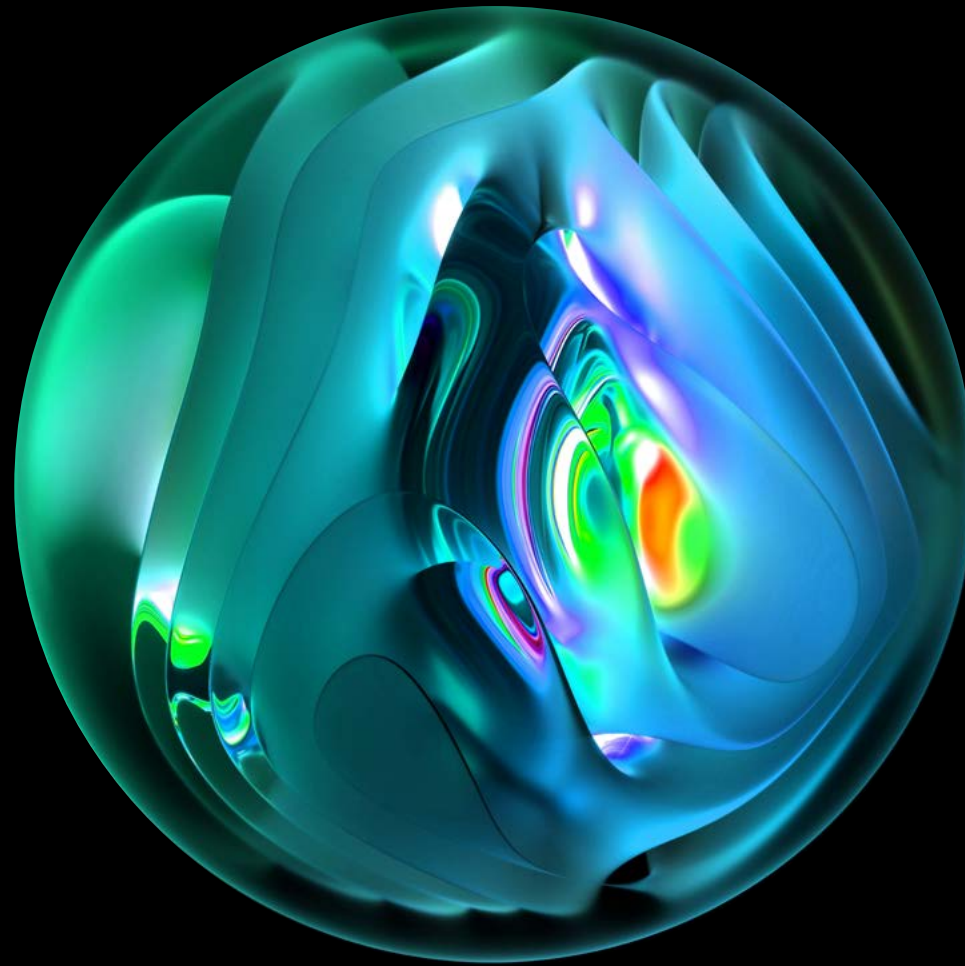


**Deloitte.**



## Australia's Digital Pulse

A new approach to building technology skills

Victoria 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

Victoria edition

Victoria is a national leader in terms of the digital economy. Maintaining leadership will require ensuring tech skills of the workforce match the rapid pace of developments in technologies such as AI, robotics and advanced data analytics. The rapid adoption of these technologies will affect almost 3.5 million Victorian workers and require 364,000 additional critical technology skills by 2030.

Already outdated digital skills cost Victorian large businesses \$840 million per year.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 Victoria will require a new approach.

## Key principles of the new approach



All hands  
on deck



Skills  
first



Driving  
diversity



Lifecycle  
of learning



Systems  
approach

# \$47 billion

Projected annual  
technology investment  
in Victoria in 2030

# 4.2 million

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

# 20,000

New technology workers  
needed each year

# 364,000

critical tech skills needed  
in Victoria by 2030

# \$840 million

Cost of outdated digital  
skills for large Victorian  
businesses each year

# Victoria is home to a large share of Australia's technology sector

## The future role of technology in Victoria

Victoria has one of the largest digital economies in Australia in terms of number of businesses, size of the technology workforce and investment in technology. The ICT sector contributed almost \$34 billion to the Victorian economy in FY22 as measured by value add with over 45,000 ICT businesses headquartered in the state.<sup>1,2</sup>

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

The Victorian technology workforce reached 279,000 in 2022, with more than half employed in businesses outside the traditional ICT sector.

Victoria is a global leader in the medical technologies (Medtech) sector. Medtech is one of Victoria's fastest growing sectors with 650 companies employing approximately 6,000 people across the state.<sup>3</sup>

Melbourne is also a key player globally, having been ranked in the top 30 global cities for technology.<sup>4</sup>

The Victorian economy will experience imminent and extensive disruption from Generative AI with the five industries to be impacted the most by the technology accounting for 33% of the economy.<sup>5</sup>

More broadly, forecasts from the International Data Corporation (IDC) indicate that technology investment in Victoria will increase from \$33 billion in 2022 to \$47 billion by 2030.

