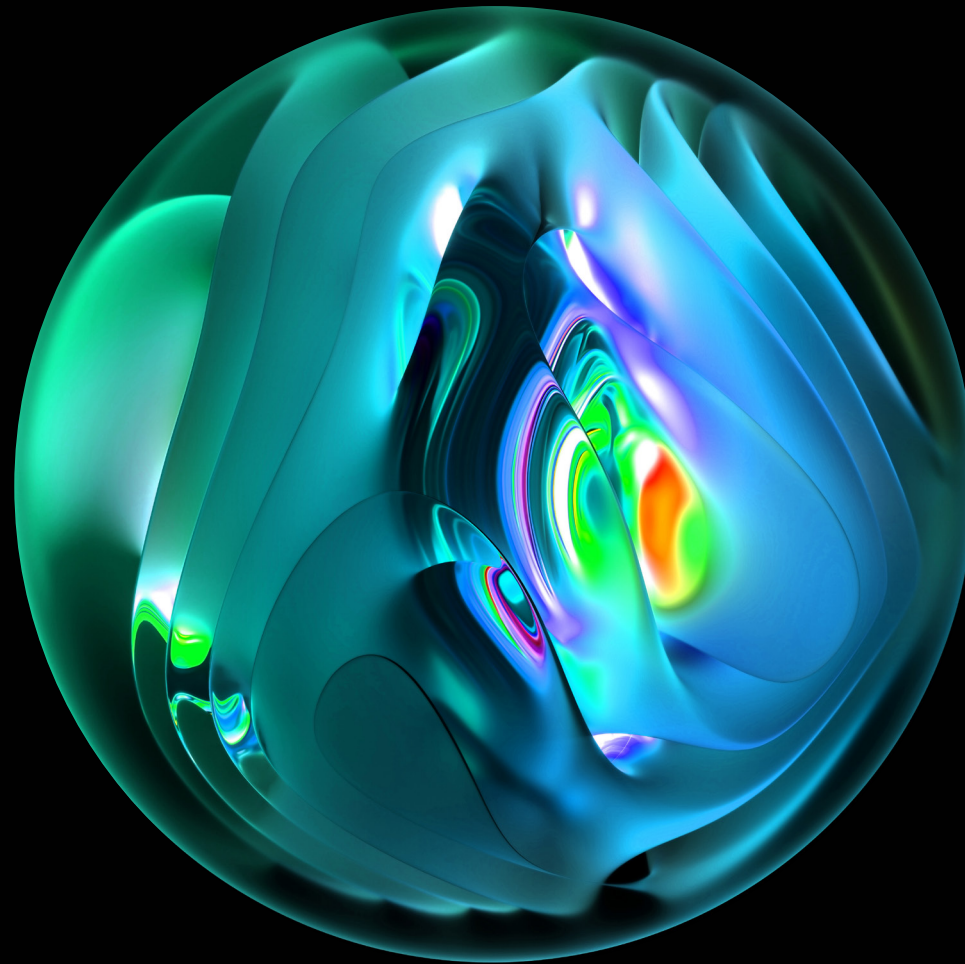# Deloitte.

acs

Australia's Digital Pulse

A new approach to building technology skills

Western 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+
Total members

12,000
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
Accredited universities

368
ACS Google Scholarships

Capability

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

11,128+
Learning Accelerator unique users

44,000
Digital resources

Migration

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

40,200
Skilled migrant applicants in 2022–23

7,107
ACS Professional Year graduates in 2022–23

ACS Australia's Digital Pulse 2023

Western Australia edition

Digital technology is becoming increasingly important for the functioning of the Western Australia economy. The rapid pace of developments in technologies such as AI, robotics and advanced data analytics are expected to have a profound impact, particularly on the priority industries which underpin Western Australia's economy. Critical technologies will affect 1.5 million workers and require 104,000 critical technology skills by 2030.

Western Australia faces a growing need to develop skills to accommodate the digital transition of priority industries such as mining, construction and transport. Critical technology threatens to leave many workers behind, with outdated digital skills already costing Western Australia large businesses $323 million per year. However, with the right framework in place, Western Australia would be able to improve digital skills, particularly in regional populations to create long-term productivity increases, jobs and economic growth.

Key principles of the new approach

All hands on deck	Skills first	Driving diversity	Lifecycle of learning	Systems approach

$24 billion
Projected annual technology investment in Western Australia in 2030

1.5 million
Western Australia workers who will need some reskilling because new tech will affect at least 20% of work time.

2,900
New technology workers needed each year

104,000
critical tech skills needed in Western Australia by 2030

$323 million
Cost of outdated digital skills for large Western Australia businesses each year

Western Australia's technology workforce is picking up steam

Western Australia's tech workforce is growing

Western Australia's technology sector has grown significantly in the past two years, with COVID-19 driving digital transformation across the state economy. In one year alone, the number of technology workers increased by 5% to reach over 63,000 workers in 2022.

ICT is an important sector for the Western Australia with the sector contributing $7.3 billion in value added to the Western Australia economy in FY22 and 13,000 ICT businesses headquarters in the state.[1,2]

The importance of digital technology extends across all industries in the Western Australia economy. Mining accounts for 45% of Gross State Product (GSP) in Western Australia and Minerals Council of Australia report found that an overall productivity improvement of up to 23% could be achieved through the adoption of digital technology in the industry.[3] Services industries account for 72% of state employment and research from Deloitte's Generation AI: Ready or not found these industries will experience imminent and extensive disruption from Generative AI notably education and professional services.[2]
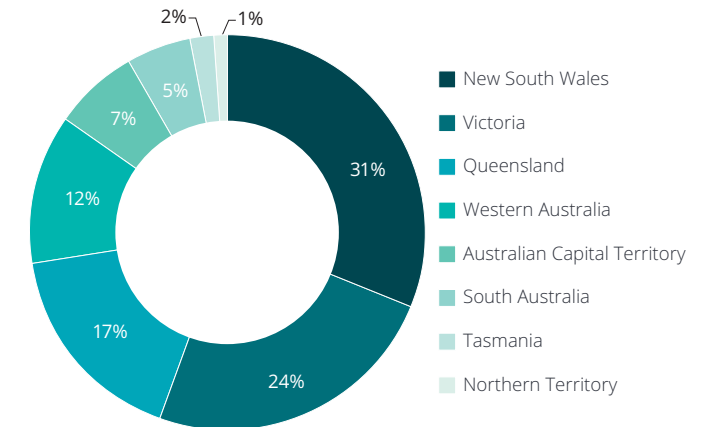
The impact of Generative AI and other digital technologies will only increase with investment in technology. Forecasts from the International Data Corporation (IDC) indicate that technology investment in Western Australia will increase from $17 billion in 2022 to $24 billion by 2030.

The Western Australia Government recognises the important role of digital technology in supporting the creation of high skilled roles, promoting productivity and achieving economic and social objectives. The Western Australia Government has committed over $500 million investment in Digital Strategy 2021-25 to improve services, reduce the digital divide, improve data access and cybersecurity. The majority of program funding is directed towards mining, health and the ICT sector to "modernise and integrate existing systems and expand capability".[4]

The Western Australia Government is already trialling generative AI tools to improve the productivity of government service delivery and for improving healthcare delivery.[5] The government has also recognised that advanced data analytics will be crucial to meeting the key policy objective of achieving net zero by 2050. The Western Australia Climate Projections Summary is an example of this, using emission scenarios across multiple RCP's and mitigation levels to provide simulations of climate scenarios at a granular scale across Western Australia.[6]

Infrastructure WA estimates the potential of digital innovation to deliver $315 billion in economic value and 250,000 new jobs by 2025. However, digital connectivity is a significant barrier across the state as well as adoption of technology by key industries.[7] With tech offering solutions to some of the biggest issues facing the state, Western Australia cannot afford to let the opportunities by developments in tech go by.

National technology investment to 2030

- New South Wales — 31%
- Victoria — 24%
- Queensland — 17%
- Western Australia — 12%
- Australian Capital Territory — 7%
- South Australia — 5%
- Tasmania — 2%
- Northern Territory — 1%

Source: IDC ICT Spend Data Custom Report

Technology employment in Western Australia 2015 to 2022

2015	2016	2017	2018	2019	2020	2021	2022
49,253	49,701	52,033	50,474	54,765	52,084	60,404	63,326
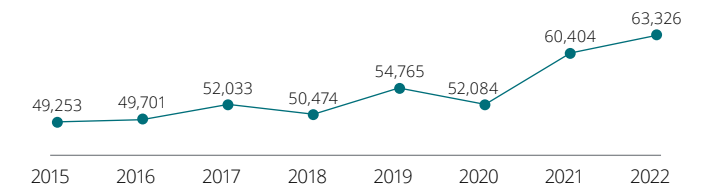
Source: Australian Bureau of Statistics (2023)

A transformation perspective

Digital connectivity and improving the uptake of digital technology in our priority industries is key to future prosperity and growth in Western Australia. With the scale and regionality of our state, current technologies are making us more integrated than ever before and going forward will play a critical role to create a safer, more connected, smarter, and sustainable economy. We can't afford to be left behind.

Justin Scanlan
Operations Transformation Leader
Deloitte Australia

Critical technology will significantly impact the work of 95% of the Western Australia workforce

Over 1.5 million workers across Western 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, additive manufacturing, 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 Australian workforce.

This analysis shows that almost all of Western Australia workers (95%) are expected to have at least 20% of their work time affected by critical technologies over the coming years. In total, 73% of all working hours across Western Australia will be affected.

Advanced data analytics and AI technologies will have the largest workforce impact, each affecting the work time of almost two-in-three workers. In total, these technologies will affect 27% and 23% of all working hours in Western Australia, respectively.

Western Australia's workforce will be more affected by advanced robotics and sensors, and Internet of Things than almost all other states. The mining and manufacturing industries, which intensively use these technologies, contribute to this exposure.

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

Of all the occupations impacted by critical tech, technology workers are among the most impacted accounting for eight out of the top twenty impacted occupations. For Western Australia with a quickly growing technology workforce, this means thinking strategically about how to skills these workers.

Occupations outside the technology workforce will also be impacted. For example, sales assistants, registered nurses and teachers will all have more than 60% of their work time impacted.

Manual labour-intensive occupations such as those in hospitality and construction trades are expected be relatively less exposed to critical technology. Yet every industries is being transformed by these technologies and strategies to upskill workers in these areas will be important.

Proportion of Western Australia workers and work hours affected by critical technology
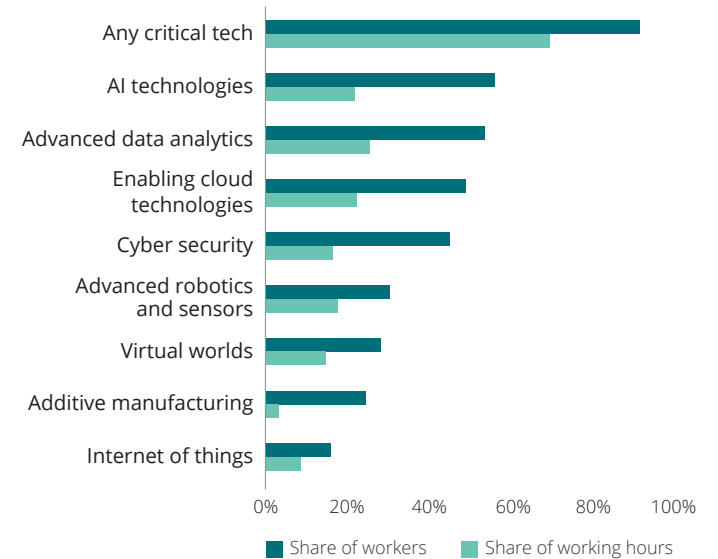
Source: Deloitte Access Economics (2023)

Knowledge, services and priority industries will have more than 80% of work time impacted

Eleven Western Australia 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 eleven impacted industries account for 75% of Western Australia economy in 2022.[1]

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] Collectively, these industries contributed $14.1 billion in Gross State Product (GSP) to the state economy in 2023.[3]

Mining contributes over $200 billion to the state economy and accounting for 45% of total state production. The industry has seen significant investment in technology to ensure growth in production capacity. Autonomous vehicles and drill rigs, AI exploration technologies and predictive maintenance have been trialled and deployed across several mine sites, resulting in significant dividends in efficiency.[4]

The pipeline of future digital technologies being used in mining, transport and other primary industries will be strengthened through the Australian Automation and Robotics Precinct located outside of Perth.
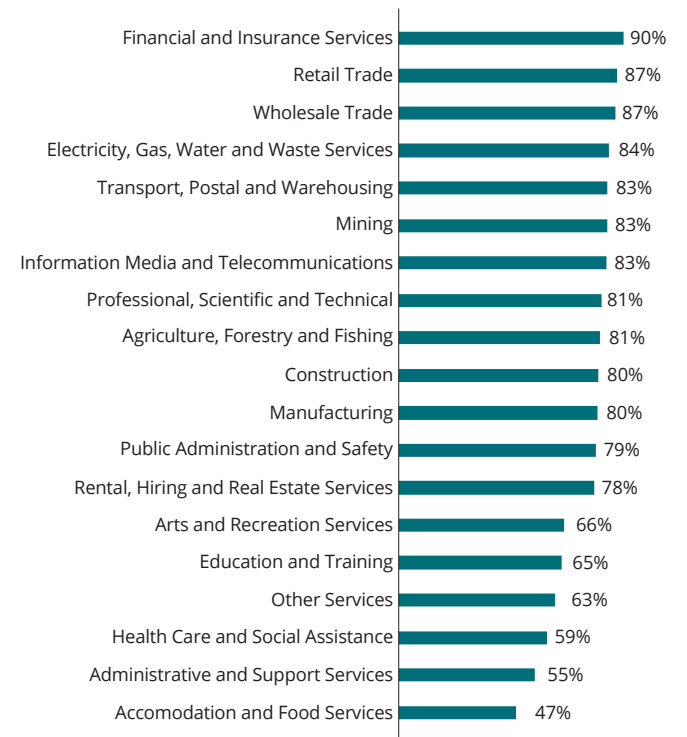
The hub is expected to generate over 5,000 experts in the field of robotics and automation.[5] The increased expertise will increase the ability of these industries to adopt digital technologies in the future.

Industries with a larger share of the workforce in people and care orientated roles such as nursing, bar attendant and café workers 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) particularly given services industries account for 72% of Western Australian employment, including health care, retail trade and education.

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, Western Australia

Industry	%
Financial and Insurance Services	90%
Retail Trade	87%
Wholesale Trade	87%
Electricity, Gas, Water and Waste Services	84%
Transport, Postal and Warehousing	83%
Mining	83%
Information Media and Telecommunications	83%
Professional, Scientific and Technical	81%
Agriculture, Forestry and Fishing	81%
Construction	80%
Manufacturing	80%
Public Administration and Safety	79%
Rental, Hiring and Real Estate Services	78%
Arts and Recreation Services	66%
Education and Training	65%
Other Services	63%
Health Care and Social Assistance	59%
Administrative and Support Services	55%
Accomodation and Food Services	47%

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

The tech skills challenge for Western Australia

Western Australia will require an additional 75,000 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, 104,000 skills will be required for critical technologies by 2030, an increase of 75,000 compared to current skills within the Western Australia workforce.

Among the largest increases in skills demanded will be for those people skills needed by most workers including communication and team teamwork skills. Cloud solutions, software development, and databases and programming skills are the most common technical skills that will be needed in Western Australia.

The current need for digital skills is not being met. 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 cost Western Australia $323 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 Western Australian workforce means the gap in digital skills is likely to grow without significant action. To ensure that Western Australia's technology skills challenge is met, barriers facing the labour market need to be addressed.

A challenge across Australia and including in Western Australia is attracting and retaining skilled critical tech workers. Ensuring critical tech jobs are available across the state is essential for businesses to make the most out of the technologies. Achieving this also requires sufficient tech infrastructure across the state to support innovative businesses and allow regions to play to their comparative advantage.

A **lack of diversity** in tech not only holds back key talent but severely limits the ability to meet our skill needs. Only 28% of people working technology occupations in Western Australia are women, substantially fewer than in comparable industries such as professional services (44%).[3] These diversity gap is there from the outset with **women only comprising 29% of Western Australian ICT graduates**. This means the gender gap in digital skills is likely to persist and future generations are likely to be lacking critical skills needed to build a successful career.

Only 1,173 students graduated with an IT qualification in Western Australia in 2022, this decreased from 2021 signalling an **increasing lack of interest in tech among younger generations**.

Not only will Western Australia need more workers with technology skills, but it will also need workers with a variety of new or emerging technology skills. Skills to work with AI will be some of the most sought after with 30,000 additional AI skills needed by 2030. These include technical skills such as data science, machine learning and deep learning (see page 8).

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

Skill	Value
Communication skills	6,779
Teamwork/collaboration	5,869
Cloud solutions	5,471
Scripting languages	4,774
Problem solving	4,774
Data science	4,712
Software development principles	4,590
Databases and programming	4,241
Data analysis	3,594
Machine learning	3,548
Planning	3,011
Data warehousing	2,618
Research	2,341
System design and implementation	2,050
Technical support	1,634

■ People skills ■ Technical skills

Source: Deloitte Access Economics (2023)

2030 skills for Artificial Intelligence, Machine Learning and Natural Language Processing
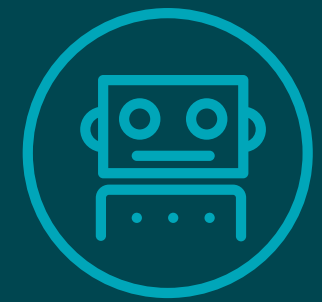
One of biggest areas of additional skill requirements will come from Artificial Intelligence (AI), Natural Language Processing (NLP), Machine Learning (ML). Annual business investment across Australia in these areas is forecast to jump from less than $5 billion in 2022 to over $27 billion by 2030. Business 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 Western Australia?

The number of Western Australia tech workers focusing on AI, ML and NPL is expected to grow from just 900 in 2022 to 8,000 by 2030.

The total skill requirement in Western Australia to support just the core tech workforce is projected to grow 793% from 3,775 in 2022 to 33,709 in 2030. The gap between skills now and in the future is a staggering 29,934 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
4,712+

Machine learning
3,534+

Data analysis
1,732+

Scripting languages
3,326+

Data warehousing
1,594+

Databases & programming
1,940+

Software development principles
2,425+

7k Skilled workers needed (2030)

30k Skills gap (2030)

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

People skills

Teamwork/collaboration	2,356+
Communication skills	2,356+
Problem Solving	1,802+
Research	1,524+
Planning	1,039+

Extra skills identified

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

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

Western Australia will need to skill at least 2,900 technology workers per year for Australia to keep up with international peers

Western Australia needs to skill at least 2,900 technology workers per year but is only educates around 1000 annually

Based on currently available data, Australia will need to spend an additional $92 billion through to 2030 on critical technologies to be at the forefront of forthcoming disruption. Based on forecast technology investment, this would amount to an additional $11 billion of critical technology spend in Western Australia by 2030.

Western Australia's technology workforce has grown to meet the needs of businesses and the economy. The number of technology workers has grown by over 13,000 in the 8 years since the first edition of Australia's Digital Pulse was published.

While 63,000 people were employed in the Western Australia technology workforce in 2022, our forecasts suggest an additional 23,000 workers will be required be 2030. That's 2,900 annually. Despite this, Western Australia is only expected to formally educate around 1000 workers per year over this period (8,000 by 2030).

The number of workers in Australia's technology workforce grows and shrinks based on a number of drivers. These include:

- Retirements capturing those workers expected to leave the labour force through to 2030
- Migration accounting for permanent and temporary workers in the sector

- Education accounting for domestic and international students who work in the tech sector after completing their studies
- Net reskillers accounting for workers coming and going from technology occupations.

Projecting the supply of workers from each of these sources between 2022 and 2030 (chart below) suggests Western Australia's technology sectors expected to reskill an additional 8,000 workers but will need to reach 10,000 to match business-as-usual demand by 2030. This rises to 12,000 workers if Australia was to match levels of spending on critical technology in the USA (proportionate to GDP).

Projected source of Western Australia technology workers, 2022-2030
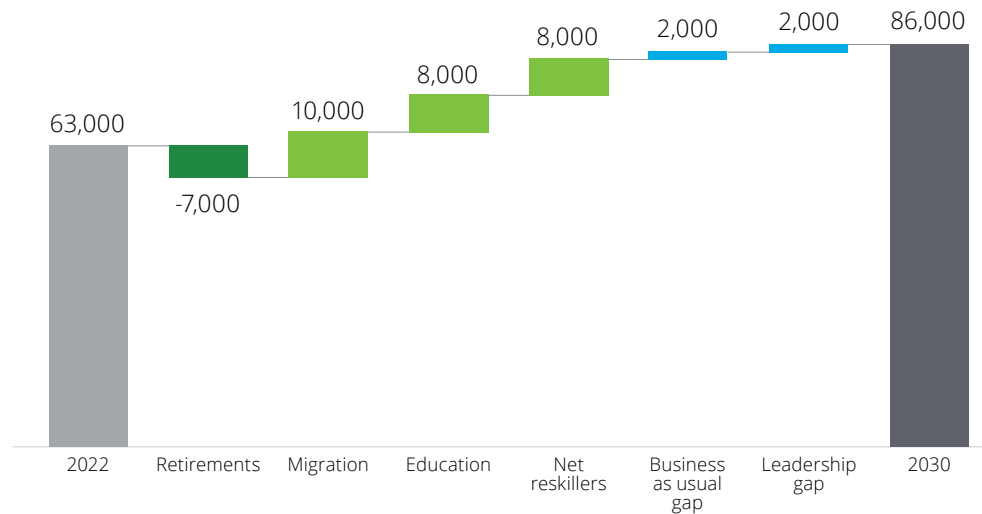
Source: Deloitte Access Economics (2023)

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

Almost two-thirds of Western Australian technology workers agree critical tech will significantly disrupt the technology sector

Like their peers across Australia, tech workers in Western Australia see the extent of potential disruption in the sector. Most do not think they are ready for the coming change. Only 44% of current technology workers surveyed believe their formal education has equipped them with the skills they need for critical technology.[1]

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

Better utilising tech workers in Western Australia includes ensuring workers have meaningful work for their skills. Based on a technology workforce survey completed for this report, a quarter of technology workers do not agree that their skills are being fully utilised. Compared to Australia at large, Western Australian tech workers are more likely to report being underutilised. Workers think that they could be given more technical tasks (62%), have their capabilities and contributions recognised (46%), and given more management opportunities (54%).[2]

Many Western Australia tech workers (46%) also want to work more hours. Key barriers facing workers are not being able to find full-time work, caring for children and starting their own business.

Two in five Western Australia tech workers are planning on leaving the sector in the next five years.

This level of planned exits from the sector highlights the need address the challenges that workers in the sector face. The top reason for workers wanting to leave the tech sector in Western Australia is for better pay (41%).[3] Pay is a larger factor influencing people's decision to leave than in Australia at large (28%), which may reflect high-pay opportunities in other Western Australian sectors. Other top reasons for wanting to leave the sector are to do something different (35%) and for better job security (24%).[4]

While workers leave technology roles, workers also reskill into the sector. The leading reasons for workers in Western Australia reskilling into the tech sector include better pay (38%), opportunities for career growth (29%) and the fast-paced growth of technology (29%).[5] Compared to Australian technology workers salary, opportunities for learning and development, and career growth are more prevalent reason for entering the workforce in Western Australia.

For workers who reskilled into the technology workforce, formal and self-directed training was an important part of the process. Across the technology workforce 46% of workers reported upskilling by learning through channels such as reading articles and watching video while 53% undertook some mandatory employer provided training.[5]

Agreement that critical technology will significantly disrupt the technology sector

2%	9%	28%	47%	14%

Legend: Strongly disagree · Disagree · Neutral · Agree · Strongly agree
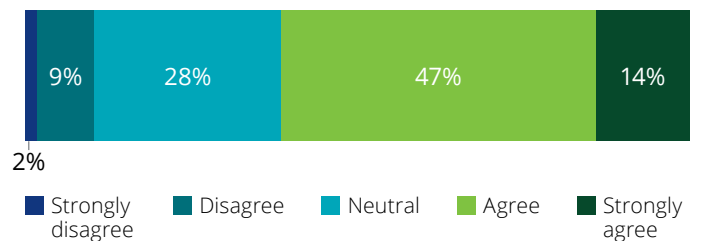
Source: Technology workforce survey (2023)

Reasons reskillers move into a technology role in Western Australia

Better salary and working conditions
Opportunities for learning and development
Opportunities for career growth
Aligns with interests
Increased demand for tech skills
Fast-paced growth of technology
Sufficiently challenging work

0%   10%   20%   30%   40%   50%

Legend: AUS · WA

Source: Technology workforce survey (2023)

A professional association perspective

"While there are 63,000 technology workers in Western Australia, we know the importance of digital technology for the Western Australia economy extends far beyond that number.

Critical technologies like AI, extended reality and robotics is impacting every industry is transforming every industry from mining to tourism and health care. Similarly digital skills will be a core component for workers across the state. "

Josh Griggs
Interim CEO
Australian Computer Society

Western Australia has an opportunity to be world leading as priority industries digitise

As priority industries digitise, the skill mismatch grows

While the Western Australian ICT sector contributed $7.3 billion to the economy in FY22, the state's economy is heavily reliant on priority industries including mining, construction, manufacturing and logistics for its economic growth. These industries contribute over 60% of the state's GSP and employ around almost a third of the workforce.[1]

The leading nature of Western Australia's priority industries provides an opportunity to be early adopters and global innovators in the application of critical tech. For example, the construction industry is already utilising drones to make visual inspections of buildings and AI to solve problems on sites.[2]

With Western Australia ranked as the most attractive jurisdiction in the world for mining investment, and opportunities to develop and export critical technology applications is significant.[3]

Rio Tinto's Gudai-Darri mine is one of the most technologically advanced mines globally, featuring a solar farm, zero-emission autonomous trucks and drills operated from 1,500km away and a virtual model of the mine to conduct data analysis.[4] This sort of innovation, in combination with heavy investment in private freight networks is driving Western Australia towards a future of fully autonomous mining from extraction to export.

Helping ensure that priority industries make innovative use of critical technology will be essential for Western Australia. However, as critical tech is expected to affect more than 80% of work time across priority industries, there is a risk of an increasing mismatch between the skills of workers and those needed in the economy.

Ensuring that workers in priority industries have the required skills will become increasingly important as technology changes. For example, research in the mining industries suggests that 35% of mining jobs will need to be re-designed and upskilled over the coming years. Skills such as project and systems evaluation, data analysis are in demand while operational skills are in decline.[5]

The government recognises the need to skill and reskill workers as technology evolves. Currently, the government is preparing its **10 Year Science and Technology Plan** with the objective of becoming a global leader in radio astronomy, space operations, remote technologies, marine science, medical technology, and food security.[6]

The government has also invested in the **Digital Technology and Skills Program and State Nominated Migration Program** to attract skilled workers and upskill the workforce. Attracting high skilled workers from overseas is important as 80% of businesses report challenges finding skilled workers. In the mining sector alone the Chamber of Minerals and Energy estimate a potential shortage of 40,000 workers, a consequence of skills mismatch and sector growth.[7]

Although technology is significantly impacting jobs, the benefits to worker safety and wellbeing should not be understated. Fatigue monitoring technology, remote operated rescue rovers and robotic welders are significantly reducing physical impacts in a traditionally dangerous occupation with underground injury frequency falling almost 4% since 2020.[8] Going forwards critical tech such as virtual worlds technologies are also likely to provide further opportunities to improve safety by making it easier to train people in higher risk roles within priority industries.

The Western Australian Government also faces the challenge of a lack of digital infrastructure across the state particularly in remote areas. Despite rating equal third with New South Wales and Queensland in Australia's Digital Inclusion Index, more than 50% of its local government areas are more than 5% below national average on the Digital Inclusion and Digital Access Indices.[9] Western Australia's size and low population density across the state presents challenges providing universally high-quality internet.

While government investment has focused on the digital divide, internet access remains a barrier to regional digitisation. As a result, Digital Inclusion remains one of the four key pillars of the **Western Australian Digital Strategy 2021-25**.[10] One initiative includes the Digital Farm Grants program which provides funding for last-mile digital connectivity infrastructure for agribusinesses and regional communities across WA. This aims to support the adoption of technologies to help improve productivity and enhance the wellbeing of regional communities.

A migration perspective

"Analysis by Deloitte Access Economics shows that migration will be the biggest source of tech talent for Western Australia. Yet we need to make sure that those migrations and their skills are utilised.

Too often we do not set up our recent residents for success.

This does not benefit migrants, businesses or the economy in Western Australia."

Siobhan O'Sullivan
Chief Growth Officer and Director
of Migration Pathways
Australian Computer Society

How can we digitally transform Western Australia?

More needs to be done to develop the technology skills to digitally transform the Western Australian economy.[1] The *WA Digital Strategy for Western Australian Government 2021-2025* aims to improve the way government works and the ease of which citizens interact with government. The *Digital Inclusion in WA Blueprint* provides a detailed approach to addressing digital inclusion. More broadly, the *State Infrastructure Strategy* acknowledge the important role digital connectivity and technology played in the development of the state and provided five key recommendations.

Yet there are gaps when it comes to encouraging businesses to engage in digital transformation while also developing and fully utilising the technology skills for new ways of working.

Addressing these issues will require a new approach to building tech skills in Australia and Western Australia. The 2023 edition of ACS Australia's Digital Pulse outlines five key principles needed to guide individual policies and initiatives.

These principles are equally as relevant to Western Australia. Using these as our foundation, we have identified three high priority recommendations for WA 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 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 WA. Combining effort to produce change will be key.

This will require the Government to collaborate with education providers and major players such as Fortescue and BHP, to develop a strategy on how digital skills can be developed to accommodate growing importance of robotics, data analysis and AI. The government should also consider establishing a network of digital skills hubs with industry and education providers.

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 WA economy and society, and continue to push for a more diverse and inclusive technology workforce.

03
Driving diversity

We need people with the right skills. Excluding or not fully utilising existing talent is not only wrong but imposes significant costs on the WA economy.

Migration will be a key source of tech talent for the state but there is high levels of underutilisation. Providing opportunities for migrants to use their skills will be key to unlocking the digital potential for WA.

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 WA workforce will change as industries such as mining, construction, professional services and tourism become increasingly digitised. Workers across all industries will need to update their skills to accommodate these changes in work.

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 WA

Assisting priority industry to digitally transform

There is significant potential for critical technologies to uplift key industries in Western Australia. However, there is evidence that mining may be not ready to digitally transform compared to other industries which could hold back the ability of Western Australia to benefit from key technologies.. For example, a study by Deloitte Access Economics on data maturity found mining had the second lowest share of businesses with the top capabilities.

Similarly, Deloitte's Generation AI report found that mining was facing a longer timeframe to realising the benefits of the technology compared to other service-based industries due to slower adoption of this technology by the mining workforce.

Increasing the use of critical technologies in key industries should involve direct incentives to uptake the technology and encourage greater upskilling for workers in that industry.

Providing grants to help businesses experiment with use cases in critical technology like the *Australian 5G Innovation Initiative* could encourage more businesses to explore the growing number of use cases. The impact of the program could be increased if the recipients of the grants and their projects and impacts were showcased to the broader industry.

To make sure businesses are making the most from the technology they deploy, co-investment in digital upskilling or reskilling for workers within these industry could lift digital skills in key industries. The Western Australia Government should consider how to connect with education providers on potentially delivering or assisting organisations developing these skills for their workforce.

Recognising important role of skilled migrants

Migration will be the largest source of technology talent into Western Australia out to 2030, more than people reskilling into tech and those graduating from education providers. Yet migrants often face high levels of underutilisation with ACS research finding 39% of migrants took longer than 12 months to find their first tech role. Our survey also found nearly one in five (18%) of migrant technology workers believer their skills and experience are not fully utilised in their current jobs.

The Western Australia Government recently launched a Migration WA portal to help employers connect with migrants looking to work in Western Australia, with an automated job matching function to link migrants with certain skills and capabilities with relevant occupations.

While this feature is an important step to helping migrant find the right role, further effort should be provided to develop their careers once in their role. The national ACS Australia's Digital Pulse called for the workshops, training and networking events by businesses to help migrants gain networks and exposure. This would be similar in style to the ACS professional Year Program.

 Western Australia Government could kick start this initiative by hosting activities described above over a week and invite major employers and tech companies to participate. This could involve migrants networking but also exploring what best practice looks like in setting up recent citizens for success looks like in Western Australia. One potential date for this could be the 18th December which is International Migrants Day.

Bridging the digital divide in Western Australia
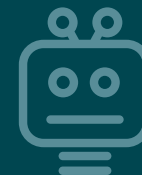
The most recent State Infrastructure Strategy noted the important role of digital connectivity to support access to services, social inclusion and economic development. Western Australia's size and low population density in many regions limits the commercial viability of service delivery. Currently more than half of Local Government Areas in Western Australia are more than 5% below national average on Digital Inclusion Index and Digital Access Index (ADII).

The Department of Primary Industries and Regional Development (DPIRD) are currently managing the distribution of $48.6 million under the WA Regional Digital Connectivity Program for co-investment in regional digital connectivity infrastructure. The State Infrastructure Strategy recommended an elevated focus on digital transformation and priority to connectivity infrastructure by allocating a lead state agency and developing and implementing a priority framework along with seeking opportunities for co-investment with Australian government. DPIRD are now developing a state digital connectivity plan which will likely see these elements be implemented.

Consideration should also be given to co-investment opportunities with the private sector for investments which may align with commercial interests.

In addition to exploring connectivity infrastructure, consideration should be given to improving digital skills for regional communities to fully utilise the connectivity and applications available to them.

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 Western Australia 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 Western Australia tech workforce.

The research notes that while the technology workforce in Western 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 (CIIER) lead researcher Ian Dennis FACS, and used in the ACS's 2008 to 2013 statistical compendiums and other CIIER analysis.

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

2030 skills for advanced data analytics

One of 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 Western Australia?

The number of Western Australia tech workers with skills in advanced data analytics is expected to grow from 2,600 in 2022 to 7,300 by 2030.

The total skill requirement to support just the core tech workforce in Western Australia is projected to grow 179% from 8,820 in 2022 to 24,600 in 2030. The gap between skills now and in the future is a sizable 15,780 technical and soft skills.

Skills sets demanded for advanced data analytics by 2030

Cyber security
1,862+

Network configuration
1,350+

Cloud solutions
1,210+

General networking
1,257+

Information security
1,024+

Software development principles
1,210+

System design & implementation
1,071+

5k Skilled workers needed (2030)

16k Skills gap (2030)

+179 Growth in skilled workers (2022–2030)

People skills
Communication skills	1,629+
Teamwork/collaboration	1,350+
Problem Solving	1,210+
Planning	791+
Stakeholder management	745+

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 Western Australia?

The number of Western Australia tech workers focusing on cyber security is expected to grow from 1,400 in 2022 to 2,700 by 2030.

The total skill requirement to support just the core tech workforce in Western Australia is projected to grow 94% from 4,579 in 2022 to 8,887 in 2030. The gap between skills now and in the future is a substantial 4,307 technical and soft skills.

Skills sets demanded for cyber security by 2030

Cyber security
1,041+

Network configuration
270+

Cloud solutions
257+

General networking
257+

Information security
283+

Software development principles
219+

System design & implementation
309+

1,300 Skilled workers needed (2030)

4,300 Skills gap (2030)

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

People skills

Communication skills	489+
Teamwork/collaboration	334+
Problem Solving	283+
Planning	206+
Stakeholder management	154+

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 Western Australia?

The number of Western Australia tech workers with skills in cloud technology is expected to grow from an already sizable 2,600 in 2022 to 8,000 by 2030.

The total skill requirement to support just the core tech workforce in Western Australia is projected to grow 206% from 10,123 in 2022 to 31,001 in 2030. The gap between skills now and in the future is a substantial 20,878 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
1,090+

Operating systems
1,199+

Technical support
1,308+

Cloud solutions
5,214+

System design & implementation
1,581+

Databases & programming
1,090+

Software development principles
1,090+

5k Skilled workers needed (2030)

21k Skills gap (2030)

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

People skills

Communication skills	1,962+
Teamwork/collaboration	1,526+
Problem Solving	1,308+
Troubleshooting	1,145+
Planning	818+

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 Western Australia?

The number of Western Australia tech workers focusing on the Internet of Things is expected to grow from 300 in 2022 to 700 by 2030.

The total skill requirement to support just the core tech workforce in Western Australia is projected to grow 156% from 1,029 in 2022 to 2,631 in 2030. The gap between skills now and in the future is 1,602 technical and soft skills.

Skills sets demanded for Internet of Things by 2030

Internet of Things
387+

General networking
69+

Technical support
73+

Scripting languages
116+

Cloud solutions
90+

Software development principles
112+

System design & implementation
163+

430 Skilled workers needed (2030)

1,600 Skills gap (2030)

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

People skills

Communication skills	172+
Teamwork/collaboration	142+
Problem Solving	103+
Project management	56+
Planning	56+

Extra skills identified

Hardware
Networking
Remote Sensing
Security

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 Western Australia?

The number of Western Australia tech workers with skills in virtual worlds is expected to grow from just 200 in 2022 to 1,500 by 2030.

The total skill requirement to support just the core tech workforce in Western Australia is projected to grow from 52 in 2022 to 386 in 2030. The gap between skills now and in the future is a total of 334 technical and soft skills.

Skills sets demanded for virtual worlds by 2030

Graphic design software
164+

Visual design production
53+

Visual design
104+

Social media
53+

Software dev principles
67+

Animation and game design
154+

Drafting & engineers design
257+

516 Skilled workers needed (2030)

2,003 Skills gap (2030)

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

People skills

Communication skills	114+
Teamwork/collaboration	107+
Planning	67+
Detail-oriented	57+
Organisational skills	50+

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 other the coming years, high-performance computing (HPC) skills will begin to be need 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 Western Australia?

The number of Western Australia tech workers focusing on HPC is expected to grow slightly from 40 in 2022 to 146 by 2030.

The total skill requirement to support just the core tech workforce is projected to grow 268% from 197 in 2022 to 724 in 2030. The gap between skills now and in the future is a 527 technical and soft skills.

Skills sets demanded for high-performance computing by 2030

Programming languages
27+

Systems administration
32+

Operating systems
43+

Scripting languages
51+

Technical support
46+

Programming principles
106+

Software development principles
47+

146 Skilled workers needed (2030)

527 Skills gap (2030)

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

People skills

Research	57+
Teamwork/collaboration	32+
Communication skills	28+
Problem solving	19+
Planning	18+

Extra skills identified

Parallel Programming

Algorithm Optimisation

Graphics Processing Unit (GPU programming & accelerators

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 Western Australia?

The number of Western Australia tech workers focusing on advanced robotics and sensors is expected to grow slightly from 187 in 2022 to 270 by 2030.

The total skill requirement to support just the core tech workforce in Western 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
124+

Mechanical engineering
31+

Imaging
32+

Scripting languages
44+

Programming languages
34+

Software development principles
47+

System design & implementation
61+

83 Skilled workers needed (2030)

314 Skills gap (2030)

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

People skills
Communication skills	28+
Teamwork/Collaboration	22+
Problem solving	18+
Planning	16+
Research	13+

Extra skills identified
Mechatronics

Electronics and hardware integration

Kinematics and Dynamics

Appendix B: Western Australia priority technology workforce

Technology employment forecasts by occupation grouping, WA, 2022 to 2030

Occupation group	2022	2030	Average annual growth
ICT Management and Operations	19,150	24,196	3.0%
ICT Technical and Professional	21,185	33,172	5.8%
ICT Sales	2,086	1,976	-0.7%
ICT Trades	10,080	11,290	1.4%
Electronic trades and professional	381	378	-0.1%
ICT Industry Admin and Logistics Support	10,443	14,866	4.5%
Total ICT workers	**63,326**	**85,878**	**3.9%**

Government funded VET subject enrolment in IT field of education in WA, 2016-2022

Qualification	2016	2017	2018	2019	2020	2021	2022
Diploma or above	515	577	554	718	845	703	811
Certificate IV	1,271	1,105	1,188	1,190	1,368	1,693	1,410
Certificate III	1,226	1,264	1,102	1,102	1,112	1,461	1,375
Certificate II	3,611	3,983	3,163	3,512	2,897	1,650	1,321
Certificate I	1,266	781	553	494	245	102	2

Technology employment by industry, WA

Industry	Employment
Agriculture, Forestry and Fishing	0
Mining	4,452
Manufacturing	1,218
Electricity, Gas, Water and Waste Services	1,784
Construction	736
Wholesale Trade	831
Retail Trade	1,541
Accommodation and Food Services	0
Transport, Postal and Warehousing	915
Rest of Information Media and Telecommunications	494
Financial and Insurance Services	2,333
Rental, Hiring and Real Estate Services	263
Rest of Professional, Scientific and Technical Services	8,252
Administrative and Support Services	991
Public Administration and Safety	6,216
Education and Training	2,666
Health Care and Social Assistance	1,164
Arts and Recreation Services	1,172
Other Services	411
Telecommunications Services	7,219
Internet Service Providers, Web Search Portals and Data Processing Services	767
Computer System Design and Related Services	19,900
Total ICT workers	**63,326**

Domestic enrolments and completions in IT degrees in WA, 2001 to 2021

	Course enrolments		Course completion	
	Undergraduate	Postgraduate	Undergraduate	Postgraduate
2001	2,999	739	408	217
2002	3,416	746	547	262
2003	3,393	691	520	214
2004	2,960	679	559	208
2005	2,489	685	480	173
2006	2,129	638	452	175
2007	1,794	623	332	157
2008	1,630	563	298	111
2009	1,528	563	220	142
2010	1,537	570	234	132
2011	1,594	526	212	127
2012	1,564	560	252	133
2013	1,503	554	254	156
2014	1,301	498	235	148
2015	1,188	440	204	143
2016	1,182	449	159	153
2017	1,086	557	126	138
2018	1,127	614	123	165
2019	1,141	816	134	239
2020	1,517	923	178	269
2021	1,989	882	210	329

International enrolments and completions in IT degrees in WA, 2001 to 2021

	Course enrolments		Course completion	
	Undergraduate	Postgraduate	Undergraduate	Postgraduate
2001	953	964	166	324
2002	1,320	534	255	277
2003	1,381	463	365	203
2004	1,229	495	399	209
2005	1,140	612	348	296
2006	950	626	301	269
2007	978	698	368	307
2008	1,038	710	299	249
2009	1,170	791	386	260
2010	1,111	741	371	331
2011	1,120	595	339	290
2012	1,304	493	315	201
2013	1,325	502	352	192
2014	1,315	490	362	200
2015	1,223	500	344	152
2016	1,292	570	348	150
2017	1,076	745	320	179
2018	981	1,078	326	261
2019	976	1,461	337	261
2020	1,086	1,528	387	494
2021	1,741	1,198	355	647

Deloitte.