

INFO4444 Computing 4 Innovation

Week 11: Innovation ecosystems

Presented by: Dr. Eman Sayed
School of Computer Science



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COMMONWEALTH OF AUSTRALIA

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Innovation Ecosystem

The Innovation System – what is it?

It is an open network of organizations that interact with each other and operate within framework conditions that regulate their activities and interactions.

- Components:
 - innovation activities,
 - networks and
 - framework conditions

These components Collectively function to produce and diffuse innovations that have, in aggregate, economic, social and/or environmental value

The Australian Innovation System – Players

The key players of innovation:

- the domestic business environment (e.g. business competition, access to finance)
- international trade (e.g. import and export competition, knowledge spillovers from foreign direct investment)
- human capital and skills (e.g. workforce training; management capability)
- collaboration and networks (e.g. cross-sector partnerships)
- R&D investment (e.g. private and public R&D expenditure).



The Australian Innovation System – Outcomes

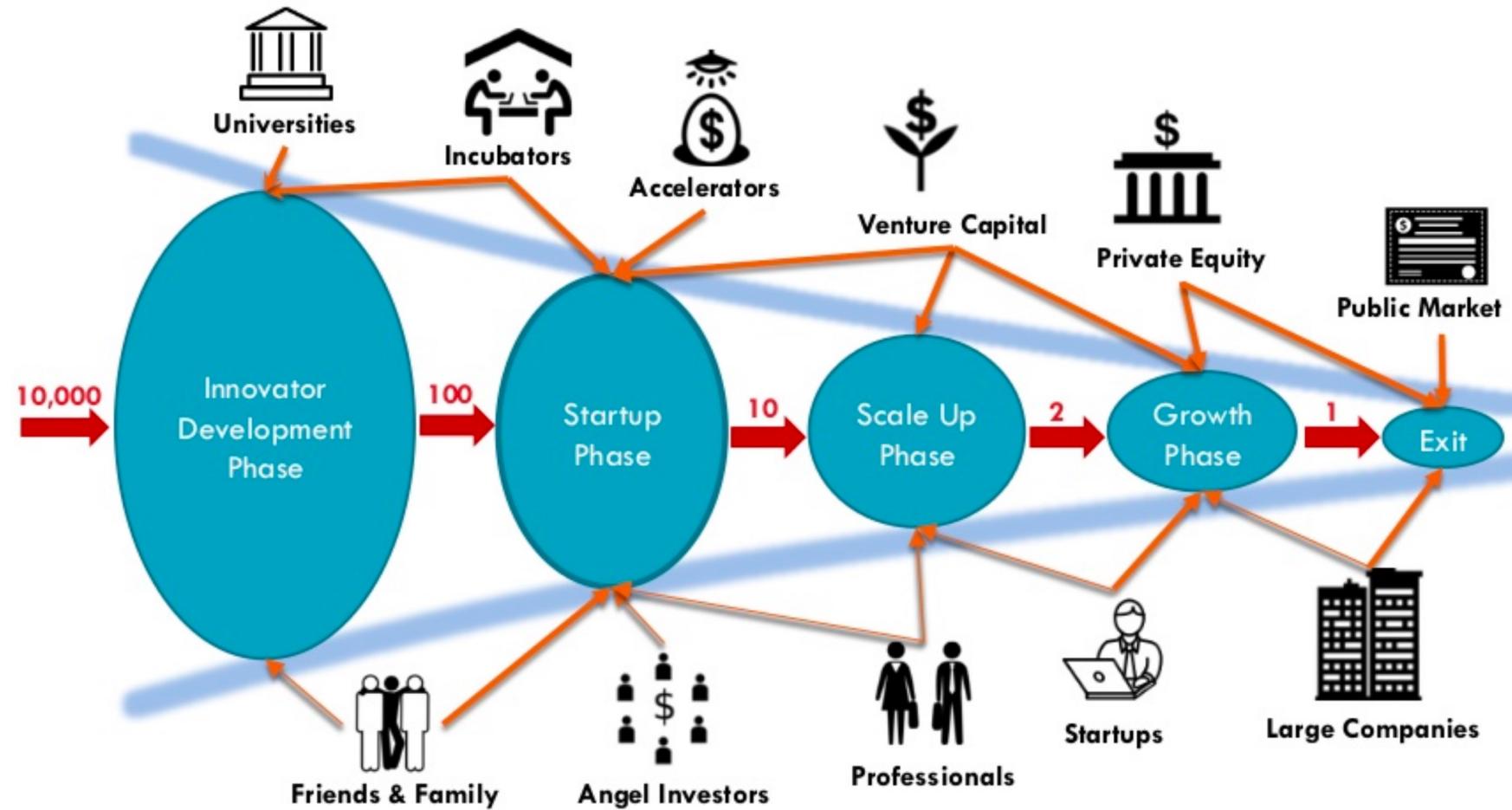
The 2 inner circles highlight Australian innovation outcomes.

- The creation of new technology and knowledge,
- The adoption of existing technology and knowledge,
- Metrics on productivity growth.

Productivity growth is the main way that innovation impacts the economy.



The innovation ecosystem – An example representation



Source: <https://www.slideshare.net/MaherHakim/building-innovation-ecosystem>

The innovation ecosystem – An example representation

The journey of innovation has several phases, each supported by different stakeholders:

Innovator Development Phase: **Activities**: Idea generation, research, and early development

Startup Phase: **Activities**: Business model development (e.g. BMC from the commercialisation module), initial funding, and product prototyping (MVP)

Scale-Up Phase: **Activities**: Market expansion, team growth, and scaling operations

Growth Phase: **Activities**: Revenue growth, market penetration, and organizational development

Exit Phase: **Activities**: Mergers, acquisitions, or public offerings

The number of startups decrease as they progress through each phase, highlighting the competitive and challenging nature of the innovation journey.

Source: <https://www.slideshare.net/MaherHakim/building-innovation-ecosystem>

The Triple Helix Model

It conceptualizes innovation as the result of interactions between three main institutional spheres:

1. University (Knowledge)

Produces basic and applied research

Educes entrepreneurs and skilled workers

Commercializes research via tech transfer offices and spin-offs

2. Government (Policy)

Shapes legal and regulatory environment

Provides R&D funding, incentives, and infrastructure

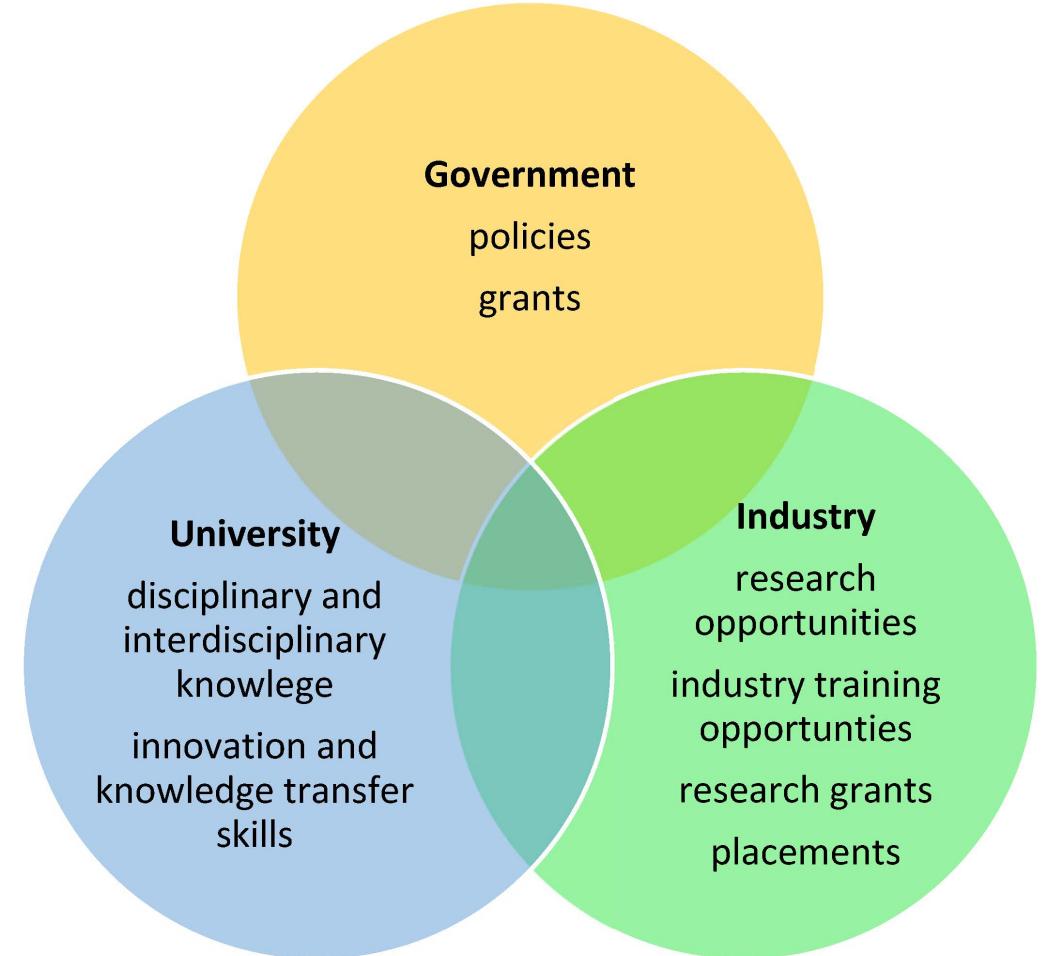
Sets national innovation agendas and priorities

3. Industry (Application)

Translates knowledge into products, services, and jobs

Drives market-oriented innovation

Invests in R&D and startup collaboration



Global Case Studies:

Singapore Silicon Valley



Singapore:

Where Policy Powers Innovation

Government-as-startup-founder: agile policy labs, real-time regulatory sandboxes

Deep Tech Hub – biotech, medtech, advanced manufacturing

Economic Development Board + SGInnovate funnel billions into venture funding and startup talent
(SGInnovate is a government-owned venture capital and talent development platform focused on deep tech startups (AI, robotics, medtech, quantum, etc.)

100% 5G coverage + nation-wide AI strategy = testbed for smart urban solutions

Close alignment between unis (e.g., NUS-National University of Singapore, NTU-Nanyang Technological University) and national innovation missions to move ideas from lab to market.

Startup magnet: 4,000+ startups, many regional HQs

Sustainability leadership: floating solar farms, green fintech ecosystem

Silicon Valley: From Chips to AI Moonshots

Still the global benchmark for tech-driven innovations.

Home to OpenAI, Anthropic, DeepMind US – AI central

Burgeoning space tech ecosystem: SpaceX, Planet Labs, Rocket Lab

Crypto epicenter (despite regulation waves): Coinbase, Andreessen Horowitz Crypto Fund

World's densest VC capital corridor (US\$300B+ deployed in 2023 alone)

Stanford & Berkeley drive founder pipeline, spinouts, and IP transfer

Embedded culture of risk, talent mobility, and hyper-speed scaling



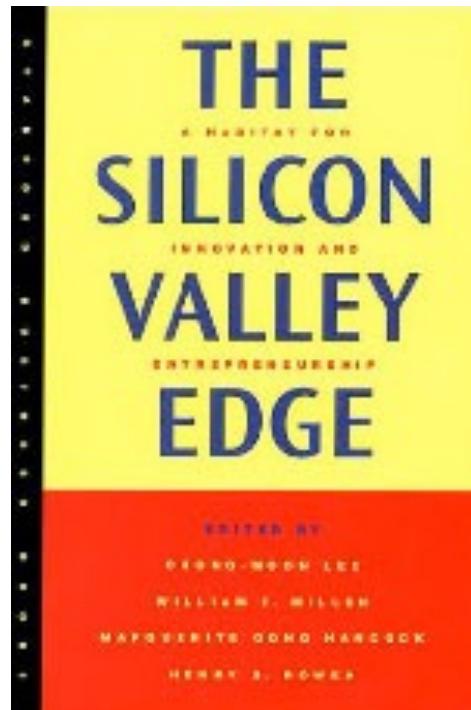
Some of the companies built in Silicon Valley

