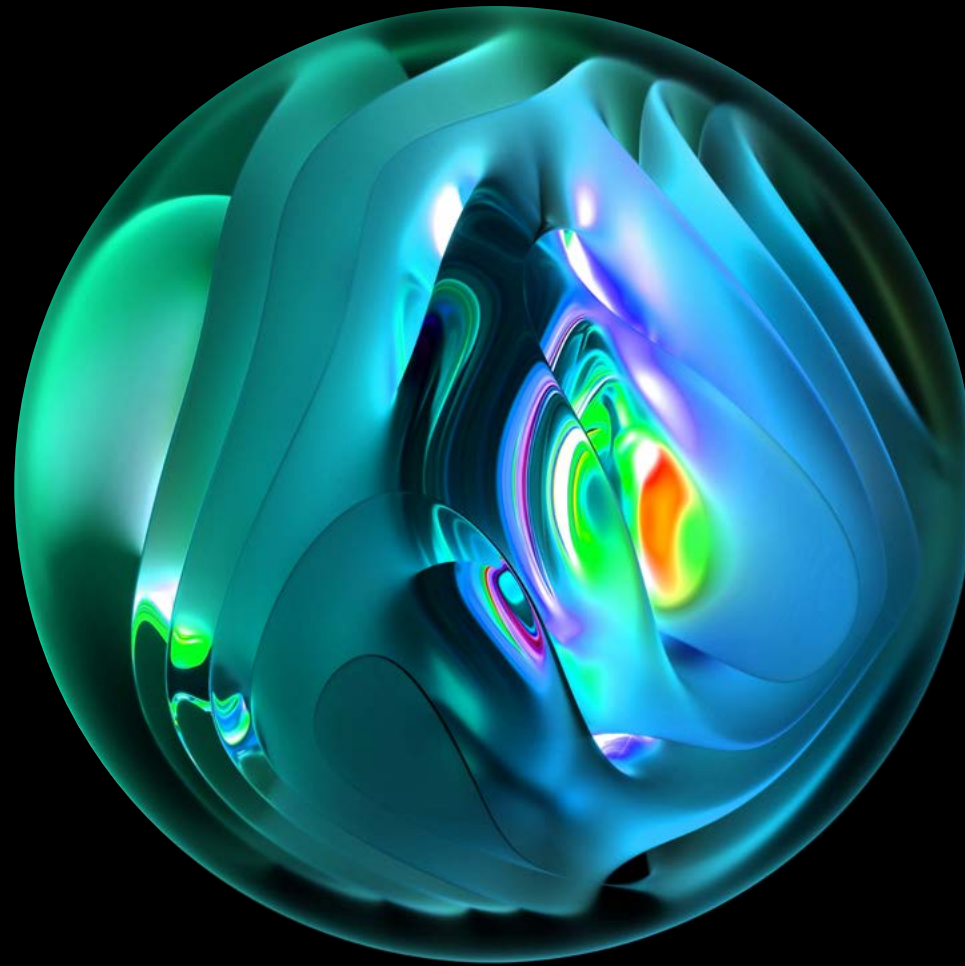


Deloitte.



Australia's Digital Pulse

A new approach to building technology skills

South Australia edition

Deloitte
Access Economics



Powering Australia's technology brilliance.

ACS is the professional association and largest community for Australia's technology professionals, with more than 47,000 members across business, government and education.

As the trusted leader in the tech sector, we work to accelerate the growth of diverse and highly skilled technology professionals, equipping them with the right skills and knowledge to power Australia. Now and in the future.

We deliver value for our members, businesses and society in four ways.

Community

We foster an innovative and inclusive community that is dedicated to powering positive change through technology.

47,000+ **12,000**
Total members Event attendees
a year

Career

We create career pathways to guide technology professionals and ensure Australia has a pipeline of talent with the right skills and knowledge.

46 **368**
Accredited ACS Google
universities Scholarships

Capability

We set the standard for assessing, developing and recognising the skills and experience of technology professionals.

11,128+ **44,000**
Learning Digital resources
Accelerator unique users

Migration

We assess and support skilled technology migrants to address critical skills shortages, improve diversity and enrich Australia's workforce.

40,200 **7,107**
Skilled migrant ACS Professional
applicants in Year graduates in
2022-23 2022-23

ACS Australia's Digital Pulse 2023

South Australia edition

South Australia has strong local capabilities and aspires to be a global leader in the sector. The rapid adoption of these critical technologies including artificial intelligence, advanced data analytics and cyber security will affect over 900,000 South Australian workers and require almost 50,000 additional critical technology skills by 2030.

Already outdated digital skills cost South Australian large businesses \$160 million per year. This estimate only reflects costs associated with existing employees, with the full opportunity from digital technology likely to be much larger. Building the tech skills needed in South Australia will require a new approach.

Key principles of the new approach



All hands on deck



Skills first



Driving diversity



Lifecycle of learning



Systems approach

\$10 billion

Projected annual technology investment in South Australia in 2030

900,000

South Australian workers who will need some reskilling because new tech will affect at least 20% of work time

49,000

critical tech skills needed in South Australia by 2030

\$160 million

Cost of outdated digital skills for large South Australian businesses each year

South Australia aims to be a leader in critical technology

Technology contributes almost \$5 billion to the South Australian economy

The South Australian ICT sector is a growing sector with innovative local businesses. The ICT sector contributed \$4.7 billion to the South Australian economy in FY22 as measured by value and almost 7,000 technology businesses have headquarters in the state.^{1,2}

The importance of digital technology extends across the whole economy. Consider the following:

- The South Australian technology workforce reached 42,776 in 2022, with half employed in businesses outside the traditional ICT sector.
- Adelaide is Australia's first member of the global GigCity network. GigCities provides extremely fast gigabit-speed internet - 100 times faster than the national average.³
- Adelaide is also Australia's centre for cyber security and defence technology research.⁴

Artificial intelligence (AI) will be at the forefront of disruption. For example, research from Deloitte's Generation AI: Ready or not found that the five industries which will experience imminent and extensive disruption from Generative AI account for 26% of the South Australia's economy.⁵

More broadly, forecasts from the International Data Corporation (IDC) indicate that technology investment in South Australia will increase from \$7.8 billion in 2022 to \$10.3 billion by 2030.

The scope of technology disruption cannot be understated. The South Australian Productivity Commission found that if South Australia had kept up with the long-run global growth of

technology and knowledge, productivity growth would have been one percentage point per year faster over the past two decades. This would have contributed an extra \$8,000 to workers' wages and \$13,500 to gross state product per capita.⁶

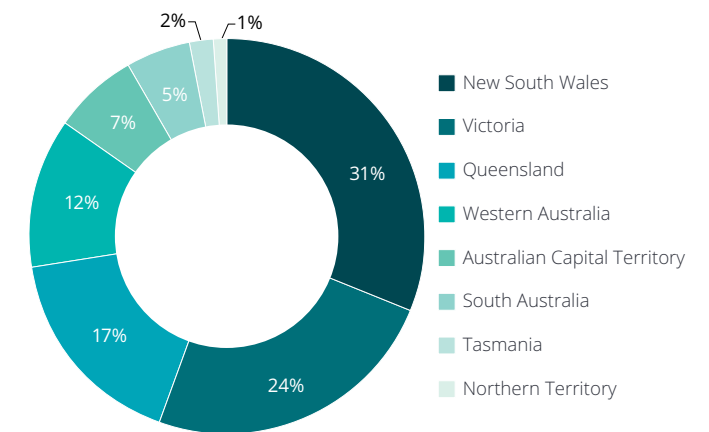
The public sector as a significant employer in South Australia has an important role to play in driving productivity through digitalisation. This could not only provide benefits through the more efficient delivery of government services and operations but has the potential to have flow on effects to other industries.

Beyond productivity, embracing technologies will provide significant dividends for other objectives. For example, the South Australian Government has targets to reduce net greenhouse gas emissions by more than 50% by 2030 and to achieve net zero emissions by 2050. Critical technology in South Australia's geospatial intelligence industry will be essential for these objectives with over half of the World Economic Forum's non-optional climate variables only being measurable from space.⁷

The South Australian Government also aims to become a digital "partner of choice" to world-class leaders in critical technologies, particularly AI, cyber and big data to improve infrastructure and develop a skills pipeline for priority industries such as space and defence.⁸ However, while South Australia aims to be a leader in these areas, a mismatch between international demand and domestic capabilities is a barrier to be overcome. Initiatives such as Lot Fourteen seek to grow skills for critical technologies and priority industries.

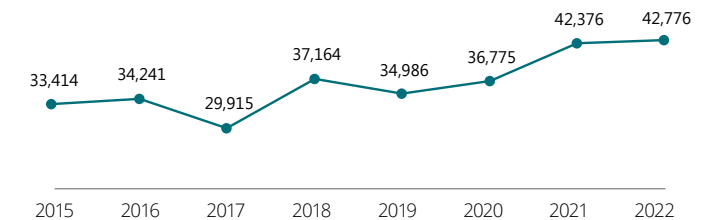
With tech offering solutions to some of the biggest issues facing the state, South Australia cannot afford to let the opportunities of developments in tech go by.

National technology investment to 2030



Source: IDC ICT Spend Data Custom Report

Technology employment in South Australia 2015 to 2022



Source: Australian Bureau of Statistics (2023)

A tech perspective

“South Australia has a competitive advantage when it comes to advanced manufacturing capabilities and businesses, but we can’t have any sense of entitlement when it comes to our position.

New technologies are transforming everything from design, production and distribution and making sure South Australian workers build the skills to operationalise these technologies will be key for the sector.”



Bec McConnochie
Tech Sector Lead Partner
Deloitte Australia

Critical technology will significantly impact the work of 96% of the South Australian workforce

Over 900,000 workers across South Australia will be substantially impacted by critical technology

To begin preparing for the incoming disruption, the Australian Government has developed the *List of Critical Technologies in the National Interest*. The latest edition of *ACS Australia's Digital Pulse* analyses the impact of eight key technologies from this list including AI, additive manufacturing, advanced data analytics, advanced robotics and sensors, cyber security, enabling cloud technology, Internet of Things (IoT) and virtual worlds.¹

To assess the skills needs for these critical technologies, Deloitte Access Economics has analysed a 2,136-task taxonomy of 229 Australian occupations from the National Skills Commission (NSC) and academic research on the impact of these technologies on tasks to understand the potential impact of the critical technologies for the Australia workforce.

This analysis shows that almost all South Australian workers (96%) are expected to have at least 20% of their work time affected by critical technologies over the coming years. In total, 72% of all working hours across SA will be affected.

Advanced data analytics and AI technologies will have the largest workforce impact, each affecting the work time of over half of all workers. In total, these technologies will affect 26% and 23% of all work hours in South Australia respectively.

While a broad range of workers will be impacted by critical technology, some jobs face greater changes in skills than others.

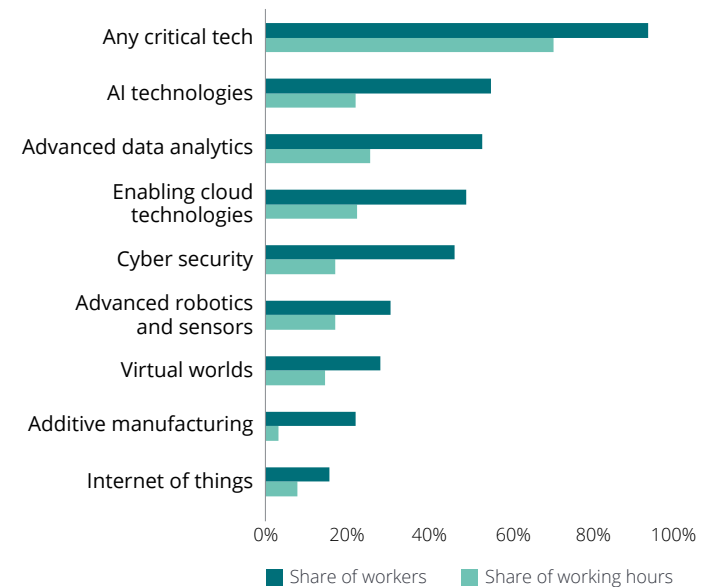
Occupations most affected by critical technology include technology workers who account for eight out of the top twenty impacted occupations. For South Australia, which already has a number of technology-based jobs on its skill shortages list, this means thinking strategically about how to attract new workers and upskill existing technology workers in critical tech.

Improving the ICT education system should be a focus for skilling technology workers. Currently, only 3% of businesses think that the education system produces job-ready tech graduate.² For South Australia, whose Universities sit at the national average in terms of student outcomes, there is room for further progress.³

Occupations outside of technology workers will also be impacted. Sales assistants, registered nurses and teachers will all have more than 60% of their work time impacted. While these roles all have some tasks that are less likely to be impacted, administrative and cognitive tasks within these occupations are likely to be made more productive or change entirely.

Manual labour-intensive occupations such as those in hospitality and construction are expected to be less impacted by critical technology relative to other industries. As every industry is being transformed by these technologies, strategies to upskill workers in these areas will be important.

Proportion of South Australian workers and work hours affected by critical technology



Knowledge and primary industries will have more than 80% of work time impacted

Nine South Australian industries will all have at least 80% of their work time affected by critical technology

A broad range of industries are expected to be affected by critical technology including knowledge industries like financial and professional services, other service-based industries like retail trade and a number of traditional industries such as utilities, mining and construction. Collectively, the top nine impacted industries account for 49% of South Australian economy in 2022.

The highly codified information within existing digital infrastructure alongside the highly skilled workforce means that knowledge industries like financial and professional services are likely to experience significant impacts from future waves of critical technologies like data analytics and AI.^{1,2}

Already major companies are focusing on critical tech in South Australia. Organisations including Commonwealth Bank, AWS and Cognizant are growing presences in Adelaide as they look to leverage the existing AI and data analytics talent pool in the state.³

Service-based and traditional industries are also facing seismic disruption from critical technologies and may be less prepared for the rapid incoming changes. Other research which compared the data infrastructure of these industries has found relatively lower capabilities in construction, mining and wholesale compared to other industries.⁴

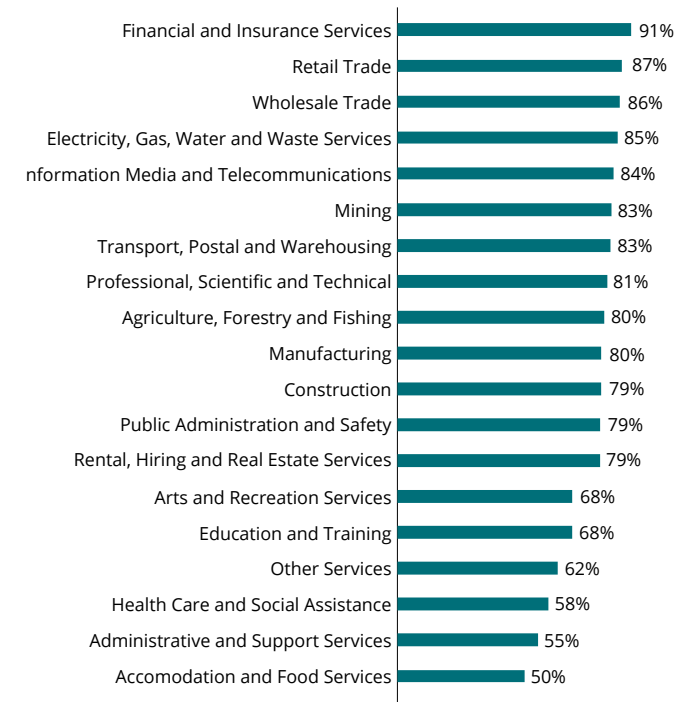
The South Australian agriculture industry is rapidly evolving through the use of AgTech. AgTech is currently supporting carbon mitigation, livestock traceability and drought resilience.⁵ While these applications contribute to improve productivity, employees in traditional industry may face a growing skills mismatch. Not addressing this issue could lead to significant challenges for the more than 31,000 people employed in agriculture, forestry and fishing in South Australia as their industry transforms.⁶

The industry recognises that a focus on building the digital skills of the workforce will play an important role in ensuring it can keep pace. Programs like the AgTech Growth Fund and, AgTech Producer Groups and Demonstration Farms provided by Department of Primary Industries and Regions, South Australia across the state are important steps in smoothing the digital skills transition for employees in the industry.⁷

Industries with a larger share of the workforce in people and care orientated roles such as nursing and hospitality will be relatively less affected than the industries described above. This includes industries such as accommodation and food services, and health care. However, the impact across these industries is still substantial with more than half of all work hours in the least affected industry expected to be affected by critical technology.

With the impacts of critical technology being felt across all industries, competition for workers with critical technology skills will likely be fierce. A focus on upskilling the existing workers in industry specific applications will therefore be key.

Affected work hours by industry, South Australia



Source: Deloitte Access Economics analysis of ABS Census (2023)

The tech skills challenge for South Australia

South Australia will need to more than triple its number of critical technology skill by 2030

The number and type of skills needed for the technology workforce in 2030 will look vastly different to those in use today. In total, almost 70,000 skills will be required for critical technologies by 2030, an increase of 49,000 compared to current skills within the South Australian workforce.

The greatest increase in skills demanded will be for the people skills needed by most workers such as communication and team teamwork skills. Cloud solutions, data science and software development principles are among the most common technical skills that will be needed in South Australia. Recognising the value of interdisciplinary skills is also important as technology permeates through all industries.

Skills to work with AI will be some of the most sought after, with 20,000 additional AI skills needed by 2030. These include technical skills such as data science, machine learning and deep learning (see page 9).

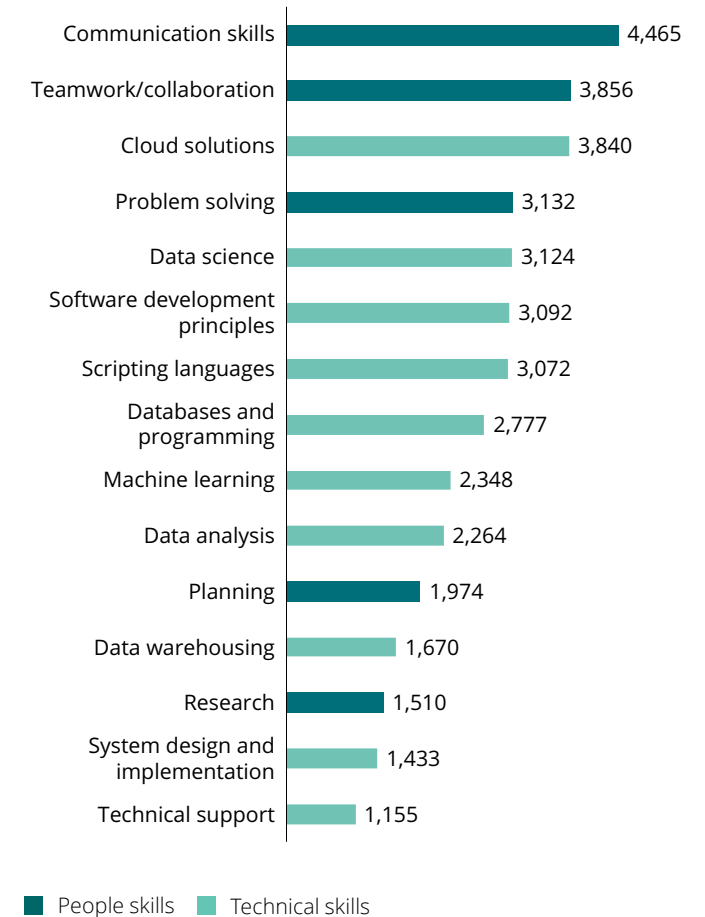
One key source of these skills will be the core technology workforce. There are now almost 43,000 people employed in the South Australian technology workforce. Our forecasts suggest an additional 14,000 workers will be required by 2030. That's 2,000 annually. Despite this, South Australia is only expected to formally educate half that number of workers per year over this period (8,000 by 2030).

Yet, addressing the tech skills challenge will require more than increasing the number of technology workers. Previous Deloitte Access Economics research suggests that three in five businesses lack the digital skills they require to do business.¹ These out-of-date digital skills come at a cost with \$160 million per year in lost output among large businesses alone.² This estimate only reflects costs associated with existing employees, with the full opportunity from digital technology likely to be much larger.

With seismic developments occurring in technology, the potential for rapid change in the skills required across the South Australian workforce means the gap in digital skills is likely to grow without significant action. Government initiatives such as the *Defence Industry Development Strategy* may trigger greater mismatches in the supply and demand for tech skills in the short-term. While these may settle, setting policy to weather the policy cycle and help ensure the skills required are supplied into the market is important.

The lack of diversity in tech not only holds back key talent but severely limits the ability to meet our skill needs. Only 27% of people working in technology occupations in South Australia are women, the lowest of any state. The share of women in the sector is also substantially lower than in comparable industries such as professional services (45%).³ The share of women enrolled in IT university courses sits at 27% of total enrolments, meaning the gender gap in the South Australian ICT sector is likely to persist.⁴

Additional skills needed by critical technology workers by 2030, South Australia



Source: Deloitte Access Economics analysis of ABS Census (2023)

2030 skills for Artificial Intelligence, Machine Learning and Natural Language Processing



One of biggest areas of additional skill requirements will come from Artificial Intelligence (AI), Natural Language Processing (NLP), Machine Learning (ML). Annual business investment across Australia in these areas is forecast to jump from less than \$5 billion in 2022 to over \$27 billion by 2030. Business use of these technologies across Australia will grow from less than 1% in 2022 to almost two-thirds by 2030.

What skills will tech workers need for this enormous change?

Already, we know that the essential technical skills include: Data Science Principles, Data Analytical Thinking, Programming, Scripting Languages, Machine Learning, and Software Development Principles. Workers will also need soft skills such as planning, research, problem-solving, effective communication, collaboration, and teamwork.








How many extra professionals and how much more skilling will be needed in South Australia?

The number of South Australian tech workers focusing on AI, ML and NLP is expected to grow from just 600 in 2022 to 5,200 by 2030.

The total skill requirement in South Australia to support just the core tech workforce is projected to grow 793% from 2,503 in 2022 to 22,348 in 2030. The gap between skills now and in the future is a staggering 19,845 technical and soft skills.

The introduction of these new technologies will also give rise to new job roles, including positions such as AI Ethicist, AI personality designers, algorithm bias auditors, information validators, and AI regulatory roles.

Skills sets demanded for AI, NLP, and ML by 2030

-  **Data science**
3,124+
-  **Machine learning**
2,343+
-  **Data analysis**
1,148+
-  **Scripting languages**
2,205+
-  **Data warehousing**
1,057+
-  **Databases & programming**
1,286+
-  **Software development principles**
1,608+

32k Skilled workers needed (2030)

138k Skills gap (2030)

+793% Growth in skilled workers (2022-2030)

People skills

Teamwork/collaboration	1,562+
Communication skills	1,562+
Problem Solving	1,194+
Research	1,011+
Planning	689+

Extra skills identified

- Ethical & responsible use of AI
- Critical thinking
- Linear Algebra and Calculus
- Machine Learning
- Deep Learning

Tech workers expect critical technology including artificial intelligence to significantly disrupt the workforce over the coming years

Three-fifths of South Australian technology workers agree that critical tech will significantly disrupt the sector

Like their peers across Australia, tech workers in South Australia see the extent of potential disruption in the sector. Most do not think they are ready for the coming change. Only half (51%) of current technology workers surveyed believe their formal education has equipped them with the skills they need for critical technology.

As well as adapting to change, there is also an underutilisation of technology workers who are currently employed. This means workers are not finding the best jobs and adding to the likelihood they leave the profession.

Better utilising tech workers in South Australia includes ensuring workers have meaningful work for their skills. Based on the technology workforce survey, one in five do not agree that their skills are being fully utilised. Workers think that they could be given more technical tasks (50%), having their international experience or education better recognised (33%) and be involved in bigger and more complex work (33%).

A third of South Australian tech workers (32%) also want to work more hours. The largest barriers for these workers are a lack of full-time opportunities and caring responsibilities. Addressing workers being stuck in a part-time role that underutilises their time and skills represents a key opportunity for meeting the needs of the future workforce.

Almost a quarter of South Australian tech workers are planning on leaving the sector in the next five years.

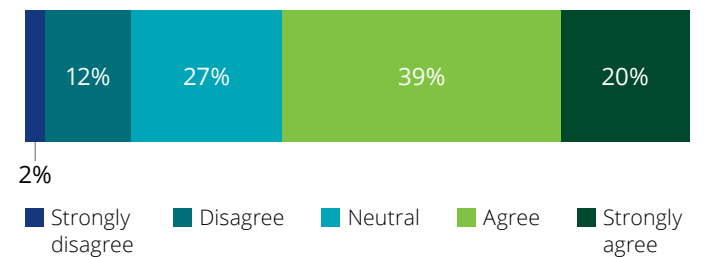
This level of planned exits from the sector highlights the need to address the challenges that workers in the sector face. Some of the top reasons for workers wanting to leave the tech sector in South Australia include wanting to do something different (35%), for better job security (30%) and a lack of growth opportunities (30%).

While workers leave technology roles, workers also reskill into the sector. In South Australia, those reskilling in the sector are much more likely to be doing so due to better pay, an increase in demand for tech skills and opportunities for leaning and development. This is indicative of an attractive range of career options in tech compared to other opportunities in the state.

Our technology workforce survey found that nearly half (49%) of technology workers look to upskill by undertaking self-directed learning through channels such as reading articles and watching videos while 29% undertook a short course or micro-credential.

Salary and career development are top reasons for workers wanting to both move into and out of the technology sector. This suggests that while workers come into the industry for advancement, they may reach a point where the opportunities in the sector are not apparent. Alternatively, a mismatch between expectations and reality could be contributing to people leaving over time.

Agreement that critical technology will significantly disrupt the technology sector



Source: Technology workforce survey (2023)

Reasons reskillers move into a technology role in South Australia



Source: Technology workforce survey (2023)

A professional association perspective

“Migrants provide our South Australian technology workforce not only with an important source of diversity but also much needed source of skills.

Making sure those skilled workers that come to this country have their skills recognised will be fundamental to ensuring South Australia has the skills needed to make the most of critical technologies.”



Josh Griggs
Interim CEO
Australian Computer Society

Transforming manufacturing in South Australia through AI

AI providing South Australian manufacturers a new competitive advantage

The manufacturing industry in South Australia is the largest sector in the state and accounts for 20% of exports and 11.5% of state output.^{1,2} However, the industry has faced challenges with increasing cost competitive manufacturing in other jurisdictions. To remain competitive, the local manufacturing industry needs to focus on higher value-adding components of manufacturing like design, quality and innovation through advanced manufacturing and integration of critical technologies.

Manufacturing businesses are already looking to integrate AI into their business model. Tindo Solar has used AI to automatically detect quality issues in their solar PV Cells.³ Memjet, a printing company with a Sydney manufacturing centre, uses AI robotics to efficiently reconfigure its current production cells to manufacture test prototypes for other medical technology businesses.⁴

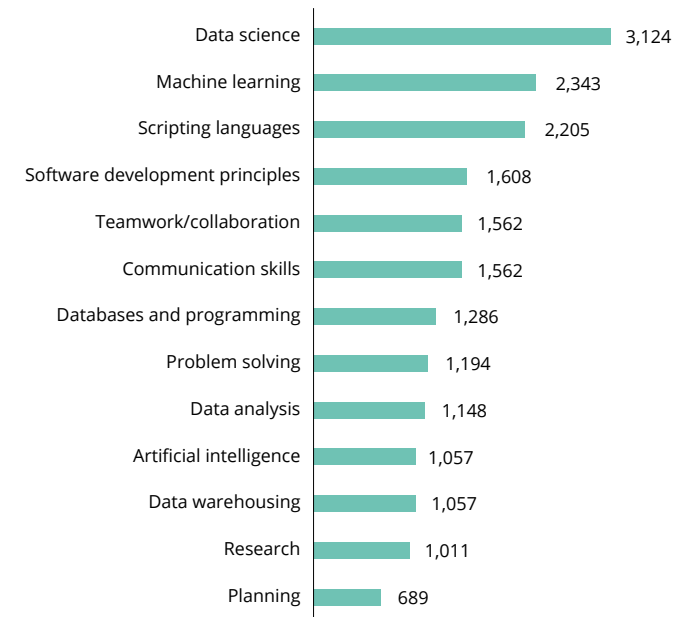
Despite the significant value add of introducing AI into manufacturing processes, adoption of critical technologies by small-to-medium businesses is lower than larger businesses. Both the state and federal government have implemented strategies to increase digital technology uptake by manufacturers more broadly by driving co-ordinated research into innovation and building capability in the industry.

Factory of the Future, an advanced manufacturing research and accelerator facility, was granted \$4 million by the South Australian Government and \$10 million by the Federal Government to increase accessibility of innovative manufacturing technologies by businesses.⁵ The facility is part of the Tonsley Innovation District, one of the government-led innovation hubs in South Australia.

At the same time as lifting business experimentation with AI and other advanced technologies, building the workforce skills required to use AI – including data science, machine learning and scripting languages – will need to be developed. The South Australian Government has sought to encourage the development of these skills through digital literacy funding, and traineeships and Degree Apprenticeships to allow students to gain relevant work experience from day dot.

With South Australia being the key manufacturing hub for large-scale Defence projects, including SSN-AUKUS, there is a pressing demand for qualified and skilled workers that can fill the 5,000 extra jobs predicted to be generated by 2040 in the defence industry.⁶ The South Australian Defence Industry Workforce and Skills Taskforce Action Report has proposed an action plan that promotes STEM participation in all stages of schooling to address this skills challenge.

Additional skills needed by workers in the AI by 2030



Source: Technology workforce survey (2023)

How can South Australia lead change?

While the South Australian Government has a number of strategies around improving digital education and specific industry strategies that acknowledge the importance of digital take-up, there is no comprehensive digital strategy around the digital economy.

The *Economic Statement* focuses on fostering an economy that is fit for the future and is known to embrace technology and innovation.

A Futureproofed Workforce is identified as one of the four strategic pillars in the *South Australian Skills Commission Strategic Plan 2022-2024*, with a focus on opportunities for school leavers. Similarly, the *Career Education and Pathways Strategy* commits to increasing vocational education and SAGE participation through technical colleges and flexible industry programs.

For school students, the Department of Education's *Digital Strategy 2023 to 2026* outlines how digital technology will transform the education system.

Industries with relevant strategies include the defence, manufacturing and agriculture sector, with the role of digital technology featuring in these respective reports. For example, the *South Australian Advanced Manufacturing Strategy* makes reference to a skilled migration program and regional workforce strategies. The *AgTech Strategic Plan* recognises skills development and education as one of the seven priorities and advocates for investment into training resources for both students and professionals.

Addressing the skills issue will require a new approach to building tech skills in Australia and South Australia. This year's Australia's Digital Pulse outlines five key principles needed to guide individual policies and initiatives. These principles are equally as relevant to South Australia. Using these as our foundations, we have identified three high priority recommendations for South Australia to kick start this new approach

These recommendations align with multiple principles listed below and illustrate how solutions should and can bring about transformative change. The three recommendations are detailed in subsequent pages of this report.



01 All hands on deck

We need all actors across both private and public sectors to play a role in addressing the skills challenge in South Australia. Combining effort to produce transformational change will be required.

This will require the Government to develop a skills strategy in collaboration with education providers like University of South Australia, University of Adelaide and Flinders University and major tech employers to outline how skills can be developed.



02 Skills first

We have designed our education system to focus on people being ready for roles they could remain in for their entire career with limited reskilling or upskilling. We need to first and foremost identify and build in-demand skills based on critical technologies shaping the Victorian economy and society.



03 Driving diversity

We need people with the right skills. Fully utilising the existing skills in the economy not only benefits individuals by providing fulfilling career options but also generates substantial benefit to the South Australian economy.

South Australia's technology workforce has lower representation than the national average in terms of workers aged over 55, First Nations Peoples and people who need assistance. Helping these cohorts build skills and participate fully in the SA economy and society is critical to realising the benefits of a digital economy.



04 Lifecycle of learning

Building a culture of continual skills development is necessary in the face of a declining half-life of skills. In addition, the skill needs of the South Australian workforce will change in unforeseeable ways as technologies interact, highlighting the need for continuous learning. For example, quantum computing may require a large increase in coding skills while Generative AI may streamline the need for in-depth knowledge of coding specific knowledge.



05 Systems approach

Too often we are working on solving the same problem in silos. Combining our efforts and thinking holistically about our networks, organisations and institutions is necessary to maximise the impact of our initiatives.

Turning the principles of the new approach into practice in South Australia

Creating a Digital Skills Action Plan



Technology skills are constantly evolving and becoming an imperative for individuals and businesses to thrive in the modern economy. While South Australia has a dedicated skills strategy and specific industry strategies that reference the need for greater digital uptake, there is a need to build a holistic digital economy strategy that identifies key priorities in the digital economy in terms of infrastructure, industries and workforce needs.

This strategy should have clear objectives with measurable success metrics in order to effectively address a growing technological skills shortage. Similar to other jurisdictions, developing a medium term strategy with several shorter-term action plans could prove useful for the South Australian Government.

In particular, initiatives to support mid-career reskilling and upskilling into the technology workforce, and promoting greater digital inclusion in regional areas should also be integrated.

The holistic strategy should leverage the several standalone strategies that could be used as a base. For example, the *ICT, Cyber Security and Digital Government Strategy* and the Department of Education's *Digital Strategy* provide a roadmap for the South Australian government. The *Defence Industry Workforce and Skills Taskforce Action Report*, *Digital Strategy 2023 to 2026*, and the *Advanced Manufacturing Strategy*, and *AgTech Strategic Plan* also provide important insights that should be incorporated into a holistic strategy.

To ensure accountability, there should be a digital economy office set up in the South Australian Government to coordinate action and measure success.

Increasing training in regional SA to bridge the digital skills divide



The government will need to implement more initiatives and investments to reduce the regional digital divide in South Australia. South Australia scored 1.2 points below the national average across all metrics in the latest Australian Digital Inclusion Index, with regional South Australia having a lower score compared to metropolitan areas and other regional areas in Australia in both digital access and ability.

While the government has rolled out various initiatives to increase digital access to regional areas, including a \$10 million technology upgrade for schools, Regional SA would benefit from a more focussed digital ability strategy to equip individuals with the necessary skillssets to be competitive in a digital world. Key priorities should include incentivising digital skills development through collaboration with local businesses and educational institutions while increasing regional training delivery capability. The South Australian Skills Commission should engage with institutions including TAFE SA to ensure that current training and education courses are aligned with regional skills needs.

Given the geographic spread of South Australia's population, building well-connected communities through technological hubs will be necessary to drive innovation and boost employment opportunities in regional areas. The proposed AgTech hubs, based in regional SA locations, are an example of this that will enhance collaboration between primary producers, entrepreneurs, and researchers. There is opportunity for these innovation hubs to partner with educational providers to increase entry pathways for regional workers and for similar hubs for other relevant industries.

Better utilising South Australian Migrants



Better utilising the skills of migrants to South Australia will be critical to achieving the skills to fully utilise critical technologies. Skilled migrants account for about 45% of the technology workforce and will be important to the South Australian economy to offset an ageing population. Across larger states, South Australia now has the highest rate of migrant qualification underutilisation.

A variety of support services are available in South Australia. These services are provided by a number of organisations, including government, industry and community groups.

To improve migrant utilisation in South Australia, the South Australian Government should partner with professional and industry associations as well as employers to address unconscious bias and discrimination in the workplace and help recognise the valuable skills migrants have in a professional setting. This should also help develop skills and understanding of local business culture and encourage smaller and medium sized enterprises (SMEs) to give more consideration to hiring migrant workers.

Migrants could also benefit from larger and deeper professional networks as recognised in the latest edition of *Australia's Digital Pulse*. Provision of workshops, training and networking events by businesses and tech employers can help migrants gain local networks and exposure to the broader labour market.

About this report

This report is a companion report to the ACS Australia's Digital Pulse written by Deloitte Access Economics for the ACS. As such, this report should be read in conjunction with the national ACS Australia's Digital Pulse, which can be viewed [here](#).

This report, like the national report, focuses on eight critical technologies based on the Australian Government's *List of Critical Technologies in the National Interest* which identifies 63 key technologies within 7 fields that will have the greatest impact on Australia.

These critical technologies will profoundly impact the South Australian economy and labour market. This report has collated a variety of data sources to provide an analysis on the impact of these technologies on the South Australian tech workforce.

The research notes that while the technology workforce in South Australia has grown strongly, there are risks to achieving the required growth in skills and people.

The analysis in this report is informed by the following data sources:

- Forecasts from the International Data Corporation (IDC) on investment spending in Artificial Intelligence (AI), cyber security, cloud computing, Internet of Things (IoT), big data and analytics, and Virtual Worlds in Australia, Japan and USA
- Lightcast data based on 265,000 technology worker job advertisements in Australia and the required skills for each role, with data extending from 2021 to 2023
- Data from the Australian Bureau of Statistics, both publicly available and from a customised data request as well as other reports and statistics from Australian government sources.

A detailed methodology assumptions and caveats for the figures produced in this report and the national report are available in the appendix of the national report.

The analysis contained in this report around technology workforce has been calculated using ABS occupation and industry classifications, based on the methodology used in previous editions of Australia's Digital Pulse. This methodology draws upon definitions and nomenclature developed by Centre for Innovative Industries Economic Research (CIER) lead researcher Ian Dennis FACS, and used in the ACS's 2008 to 2013 statistical compendiums and other CIER analysis.



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How can South Australia lead change?

1. South Australian Skills Commission (2022) South Australian Skills Commission Strategic Plan 2022-2024
2. South Australian Defence Industry Workforce and Skills Taskforce (2023) South Australian Defence Industry Workforce and Skills Action Plan
3. Department for Education South Australia (2023) Career Education and Pathways Strategy
4. Department for Education South Australia, Digital Strategy 2023 to 2026
5. Department for Industry, Innovation and Science (2023) South Australia's Advanced Manufacturing Strategy

Appendix A: Technology workforce skill impacts from critical technologies in South Australia

2030 skills for advanced data analytics



One of the biggest areas of additional skill requirements will come from advanced data analytics. Annual business investment in Australia in these areas is forecast to jump from \$8 billion in 2022 to \$15 billion by 2030. Business use of these technologies will grow from less than 5% in 2022 to more than half by 2030 nationally.

What skills will tech workers need for this enormous change?








The essential technical skills needed for advanced data analytics workers include: Data analysis, Data techniques, Scripting languages, Big data, Databases and programming, and Data warehousing. Workers will also need soft skills such as planning, research, problem-solving, effective communication, collaboration, and teamwork.

How many extra professionals and how much more skilling will be needed in South Australia?

The number of South Australian tech workers with skills in advanced data analytics is expected to grow from 1,559 in 2022 to 4,349 by 2030.

The total skill requirement to support just the core tech workforce in South Australia is projected to grow 179% from 5,286 in 2022 to 14,743 in 2030. The gap between skills now and in the future is a sizable 9,457 technical and soft skills.

Skills sets demanded for advanced data analytics by 2030

-  **Data analysis**
1,116+
-  **Data techniques**
809+
-  **Big data**
725+
-  **Scripting languages**
753+
-  **Data warehousing**
614+
-  **Databases & programming**
725+
-  **Database administration**
642+

2,800 Skilled workers needed (2030)

9,400 Skills gap (2030)

+179% Growth in skilled workers (2030)

People skills

Communication skills	976+
Teamwork/collaboration	809+
Problem Solving	725+
Planning	474+
Research	446+

Extra skills identified

Linear Algebra and Calculus
Machine Learning
Critical thinking

2030 skills for cyber security



One of the most important areas of additional skill requirements will come from cyber security. Annual business investment in Australia in these areas is forecast to jump from slightly more than \$9 billion in 2022 to \$15 billion by 2030. Business use of these technologies across Australia will grow from less than 63% in 2022 to 78% by 2030.

What skills will tech workers need for this enormous change?








Already, we know that the essential technical skills include: Cyber security, System design and implementation, Information security, Network configuration, Cloud solutions and Software development principles. Workers will also need soft skills such as planning, stakeholder management, problem-solving, effective communication, collaboration, and teamwork.

How many extra professionals and how much more skilling will be needed in South Australia?

The number of South Australian tech workers focusing on cyber security is expected to grow from 1,000 in 2022 to 2,000 by 2030.

The total skill requirement to support just the core tech workforce in South Australia is projected to grow 94% from 3,451 in 2022 to 6,698 in 2030. The gap between skills now and in the future is a substantial 3,246 technical and soft skills.

Skills sets demanded for cyber security by 2030

-  **Cyber security**
785+
-  **Network configuration**
204+
-  **Cloud solutions**
194+
-  **General networking**
194+
-  **Information security**
213+
-  **Software development principles**
165+
-  **System design & implementation**
233+

1k Skilled workers needed (2030)

3,200 Skills gap (2030)

+94% Growth in skilled workers (2022–2030)

People skills

Communication skills	368+
Teamwork/collaboration	252+
Problem Solving	213+
Planning	155+
Stakeholder management	116+

Extra skills identified

Forensics and incident analysis
Cloud security
Adaptability and continuous learning

2030 skills for enabling cloud technology



One of the largest and most fundamental skilling needs over the coming years is in enabling cloud technology. Annual business investment in Australia in these areas is forecast to jump from almost \$21 billion in 2022 to \$41 billion by 2030. Business use of these technologies will grow from 59% in 2022 to 84% by 2030 across Australia.

What skills will tech workers need for this enormous change?

Enabling cloud technology will require a broad set essential technical skills include: Cloud solutions, Software development principles, System design and implementation, Operating systems, Network configuration and Databases and programming. Workers will also need soft skills such as planning, research, problem-solving, effective communication, troubleshooting, and teamwork.








How many extra professionals and how much more skilling will be needed in South Australia?

The number of South Australian tech workers with skills in cloud technology is expected to grow from an already sizable 1,900 in 2022 to 5,700 by 2030.

The total skill requirement to support just the core tech workforce in South Australia is projected to grow 206% from 7,104 in 2022 to 21,756 in 2030. The gap between skills now and in the future is a substantial 14,652 technical and soft skills.

To date, the relationship between business investment in and adoption of cloud has generated significant jobs and skill needs. We note that this relationship could shift considerably by 2030, with businesses able to achieve similar outcomes with fewer cloud specialists. If there is a big change, that will mean these projections overstate the jobs and skill needs.

Skills sets demanded for cloud technology by 2030

-  **Network configuration**
765+
-  **Operating systems**
842+
-  **Technical support**
918+
-  **Cloud solutions**
3,596+
-  **System design & implementation**
1,109+
-  **Databases & programming**
765+
-  **Software development principles**
1,148+

4k Skilled workers needed (2030)

15k Skills gap (2030)

+206% Growth in skilled workers (2022-2030)

People skills

Communication skills	1,377+
Teamwork/collaboration	1,071+
Problem Solving	918+
Troubleshooting	803+
Planning	574+

Extra skills identified

- Cost optimisation
- Data management
- Service selection
- Collaboration & communication

2030 skills for Internet of Things



Continued proliferation of the Internet of Things will grow the skill requirements for technology workers involved in this technology. Annual business investment in these areas is forecast to jump from less than \$20 billion in 2022 to over \$34 billion by 2030 nationally. Business use of these technologies across the country will grow from less than 6% in 2022 to almost half by 2030.

What skills will tech workers need for this enormous change?








Already, we know that the essential technical skills include Software development principles, Scripting languages, System design and implementation, Cloud solutions and General networking. Workers will also need soft skills such as planning, research, problem-solving, effective communication, project management, and teamwork.

How many extra professionals and how much more skilling will be needed in South Australia?

The number of South Australian tech workers focusing on the Internet of Things is expected to grow from 150 in 2022 to 400 by 2030.

The total skill requirement to support just the core tech workforce in South Australia is projected to grow 156% from 567 in 2022 to 1,449 in 2030. The gap between skills now and in the future is 883 technical and soft skills.

Skills sets demanded for Internet of Things by 2030

-  **Internet of Things**
213+
-  **General networking**
38+
-  **Technical support**
40+
-  **Scripting languages**
64+
-  **Cloud solutions**
50+
-  **Software development principles**
62+
-  **System design & implementation**
90+

237 Skilled workers needed (2030)

883 Skills gap (2030)

+156% Growth in skilled workers (2022-2030)

People skills

Communication skills	95+
Teamwork/collaboration	78+
Problem Solving	57+
Project management	31+
Planning	31+

Extra skills identified

- Hardware
- Networking
- Remote Sensing
- Security

Source: Deloitte Access Economics analysis based on Lightcast (2023) & IDC (2023)

2030 skills for virtual worlds



Virtual worlds technology including augmented and virtual reality will experience continued growth over the coming years. Annual business investment in Australia in these areas is forecast to jump from about \$267 million in 2022 to \$1 billion by 2030. Business use of these technologies will grow from less than 1% in 2022 to almost one-quarter of businesses in Australia by 2030.

What skills will tech workers need for this enormous change?








Essential technical skills for virtual worlds include: Drafting and engineers design, Graphic and visual design software, Animation and game design, Software development principles and Social media. Workers will also need soft skills such as planning, research, problem-solving, effective communication, collaboration, and teamwork.

How many extra professionals and how much more skilling will be needed in South Australia?

The number of South Australian tech workers with skills in virtual worlds is expected to grow from just 200 in 2022 to 1,400 by 2030.

The total skill requirement to support just the core tech workforce in South Australia is projected to grow from 720 in 2022 to 5,316 in 2030. The gap between skills now and in the future is a total of 4,596 technical and soft skills.

Skills sets demanded for virtual worlds by 2030

-  **Graphic design software**
580+
-  **Visual design production**
190+
-  **Visual design**
367+
-  **Social media**
190+
-  **Software dev principles**
237+
-  **Animation &**
545+
-  **Drafting & engineers design**
912+

1,200 Skilled workers needed (2030)

4,596 Skills gap (2030)

+639% Growth in skilled workers (2022-2030)

People skills

Communication skills	403+
Teamwork/collaboration	379+
Planning	237+
Detail-oriented	201+
Organisational skills	178+

Extra skills identified

3D modelling and design
User Interface/User Experience
Sensor technologies
Adaptability to change

2030 skills for high-performance computing



An early technology expected to grow over the coming years, high-performance computing (HPC) skills will begin to be needed in the technology workforce. Annual business investment nationally in these areas is forecast to jump from less than \$349 million in 2022 to over \$699 million by 2030.

What skills will tech workers need for this enormous change?


Some of the essential technical skills for HPC workers include: Programming principles, Scripting languages, Software development principles and Operating systems. Workers will also need soft skills such as planning, research, problem-solving, effective communication, collaboration, and teamwork.


How many extra professionals and how much more skilling will be needed in South Australia?

The number of South Australian tech workers focusing on HPC is expected to grow slightly from 30 in 2022 to 115 by 2030.


The total skill requirement to support just the core tech workforce is projected to grow 268% from 155 in 2022 to 572 in 2030. The gap between skills now and in the future is a 416 technical and soft skills.

Skills sets demanded for additive manufacturing by 2030

 **Drafting and design**
21+


 **Operating systems**
25+

 **Robotics**
34+

 **Test automation**
40+

 **Mechanical engineering**
36+

 **Software dev principles**
84+

 **System design & implementation**
37+

85 Skilled workers needed (2030)

416 Skills gap (2030)

+268% Growth in skilled workers (2022-2030)

People skills

Research	45+
Communication skills	25+
Technical support	22+
Problem solving	15+
Teamwork/collaboration	14+

Extra skills identified

CAD modelling
Material selection
Production and business development
Patent law

Source: Deloitte Access Economics analysis based on Lightcast (2023) & IDC (2023)

2030 skills for advanced robotics and sensors



Advanced robotics and sensors comprises a small share of the overall technology workforce skilled in critical technology. Annual business investment in Australia in these areas is forecast to stay steady at around \$1 billion a year between 2022 and 2030. Business use of these technologies will grow from around 1% in 2022 to 15% by 2030 nationally.

What skills will tech workers need for this enormous change?

Already, we know that the essential technical skills include: Robotics, Software development principles, Scripting languages, Programming languages and Imaging. Workers will also need soft skills such as planning, research, problem-solving, effective communication, collaboration, and teamwork.








How many extra professionals and how much more skilling will be needed in South Australia?

The number of South Australian tech workers focusing on advanced robotics and sensors is expected to grow slightly from 70 in 2022 to 100 by 2030.

The total skill requirement to support just the core tech workforce in South Australia is projected to grow 44% from 2022 to 2030.

The robotics and sensors skills projections are much smaller than other areas of critical technology. This reflects an assumption that robotics and sensors' most profound impacts will be on complementing work and as a tool used by workers, more so than the number of tech workers directly involved in developing the technology. As the projections are off a relatively low base, they are more uncertain.

Skills sets demanded for robotics and sensors by 2030

-  **Robotics**
26+
-  **Mechanical engineering**
6+
-  **Imaging**
7+
-  **Scripting languages**
9+
-  **Programming languages**
7+
-  **Software development principles**
10+
-  **System design & implementation**
15+

32 Skilled workers needed (2030)

123 Skills gap (2030)

+44% Growth in skilled workers (2022–2030)

People skills

Communication skills	11+
Teamwork/Collaboration	8+
Problem solving	7+
Planning	6+
Research	5+

Extra skills identified

Mechatronics
Electronics and hardware integration
Kinematics and Dynamics

Source: Deloitte Access Economics analysis based on Lightcast (2023) & IDC (2023)

Appendix B: South Australian traditional technology workforce

Technology employment forecasts by occupation grouping, South Australia (2022 to 2030)

Occupation group	2022	2030	Average annual growth
ICT Management and Operations	14,399	20,356	4.4%
ICT Technical and Professional	14,561	20,040	4.1%
ICT Sales	1,131	1,042	-1.0%
ICT Trades	6,952	8,082	1.9%
Electronic trades and professional	158	189	2.3%
ICT Industry Admin and Logistics Support	5,575	6,711	2.3%
Total ICT workers	42,776	56,420	3.5%

Government funded VET subject enrolment in IT field of education in South Australia 2016-2022

Qualification	2016	2017	2018	2019	2020	2021	2022
Diploma or above	2,906	2,513	2,632	2,464	2,481	2,007	19,010
Certificate IV	2,275	2,155	2,165	3,350	4,459	4,721	3,854
Certificate III	3,109	3,092	3,425	3,090	3,258	3,219	3,651
Certificate II	1,309	1,899	1,686	1,480	1,254	1,069	1,801
Certificate I	2,076	2,623	2,105	1,652	1,015	517	35

Technology employment by industry, Victoria (2022)

Industry	Employment
Agriculture, Forestry and Fishing	0
Mining	432
Manufacturing	1,550
Electricity, Gas, Water and Waste Services	602
Construction	710
Wholesale Trade	441
Retail Trade	890
Accommodation and Food Services	218
Transport, Postal and Warehousing	560
Rest of Information Media and Telecommunications	749
Financial and Insurance Services	2,521
Rental, Hiring and Real Estate Services	70
Rest of Professional, Scientific and Technical Services	5,058
Administrative and Support Services	780
Public Administration and Safety	5,277
Education and Training	1,710
Health Care and Social Assistance	1,666
Arts and Recreation Services	358
Other Services	676
Telecommunications Services	4,338
Internet Service Providers, Web Search Portals and Data Processing Services	426
Computer System Design and Related Services	13,742
Total ICT workers	42,776

Domestic enrolments and completions in IT degrees in South Australia, 2001 to 2021

	Course enrolments		Course completion	
	Undergraduate	Postgraduate	Undergraduate	Postgraduate
2001	2,208	240	311	76
2002	2,219	215	355	73
2003	2,139	201	385	51
2004	1,816	223	401	69
2005	1,465	187	303	64
2006	1,254	202	269	33
2007	1,063	212	223	37
2008	931	218	174	58
2009	900	224	170	64
2010	962	245	163	69
2011	959	299	165	50
2012	1,083	298	174	64
2013	1,147	286	167	78
2014	1,245	296	173	71
2015	1,422	254	202	78
2016	1,551	260	168	76
2017	1,675	268	231	71
2018	1,920	262	259	79
2019	2,152	320	254	71
2020	2,560	437	275	72
2021	2,864	655	333	141

International enrolments and completions in IT degrees in South Australia, 2001 to 2021

	Course enrolments		Course completion	
	Undergraduate	Postgraduate	Undergraduate	Postgraduate
2001	747	156	75	73
2002	910	168	94	67
2003	1,034	265	223	98
2004	1,067	399	228	66
2005	936	632	206	165
2006	809	687	322	241
2007	702	640	253	266
2008	634	476	191	240
2009	569	437	189	152
2010	534	378	135	180
2011	467	309	143	111
2012	446	360	115	97
2013	424	397	105	120
2014	458	462	107	105
2015	509	572	141	122
2016	577	752	124	159
2017	634	846	142	203
2018	777	1032	176	213
2019	1,126	1,380	224	250
2020	1,702	2,054	243	363
2021	1,959	3,525	291	1,326



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