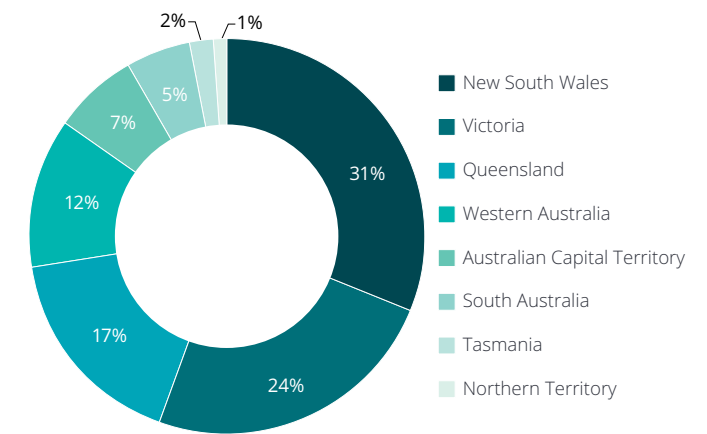
The importance of innovating and adopting new technologies for Victorian businesses and the economy cannot be understated. The Victorian Government recognises the importance of technology and has set up a \$2 billion investment fund targeted at making Victoria a global innovation leader.<sup>6</sup>

Beyond economic outcomes, embracing technology can also provide dividends across broader societal objectives. For example, Victoria has targets to cut the state's greenhouse gas emissions and achieve net zero by 2045. Technology has an important part to play in achieving this with the Victorian Government offering grants of up to \$750,000 to manufacturers to develop new equipment, skills or technology to capitalise on renewable energy opportunities.<sup>7</sup>

Technologies can also assist the Victorian Government in addressing the cost-of-living crisis by improving service delivery and reducing costs. For instance, AI-powered systems can enhance the efficiency and targeting of social support programs by automating eligibility assessments.

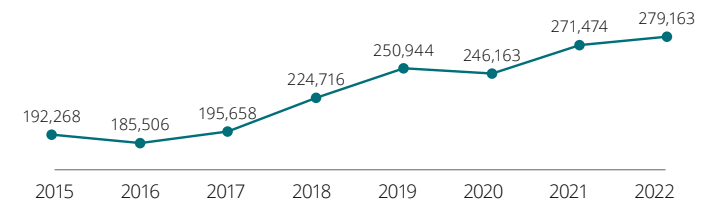
With tech offering solutions to some of the biggest issues facing the state, Victoria cannot afford to let the opportunities by developments in tech go by.

## National technology investment to 2030



Source: IDC ICT Spend Data Custom Report

## Technology employment in Victoria 2015 to 2022



Source: Australian Bureau of Statistics (2023)

## An innovation perspective

“Victoria is a leader when it comes to the digital economy, but we can’t have any sense of entitlement when it comes to that position. Generative AI is making change in continuously evolving areas even faster.

We need to make sure Victorian businesses are actively adopting and experimenting with Gen AI and creating environments where the next generation of digital workers. In fact all workers, can collaboratively build and apply their skills in this exciting new era of information and technology.”



**Peter Williams**  
Centre for the Edge  
Deloitte Australia

# Critical technology will significantly impact the work of 94% of the Victorian workforce

## Nearly 4.5 million workers across Victoria 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.<sup>1</sup>

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 Victorian workers (94%) are expected to have at least 20% of their work time affected by critical technologies over the coming years. In total, 70% of all working hours across Victoria will be affected.

Advanced data analytics and AI technologies will have the largest workforce impact, each affecting the work time of almost three-in-five workers. In total, these technologies will affect 26% and 23% of all working hours in Victoria respectively.

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

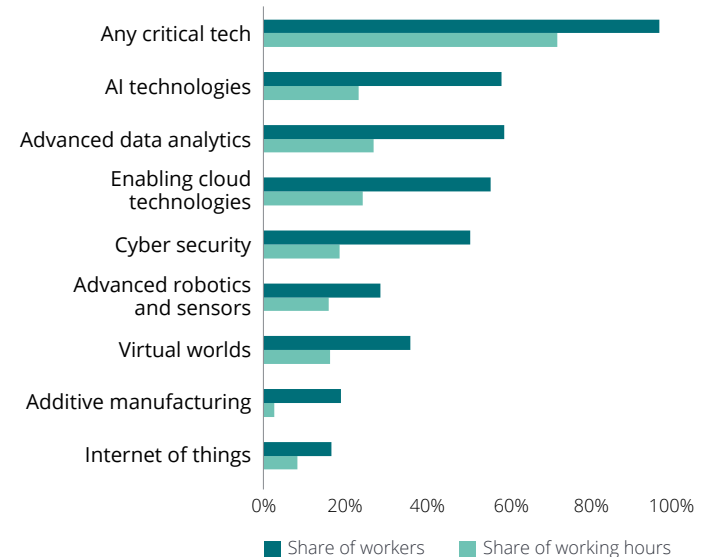
Some of the occupations most affected by critical technology include technology workers who account for eight out of the top twenty impacted occupations. For Victoria, with a number of technology-based jobs already on its skill shortages list, this means thinking strategically about how to upskill existing technology workers in critical tech.<sup>2</sup>

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.

For teachers, early application of generative AI include applications that create bespoke lesson plans, assessments and personalised content for students.<sup>3</sup> As these technologies free up time, they are likely to focus on other tasks that improve educational outcomes.

Manual labour-intensive occupations such as those in hospitality and construction are expected to be less impacted by critical technology relative to other industries. However, all industries will be transformed by these technologies, meaning that strategies to upskill workers in these areas will be important.

