>

ICT Industry Landscape Report

Prepared by Accenture for the NSW Skills Board

Accenture Strategy

Executive Summary

Demand for ICT workers is expected to grow at 3.8% p.a., reaching over 1.2 million workers nationally by 2030
- Australia's ICT sector includes workers in 29 core occupations in both direct ICT industries and other industries, with software engineers and technicians the most in-demand occupations
- Employers of core ICT occupations are looking for experienced (more than 2 years), university-qualified candidates with skills in programming languages, communication and teamwork

Based on forecast supply, there is expected to be a shortfall of 186,000 workers nationally by 2030; 85,000 in NSW alone
- Accredited and non-accredited training plays a crucial role in developing the supply of ICT workers. While the pipeline of university graduates is strong, 66% of graduates do not join the ICT sector. Meanwhile the number of VET graduates is falling, with just 40% of IT graduates seeing the training as relevant to their job after training. Micro-credentials and single subjects are an important means of reskilling experienced workers.
- Some workers join the ICT sector from a range of non-tech roles, including information professionals, project admins and sales, but with little overlap in skills most in demand, the entry cost for these workers is high
- Skilled migration is another important potential source of supply, but migration makes up a small and declining portion of the ICT workforce, with the number of visas granted down 48% in the last two years as COVID disrupted supply of experienced workers
- Retraining workers from outside the ICT sector is essential to fill the national workforce gap by 2030
- Sources of supply are expected to support the national ICT workforce to grow to just over a million by 2030, leaving a gap of 186,000. In NSW, sources of supply are expected to support the ICT workforce to grow to 392,000 by 2030, leaving a gap of 85,000
- There are four key factors driving digital skills shortages including low diversity, negative perceptions, poor awareness and high switching costs

There are a range of programs and policies to address the gap, however, shortages continue to persist. There are several options for NSW to consider in addressing the needs of the workforce
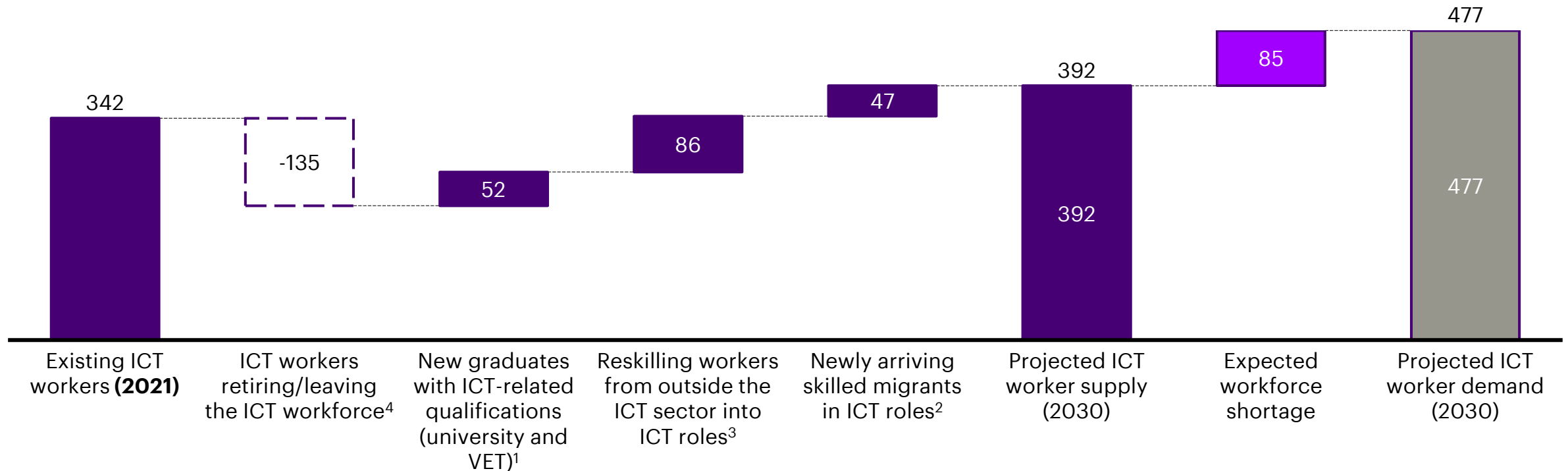- There are a broad range initiatives already in place to address the workforce gap, with a particular focus on retraining workers and boosting the pipeline of graduates and trainees joining the sector
- There is scope for NSW Government, VET and industry to address the workforce gap by focussing on retraining individuals from non-ICT sectors and from outside the labour force and new workforce entrants
- There is an opportunity to learn from international examples in addressing with workforce gap, with initiatives to reskill and improve the pipeline of graduates and trainees.

In NSW, current sources of supply are expected to support the ICT workforce to grow to 392,000 by 2030, leaving a gap of 85,000

Projected NSW ICT sector workers in 2030

Number of ICT sector workers in NSW, '000

Existing ICT workers **(2021)**	ICT workers retiring/leaving the ICT workforce[4]	New graduates with ICT-related qualifications (university and VET)[1]	Reskilling workers from outside the ICT sector into ICT roles[3]	Newly arriving skilled migrants in ICT roles[2]	Projected ICT worker supply (2030)	Expected workforce shortage	Projected ICT worker demand (2030)
342	-135	52	86	47	392	85	477

Contents

1
Understanding demand for ICT workers in Australia

National demand for ICT workers is growing quickly and expected to surpass 1.2 million by 2030
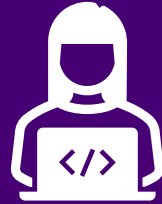
Technicians and engineers are the most in-demand occupations

Employers are looking for experienced, university-qualified candidates

Knowing programming languages and being able to work in a team are two of the most demanded skills

Australia's ICT sector includes ICT workers in 29 core occupations in both direct ICT industries and other industries

Australia's ICT sector includes workers in a range of roles across direct ICT and other industries; we defined 29 "core" occupations for this report

Definition of ICT sector and 29 core ICT occupations

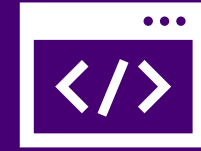| Direct ICT industries	All other industries
▪ Internet publishing and broadcasting ▪ Telecommunications services ▪ Internet Service providers, Web Search Portals & Data Processing Services ▪ Computer System Design and Related Services	This includes but is not limited to: ▪ Retail ▪ Agriculture ▪ Mining

Technical occupations

1. Cybersecurity Specialist
2. Data Scientist
3. Database Administrator
4. Electrical Engineer
5. Electrical Engineering Draftspersons and Technician
6. Electronic Equipment Technician
7. Electronics Engineers
8. Engineering Manager
9. Front-end Developer
10. IT Support Engineer
11. IT Support Technician
12. Network Development Engineer
13. Other Engineering Professionals
14. Quality Controller
15. Software Engineer
16. Telecommunications Technician
17. Telecommunications Trainer

Non-technical occupations

In direct ICT industries only
18. Account Executive
19. Account Manager
20. Accountants
21. Advertising & PR
22. Customer Support Officer
23. Finance Managers
24. Human Resources

Across both direct and other industries
25. Graphic / Web Designer
26. IT Business Analyst
27. IT Project Manager
28. Product Manager
29. UX Designer

Source: ABS; Accenture analysis

Software engineers are the largest occupation group among the 671,000 core ICT workers and just 30% of all ICT workers in direct ICT industries

These roles illustrate the breadth of occupations employed in the ICT sector, both directly and indirectly

Australia, '000s, number of people employed in core ICT occupations, 2021

■ Direct ICT industries   ■ All other industries

CORE ICT OCCUPATIONS

TECHNICIAL

STEM skilled workers

Occupation	Direct	All other	Total
Software Engineer	49	101	150
Cybersecurity Specialist	1	9	11
Network Development Engineer	11	38	49