- Adobe
- Airbnb
- AMD
- Apple
- Cisco
- eBay
- Google
- HP
- Intel
- Nvidia
- Oracle
- PayPal
- Intuit
- Uber
- Open AI
- SpaceX
- Palantir
- Tesla

Silicon Valley: phases of IT innovation history

| Era | Time Period | Key Developments | Notable Companies / Institutions |
|---------------------------------|---------------|--|--|
| Foundational | 1930s–1940s | Radio communications and military electronics | Stanford University, U.S. Department of Defense |
| Semiconductor Revolution | 1950s–1960s | Birth of silicon-based semiconductors, invention of the transistor | Fairchild Semiconductor, Intel, Shockley Labs |
| Personal Computing | 1970s–1980s | Rise of PCs, graphical user interfaces, accessible computing | Apple, HP, Microsoft (influential in region) |
| Internet Boom | 1990s–2000s | Commercial internet, dot-com boom, digital services | Google, Yahoo!, eBay, Cisco |
| Mobile & Cloud | 2000s–2010s | Mobile devices, cloud computing, app ecosystems | Facebook, Apple (iPhone), Salesforce, Dropbox |
| AI & Deep Tech | 2010s–Present | Artificial Intelligence, autonomous vehicles, biotech, quantum computing | OpenAI, NVIDIA, Tesla, Palantir, Google DeepMind |

Silicon Valley: Importance of the innovation ecosystem



The Silicon Valley Edge: A Habitat for Innovation and Entrepreneurship

By Lee, Miller, Hancock and Rowen (2000)

How does Silicon Valley work? Why here and not somewhere else? Although many accounts chronicle the story of Silicon Valley through the lives of important entrepreneurs or companies, these are insufficient to answer the compelling questions of how and why the Valley works. This book argues that the Valley's sustaining edge arises from factors that go beyond any individual or single company. Rather, the Silicon Valley edge stems from an entire environment, or habitat, honed for innovation and entrepreneurship.² This habitat has developed endogenously over time, co-evolving with generation after generation of new firms and new technologies.

Why is Silicon Valley a successful innovation ecosystem?

- 1. Strong research-driven universities (with endowments)**
- 2. Globally experienced repeat entrepreneurs**
- 3. Sophisticated risk capital**
- 4. Social capital**
- 5. Knowledge sharing**
- 6. Tolerance for risk taking**
- 7. Creative destruction**
- 8. Constructive failure**
- 9. Positive aggregate returns**
- 10. Supportive government policy**

From Adrian Turner: "Blue Sky Mining: Building Australia's next billion dollar industries"

1. Strong research-driven universities (with endowments)

- Stanford and UC Berkeley anchor the region's talent and innovation.
- Deep links to industry through labs, grants, and spinouts.
- Endowments fund bold, long-term research and startup pipelines.
 - Example: Google originated as a PhD project at Stanford.