## Proportion of Victorian workers and work hours affected by critical technology



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

## Ten Victorian 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 ten impacted industries account for 51% of Victorian 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.<sup>1,2</sup>

Already companies like Value Australia, a part of Melbourne based PEXA, are working to improve property development and banking. Their tool uses AI to give a more accurate and timely valuation of properties based on local market data and a range of environmental, infrastructure and location factors such as a property's proximity to a school, or the planned building of a new train station or hospital nearby.<sup>3</sup>

Service-based and traditional industries are also facing seismic disruption from critical technologies and may be less prepared for the rapid incoming changes. However, research comparing the data infrastructure of these industries has found relatively low capabilities in many of them, including construction, mining and wholesale trade.<sup>4</sup>

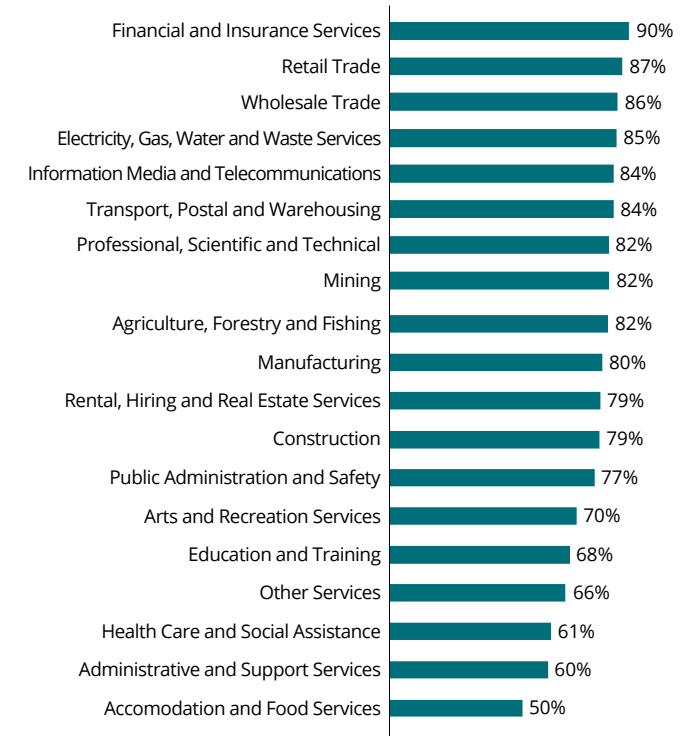
In construction, critical technology is likely to help improve efficiency and also safety. Virtual reality is currently being used to create more engaging safety training through simulating worksites.<sup>5</sup> On site, IoT devices have also turned regular safety equipment into smart devices capable of alerting users to potential dangers.<sup>6</sup> These can be especially effective in warmer climate or hazardous underground sites where heat stress may cause workers to become ill or cause an accident.<sup>7</sup>

One trial of VR on a worksite noted that almost two-thirds of workers have not previously interacted with the technology. As such, ensuring a baseline level of skills in relevant technologies will be important for construction workers to keep up.<sup>8</sup>

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 knowledge industries. However, the impact across these industries is still substantial with more than half of all work hours of accommodation and food services 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 be key.

## Affected work hours by industry, Victoria



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

# The tech skills challenge for Victoria

## Victoria will require half a million critical technology skills 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, over 510,000 skills will be required for critical technologies by 2030, an increase of 364,000 compared to current skills in the Victorian 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, scripting languages and software development principles are among the most common technical skills that will be needed in Victoria.

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.<sup>1</sup> These out-of-date digital skills come at a cost with \$840 million per year in lost output among large businesses alone.<sup>2</sup> This estimate only reflects costs associated with existing employees, with the full impact 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 Victorian workforce means the gap in digital skills is likely to grow without significant action. To ensure that Victoria's technology skills challenge is met, barriers facing the labour market need to be addressed.

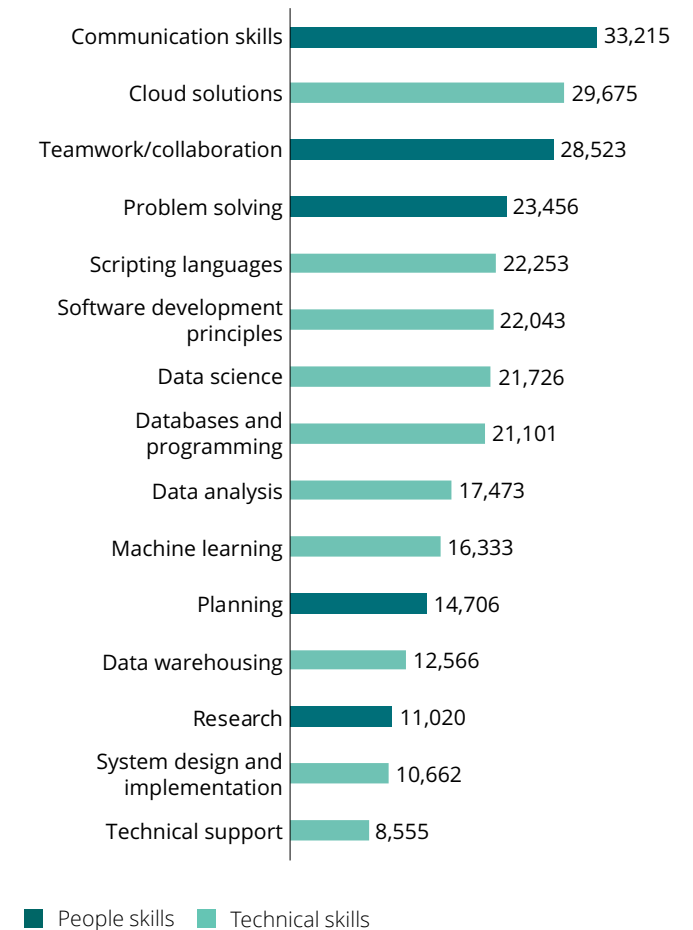
The **lack of diversity** in tech not only holds back key talent but severely limits the ability to meet our skill needs. Only 29% of people working in technology occupations in Victoria are women, substantially fewer compared to similar industries such as professional services (46%).<sup>3</sup> Victoria also has **the lowest share of women enrolled in IT university courses (26%)**, meaning the gender gap in the ICT sector is likely to persist.<sup>4</sup>

The gender gap in technology begins early in life with large differences in the pre-tertiary STEM subjects chosen by Victorian boys and girls. Female students are far less likely than male students to choose technology subjects and more likely to study life sciences, and health and human development.<sup>5</sup>

More generally, a decline in domestic student enrolments and completions in IT degrees in Victoria in 2022 signals an **increasing lack of interest in tech among younger generations.**<sup>6</sup> This could lead to future generations lacking critical skills needed to build a successful career.

Not only will Victoria need more workers with technology skills, but it will also need workers with a variety of new or emerging technology skills. Technical skills, such as data science, machine and deep learning, will be some of the most sought after, with 138,000 additional AI skills needed by 2030.

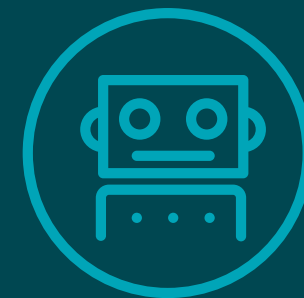
## Additional skills needed by critical technology workers by 2030, Victoria



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 Victoria?

The number of Victorian tech workers focusing on AI, ML and NLP is expected to grow from just 4,000 in 2022 to 36,000 by 2030.

The total skill requirement in Victoria to support just the core tech workforce is projected to grow 793% from 17,408 in 2022 to 155,435 in 2030. The gap between skills now and in the future is a staggering 138,027 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

21,726+



### Machine learning

16,295+



### Data analysis

7,988+



### Scripting languages

15,336+



### Data warehousing

7,349+



### Databases & programming

8,946+



### Software development principles

11,183+

32k

Skilled workers needed  
(2030)

138k

Skills gap  
(2030)

+793%

Growth in skilled  
workers (2022-2030)

### People skills

Teamwork/collaboration	10,863+
Communication skills	10,863+
Problem Solving	8,307+
Research	7,029+
Planning	4,793+

### 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)

## A tech perspective

“Building greater gender diversity in our technology workforce and the education pipeline is critical for the industry at a national level as well as in Victoria.

The technology skills challenge is immense and will only be addressed when everybody knows they can contribute to this important part of the economy.”



**Bec McConnochie**  
Tech Sector Lead Partner  
Deloitte Australia

# Victoria will need to skill almost 20,000 technology workers per year for Australia to keep up with international peers

## Victoria needs to skill almost 20,000 technology workers per year but only educates 6,500 technology workers annually

Based on currently available data, Australia will need to spend an additional \$92 billion through to 2030 in critical technologies to be at the forefront of forthcoming disruption. Based on forecast technology investment, this would amount to an additional \$22 billion of critical technology spend in Victoria by 2030.

The Victorian technology workforce has grown strongly to meet the needs of businesses and the economy. The number of technology workers has grown by almost 90,000 in the 8 years since the first edition of Australia's Digital Pulse was published.

There were 279,000 people employed in the Victoria technology workforce in 2022. Our forecasts suggest an additional 155,000 workers will be required by 2030. That's almost 20,000 annually. Despite this, Victoria is only expected to formally educate 6,500 technology workers per year over this period (52,000 by 2030).

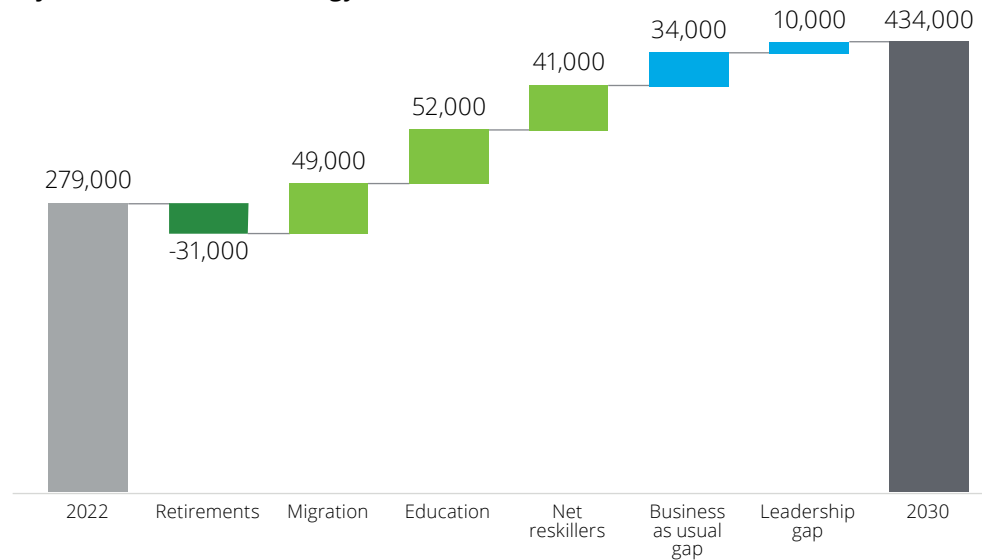
The number of workers in Australia's technology workforce grows and shrinks based on a number of drivers. These include:

- 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 Victoria technology sectors are expected to reskill an additional 41,000 workers but will need to reach 75,000 to match business-as-usual demand by 2030. This rises to 85,000 workers if Australia was to match levels of spending on critical technology in the USA (proportionate to GDP).

Projected source of technology workers, 2022-2030



Source: Deloitte Access Economics (2023)

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

## Two-thirds of Victorian technology workers agree that critical tech will significantly disrupt the technology sector

Like their peers across Australia, tech workers in Victoria see the extent of potential disruption in the sector. Most do not think they are ready for the coming change. Only half (52%) 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, adding to the likelihood they leave the profession.

Better utilising tech workers in Victoria includes ensuring workers have meaningful work for their skills. Based on a technology workforce survey completed for this report, one in five do not agree that their skills are being fully utilised. Workers think that they could have their capabilities and contributions better recognised (70%), be given more technical tasks (35%) and be involved in bigger and more complex work (26%).

Many Victorian tech workers (44%) also want to work more hours. While systemic barriers such as caring for children or other personal responsibilities are key barriers for these workers, a lack of full-time opportunities is also a barrier. 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 Victorian tech workers are planning on leaving the sector in the next five years.

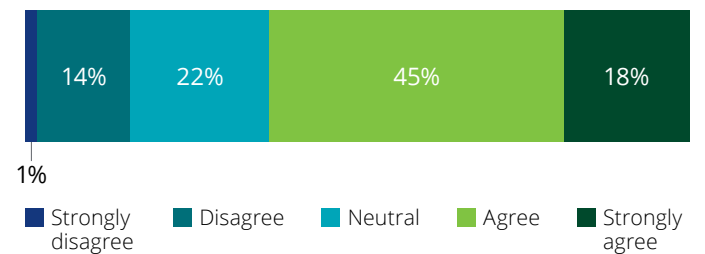
This level of planned exits from the sector highlights the need to address the challenges that workers in the sector face. Some of the top reasons for workers wanting to leave the tech sector in Victoria include wanting to do something different (32%), for better pay (32%) and for better job security (21%).

While workers leave technology roles, workers also reskill into the sector. In Victoria, the leading reasons people reskill into the sector are better pay (41%), opportunities for career growth (38%) and learning and development (35%). This is indicative of the existing opportunities and industry leading nature of the local industry.

Our technology workforce survey found that almost two in five (39%) of Victorian technology workers look to upskill by undertaking self-directed learning through reading articles and watching videos while 53% undertook some mandatory employer provided training.

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 working overtime.

## Agreement that critical technology will significantly disrupt the technology sector



Source: Technology workforce survey (2023)

## Reasons reskillers move into a technology role in Victoria



Source: Technology workforce survey (2023)

# Modernising IT education

## Rethinking how IT education is taught across the lifecycle is needed to build a digitally skilled workforce

Our educational system is geared towards producing qualified people prepared for occupations such as accountants, software developers or teachers. Yet, we know the work and tasks for nearly 4.5 million Victorian workers could change significantly in response to critical tech.<sup>1</sup> Now more than ever, a focus on teaching the digital skills required to participate in the modern economy is essential as people looking to enter the workforce reskill throughout their career.

When it comes to formal technology education, the system is not currently providing people with the skills they need. A 2023 AIIA survey found that just 3% of tech businesses believed the education system produced job ready candidates.<sup>2</sup> Similarly, the 2022 QILT (Quality Indicators for Learning and Teaching) Employer Satisfaction Survey found IT was ranked last for 'employability'.<sup>3</sup>

The Australian Universities Accord found that the Australian higher education sector and industry need to engage more effectively to design and accredit curricula that reflect employer needs adequately.<sup>4</sup> While it notes that the technology sector is among the most proactive in this space already, the poor employer satisfaction measures suggest more work is needed to make technology graduates job ready.

Falling student enrolments and completions in tertiary IT courses in Victoria also highlight the need to rethink training. Similarly, enrolments in IT based certificates IV and

diplomas in Victorian have steadily fallen in recent years.<sup>5</sup> These enrolment challenges are also likely to be exacerbated by the additional scrutiny being placed on international student visa applications in 2024.<sup>6</sup>

Growing the number of workers coming through the technology education pipeline and developing skills in emerging technologies requires better student engagement in school.

The Victorian government is already taken steps in this direction. For example, the Digital Teaching Skills series, a collaboration between the Department of Education and Digital Learning and Teaching Victoria, covers digital learning opportunities aimed at covering digital teaching opportunities in a variety of curriculum areas.<sup>7</sup> The series provides insights and suggestions for integrating emerging technologies such as AI, virtual worlds and programming into existing classroom curriculum.

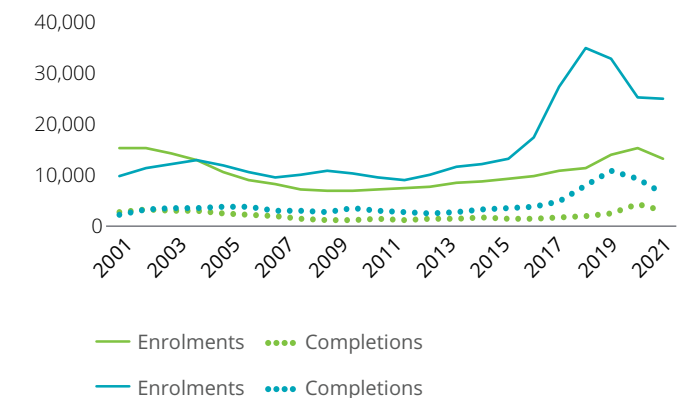
The Victorian Government is also building six new Tech Schools that provide students opportunities to work on real-world problems and gain exposure to critical technology.<sup>8</sup> The facilities and programs will be developed with ongoing input from local schools, industry and communities and will be operational by 2026.

With Victoria having the lowest share of women enrolled in IT university courses in the nation, a focus on encouraging female student engagement with technology in schools will be crucial to long-term success.<sup>9</sup>

Better teaching of technology skills and exposing students to possibilities in Victorian schools will likely pay dividends outside the formal education sector. In fact, most of Australia's technology workforce (70%) is actually made up of people who did not start their career in tech or have a formal IT qualification through a university or VET provider.<sup>10</sup>

A greater focus on modular, stackable skills that helps individuals to attain the skills they need across their working life, as suggested by the Accord, is needed.<sup>11</sup> This could include through the VET system and microcredentials in partnership with industry.

## IT university course statistics, Victoria



Source: Department of Education (2023)

## A professional association perspective

“The Victorian economy demonstrates the need for technology skills is not limited to Telecommunication providers or Internet Service Providers. Technology has transformed every industry and has made a sound understanding of technology a requirement for farmers, office managers and everyone in-between. We are all technology workers now.”



**Josh Griggs**  
Interim CEO  
Australian Computer Society

# How can Victoria lead change?

Victoria is not on track to develop the technology skills needed to meet the demands of business and the economy. The Digital Strategy 2021-2026 identifies 15 recommendations to achieve outcomes in three key priority areas.<sup>1</sup> There are nine Regional Digital Plans that identify connectivity issues for the area and local industries and provides recommendations for improvement.<sup>2</sup>

Yet, there are gaps when it comes to encouraging businesses across a variety of industries to adopt key technologies and encouraging greater diversity in the workforce.

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

Using these as our foundation, we have identified four high priority recommendations for Victoria 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 Victoria. Combining effort to produce transformational change will be required.

In Victoria, this will require the Government to develop a skills strategy in collaboration with education providers like University of Melbourne and Monash University along with major tech employers like Telstra and Vocus 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. Excluding or not fully utilising existing talent is not only wrong but imposes significant costs on the Victorian economy.

Victoria's technology workforce has a lower representation of women compared to other sectors. Helping these cohorts build skills and participate fully in the Victorian 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 Victorian 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 Victoria

## Encouraging greater digital adoption across industries



Greater digital adoption across all industries will be important for realising the productivity benefits associated with technology. While the recent technology developments – such as AI, big data analytics and virtual worlds – can transform each industry, there are a variety of starting points and potential barriers for individual industries.

For example, improving the development of AgTech may require greater connectivity infrastructure in Victoria's regions and increasing education of the benefits associated with digital adoption. Increasing the number and scale of fintech businesses may require improved communication around the regulatory or data requirements.

To better understand the unique landscape, the Victorian government should develop industry digital plans for key industries that sets out challenges and specific goals depending on the starting point of that industry. These plans could leverage the Regional Digital Plans already developed in Victoria.

More generally, improving digital adoption could be assisted by grants for businesses in key industries to utilise specific technologies such as AI or virtual worlds. The products and innovative models from successful grant recipients could be collated to create use case dossiers to generate interest in other businesses for the relevant sectors. Partnering with relevant industry associations could help to gain wider audiences.

## Greater gender diversity



Increasing gender diversity is a clear priority for Victoria. Only 29% of Victorian technology workers are women, compared to 48% across all industries. This issue is unlikely to be addressed soon, with women making up only 26% of enrolments in IT degrees in Victoria.

Victorian Government initiatives such as SummerTech LIVE seek to address this imbalance by improving the job readiness of graduates. Participants are provided with a \$5000 studentship at a tech business for 10-12 weeks over the summer break. Half of last year's cohort were women with 60% gaining positions at the participating business, suggesting that this program can promote greater participation for women in the sector.

To improve women's participation, more efforts should be directed to earlier in the education system. The national ACS Australia's Digital Pulse recommended student tech mentors at schools to mitigate the impact of gender norms impacting study decisions. This initiative could be impactful in the Victorian context and would require involvement by the Department of Education Victoria.

In particular, the Alumnae of the SummerTech Live program who go on to work in the field could be suitable and interested in being mentors for younger generations. The participation from women in other industry associations would also be invaluable.

Use of a similar funding model to SummerTech Live or a co-investment with businesses approach should be investigated to help fund this initiative.



# Turning the principles of the new approach into practice in Victoria

## Education and workforce skills



The fast-paced nature of technology means that the skills required by businesses are constantly changing based on the latest developments. This shifting field necessitates a change in the way we build tech skills in the education system.

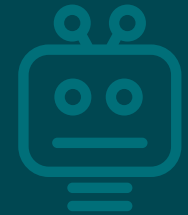
A greater focus on student experimentation and problem solving with technology should be prioritised across all levels of education. This will require a more principled approach to technology that emphasises students playfully engaging with technology rather than focusing on content or specific technology solutions that may become outdated soon after they join the workplace.

To encourage this approach in the Victorian education system, an awards night that celebrates teachers and education providers at primary, secondary and tertiary levels should be organised with awards given to innovative ideas or methods.

There could be a similar awards night for students at various age groups who use tech to solve an issue or challenge faced by businesses or society to encourage greater investigation or development of technology skills.

For those looking to upskill or reskill in mid-career, the national ACS Australia's Digital Pulse has recommended the Career Transition Scheme to encourage greater adoption. In the Victorian context, reskilling can be encouraged through subsidies for microcredentials that involve technology skills to ensure skills remain relevant.

## Develop an AI Adoption Framework



The 2023 Victorian digital technology sector survey found that nearly half of businesses identified AI and ML as one of the top five technologies for deployment over the next year. In addition, AI and ML were one of the most common skills gaps for businesses that negatively impact the business.

To help promote the responsible use of AI across businesses and technology workers, the Victorian Government should consider issuing an AI Assurance and Adoption Framework that provides guidelines and best practice for businesses experimenting or deploying AI solutions in their business.

The Adoption Framework should identify common use cases by industry and best practice for trialling AI organisations. The Framework should align with the Industry Digital Plans discussed as part of the first recommendation in this report.

The framework should be developed in concert with industry experts and associations to make sure appropriate investments are made and skills are developed in parts of the workforce that may require assistance adjusting to changing skill requirements. The variety of potential skills required to effectively use AI should be recognised – including technical skills, people skills and strategic business applications to leverage technologies. Providing holistic upskilling and reskilling opportunities will make sure deployment of AI is effective from a commercial viewpoint.

# 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 Victorian 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 Victorian tech workforce.

The research notes that while the technology workforce in Victoria 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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# **Appendix A: Technology workforce skill impacts from critical technologies in Victoria**

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# 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 Victoria?

The number of Victorian tech workers with skills in advanced data analytics is expected to grow from 13,300 in 2022 to 37,000 by 2030.

The total skill requirement to support just the core tech workforce in Victoria is projected to grow 179% from 44,936 in 2022 to 125,328 in 2030. The gap between skills now and in the future is a sizable 80,392 technical and soft skills.

## Skills sets demanded for advanced data analytics by 2030

-  **Data analysis**  
9,486+
-  **Data techniques**  
6,877+
-  **Big data**  
6,403+
-  **Scripting languages**  
6,403+
-  **Data warehousing**  
5,217+
-  **Databases & programming**  
6,166+
-  **Database administration**  
5,454+

**24k** Skilled workers needed (2030)

**80k** Skills gap (2030)

**+179%** Growth in skilled workers (2030)

### People skills

Communication skills	8,300+
Teamwork/collaboration	6,877+
Problem Solving	6,166+
Planning	4,031+
Research	3,794+

### 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 Victoria?

The number of Victorian tech workers focusing on cyber security is expected to grow from 6,800 in 2022 to 13,200 by 2030.

The total skill requirement to support just the core tech workforce in Victoria is projected to grow 94% from 22,772 in 2022 to 44,190 in 2030. The gap between skills now and in the future is a substantial 21,418 technical and soft skills.

## Skills sets demanded for cyber security by 2030

-  **Cyber security**  
5,179+
-  **Network configuration**  
1,343 +
-  **Cloud solutions**  
1,279+
-  **General networking**  
1,279+
-  **Information security**  
1,407+
-  **Software development principles**  
1,087+
-  **System design & implementation**  
1,534+

**6,400** Skilled workers needed (2030)

**21k** Skills gap (2030)

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

### People skills

Communication skills	2,430+
Teamwork/collaboration	1,662+
Problem Solving	1,407+
Planning	1,023+
Stakeholder management	767+

### 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 Victoria?

The number of Victorian tech workers with skills in cloud technology is expected to grow from an already sizable 14,500 in 2022 to 44,500 by 2030.

The total skill requirement to support just the core tech workforce in Victoria is projected to grow 206% from 55,608 in 2022 to 170,300 in 2030. The gap between skills now and in the future is a substantial 114,692 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**  
5,989+
-  **Operating systems**  
6,588+
-  **Technical support**  
7,187+
-  **Cloud solutions**  
28,149+
-  **System design & implementation**  
8,684+
-  **Databases & programming**  
5,989+
-  **Software development principles**  
8,984+



### People skills

Communication skills	10,780+
Teamwork/collaboration	8,385+
Problem Solving	7,187+
Troubleshooting	6,289+
Planning	4,492+

### 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 Victoria?

The number of Victorian tech workers focusing on the Internet of Things is expected to grow from 800 in 2022 to 1,900 by 2030.

The total skill requirement to support just the core tech workforce in Victoria is projected to grow 156% from 2,818 in 2022 to 7,208 in 2030. The gap between skills now and in the future is 4,389 technical and soft skills.

## Skills sets demanded for Internet of Things by 2030

-  **Internet of Things**  
1,059+
-  **General networking**  
188+
-  **Technical support**  
200+
-  **Scripting languages**  
318+
-  **Cloud solutions**  
247+
-  **Software development principles**  
306+
-  **System design & implementation**  
447+

**1,100** Skilled workers needed (2030)

**4,400** Skills gap (2030)

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

### People skills

Communication skills	471+
Teamwork/collaboration	388+
Problem Solving	282+
Project management	153+
Planning	153+

### 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 Victoria?

The number of Victorian tech workers with skills in virtual worlds is expected to grow from just 400 in 2022 to 2,800 by 2030.

The total skill requirement to support just the core tech workforce in Victoria is projected to grow from 98 in 2022 to 720 in 2030. The gap between skills now and in the future is a total of 623 technical and soft skills.

## Skills sets demanded for virtual worlds by 2030

-  **Graphic design software**  
305+
-  **Visual design production**  
100+
-  **Visual design**  
193+
-  **Social media**  
100+
-  **Software dev principles**  
125+
-  **Animation &**  
**design**  
286+
-  **Drafting & engineers design**  
479+

**2,400** Skilled workers needed (2030)

**623** Skills gap (2030)

**+636%** Growth in skilled workers (2022-2030)

### People skills

Communication skills	212+
Teamwork/collaboration	199+
Planning	125+
Detail-oriented	106+
Organisational skills	93+

### Extra skills identified

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

# 2030 skills for additive manufacturing (including 3D printing)



The expected growth and size of the technology workforce involved in additive manufacturing is comparatively modest. Annual business investment in these areas across Australia is forecast to jump from \$317 million in 2022 to \$434 million by 2030. Business use of these technologies is currently around 2%, in Australia.

## What skills will tech workers need for this enormous change?

For additive manufacturing the essential technical skills include: Drafting and engineers design, Robotics, System design and implementation, Software development principles and Mechanical engineering. Workers will also need soft skills such as research, effective communication, technical support, problem-solving, collaboration, and teamwork.

## How many extra professionals and how much more skilling will be needed in Victoria?


The number of tech workers focusing on additive manufacturing is expected to grow slightly from 22 in 2022 to 56 by 2030.

In observing that these numbers appear low, it is important to note that they are simply the tech workers involved with the development of the technology. Additive manufacturing could have dramatic impacts on the manufacturing (and other) workforces and be used by a great many workers.

## Skills sets demanded for additive manufacturing by 2030


 **Drafting and design**  
34+


 **Operating systems**  
5+

 **Robotics**  
13+

 **Test automation**  
5+

 **Mechanical engineering**  
8+

 **Software dev principles**  
8+

 **System design & implementation**  
10+

**34** Skilled workers needed (2030)

**150** Skills gap (2030)

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

### People skills

Research	13+
Communication skills	12+
Technical support	11+
Problem solving	9+
Teamwork/collaboration	8+

### 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 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 Victoria?


The number of Victoria tech workers focusing on HPC is expected to grow slightly from 100 in 2022 to 380 by 2030.

The total skill requirement to support just the core tech workforce is projected to grow 268% from 508 in 2022 to 1,867 in 2030. The gap between skills now and in the future is a 1,359 technical and soft skills.


## Skills sets demanded for high-performance computing by 2030

 **Programming languages**  
68+

 **Systems administration**  
82+

 **Operating systems**  
112+

 **Scripting languages**  
131+

 **Technical support**  
118+

 **Programming principles**  
274+

 **Software development principles**  
120+

**280** Skilled workers needed (2030)

**1,359** Skills gap (2030)

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

### People skills

Research	148+
Teamwork/collaboration	82+
Communication skills	71+
Problem solving	49+
Planning	46+

### Extra skills identified

Parallel Programming  
Algorithm Optimisation  
Graphics Processing Unit (GPU) programming and 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 Victoria?

The number of Victorian tech workers focusing on advanced robotics and sensors is expected to grow slightly from 500 in 2022 to 730 by 2030.

The total skill requirement to support just the core tech workforce in Victoria 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**  
182+



**Mechanical engineering**  
45+



**Imaging**  
47+



**Scripting languages**  
65+



**Programming languages**  
49+



**Software development principles**  
70+



**System design & implementation**  
90+

230

**Skilled workers needed**  
(2030)

850

**Skills gap**  
(2030)

+44%

**Growth in skilled workers** (2022-2030)

### People skills

Communication skills	76+
Teamwork/Collaboration	58+
Problem solving	49+
Planning	43+
Research	36+

### Extra skills identified

- Mechatronics
- Electronics and hardware integration
- Kinematics and Dynamics

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

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# Appendix B: Victorian traditional technology workforce

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## Technology employment forecasts by occupation grouping, Victoria, 2022 to 2030

Occupation group	2022	2030	Average annual growth
ICT Management and Operations	97,207	156,825	6.2%
ICT Technical and Professional	114,347	181,687	6.0%
ICT Sales	7,443	8,612	1.8%
ICT Trades	21,093	23,666	1.4%
Electronic trades and professional	316	508	6.1%
ICT Industry Admin and Logistics Support	38,758	52,961	4.0%
<b>Total ICT workers</b>	<b>279,163</b>	<b>424,260</b>	<b>5.4%</b>

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

Qualification	2016	2017	2018	2019	2020	2021	2022
Diploma or above	4,004	2,906	2,513	2,632	2,464	2,481	2,007
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	432
Mining	674
Manufacturing	5,768
Electricity, Gas, Water and Waste Services	5,096
Construction	2,469
Wholesale Trade	5,658
Retail Trade	13,724
Accommodation and Food Services	538
Transport, Postal and Warehousing	7,084
Rest of Information Media and Telecommunications	3,046
Financial and Insurance Services	25,274
Rental, Hiring and Real Estate Services	2,303
Rest of Professional, Scientific and Technical Services	35,686
Administrative and Support Services	3,150
Public Administration and Safety	14,443
Education and Training	9,538
Health Care and Social Assistance	9,751
Arts and Recreation Services	1,999
Other Services	3,108
Telecommunications Services	24,816
Internet Service Providers, Web Search Portals and Data Processing Services	2,251
Computer System Design and Related Services	102,354
<b>Total ICT workers</b>	<b>279,163</b>

## Domestic enrolments and completions in IT degrees in Victoria, 2001 to 2022

	Course enrolments		Course completion	
	Undergraduate	Postgraduate	Undergraduate	Postgraduate
2001	10,218	4,959	1,802	1,120
2002	10,482	4,814	1,919	1,273
2003	10,256	3,979	2,093	1,050
2004	9,569	3,286	2,030	954
2005	8,061	2,557	1,908	715
2006	6,892	2,092	1,628	538
2007	6,384	1,821	1,465	474
2008	5,612	1,611	1,127	453
2009	5,359	1,616	965	390
2010	5,447	1,597	970	325
2011	5,613	1,572	1,021	419
2012	5,773	1,645	974	372
2013	6,081	1,680	987	400
2014	6,685	1,720	1,125	406
2015	7,055	1,773	1,175	476
2016	7,378	1,836	1,139	406
2017	7,801	2,041	1,170	421
2018	8,572	2,339	1,318	496
2019	8,679	2,551	1,410	575
2020	9,257	4,554	1,478	1,155
2021	9,701	5,630	1,799	2,456
2022	9,173	3,957	1,547	1,464

## International enrolments and completions in IT degrees in Victoria, 2001 to 2022

	Course enrolments		Course completion	
	Undergraduate	Postgraduate	Undergraduate	Postgraduate
2001	6,240	3,566	1,298	1,072
2002	7,491	3,952	1,644	1,557
2003	7,795	4,427	2,116	1,369
2004	7,494	5,469	2,332	1,260
2005	6,477	5,248	1,926	1,993
2006	5,994	4,442	1,785	2,064
2007	5,429	4,215	1,527	1,414
2008	5,253	4,811	1,368	1,713
2009	5,623	5,183	1,285	1,494
2010	5,586	4,741	1,509	2,024
2011	5,696	3,844	1,431	1,695
2012	5,225	3,804	1,381	1,284
2013	5,071	4,861	1,325	1,235
2014	5,256	6,224	1,255	1,465
2015	5,360	6,678	1,278	2,022
2016	6,155	6,975	1,269	2,238
2017	7,773	9,456	1,545	2,212
2018	11,043	16,165	1,954	2,951
2019	13,737	20,860	2,401	5,666
2020	13,739	18,712	3,214	7,614
2021	12,339	12,601	3,293	6,049
2022	14,164	10,567	3,212	3,206



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