Will concede on “market failure” arguments
- **Incremental**
  - As Edward H Litchfield would say “muddling through” with limited successive comparisons



# Institutional Enablers

- **Economic**
  - Tax policy requires serious reform
  - Competition policy loosely applied—has not dealt with serious issues in exercise of market power
  - Banks prefer to lend for housing and property development rather than for growing businesses
  - Businesses borrow to grow through credit card debt—Aus credit card debt is very high
  - Strong and uniform Corporations law, but requires updating
- **Cultural**
  - Absence of a strong entrepreneurial culture
  - Over-reliance/expectation of government subsidies and support for business growth
- **Political**
  - Unstable/uncertain—five Prime Ministers over the last 10 years; 10 Industry Ministers
  - Politics rather than policy focus in media. Senate holds the balance of power
  - More independents elected in 2022—the demise of the two-party system?
  - Prime Minister can call elections at any time the politics suit
  - Only just over half of Australians have trust in the government
- **Legal**
  - The court system and rule of law is strong but expensive to access and long delays
  - Concerns about excessive regulation
  - No “Chapter 11” type protection
  - IP protection is strong but expensive to defend
  - Absence of an integrity/anti-corruption watchdog at the Federal level



# Infrastructure

- **Resources and talent**
  - Public research investment has picked up after several years of decline. Programs are frequently changing.
  - Priority and long-term stability in medical research and rural research
  - Investment shifting from independent research councils to direct government grants
  - Abundant seed and start-up capital, but follow-on/expansion capital is tight. Deals considered too small
- **Platforms and facilities**
  - Cooperative Research Centres Program since 1992. Highly regarded.
  - Many (too many?) incubators, start-up accelerators, co-working spaces, and research and technology parks—many with a property development focus.
  - Tech parks/precincts need committed “anchor” tenants in addition to a university
  - Recent \$20 billion Federal Government Commercialisation Action Plan (over 10 years) has been welcomed
  - Research training is embedded in Federal Government research block grants for universities.
  - There is a broad suite of National Critical National Research Facilities
- **Channels**
  - Governments prefer to deal with prime contractors in procurement
  - Excellent University-led collaborations in many technology areas—e.g. Sydney Quantum Academy, Melbourne Biomedical Precinct
  - Wide internet access but bandwidth constraint. Optical fibre rollout continues



# Enterprises (producers)

- **Business strategy**
  - Very high level of overseas ownership
  - Service businesses predominate
  - Shareholder value a high priority
  - Superannuation funds very influential
  - Transactional rather than relational culture
  - Internationalization for market expansion.
- **Organisational structure**
  - Distributed model predominates, with independent/separate operating units
  - Still a tendency towards bureaucracy—hierarchy, command/control structures
  - In Construction, a very large sector, project-type organisations
- **Functional capabilities**
  - Businesses focus on core business/competencies and outsource/procure other capabilities—e.g. manufacturing, distribution, ICT, etc
  - Expanding roles for professional, scientific, technical and global management consulting firms (7% of GDP)
  - *They exist in a local and global ecosystem.*
- **People**
  - HRM is compliance driven—by comprehensive and complex employment laws
  - Operational and professional recruitment through online employment marketplaces
  - Senior appointments headhunted for fixed-term (renewable) contracts (3-5 years)
  - CEO roles dominated by people with Finance and Marketing backgrounds.
  - Venture/private equity investors tend to replace technology founders with finance people



# Australian notable technological inventions

- 1958 – Black box flight recorder
- 1979 – Bionic ear – The cochlear implant
- 1984 – The world's first frozen embryo baby was born in Melbourne
- 1988 – Polymer banknote. Now used in 30 countries. The chief advantages are high counterfeiting resistance and longer circulation lifetimes.
- 1992 – Multi-focal contact lens
- 1992 – Spray-on skin
- 1992 – Wi-Fi – a method to "unsmear" radio waves that echo off indoor surfaces. This method has caused WiFi to be attributed as an Australian invention.
- 1995 – Gene silencing – A CSIRO team discovered that double-stranded RNA was the trigger for RNA interference (RNAi) or gene silencing
- 1995 – Jindalee Radar System – detects stealth aircraft and missiles by searching for the air turbulence generated by such vehicles.
- 1996 – Anti-flu Medication – Relenza
- 2002 – The Scramjet—a supersonic-combustion ramjet
- 2003 – UltraBattery – A hybrid energy storage device that combines supercapacitor technology with lead-acid battery technology in a single cell with a common electrolyte.
- 2006 – Cervical Cancer Vaccine – a preventative for cervical cancer, Gardasil is a vaccine to work against certain types of human papillomavirus (HPV).
- 2010 – Robotic Visual Horizon – An automated system that allows unmanned aeroplanes to perform complex manoeuvres was adapted from the way a bee's brain processes visual information
- 2012 – Hendra virus vaccine – CSIRO produced the first vaccine (called Equivac® HeV) to protect horses against the Hendra virus.
- 2012 – Quantum bit – A team of Australian scientists built the first quantum bit, the basic unit of quantum computing
- 2015 – Quantum Logic Gate – Logic gates are the main idea behind computational theory, allowing qubits to be utilised for computation





# What to do from here?

- **Leverage what Australia is really good at or has the potential to be good at (distinctive capabilities)—**
  - Biomedical research is a national strength, particularly in immunology and medical devices. Australia already has three biomedical clusters in the global top 100
  - Physics has a long history of commitment and excellence—the foundation of innovations in radio astronomy, WiFi, Radar, Quantum communications, GPS technologies, and space technologies
  - There is massive potential in Agriculture and Food, Advanced Manufacturing, and Materials Science
- **Remove bias in innovation policy away from SMEs**
  - They don't invest in new to the world innovations. There may be the odd “unicorn”
  - Encourage established businesses with good technologies, inspired leadership, and potential growth markets to transform, expand and prosper (e.g. avionics)
- **Streamline and support the development of research capability and infrastructure**
  - Urgently invest in growing the research workforce—covering the whole talent pipeline—school, tertiary education, PhDs, postdocs, ECRs
  - Boost investment in research infrastructure – major national facilities and equipment, including testing facilities and prototyping
  - Strengthen long-term investment in cooperative/collaborative research centres and institutes in areas of distinctive capability
- **Policy and program design**
  - Scale back the of multitude small grants programs, subsidies, concessions, and incentives—that encourage businesses to get revenues from governments rather than customers
  - Commit to achieving a balance between basic and applied research
- **Develop policy positions that support Regional Smart Specialization Strategies**
  - Learn from international experience—including attracting large corporate “anchors”