<http://stanford.edu>

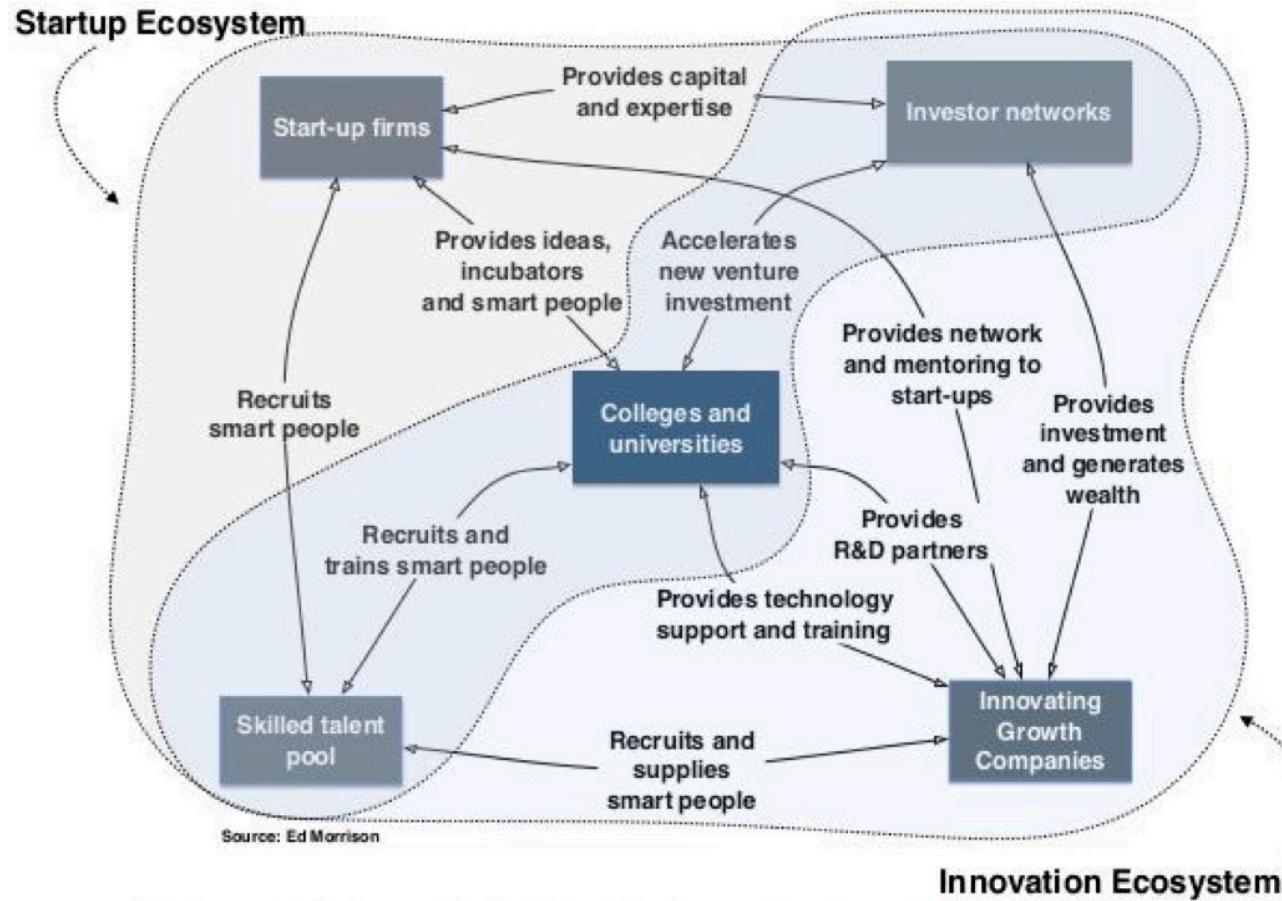
Stanford University



<http://berkeley.edu>

University of California Berkeley

University Operate Within Ecosystems



Stanford Bio-X Interdisciplinary Initiatives Seed Grants Program (IIP) Seed Fund

- For teams of faculty with **early-stage, high-risk ideas** that couldn't be funded by traditional sources
- Stanford Bio-X awards ~ \$4 million two-year seed grants
 - Currently \$200,000 per project
- Over \$270 million external funding in first seven rounds (started in 2000)
- Supported hundreds of graduate students and post-doc. fellows
 - Hundreds of publications and dozens of patents filed, and accelerated the pace of scientific discovery and innovation

Usyd's Industry & Business Partners

Partnership_

Industry and business partnerships

Sharing expertise to solve problems

We connect our leading researchers and students with industry, business and government partners. We're working with our partners to tackle issues ranging from climate change to mental health.

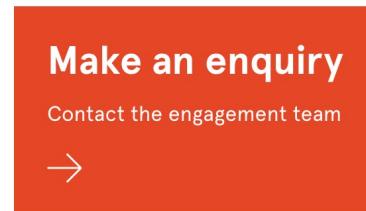
Why partner with us?

We have both the experts and facilities to accommodate your research and development (R&D) needs.

When you partner with us, you'll work with people who are leaders in their fields, and have the ability to solve some of the greatest challenges faced by industry, businesses and government.

You'll also have access to our state-of-the-art [equipment and facilities](#).

Our competitive rates ensure your organisation maximises R&D budgets, and allows you to claim the R&D tax incentive. We can scope projects according to your budget without the need to hire or retain costly full-time staff. We also have access to [government funding and grants](#), which can increase your [research budget](#).



Partner with us to tackle
wicked problems



- Offers:

- Experts
- Testing
- professional services

<https://sydney.edu.au/about-us/engage-with-us/industry-and-business-partners.html>

Usyd's Industry & Business Partners – Use Case



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Researchers help Qantas fly cleaner and cheaper

23 June 2016

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<https://www.sydney.edu.au/news-opinion/news/2016/06/23/researchers-help-qantas-fly-cleaner-and-cheaper.html>

2. Globally experienced REPEAT entrepreneurs

- Serial founders reinvest expertise and capital into new ventures.
- Network effects from mentors, advisors, and founder alumni groups.
- Success breeds more startups —> a self-reinforcing cycle
 - Example: Elon Musk (Zip2 → PayPal → Tesla → SpaceX → xAI).

Eg Elon Musk



3. Sophisticated Risk Capital

- Silicon Valley is home to firms like Sequoia, Andreessen Horowitz, and Accel.
 - Example: Sequoia backed Apple, Airbnb, WhatsApp, and Stripe early.
- Capital is abundant for high-risk, high-reward ideas.



ANDREESSEN
HOROWITZ

Sophisticated venture capital

Sophisticated angel investors
Eg Ron Conway

"With us and many other angel groups, Y Combinator startups get moved to the top of the list automatically." – Ron Conway



Sophisticated corporate investors



Sophisticated stock exchange

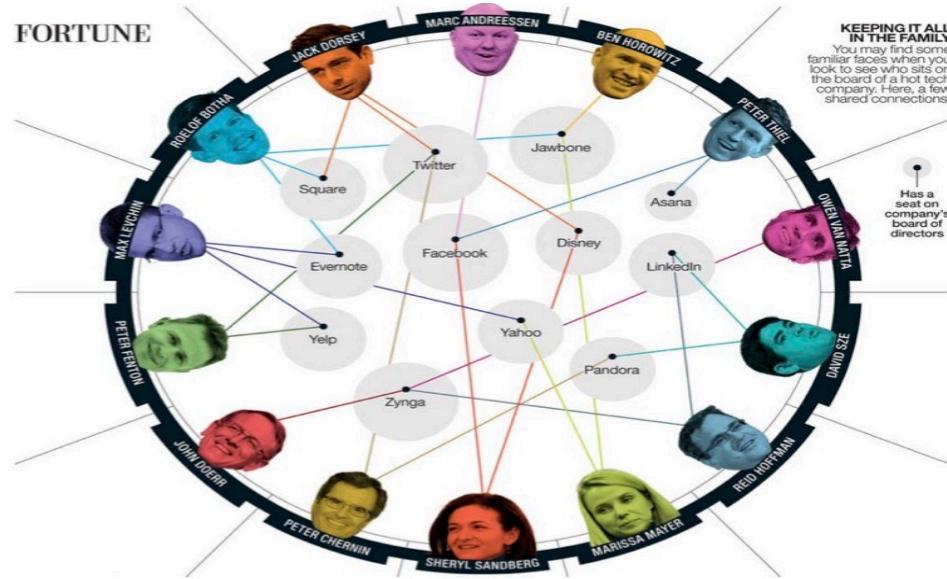
Venture capital firms like Andreessen Horowitz fuel billion-dollar startups.

Angel investors such as Ron Conway provide early-stage support and credibility.

Corporate investors (e.g. Intel Capital) strategically fund tech growth.

Exit pathways like NASDAQ ensure liquidity and massive returns.

4. Social capital



“Some call it an ecosystem; others call it incestuous. In Silicon Valley every prominent player is just an adviser, an investor, a co-founder, an acquirer, or a director away from another. It’s an industry worth trillions that operates like a small town.”

<http://fortune.com/2014/03/20/silicon-valleys-single-degree-of-separation/>

The PayPal Mafia – A Network of Repeat Social capital

A group of early PayPal employees who went on to found or lead major Silicon Valley companies, including LinkedIn, YouTube, SpaceX, Palantir, Affirm, Yelp, and more.

Many were graduates of Stanford or University of Illinois Urbana-Champaign, forming a powerful network of serial innovators.

5. Knowledge Sharing

- Culture of open forums, blogs, meetups, and conferences.
- Founders and engineers frequently share failures.
- Mistakes are shared to help others succeed faster.
- Accelerators like Y Combinator amplify collective learning.



5. Knowledge Sharing – Accelerator for startups

- Nearly 3000 startups so far (since 2005)
- ~200 new startups per year
- 110 companies valued over \$100M
- more than 25 companies valued over \$1B



"Y Combinator is the best program for creating top-end entrepreneurs that has ever existed."

Marc Andreessen, General Partner, Andreessen Horowitz

5. Knowledge Sharing – Accelerator for startups

- Since 2005, they have invested in over 5,000 companies that have a combined valuation of over \$800B
- Ycombinator startups include:
 - Reddit
 - Airbnb
 - Scribd
 - Stripe
 - Docker



<https://www.ycombinator.com/companies/>

6. Tolerance for Risk Taking

- Entrepreneurs take risks by taking on ambitious missions
- Employees take risks by working for unproven start-ups
- Banks take risks by lending to unproven start-ups
- Property owners take risks via offering accommodation to unproven start-ups
 - Example: Airbnb was rejected by dozens of investors before succeeding.

7. Creative destruction – Creating new Businesses while destroying old ones

Constant innovation disrupts old models and opens new markets.

Startups challenge incumbents; winners redefine industries.

Silicon Valley thrives on reinvention and market turnover.

Example: Netflix displaced Blockbuster; Uber disrupted taxis.

8. Constructive Failures

Failed startups are stepping stones, not stigma.

Failure is reframed as progress, not personal loss.

Investors value lessons learned from failure.

Lessons from failed startups fuel future success.



EO Personal Communicator (originally by Go Corp)

Failed in market but staff went on to form:



9. Positive Aggregate Returns

- One big win can fund hundreds of experiments.
 - Many failures, are covered by large successes
- For example,
 - in 1997, Benchmark Capital invested \$6.7M in eBay. In 1999, this was worth \$5b
 - Peter Thiel, Facebook's first big investor, turning his initial \$500,000 investment in 2004, into more than \$1 billion in cash, in 2012
- These windfalls fund new Venture Capital firms and startups.

<https://money.cnn.com/2012/08/20/technology/facebook-peter-thiel/index.html>

10. Supportive government policy

Policies enable fast experimentation and growth.

Example:

- Stock options not treated as taxable income until exercised
- Flexible labour laws
- Tax incentives to encourage new ventures
- Large Govt / defense R&D funding

Australia's Innovation Ecosystem

The Australian Startup Ecosystem



<https://www.startupmuster.com/>

Australian startups building for the future

Australia is considered one of the quickest countries in the world to start a business – and the nation's dynamic tech sectors are proving fertile ground.

<https://international.austrade.gov.au/en/news-and-analysis/news/australian-startups-building-for-the-future>

Global Investor Interest: Overseas investors participated in 25% of all reported startup deals, with a notable shift towards climate and cleantech sectors.

Sydney: Ranks among the world's top 20 startup ecosystems, hosting 60% of Australia's 800 fintech startups. Sydney has the highest-density startup space in the Southern Hemisphere at the [Sydney Startup Hub](#).

Victoria: Home to over 2,600 startups across sectors like life sciences, AI, and fintech, bolstered by initiatives like [LaunchVic](#).

BIGGEST SURPRISES IN 2023



56% of startups are using AI for key team functions



24% of incubators and accelerators are run by universities, and 15% of founders have PhDs in 2023 vs 6% in 2018



Emergence of Greentech as the largest and fastest growing vertical for Australian startups, from 5% in 2018 to 14% in 2023



21% of founders say their decisions are driven by impact, 56% from impact and profit equally

31% of startups identified as being part of an innovation precinct or cluster



WHO is launching?

2023
2018
Highlight

Female founders by survey year



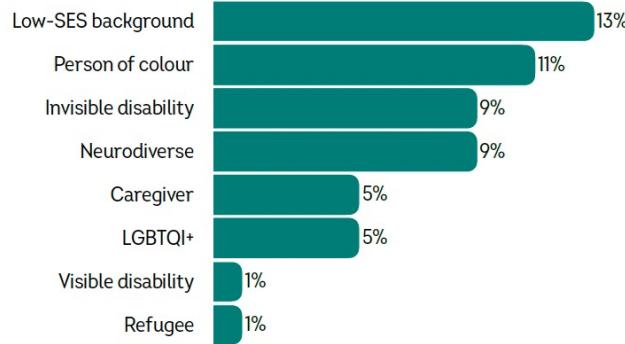
AVERAGE FOUNDER AGE

46

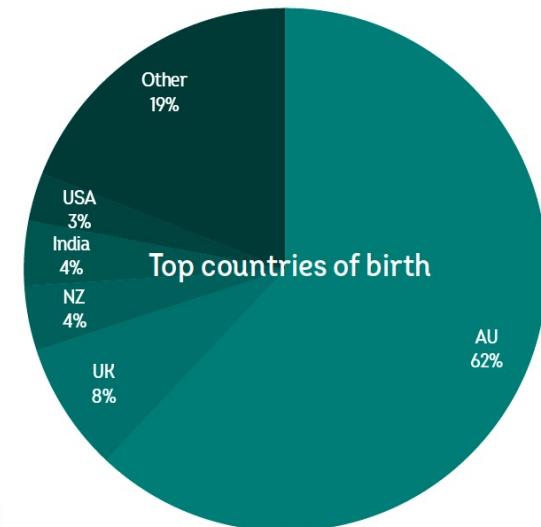
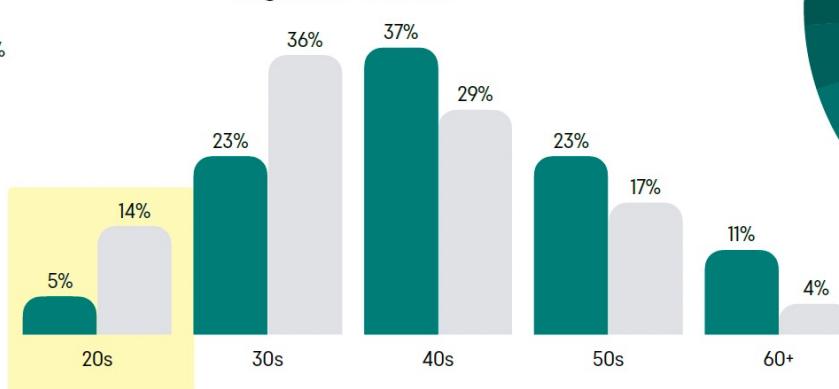
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We are working with NiceTo on a deeper dive into founder demographics; this report will be released in 2024.

DEMOGRAPHICS



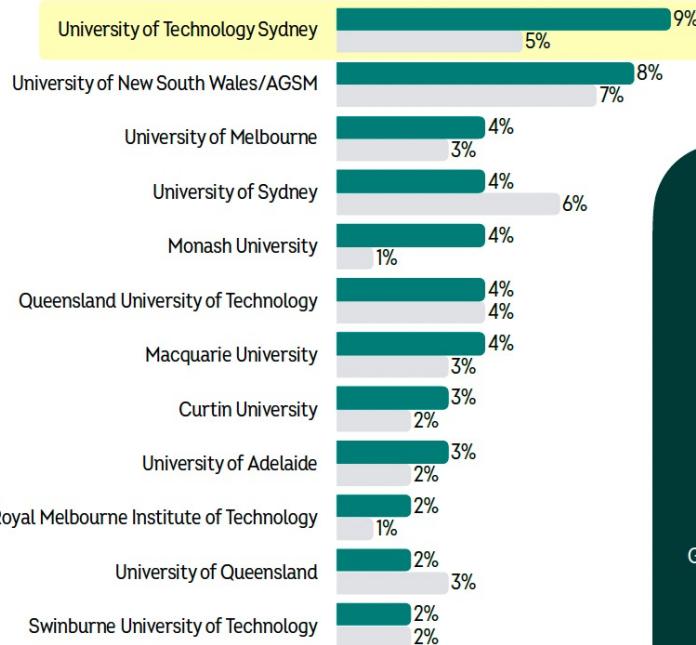
Age distribution



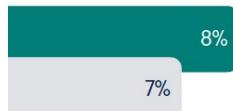
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WHO is launching? (cont'd)

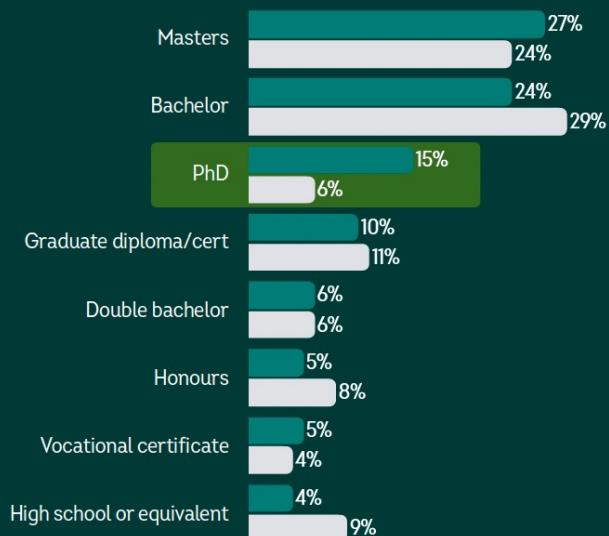
Institutes for highest level of education



Founders currently studying



LEVEL OF EDUCATION



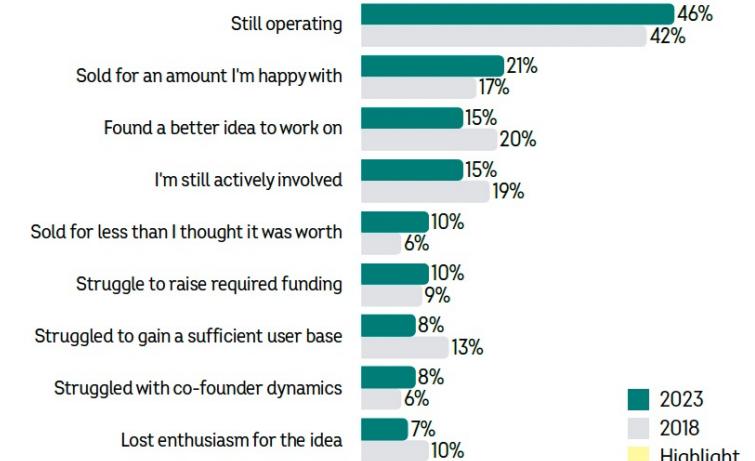
Founders with past startup experience



Founders working a job outside their startup



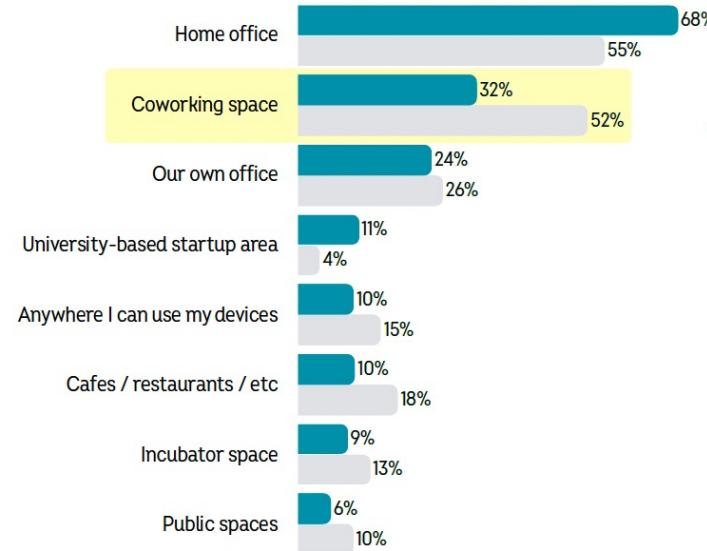
Status of last startup



2023
2018
Highlight

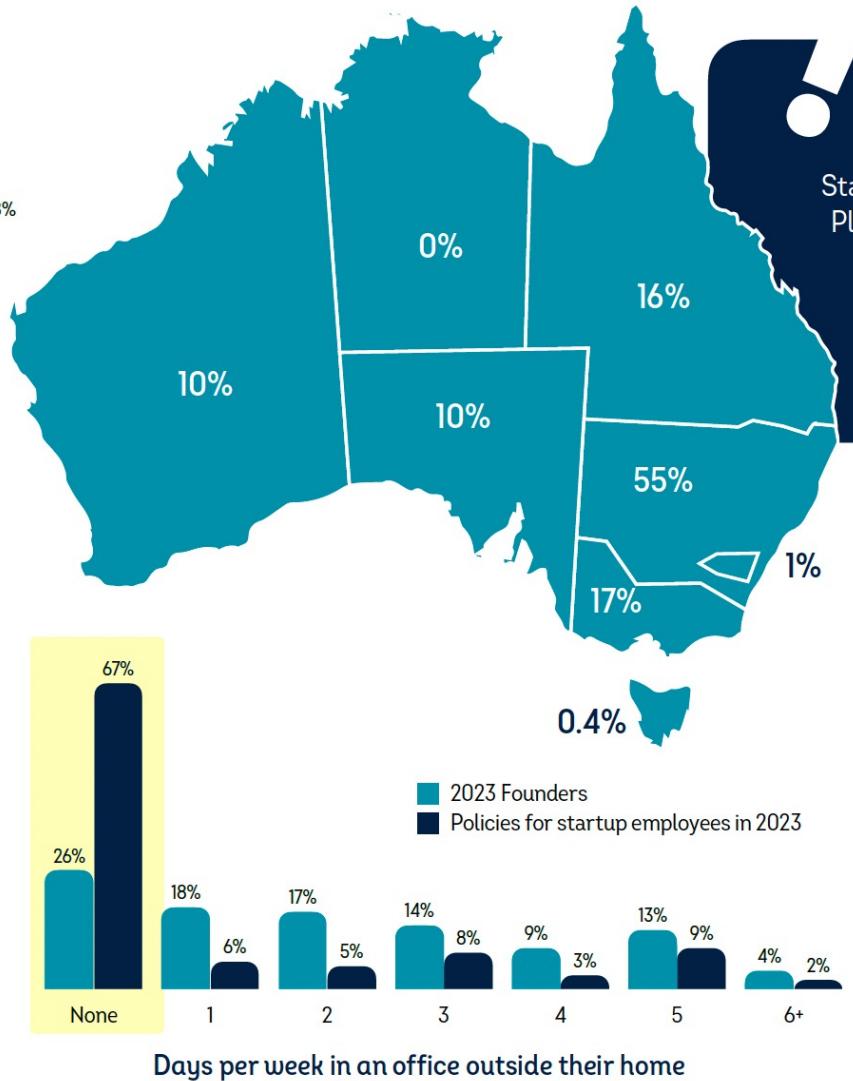
WHERE are they?

LOCATIONS worked from



17% of startup founders are working full-time from an office outside their home.

60% of startups felt engaged in their local startup ecosystem.



This map represents who took part in Startup Muster 2023 and provided addresses. Please note this is not a population estimate.

Also note some startups had offices and home addresses in multiple states.

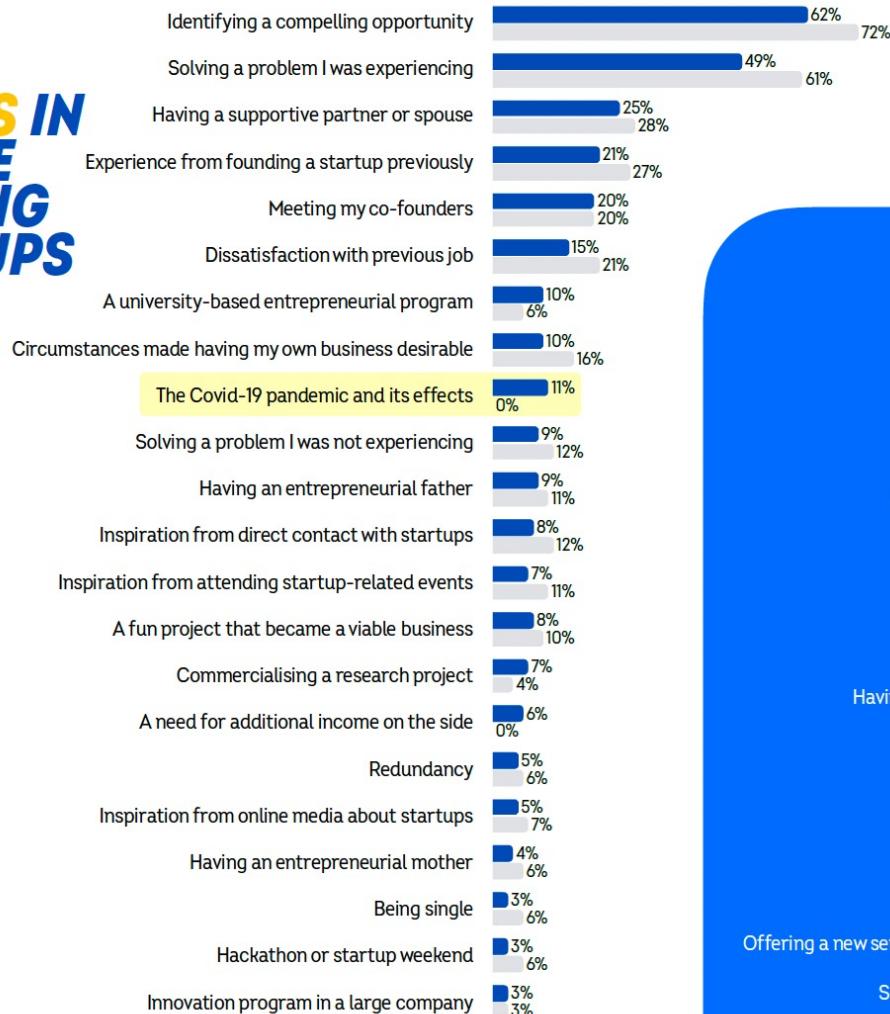
POSTCODES with the most startups reporting engagement in their local ecosystem

1. 2000 (Sydney)
2. 2007 (Ultimo)
3. 5000 (Adelaide)
4. 2010 (Surry Hills)
5. 4000 (Brisbane)
6. 2113 (Macquarie Park)
7. 4006 (Bowen Hills)

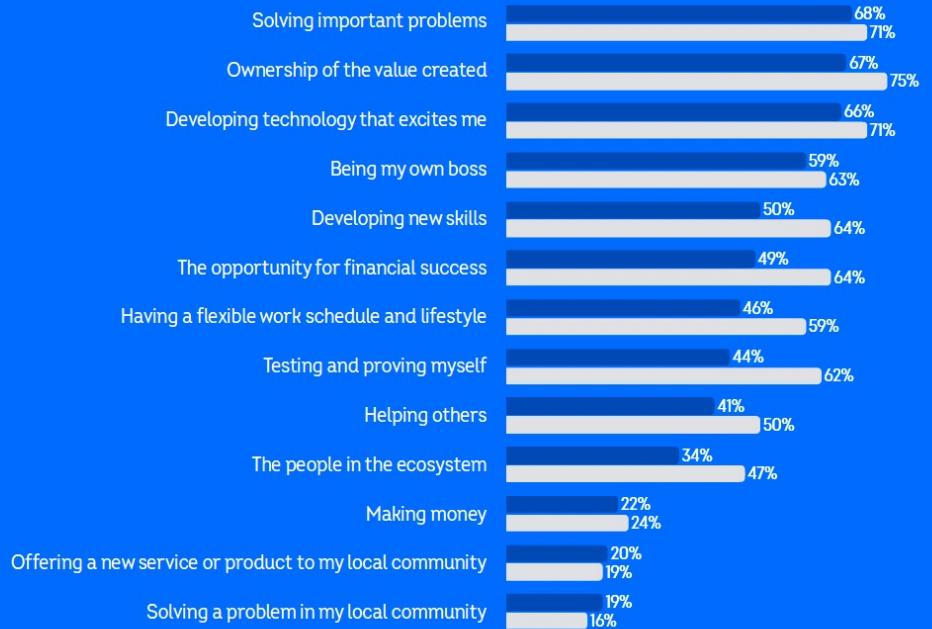
WHY are they starting?

CRITICAL EVENTS IN THE FOUNDING OF STARTUPS

January and July were the most popular months for new startups (18% and 12%)



What founders ENJOYED about running a startup



Some of Sydney's innovation ecosystem

- Co-working spaces: eg
 - Fishburners, <https://fishburners.org/>
 - BlueChilli, <http://www.innovationnetwork.com.au/c/14>
 - Stone & Chalk, <https://www.stoneandchalk.com.au/>
- Accelerators: eg
 - Incubate, <https://incubate.org.au/>
 - Startmate, <https://startmate.com.au/>
 - ON, <http://www.oninnovation.com.au/>
- Tech business incubators: eg Cicada Innovations
<https://www.cicadainnovations.com/>

Some of Sydney's innovation ecosystem

- Government programs: eg R&D Tax Incentives
<https://www.business.gov.au/assistance/research-and-development-tax-incentive>
- Universities
- Government-funded research organisations: eg
 - CSIRO (including Data61) <https://www.csiro.au/>
- Established companies doing software/hardware development (Atlassian, Google, Canon, Optiver, Dolby, Freelancer, Canva, etc)
- Hacker spaces, etc

Australia's innovation ecosystems (some examples)

Industry innovation

We are growing innovative and competitive Australian businesses, industries and regions.

National Reconstruction Fund (NRF) →

The Australian Government established the National Reconstruction Fund Corporation (NRFC) to support priority areas of the Australian economy. It will provide finance in the form of debt, equity and guarantees to su...

Industry Growth Program →

This program provides advice and grant funding for innovative small to medium enterprises and startups to commercialise their ideas and grow their businesses. Projects must align with NRF priority areas.

Boosting Female Founders (BFF) Initiative →

We help women entrepreneurs grow their startups in national and international markets through the BFF Initiative.

Business Research and Innovation Initiative (BRII) →

BRII grants encourage businesses to develop innovative solutions to government challenges.

Cooperative Research Centres (CRC) Grants →

CRC Grants support medium to long-term collaborative research for up to 10 years.

Cooperative Research Centres (CRC) Projects grants →

CRC Project grants support short-term collaborative research for up to 3 years.

Industry Growth Centres →

Industry growth centres are driving innovation, productivity and competitiveness in 6 key growth industry sectors.

Research and Development (R&D) Tax Incentive →

The R&D Tax Incentive stimulates business investment in R&D through tax offsets.

Venture capital program →

We provide venture capital tax benefits to encourage investment in innovative early-stage businesses.

Summary

- Healthy ecosystems are important for innovation
- Successful areas (eg Silicon Valley) are successful because of the ecosystem, not just the people and companies
- We can learn from successful innovation ecosystems (and the Australian government is putting in place changes to improve the Australian ones)
- There are lots of people who are able and willing to help in the ecosystem so always feel free to ask for help