Technicians

| Telecommunications technicians | 12 | 12 | 24 |

Other technical

| Other technical | 58 | 147 | 204 |

NON-TECHNICIAL

Design professionals

| UX Designer | 2 | | 8 |
| Graphic / Web Designer | 5 | 45 | 50 |

Business operations

| Advertising & PR | | | 11 |
| Human Resources | | | 4 |

Other non-technical

| Other non-technical | 45 | 115 | 160 |

ALL

Total in core ICT jobs

| Total: core ICT occupations | 199 | 472 | 671 |

Total in ICT sector

| Total: whole ICT sector | 343 | 517 | 861 |

In total about 671,000 workers are employed in the 29 core ICT occupations.
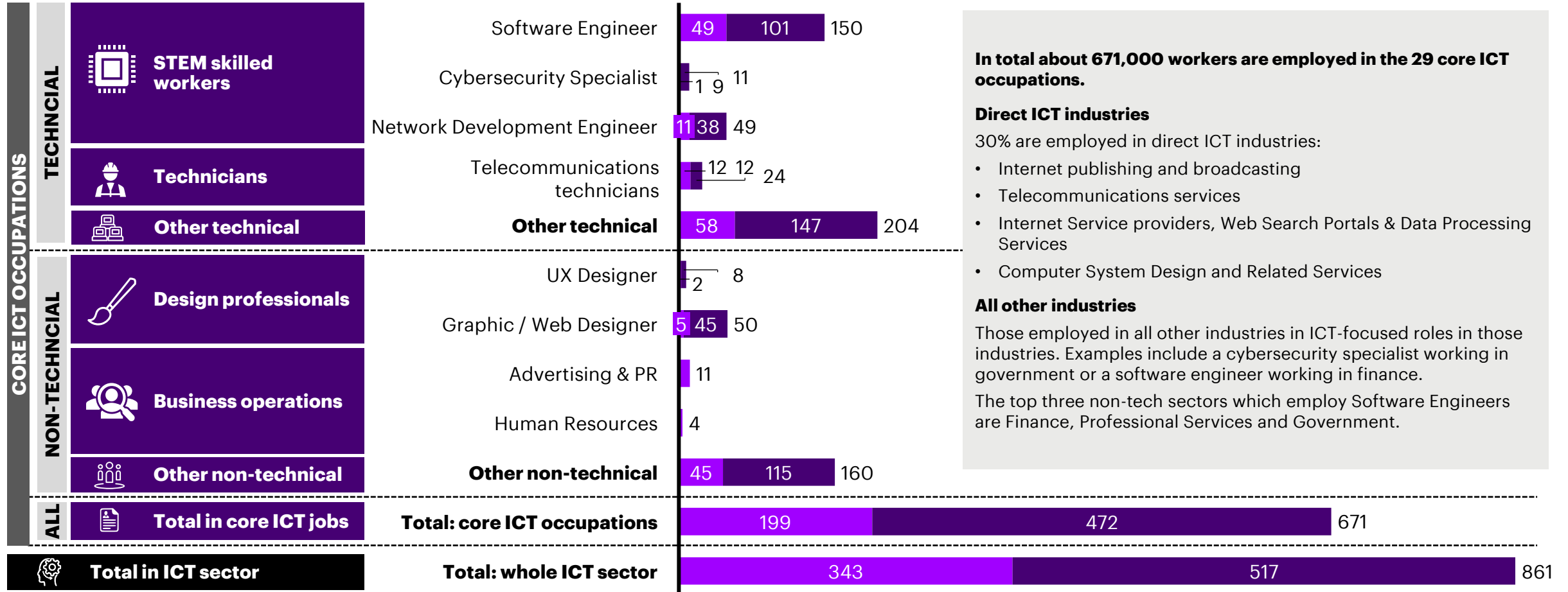
Direct ICT industries

30% are employed in direct ICT industries:

- Internet publishing and broadcasting
- Telecommunications services
- Internet Service providers, Web Search Portals & Data Processing Services
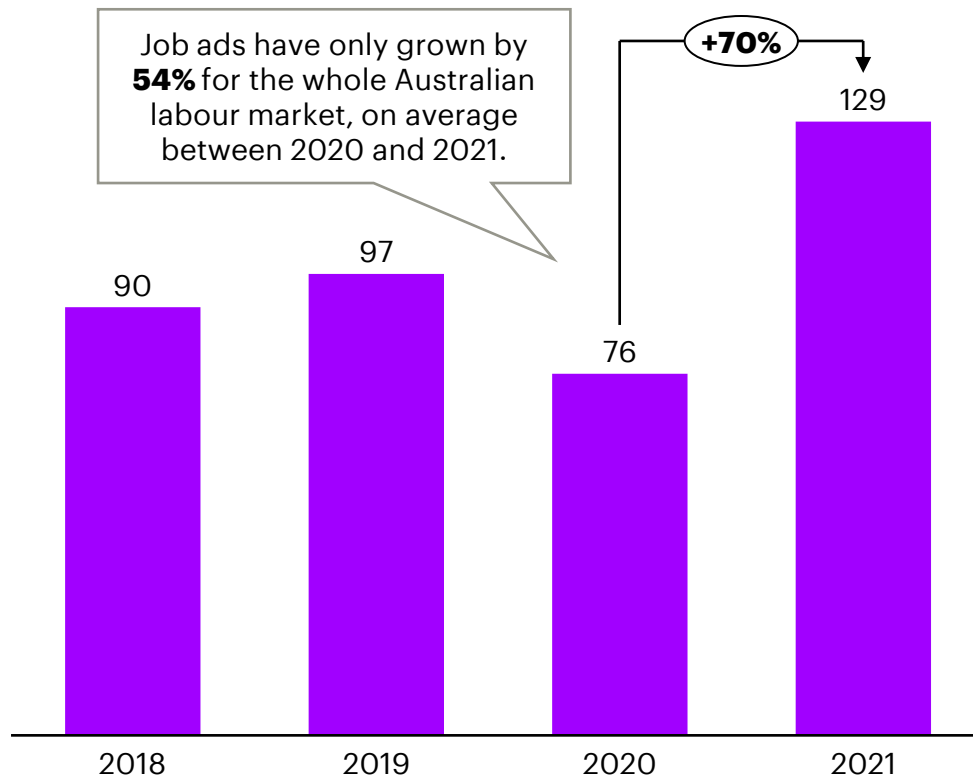- Computer System Design and Related Services

All other industries

Those employed in all other industries in ICT-focused roles in those industries. Examples include a cybersecurity specialist working in government or a software engineer working in finance.

The top three non-tech sectors which employ Software Engineers are Finance, Professional Services and Government.

Source: ABS; Accenture analysis

8

Australia's job ads are up 70% in the last year, with software engineers, network professionals and data admin being the jobs in highest demand

In the last year, core ICT sector job ads have grown by 70%

'000s job advertisements for core tech sector occupations, 2018-2021, Australia

Job ads have only grown by **54%** for the whole Australian labour market, on average between 2020 and 2021.

+70%

90 — 2018
97 — 2019
76 — 2020
129 — 2021

57% of job ads are concentrated in 3 of 29 core ICT occupations in 2021

Share of job ads by occupation, 2021, Australia

Software Engineers — 31.0%

Other core tech sector occupations — 43.0%

These three occupations accounted for **57% of job ads for core tech sector workers in 2021.**

Computer Network Professionals — 16.0%

Database Administrators — 10.0%

Source: Burning Glass; ABS; Accenture analysis
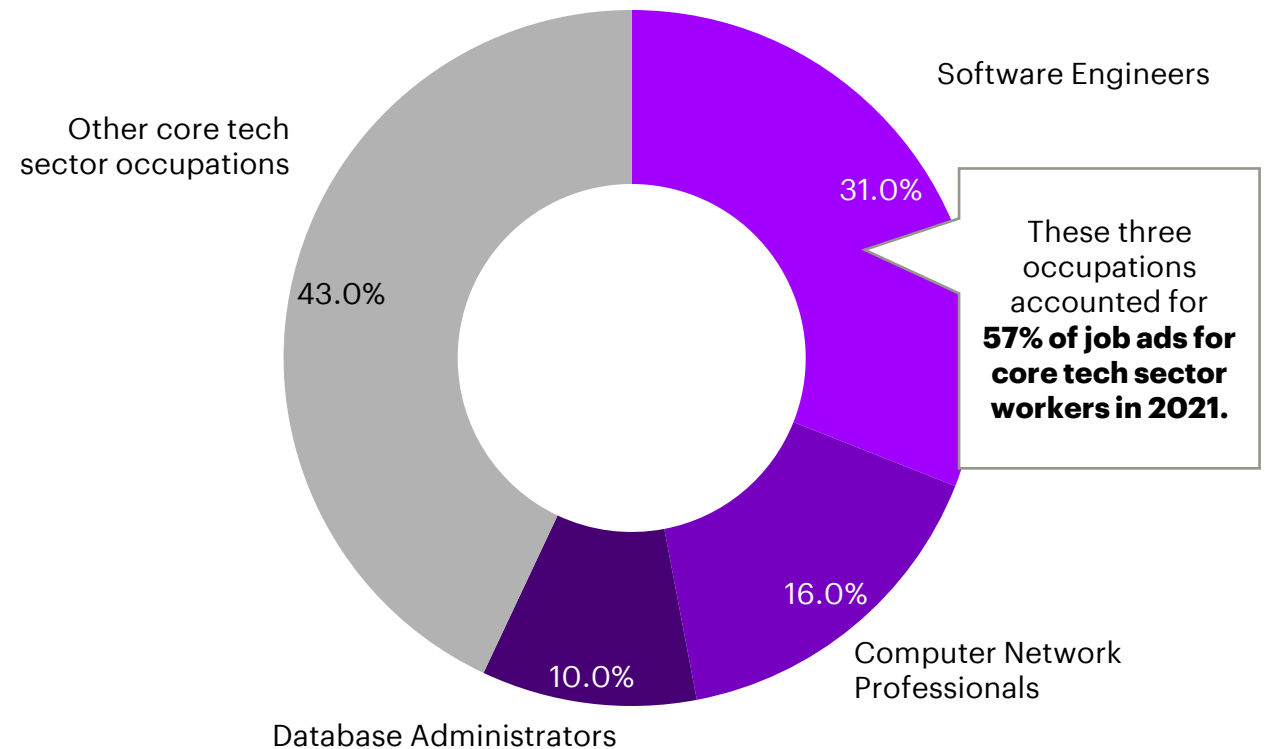
In Australia, demand in the overall ICT sector is expected to continue to grow at 3.8% p.a., reaching over 1.2 million workers by 2030

The number of workers in the entire ICT sector is expected to reach 1.2 million by 2030 in Australia

Number of workers, '000, Australia

3.8%

Year	Workers
2020-21	861
2021-22	899
2022-23	932
2023-24	966
2024-25	1,002
2025-26	1,040
2026-27	1,080
2027-28	1,121
2028-29	1,164
2029-30	1,200
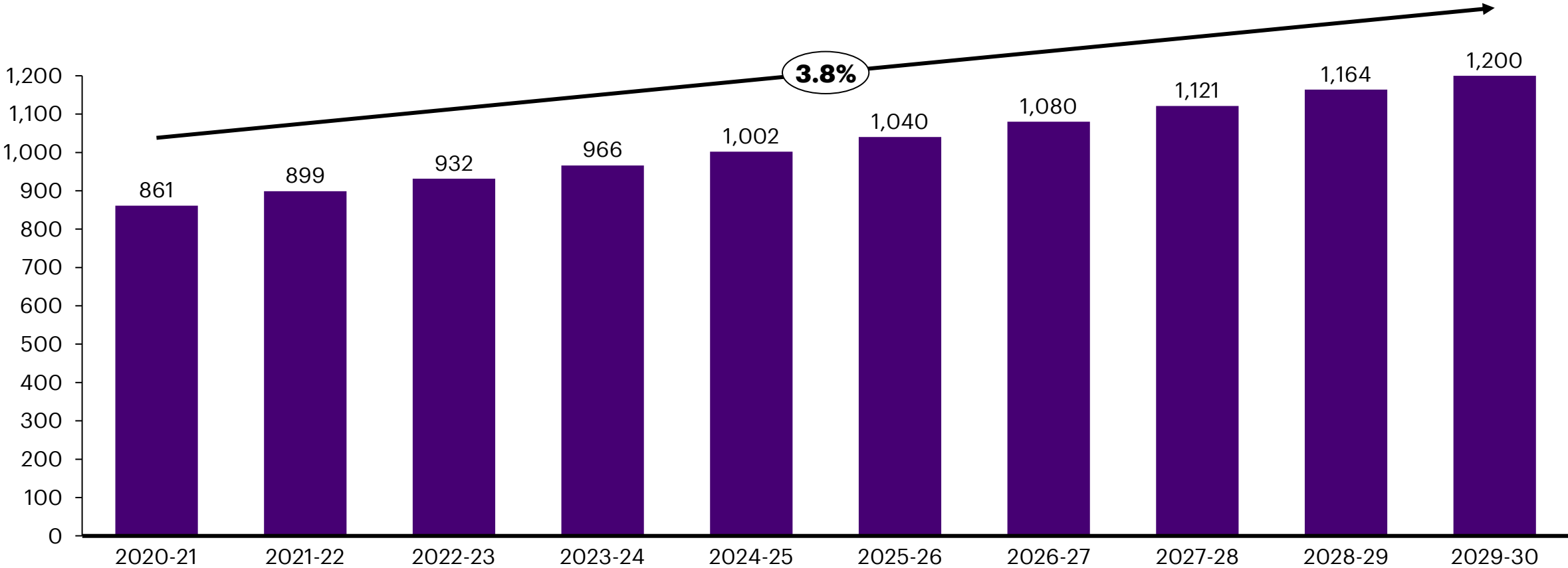
ICT occupations in highest demand tend to be engineering, data and security based roles but also includes business analysts and UX designers

Demand for ICT occupations by vacancy rate, number of job ads and forecast growth for Australia

Forecast demand growth (2020-2025), vacancy rate (quarterly, 2021), number of job ads (2021), Australia

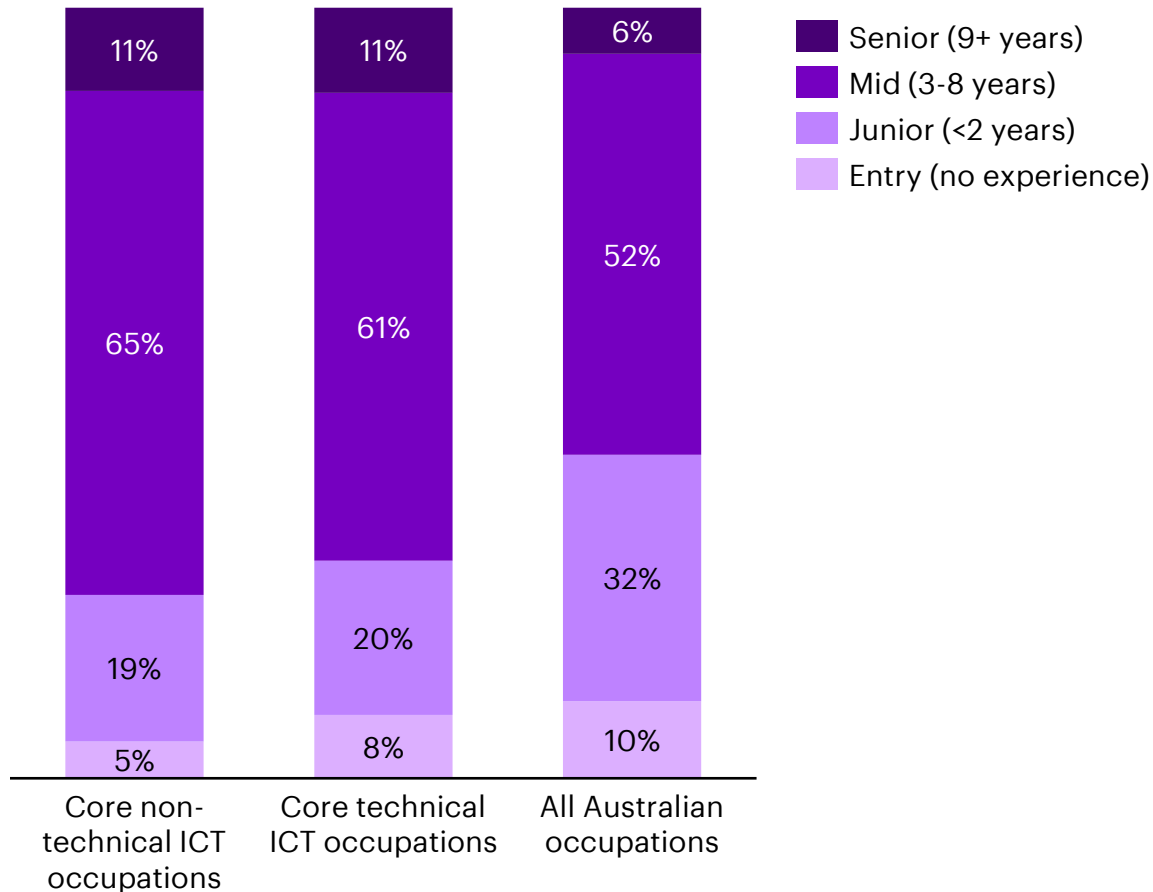Source: ABS, National Skills Commission, Burning Glass, Accenture analysis
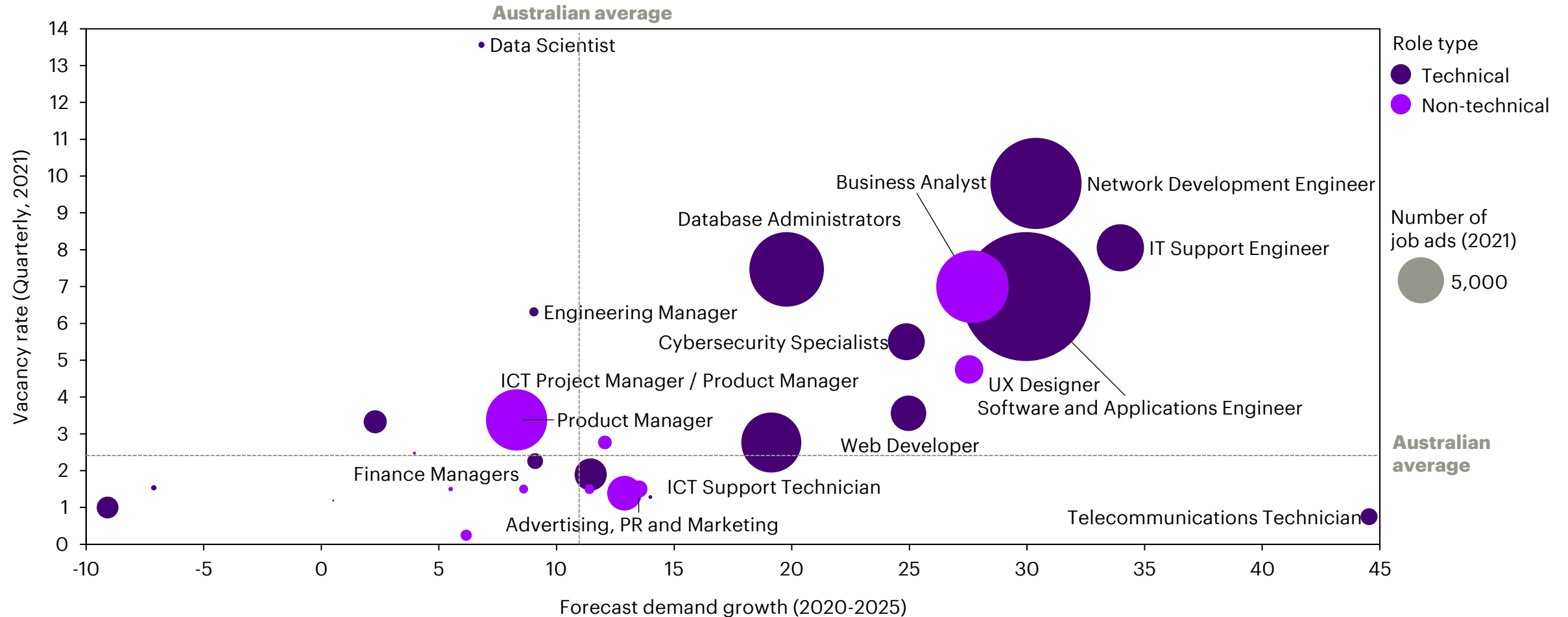
Employers of core ICT occupations are demanding more experience (>2 years) and higher level of qualifications (>87% seeking bachelors or higher)

Core ICT jobs require more experience
Share of job ads* by years of experience required, Australia

Core non-technical ICT occupations: 11%, 65%, 19%, 5%
Core technical ICT occupations: 11%, 61%, 20%, 8%
All Australian occupations: 6%, 52%, 32%, 10%

Legend:
- Senior (9+ years)
- Mid (3-8 years)
- Junior (<2 years)
- Entry (no experience)

Core ICT jobs require higher levels of education
Share of job ads by qualification required, Australia

Core non-technical ICT occupations: 5%, 90%, 4%, 1%, 0%
Core technical ICT occupations: 3%, 87%, 6%, 4%, 1%
All Australian occupations: 3%, 69%, 7%, 20%, 2%

Legend:
- Postgraduate Degrees
- Bachelors Degrees
- Diplomas and Grad Certs
- Certificates III-IV
- High School
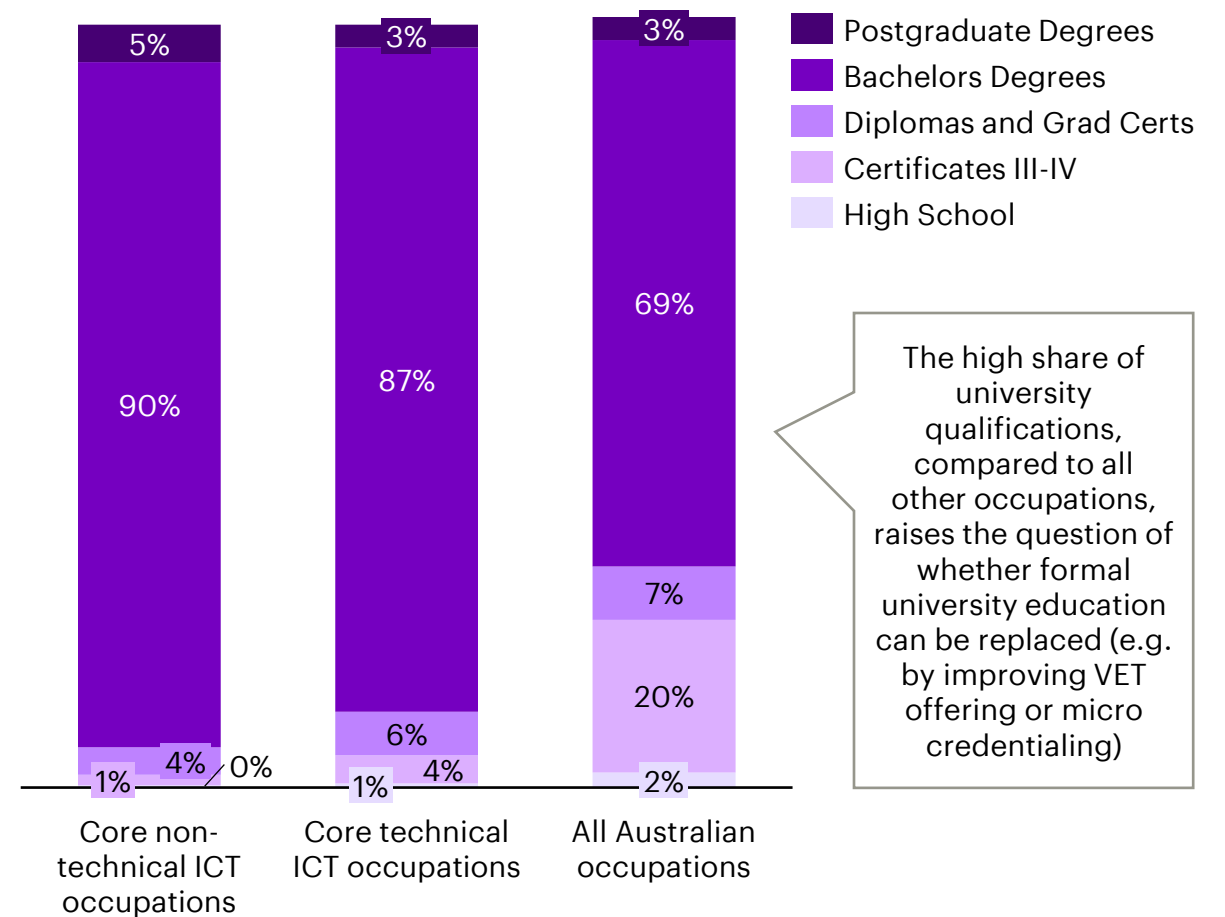
> The high share of university qualifications, compared to all other occupations, raises the question of whether formal university education can be replaced (e.g. by improving VET offering or micro credentialing)

Programming languages and teamwork are among the most demanded skills by employers of core ICT occupations

Top 10 skills required for core technical occupations

Share of job ads by skill required, Australia

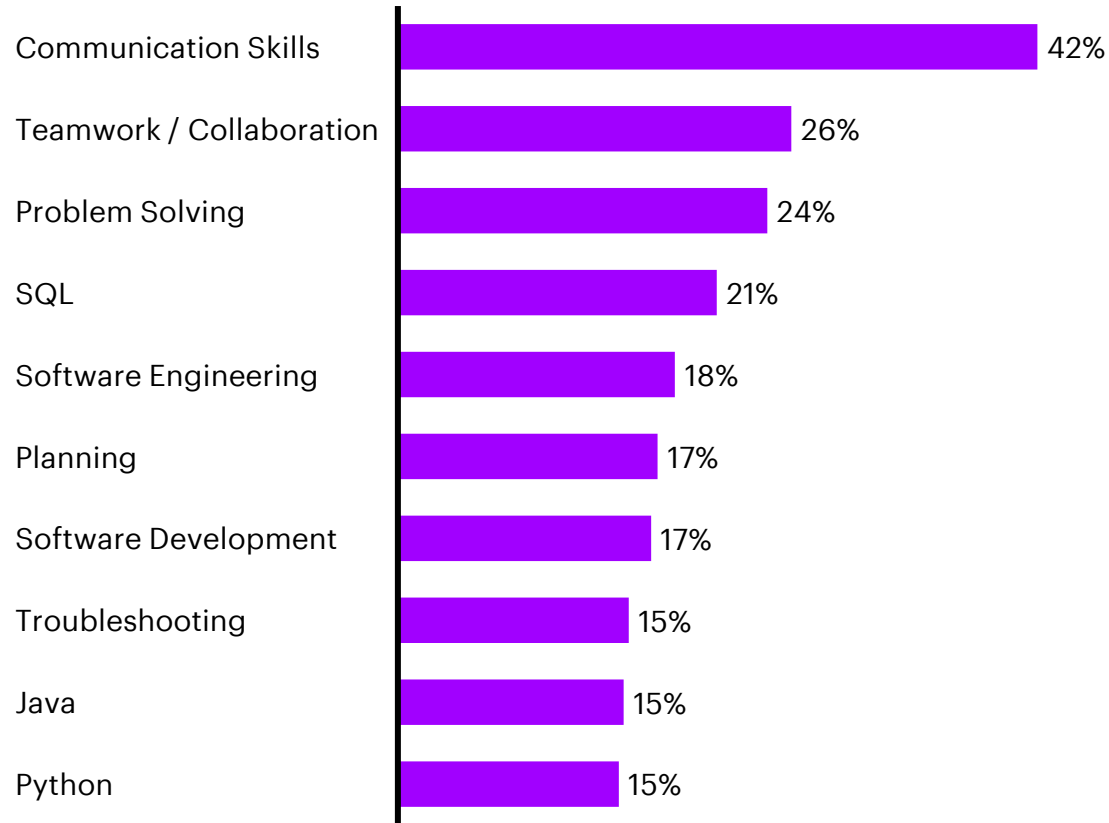| Skill	%
Communication Skills	42%
Teamwork / Collaboration	26%
Problem Solving	24%
SQL	21%
Software Engineering	18%
Planning	17%
Software Development	17%
Troubleshooting	15%
Java	15%
Python	15%

Top 10 skills required for core non-technical occupations

Share of job ads by skill required, Australia

Skill	%
Communication Skills	44%
Teamwork / Collaboration	31%
Project Management	26%
Planning	25%
Problem Solving	24%
Creativity	21%
Detail-Orientated	17%
Business Analysis	14%
Stakeholder Management	14%
Building Effective Relationships	14%
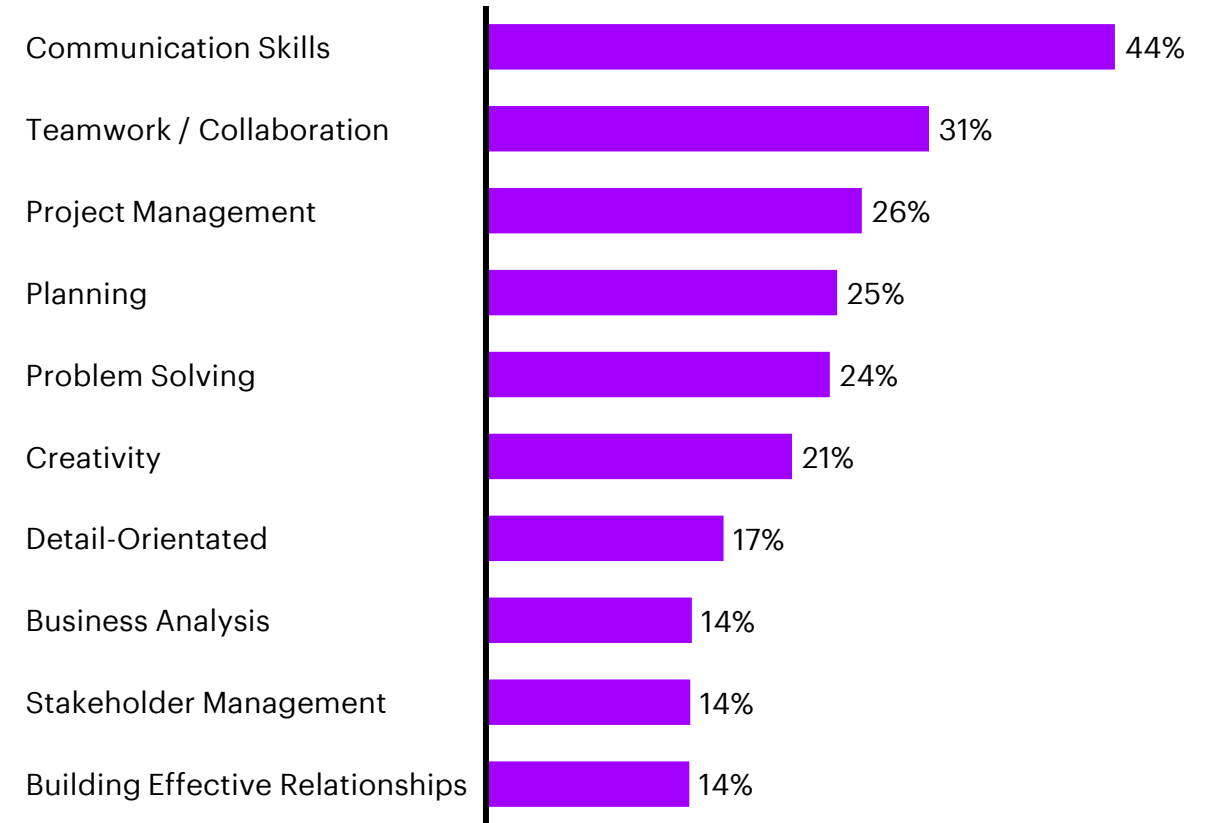
2
Understanding supply of ICT workers in Australia

Graduates are a considerable source of supply but many do not join the ICT sector

Micro-credentials and single subjects are an important means of reskilling experienced workers

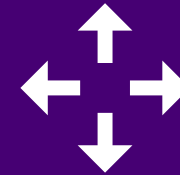Skilled migration has been disrupted by COVID exacerbating supply challenges for experienced workers

Retraining workers from outside the ICT sector is essential to fill the workforce gap of 186,000 by 2030

There are three main sources of ICT worker supply in the Australian economy

1 **Graduates, trainees & post-secondary students**

Many new entrants to the ICT workforce have completed university qualifications or VET qualification in information technology.
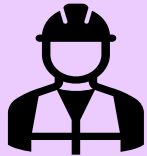
2 **Retraining individuals from other sectors or from outside the labour force**

ICT occupations can also be filled by non-ICT workers from other sectors or individuals outside the labour force by retraining into ICT jobs.

3 **Skilled migration**

Skilled migrants are another important source of labour supply.

University qualified graduates are an increasing source of ICT labour supply, with postgrad completions up 228% while VET has fallen

The number of ICT course completions at the Bachelors level has increased 67% in the last five years; VET completions have declined

Number of IT course completions, post-secondary, international and domestic students, '000s, 2016-2020, Australia
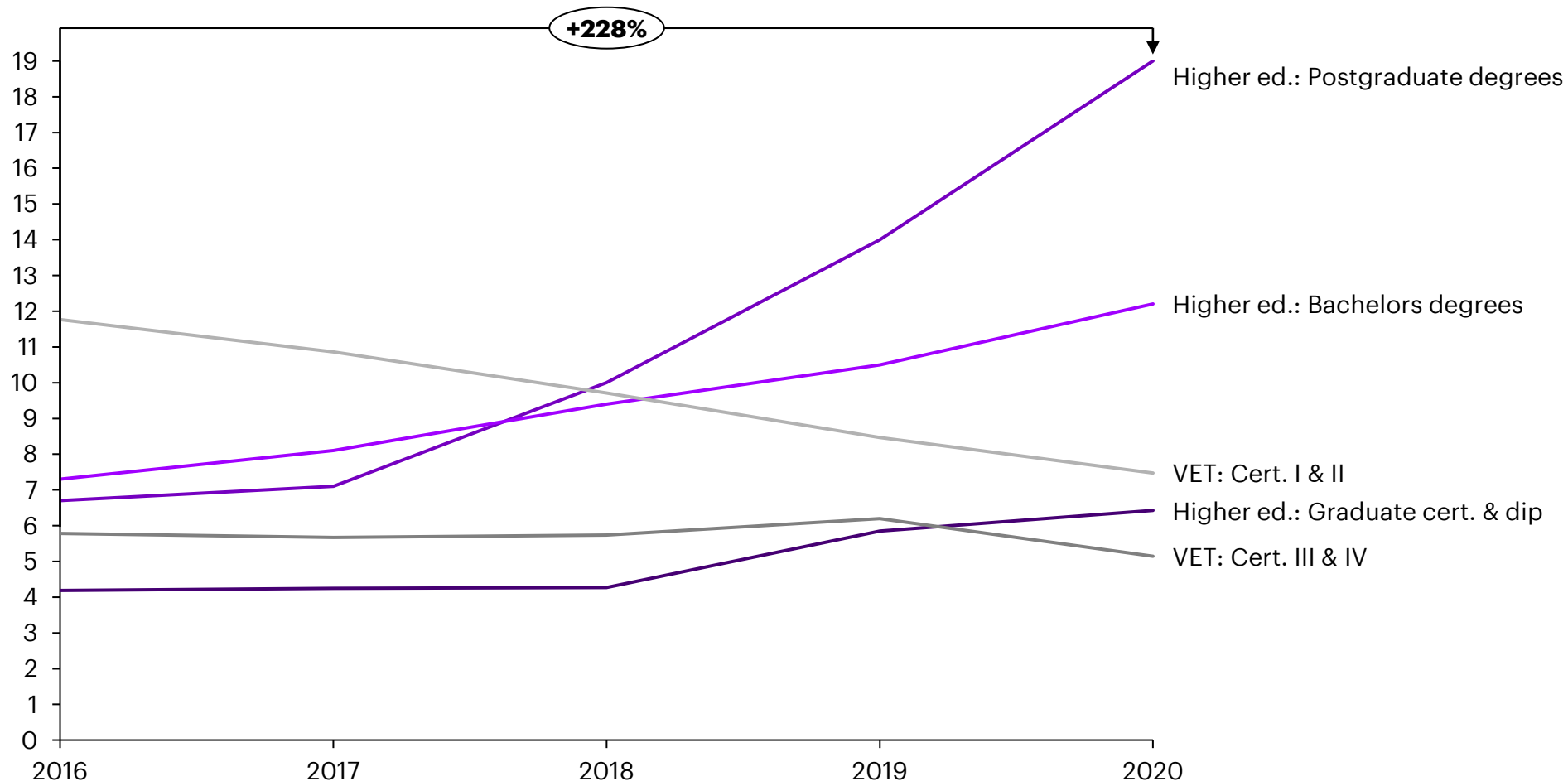
+228%

Higher ed.: Postgraduate degrees

Higher ed.: Bachelors degrees

VET: Cert. I & II

Higher ed.: Graduate cert. & dip

VET: Cert. III & IV

2016   2017   2018   2019   2020

Post grad ICT degrees are considerably higher due to significant uptake from international students who have come to Australia to study

While there is a preference for degrees, many ICT jobs don't require that level of qualification.

Example

AIGROUP

AI Group has been partnering with training providers to develop IT apprenticeships for jobs such as helpdesk support, IT support technician, data centre technician, junior software engineer and junior cyber security analyst.

Note: See appendix for NSW figures; VET completions (Certificates, Advanced Diplomas and Diplomas) are those graduating with qualifications which NCVER defines as in the field of Information Technology. Bachelors degrees are those categories in 'Information Technology' as the primary broad field of education by the Department of Education, Skills and Employment. Source: NCVER, DESE, Accenture analysis

However, there is a 66% leakage of ICT bachelor graduates with the loss of international students overseas and domestic students to other roles

Supply of ICT related bachelors graduates into tech related occupations

Annual supply and demand of graduates (2021)

■ International Students
■ Domestic Students

66% leakage

53% gap

12,200

7,200

5,000

3,500

2,000

2,600

4,600

4,100

4,600

8,700

Note that supply is restrained by university funding for Commonwealth placements

The loss of many international students and those who move into non-tech roles leads to an undersupply of 4,600 ICT graduates (a 53% gap to demand)

Supply of tech related bachelors graduates | Loss of international students returning home | Move into a role outside tech industry | Net supply of bachelors degrees for tech industry | Gap to demand | Demand for tech related bachelors graduates
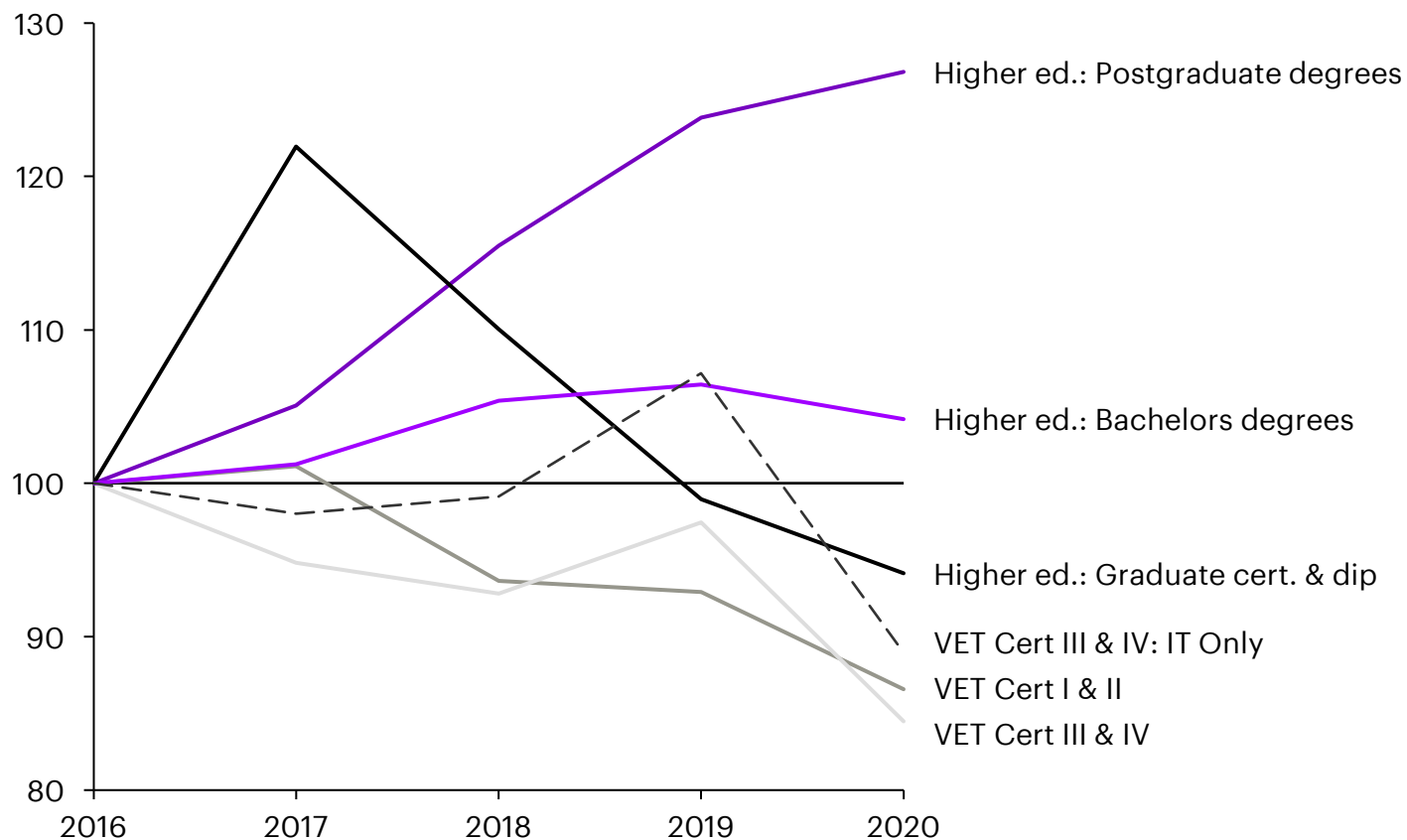
The decline in VET completions reflects a broader shift in education preferences with ICT VET courses performing poorly in perceived relevance
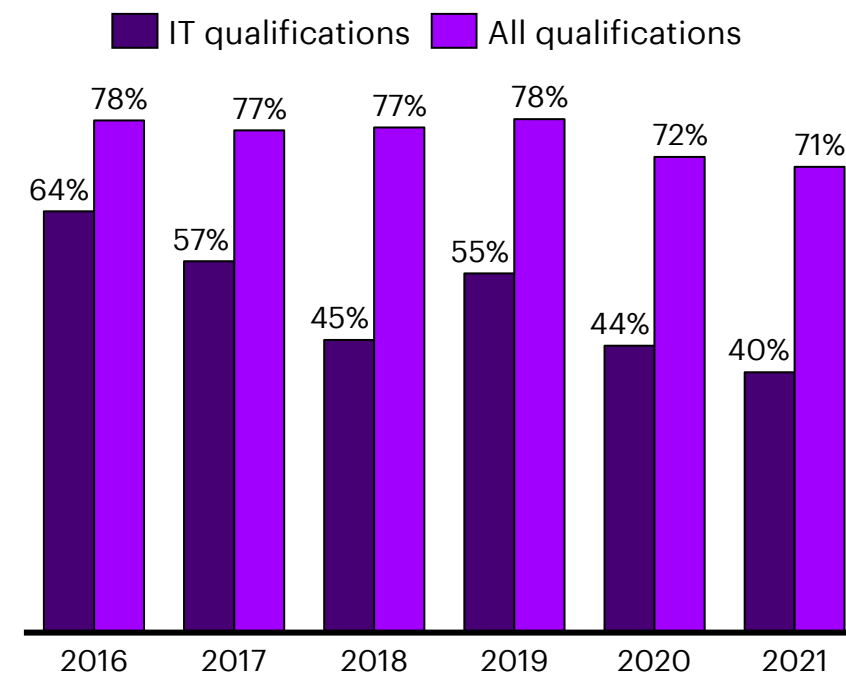
Qualification completions across all fields are declining in the VET space

Index, 2016 = 100, change in course completions, post-secondary, international and domestic students, 2016-2020, Australia

- Higher ed.: Postgraduate degrees
- Higher ed.: Bachelors degrees
- Higher ed.: Graduate cert. & dip
- VET Cert III & IV: IT Only
- VET Cert I & II
- VET Cert III & IV

Declined relevance of ICT VET qualifications to jobs

Percent of VET qualification graduates reporting that the training received was relevant to their job after training, 2016 – 2021, %

■ IT qualifications ■ All qualifications

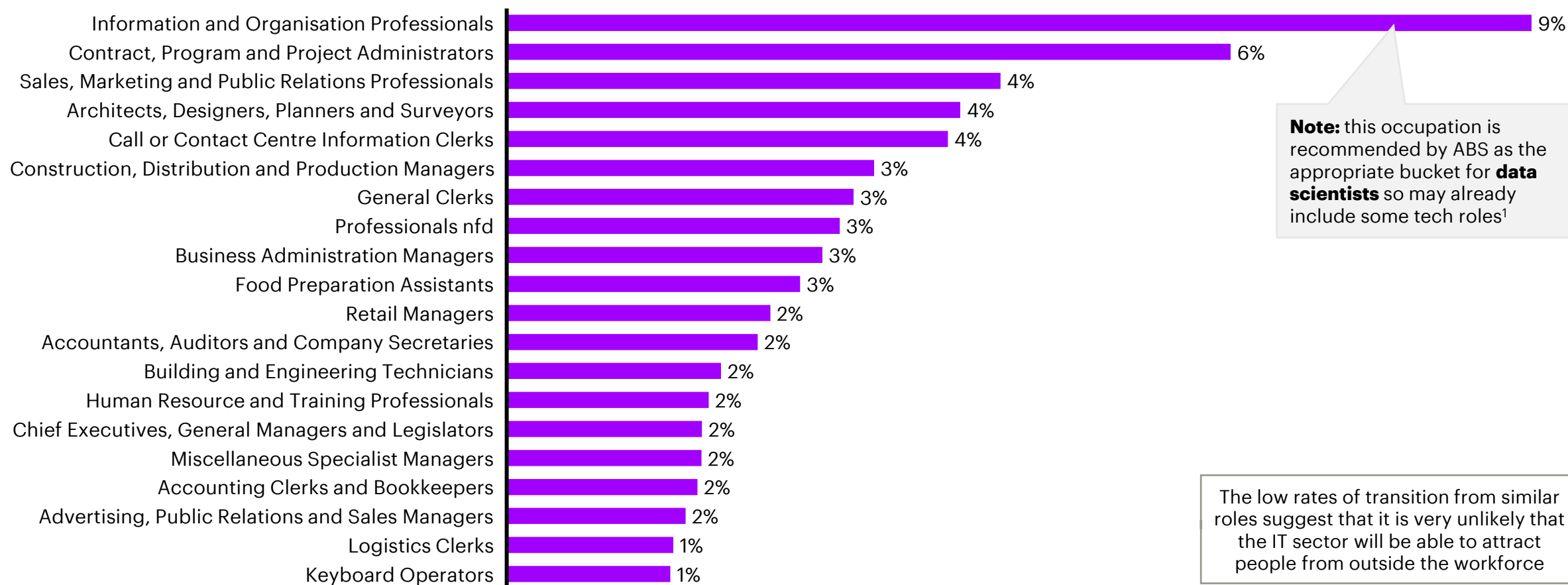| Year	IT qualifications	All qualifications
2016	64%	78%
2017	57%	77%
2018	45%	77%
2019	55%	78%
2020	44%	72%
2021	40%	71%

NCVER data indicates that **over 50%** of industry employers are **not satisfied with the digital skills** of their VET graduate recruits (2019)

Workers re-training from outside the ICT sector come from a range of non-tech roles, including information professionals, project admins and sales

Top 20 non-tech roles that are pathways into tech occupational clusters

% tech workers (2016) from non-tech occupation (2011), by non-tech occupation

Non-tech occupation	%
Information and Organisation Professionals	9%
Contract, Program and Project Administrators	6%
Sales, Marketing and Public Relations Professionals	4%
Architects, Designers, Planners and Surveyors	4%
Call or Contact Centre Information Clerks	4%
Construction, Distribution and Production Managers	3%
General Clerks	3%
Professionals nfd	3%
Business Administration Managers	3%
Food Preparation Assistants	3%
Retail Managers	2%
Accountants, Auditors and Company Secretaries	2%
Building and Engineering Technicians	2%
Human Resource and Training Professionals	2%
Chief Executives, General Managers and Legislators	2%
Miscellaneous Specialist Managers	2%
Accounting Clerks and Bookkeepers	2%
Advertising, Public Relations and Sales Managers	2%
Logistics Clerks	1%
Keyboard Operators	1%

Note: this occupation is recommended by ABS as the appropriate bucket for **data scientists** so may already include some tech roles[1]

The low rates of transition from similar roles suggest that it is very unlikely that the IT sector will be able to attract people from outside the workforce
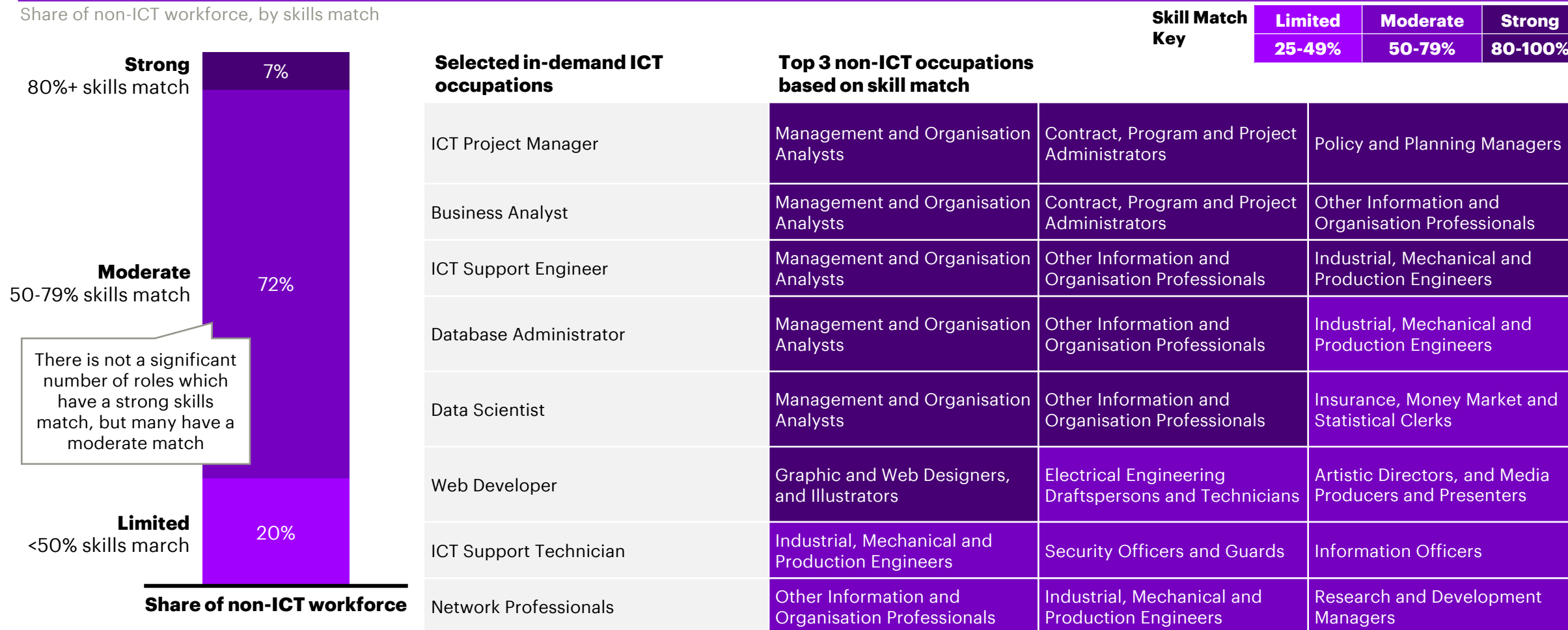
Note: 1. Other occupations include: economists, actuaries, mathematicians and statisticians, archivists, curators and record managers, intelligence and policy analysts, land economists and valuers, librarians and managements and organisation analysts
Source: ABS, Accenture analysis

>

There is a high entry cost for non-tech workers entering the IT sector with only 7% having a strong skills match for in-demand occupations

Assessment of non-tech workforce skills match with in-demand ICT occupations

Share of non-ICT workforce, by skills match

Skill Match Key	Limited	Moderate	Strong
	25-49%	50-79%	80-100%

Strong
80%+ skills match — 7%

Moderate
50-79% skills match — 72%

There is not a significant number of roles which have a strong skills match, but many have a moderate match

Limited
<50% skills march — 20%

Share of non-ICT workforce

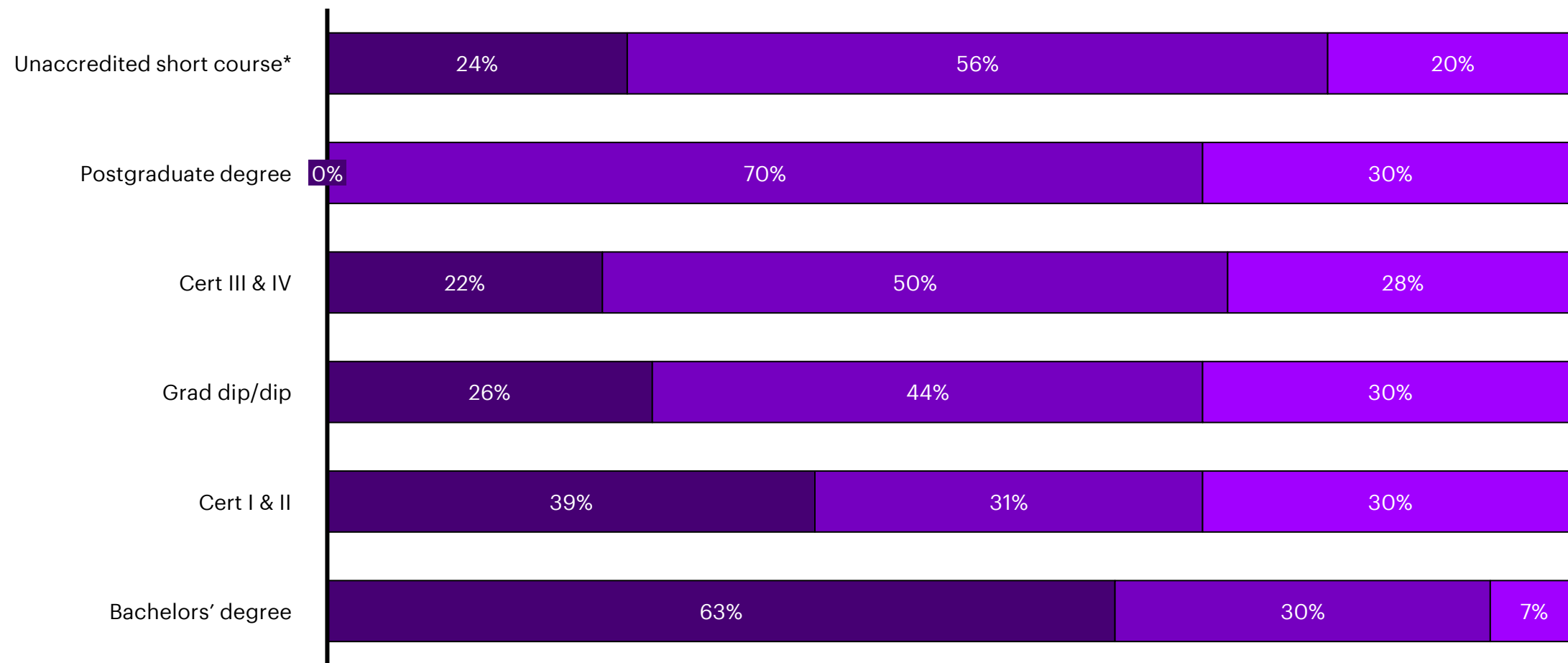| Selected in-demand ICT occupations	Top 3 non-ICT occupations based on skill match		
ICT Project Manager	Management and Organisation Analysts	Contract, Program and Project Administrators	Policy and Planning Managers
Business Analyst	Management and Organisation Analysts	Contract, Program and Project Administrators	Other Information and Organisation Professionals
ICT Support Engineer	Management and Organisation Analysts	Other Information and Organisation Professionals	Industrial, Mechanical and Production Engineers
Database Administrator	Management and Organisation Analysts	Other Information and Organisation Professionals	Industrial, