Dialogue Paper
October 2025

Actuaries Institute.

Where Are Australia's Data Science Leaders?

The Case for Technical Career Pathways

About the Author

Victor Bajanov

Victor Bajanov is a Fellow of the Actuaries Institute and a seasoned analytics leader with two decades of experience in data science. Currently serving as Executive AI Transformation at Quantium, Victor has a diverse background spanning consulting and product development across industries including financial services, retail, and telecommunications. Victor is a member of the Institute's Data Science and AI Practice Committee, and has served as an expert witness for the Federal Court of Australia. With his blend of actuarial knowledge and cutting-edge data science skills, Victor brings valuable insights to the intersection of traditional actuarial work and modern analytics.

About the Actuaries Institute and the Profession

As the peak professional body for actuaries in Australia, the Actuaries Institute represents the profession to government, business, and the community. Our members work in a wide range of fields including insurance, superannuation and retirement incomes, enterprise risk management, data analytics and AI, climate change and sustainability, and government services.

Actuaries use data for good by harnessing the evidence to navigate into the future and make a positive impact. They think deeply about the issue at hand, whether it's advising on commercial strategy, influencing policy, or designing new products. Actuaries are adept at balancing interests of stakeholders, clients and communities. They're called upon to give insight on complex problems and they'll look at the full picture. Actuaries analyse the data and model scenarios to form robust and outcome-centred advice.

www.actuaries.asn.au

Acknowledgement of Country

The Actuaries Institute acknowledges the traditional custodians of the lands and waters where we live and work, travel, and trade. We pay our respect to the members of those communities, Elders past and present, and recognise and celebrate their continuing custodianship and culture.

About this Dialogue Paper

Dialogue Papers are a series of papers written by actuaries and published by the Actuaries Institute as part of its Public Policy Thought Leadership program. Enquiries should be directed to the Institute's Public Policy Team at public_policy@actuaries.asn.au. The papers aim to stimulate discussion on important, emerging issues. Opinions expressed in this publication are the opinions of the Paper's author and do not necessarily represent those of either the Institute of Actuaries of Australia (the "Institute"), its members, directors, officers, employees, agents, or of the employers of the author.

ISBN: 9781763754287

Suggested citation: Bajanov, V. (2025). Where Are Australia's Data Leaders? The Case for Technical Career Pathways. Actuaries Institute.

Contents

Executive Summary

Australia has world-class technical innovation capabilities, yet we can name only a few prominent Australian data scientists of global standing. This gap in technical leadership at senior levels is already limiting Australia's ability to compete as AI transforms global industries.

- **The AI revolution is redefining work** — today. Telegram runs a billion-dollar business with 30 engineers. Solo founders are selling companies for US$80 million after six months. While Australian companies are taking initial steps with tools like Copilot, global competitors are already building AI systems that fundamentally reimagine entire business functions.
- **Many Australian organisations lack senior career pathways for technical talent.** After seven to ten years, our best data scientists face an impossible choice: abandon their technical expertise for management or remain in limited individual contributor roles. Meanwhile, global tech giants offer nine-figure packages to secure top technical talent.
- **Without technical leaders, we default to adoption over invention.** Most Australian organisations rely on externally-developed solutions rather than building proprietary capabilities. The majority of Chief Data Officers hold business leadership rather than technical qualifications, and just 1% of our tech workers have scale-up experience versus 17% in Singapore.
- **Teams are fundamentally changing to include AI agents as core members.** The nature of work is shifting from managing large human teams to orchestrating smaller hybrid teams of humans and AI systems. Successful organisations will need a mix of leadership, promoting technical experts to senior roles while helping existing business leaders develop as much technical understanding as possible. Without both approaches, organisations risk mis-deploying AI capabilities, causing the same harms as putting the wrong person in the wrong role in traditional management.
- **Australian organisations must urgently create technical leadership tracks** that allow experts to reach senior levels while maintaining technical focus, restructure around small high-impact teams, and build a culture that values technical excellence. The window for action is measured in quarters, not years.

1. The Current State

1.1 Market Context

The Australian market for artificial intelligence (AI) and data science capabilities is experiencing unprecedented growth. The Department of Industry, Science and Resources' 2025 AI Ecosystem Report identifies 1,533 AI companies operating in Australia, with 110 new companies founded in 2023-2024 alone[1]. The CSIRO estimates that developing and commercialising AI will add over $22 trillion to the global economy by 2030, with digital innovations including AI potentially contributing $315 billion to Australia's GDP in the same timeframe[2].

Over 1,500 - the number of AI companies operating in Australia

However, beneath these headline figures lies a concerning pattern. The direct tech sector currently contributes just 3.8% to Australia's GDP — significantly below peer nations like the United States (10.2%), United Kingdom (8.1%), and Canada (6.8%)[3]. This gap reflects not just differences in market size but fundamental disparities in how technology is developed and deployed.

Only 3.8% - the direct tech sector's share of GDP

History offers a stark warning. During the industrial revolution, nations that invested heavily in steam engines, railways, and manufacturing infrastructure — like Britain, which achieved total domestic investment approaching 10% of GDP by the 1860s[4] — emerged as global economic powers. Those that remained primarily agricultural or extractive — like Spain, where GDP per capita grew at only 0.7% annually between 1850-1950[5], and Portugal, which maintained minimal industrial development with GDP per capita at just 40% of the Western European average (and only 29% of the UK's) by 1900[6] — saw their relative economic standing permanently diminished.

Today's AI revolution presents a similar inflection point: nations that build deep technical capabilities will shape the global economy, while those that merely consume technology risk compromising their economic sovereignty.

Current spending patterns tell a revealing story. Of total AI investment in Australia:

- 52% is directed to software, primarily commercial off-the-shelf solutions
- 30% goes to services, mostly integration and change management
- Only 18% (approximately $650 million) is allocated to infrastructure and foundational capabilities[7].

Meanwhile, competitor nations are making substantial commitments to building advanced capabilities. Canada and Singapore have recently committed $2.7 billion and $5 billion, respectively, towards AI development and adoption. By contrast, not a single AI-focused research project will receive funding from the 2026 Australian Research Council Centre of Excellence grants[8].

The skills challenge ahead is equally daunting. The CSIRO estimates that Australian industry will need up to 161,000 new AI specialist and AI-savvy workers by 2030 in areas like machine learning, computer vision and natural language processing[9]. Yet only 1% of Australian tech sector workers have experience in scale-up firms, compared to 17% in Singapore[10], highlighting the limited opportunities for developing advanced technical capabilities locally.

1.2 Implementation vs Innovation

The majority of Australian organisations are focused on implementing existing AI and data science solutions rather than driving genuine technical innovation. This manifests in several characteristic patterns.

Current Focus: Basic Implementation

Most organisations concentrate on:

- Deploying pre-built AI tools for standard business processes
- Implementing vendor-provided solutions that auto-train on organisational data
- Building simple predictive models for routine tasks like churn prediction or fraud detection
- Creating basic interfaces for commercial machine learning models.

While these implementations can deliver value, they represent a fundamentally different approach from genuine technical innovation. They rely on intellectual property developed overseas, with local teams focused primarily on integration and customisation rather than advancing technical boundaries. This dependence was starkly illustrated in 2021 when Google threatened to withdraw its search engine from Australia over proposed media bargaining laws — a move that would have severely disrupted many Australian businesses overnight — highlighting our vulnerability when we don't control the underlying technology[11]. In the emerging AI landscape, these initial implementations, though necessary, risk being mistaken for transformation when they're merely the price of entry.

Missing: Transformative Innovation

What's notably absent are examples of Australian organisations:

- Developing novel algorithms for complex business challenges
- Creating proprietary machine learning architectures for unique problem domains
- Building scalable, specialised data science platforms
- Advancing the fundamental state of the art in specific technical domains.

This gap becomes particularly concerning when viewed through the lens of AI transformation. While many Australian companies are adopting today's AI capabilities, leading global organisations are inventing tomorrow's — and that tomorrow is arriving in quarters, not years.

International comparisons highlight this disparity starkly. In Silicon Valley, technical leaders at companies like Google, OpenAI, and Anthropic are not just implementing AI, they're inventing it.

Canada has established the world's most systematic AI research-to-industry pipeline, with technical leaders from government-funded research institutes transitioning directly into senior corporate roles. The country's three premier AI institutes — Vector (Toronto), MILA (Montreal), and AMII (Alberta) — have generated extraordinary corporate leadership. Raquel Urtasun moved from University of Toronto professor to Uber's Chief Scientist for autonomous vehicles, then founded Waabi (valued at over US$800 million), while Ilya Sutskever transitioned from Geoffrey Hinton's research group to co-founding OpenAI. Singapore has similarly ensured technical experts lead their AI initiatives, with government-backed programs specifically designed to develop technical leadership and Smart Nation initiatives that systematically transition government technologists into corporate roles.

The gap:

Australian organisations are adopting AI capabilities and not enough are inventing them.

This gap is not due to lack of talent or potential. Australia has repeatedly demonstrated its capacity for world-leading technical innovation and research excellence:

- The invention of the black box flight recorder by David Warren at the Aeronautical Research Laboratories in Melbourne, a technology that transformed aviation safety worldwide[12]
- The development of the multi-channel cochlear implant by Professor Graeme Clark at the University of Melbourne, which became the world's first clinically successful multi-channel cochlear implant[13]
- The development of the HPV vaccine by Professor Ian Frazer at the University of Queensland[14]
- The invention of polymer banknotes by CSIRO, introducing revolutionary security features and durability now used in more than 45 countries worldwide[15]
- The development of Google Maps, originally created by Sydney-based Where 2 Technologies as a desktop application before being acquired by Google and transformed into the web service used globally today[16].

More recently, Australia has continued to demonstrate leadership in emerging fields, with the Commonwealth and Queensland State Governments' $940 million investment to establish PsiQuantum's Asia-Pacific headquarters in Brisbane and build the world's first utility-scale quantum computer[17].

1.3 Leadership and Career Structures

The current landscape of data science leadership in Australian organisations reveals concerning structural patterns that help explain our implementation-heavy approach.

Leadership Composition

While organisations are investing heavily in data science capabilities and AI initiatives, the leadership of these functions often emphasises business over technical expertise.

Recent analysis shows that among Chief Data Officers in Australia, only 35% hold a Bachelor's degree as their highest qualification, with the remainder pursuing advanced business-focused degrees — 29% hold Master's degrees and 20% hold MBAs[18]. The leading source of CDOs is the Australian Institute of Company Directors rather than technical institutions.

This stands in contrast to Australian technical founders who have successfully built global companies. Atlassian's founders, Mike Cannon-Brookes and Scott Farquhar, maintained technical involvement while scaling their company to a $100+ billion valuation, demonstrating that technical leaders can effectively run major enterprises. More recently, a new generation of Australian AI startups like Lorikeet and Relevance AI are showing promising technical leadership, though their scale and global impact remain modest compared to their US counterparts. While these emerging companies offer hope, the broader pattern remains concerning. We have some technical founders but lack technical leaders who have risen through AI and data science ranks to senior positions within established organisations.

The issue:

CDOs tend to have business instead of technical expertise.

Career Progression Constraints

After approximately seven to ten years of professional experience, technically skilled practitioners typically face a critical decision point:

- Continue deepening their technical expertise in an individual contributor role, often with limited influence and career progression
- Transition into general management to advance their career, often with limited opportunity to maintain technical development.

This creates an artificial ceiling on technical leadership development. Those who choose the technical path often find themselves limited in their ability to influence organisational direction or lead large teams, regardless of their expertise. Those who opt for management typically step away from technical work entirely.

The absence of visible technical leadership paths creates a role model vacuum. As one industry leader noted, “you cannot be what you cannot see”. When aspiring data scientists look up the career ladder and see only business managers at the top, the message is clear: technical excellence alone won’t take you to senior leadership.

> “The absence of visible technical leadership paths creates a role model vacuum”

Impact on Innovation Capability

This leadership and career structure creates several compounding effects:

- Without technical depth at senior levels, organisations struggle to effectively evaluate and direct technical initiatives
- Quality frameworks and technical governance lack effectiveness when overseen by leaders without the technical background to ensure genuine accountability
- Organisations default to low-risk, incremental improvements rather than transformative innovation
- Technical talent often seeks opportunities overseas where they can find roles that combine technical depth with organisational influence.

Talent Retention Challenge

The impact extends beyond individual career trajectories. When talented technical practitioners depart for overseas opportunities or transition to general management, organisations lose:

- Their technical expertise and innovation potential
- Their ability to mentor and develop the next generation of technical leaders
- Their potential contribution to building Australia’s technical leadership capability.

This creates a self-perpetuating cycle: without technical leaders at senior levels, organisations struggle to recognise the value of technical leadership, leading to continued emphasis on general management career paths and basic implementation approaches.

1.4 The AI Transformation Imperative

The challenges outlined above, from our implementation-focused approach to the absence of technical leadership pathways, are not merely operational inefficiencies. They represent fundamental structural weaknesses that will determine whether Australian organisations can compete in an AI-transformed global economy.

The pace of AI advancement is not linear but exponential. While Australian companies debate whether to adopt basic AI tools, global technology leaders are developing AI systems that can outperform entire departments. The gap between organisations with deep technical capabilities and those without is not measured in percentage points of efficiency but in orders of magnitude of capability.

Looking ahead, several factors suggest these challenges will intensify dramatically:

- Growing sophistication of AI applications will exponentially increase the advantage of deep technical capabilities
- Rising global competition for technical talent, with compensation packages that dwarf Australian offerings
- Increasing importance of AI and machine learning in core business processes across all industries
- Growing need for customised solutions in regulated industries where off-the-shelf AI tools are insufficient.

Without structural changes to how technical leadership is developed and positioned within organisations, Australian companies risk watching from the sidelines as others shape the AI-powered future of their industries.

In an AI-driven economy, the difference between technical leadership and technical followership is the difference between setting the agenda and struggling to survive. The window for action is rapidly closing, with competitive advantages measured in months rather than years.

2.Leading in the Age of AI: Why Technical Depth Matters More Than Ever

The traditional argument for appointing business-minded leaders to head technical functions was compelling: large organisations are fundamentally about people, regardless of whether those people perform technical or non-technical work. This approach served us well in an era of applied technical work that followed established patterns and best practices. But we are now in the midst of an AI revolution that fundamentally changes both the nature of technical work and the composition of our workforce.

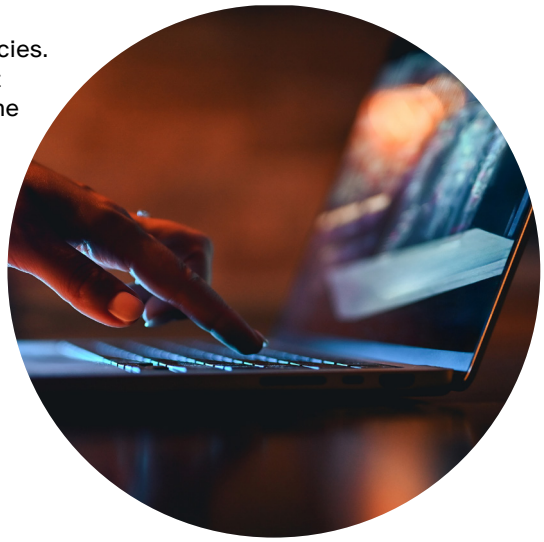
2.1 The Changing Nature of Technical Work

The days of "no one gets fired for buying IBM" are over. Technical work is becoming increasingly dynamic, requiring professionals to form independent judgements based on limited information rather than following prescribed best practices from textbooks or certification courses. This shift demands leaders who can navigate uncertainty and evaluate novel technical approaches in real-time.

More fundamentally, the nature of teams itself is transforming. Managing an organisation is no longer solely about managing people, it's about orchestrating hybrid teams of humans and AI systems.

Consider the trajectory: in 2020, a typical team might have comprised five managers and 25 contributors. By 2030 — likely sooner — that same function may be performed by five strong domain specialists working with sophisticated AI tools within a defined compute budget[19]. McKinsey's 2024 Global Survey shows 65% of organisations regularly using generative AI, doubled from the previous year[20], with predictions of decreasing headcount in service operations while technical roles grow.

This transformation demands that business leaders develop new competencies. Pure business managers must acquire technical literacy to understand what AI can and cannot do, while technically skilled professionals need to learn the leadership side to guide these hybrid teams effectively.



The skills required are fundamentally different from traditional management, it's not about motivating AI or managing its career development, but about understanding capability boundaries, managing compute resources and orchestrating human-AI collaboration for optimal outcomes. The pace of this change is breathtaking. Dario Amodei, CEO of Anthropic, predicts that by 2026, we will see the first company reach a billion-dollar valuation with no human team — just a solo founder leveraging AI[21]. This isn't merely speculation. Base44, founded by a solo entrepreneur, sold for US$80 million just six months after its founding, operating with only eight staff members[22]. Similarly, Telegram generates over US$1 billion in annual revenue with just 30 engineers plus 30 support staff[23] — a feat that would have required thousands of employees in traditional organisational models.

While this transformation may appear to reduce the need for human knowledge workers, history suggests a different outcome. When technology dramatically reduces the cost of production, consumption typically increases proportionally. Modern frameworks like React have made building responsive websites exponentially easier than in the early 2000s, yet there are more JavaScript developers today than ever before.

Similarly, as automobiles became affordable mass-market products rather than luxury items for the wealthy, the number of mechanics grew rather than shrank. The AI revolution is likely to follow this pattern: as the cost of knowledge work decreases, we should expect increased total output, new categories of work, and ultimately higher living standards as people find new ways to create value in an AI-augmented economy.

> "Leading in an AI-augmented world demands deep comprehension of AI systems."

2.2 Understanding Your New Workforce

Just as effective people leadership requires understanding human capabilities, limitations, values and beliefs, leading in an AI-augmented world demands deep comprehension of AI systems. While AI tools may not possess "values and beliefs" in the traditional sense, they exhibit consistent patterns of behaviour and have capabilities and limitations that follow fundamentally different profiles from human professionals.

This understanding is not academic — it's essential for avoiding costly mis-deployment. The same large language model that struggles to count the letters in "strawberry" can simultaneously solve PhD-level mathematics problems. A system that writes flawless code might hallucinate basic facts. These capability profiles don't map to any human equivalent — unlike humans, who progress from letters to words to sentences to sonnets, AI learns everything simultaneously through pattern matching, often excelling at the complex while failing at the simple. Business leaders who lack this technical depth risk the AI equivalent of putting a hot-tempered person in customer relations — except the failure modes are entirely different and potentially more damaging.

Decades of psychology and leadership research have taught us how to lead people, from Maslow's hierarchy to emotional intelligence frameworks. We now need similar depth to understand and deploy AI agents effectively. This isn't about becoming a programmer; it's about developing intuition for when AI excels (instant context switching, knowledge synthesis across disciplines, rapid prototyping of ideas) versus when it fails (common-sense reasoning, handling edge cases, understanding context). Without this fluency, leaders cannot distinguish between vendor hype and genuine breakthrough, between appropriate and inappropriate use cases, or between sustainable competitive advantage and temporary arbitrage.

2.3 Lessons from Bell Labs: Managing Exceptional Capability

The Bell Labs case study, while predating AI, offers crucial insights. Bell Labs researchers possessed capabilities that were, in their domain, superhuman — their inventions still fill university curricula and their names adorn scientific laws. These individuals were motivated differently from typical business professionals: by the pursuit of discovery and truth rather than promotions, office politics or status[24].

The key to Bell Labs' golden age was that these exceptional individuals were led by those who deeply understood them — leaders who had walked similar paths and grasped both the potential and the peculiarities of cutting-edge technical work. When Bell Labs shifted to generic business managers who lacked this deep technical empathy, the institution's innovative capacity withered[25].

Today's AI systems represent a new form of "exceptional capability" that requires similarly specialised leadership. Leaders must understand not just what AI can do, but how it "thinks", where it excels, where it fails, and how to create environments where human creativity and AI capability amplify each other.

2.4 Building Australia's AI-Native Technical Leadership

The world's most successful technology companies have already recognised this imperative. Google, Amazon, and Meta have all established dual career tracks that allow technical professionals to reach senior leadership positions — such as Distinguished Engineer or Google Fellow — without abandoning their technical focus[26]. These roles provide engineers at all levels with a visible technical career pinnacle to aspire toward[27], creating role models for the next generation of technical leaders. Importantly, these positions come with compensation that can exceed that of traditional management roles, e.g., at Google, for instance, a Senior Engineer can earn more than their boss's boss[28].

> "Globally, the value placed on top technical talent has reached extraordinary levels."

The value placed on top technical talent has reached extraordinary levels. Meta recently made headlines by offering individual OpenAI researchers US$100 million sign-on bonuses, with annual salaries reaching even higher. OpenAI countered and matched these offers[29], demonstrating that the war for technical talent is not about marginal differences but order-of-magnitude investments.

This global competition makes local opportunities even more critical. While Australian tech professionals might be tempted by Silicon Valley's astronomical packages, companies like Atlassian and Canva have proven that world-class technical careers can be built in Australia. These companies have transformed the local employment market for software engineers and designers, elevating both salaries and skills by giving talented Australians the chance to learn from the best, earn competitive compensation, and build globally-respected reputations — all without leaving home.

To capture the opportunities of the AI revolution, Australian organisations need leaders who combine three critical capabilities:

- **Deep technical fluency:** Leaders must understand AI at a level that goes beyond vendor presentations and executive briefings. They need hands-on experience with AI systems, an understanding of their underlying architectures, and intuition for their possibilities and limitations.
- **Hybrid team orchestration:** The ability to design and manage teams that seamlessly blend human expertise with AI capabilities. This includes understanding optimal task allocation, human-AI interface design, and the economics of compute versus human resources.
- **Innovation at the frontier:** In a rapidly evolving field, leaders must be comfortable operating without established playbooks. They need the technical confidence to evaluate novel approaches and the courage to pursue transformative rather than incremental gains.

2.5 Implementation Pathways

Australian organisations should consider several approaches to developing AI-native technical leadership:

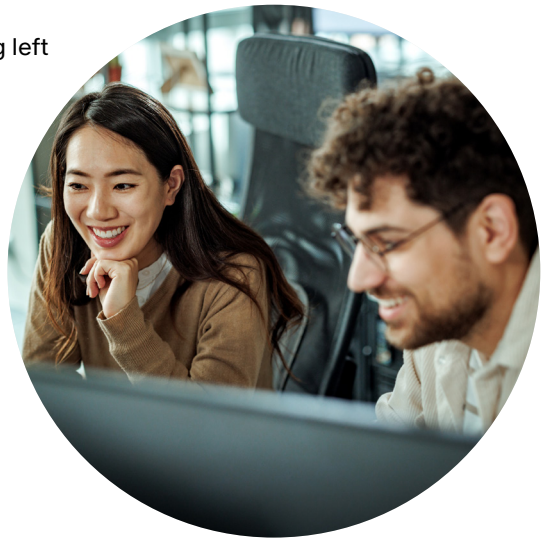
- **Create genuine technical leadership tracks**: Establish career pathways that allow technical experts to advance to senior organisational levels without abandoning their craft. These roles should carry real authority over technical strategy and resource allocation.
- **Rethink leadership development:** Traditional MBA programs and leadership courses are insufficient. Develop programs that combine deep technical education with leadership skills, taught by practitioners who have successfully led technical transformation.
- **Embrace small, high-impact teams:** Follow the emerging model of small teams with exceptional capability. A team of five world-class technologists with AI tools can outperform traditional departments of 50. This requires rethinking organisational structures and success metrics.
- **Foster technical excellence culture:** Create environments where technical mastery is valued and rewarded. This includes peer review processes, investment in continuous learning, and celebration of technical achievements alongside business outcomes.
- **Build AI leadership literacy:** For existing non-technical leaders, provide intensive education on AI capabilities and limitations. While they may not become technical experts, they must develop sufficient understanding to make informed strategic decisions.

2.6 The Competitive Imperative

The organisations that master AI-augmented operations will operate at fundamentally different levels of efficiency and innovation than those that don't. We're not talking about marginal improvements but order-of-magnitude differences in capability. A technically-led organisation that effectively leverages AI might accomplish with 10 people what traditionally required 100, while simultaneously improving quality and speed of delivery.

This is not a vision of the future — it's the reality of the present. Companies like Telegram are generating billion-dollar revenues with 30-person teams. Tech giants are investing nine-figure sums to secure individual technical contributors. Solo founders with AI are building and selling companies for tens of millions within months. These aren't outliers or experiments; they represent the new normal for organisations operating at the technical frontier.

Australian organisations that fail to develop technical leadership capable of navigating this transition risk obsolescence at an accelerating pace. The global competition for markets, talent and innovation is increasingly won by those who can effectively blend human expertise with AI capabilities. If Australian organisations don't catch up — and quickly — we risk our entire nation being left behind in the global economy.



The question is not whether to develop deep technical leadership, but how quickly we can build this capability before the competitive gap becomes insurmountable. The Bell Labs story reminds us that when you're pushing the boundaries of what's possible, you need leaders who understand the frontier. In an AI-transformed economy, that frontier is everywhere.

Technical leadership is no longer a nice-to-have for specialised R&D functions — it's an existential requirement for any organisation that hopes to remain relevant.

References

1. Department of Industry, Science, Energy and Resources. (2025). *Australia's artificial intelligence ecosystem: growth and opportunities.* Australian Government. https://www.industry.gov.au/publications/australias-artificial-intelligence-ecosystem-growth-and-opportunities
2. CSIRO. (2019). *Artificial Intelligence Roadmap.* https://www.csiro.au/en/research/technology-space/ai/artificial-intelligence-roadmap
3. Tech Council of Australia, Microsoft and LinkedIn. (2023). *Harnessing the Hidden Value*. Tech Council of Australia. Note that another Tech Council of Australia report, *The Economic Contribution of Australia's Tech Sector (2021)*, measures the tech sector's total contribution, including both direct (3.8%) and indirect (4.6%) effects, totalling 8.5% of GDP.
4. Centre for Economic Policy Research. (n.d.). *Capital and economic growth in Britain, 1270-1870: Preliminary findings.* CEPR VoxEU. https://cepr.org/voxeu/columns/capital-and-economic-growth-britain-1270-1870-preliminary-findings
5. Centre for Economic Policy Research. (n.d.). *Spanish economic growth in the long run: What the historical national accounts show.* CEPR VoxEU. https://cepr.org/voxeu/columns/spanish-economic-growth-long-run-what-historical-national-accounts-show
6. Bolt, J. van Zanden, J.L. (2014). *Maddison Project Database, version 2013. Maddison Project Database. Retrieved June 28, 2025.* https://www.rug.nl/ggdc/historicaldevelopment/maddison/releases/maddison-project-database-2013
7. Arboleda, N. (2022). *Australian artificial intelligence spending to reach $3.6 billion by 2025: IDC.* CRN Australia.
8. Australian Information Industry Association. (2025). *Federal Budget is an opportunity for Australia to be dealt into AI global race. AIIA Media Release.* https://aiia.com.au/wp-content/uploads/2025/02/2025-02-03-Federal-Budget-is-an-opportunity-for-Australia-to-be-dealt-into-AI-global-race.pdf
9. CSIRO. (2019). *Artificial Intelligence Roadmap*. https://www.csiro.au/en/research/technology-space/ai/artificial-intelligence-roadmap
10. Microsoft, LinkedIn and Accenture. (2023). *Harnessing the Hidden Value: How US tech workers boost the growth of Australia's tech ecosystem.*
11. Silva, K. (2021). *Google threatens to shut down search in Australia if media code becomes law.* BBC News.
12. Defence Science and Technology Group. (2020). *The Black Box Story: David Warren and the invention that changed aviation safety.* Australian Government Department of Defence. https://www.dst.defence.gov.au/innovation/black-box-flight-recorder/david-warren-inventor-black-box-flight-recorder
13. Beiter, A.L., Nel, E. (2015). *The history of Cochlear™ Nucleus® sound processor upgrades: 30 years and counting*. Journal of Otology, 10(4), 108-114.
14. Frazer, I.H. (2019). *The HPV Vaccine Story.* ACS Pharmacology & Translational Science, 2(3), 210-212.
15. Rafiei, A., Karimi, A., Bodaghi, M. (2023). Polymer Banknotes: *A Review of Materials, Design, and Printing.* Sustainability, 15, Article 3736.
16. Hutcheon, S. (2015). *The Untold Story About the Founding of Google Maps*. Medium.

17. Department of Industry, Science and Resources. (2024). *State of Australian quantum report 2024*. Australian Government. https://www.industry.gov.au/publications/state-australian-quantum-report-2024

18. Ignite Limited. (2024). *Digital Leadership Down Under:* Insights into Australia's Tech Roles. https://www.igniteco.com/whitepaper/digital-leadership/

19. A compute budget refers to allocated computational resources (processing power, memory, storage) for AI systems and digital operations, typically measured by cost or processing capacity. Similar to financial budgets limiting spending on salaries, compute budgets limit how much computational power can be used for AI tools and automated systems. As AI becomes more prevalent, organisations increasingly manage these resources as a strategic constraint, balancing AI system demands against costs and capabilities.

20. McKinsey & Company. (2024). *The state of AI in 2024: McKinsey Global Survey on AI.* https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-2024

21. Amodei, D. (2025). Remarks at Anthropic's "Code with Claude" conference. As reported in *India Today*, 26 May 2025. https://www.indiatoday.in/technology/news/story/anthropic-ceo-dario-amodei-predict-ai-will-allow-just-one-person-run-a-billion-dollar-company-by-2026-2730513-2025-05-26

22. TechCrunch. (2025). *6-month-old solo-owned vibe coder Base44 sells to Wix for $80M cash.* Retrieved 18 June 2025. https://techcrunch.com/2025/06/18/6-month-old-solo-owned-vibe-coder-base44-sells-to-wix-for-80m-cash/

23. Durov, P. (2024). *Pavel Durov says Telegram is now profitable*. https://techcrunch.com/2024/12/23/pavel-durov-says-telegram-is-now-profitable/

24. Kelly, M.J. (1950). *The Bell Telephone Laboratories—an example of an institute of creative technology*. Proceedings of the Royal Society A, Vol. 203, pp. 287-301.

25. Noll, A. Michael. (2015). *Memories: A Personal History of Bell Telephone Laboratories.* Quello.msu.edu. https://quello.msu.edu/wp-content/uploads/2015/08/Memories-Noll.pdf

26. Google Careers (https://careers.google.com), Amazon Jobs (https://amazon.jobs), and Meta Careers (https://metacareers.com) official websites document these dual career tracks, with Distinguished Engineer roles at levels equivalent to Director/VP.

27. Engineering Bolt. (2024). *Google Software Engineer Levels: Roles, Expectations and Salary*. https://engineeringbolt.com/tech/google-software-engineer-levels-roles-expectations-salary/

28. Engineering Bolt. (2025). *Google Software Engineer Levels,* Roles, Expectations & Salary. Individual contributors at L7+ can earn comparable or higher compensation than L5-L6 engineering managers. https://engineeringbolt.com/tech/google-software-engineer-levels-roles-expectations-salary/

29. Altman, S. (2025). *Interview on Uncapped podcast, 17 June 2025*. As reported in CNBC: https://www.cnbc.com/2025/06/18/sam-altman-says-meta-tried-to-poach-openai-staff-with-100-million-bonuses-mark-zuckerberg.html

Actuaries Institute.

Actuaries Institute
ABN 69 000 423 656

Level 34, Australia Square
264 George Street, Sydney NSW 2000

T +61 (0) 2 9239 6100
E actuaries@actuaries.asn.au
W actuaries.asn.au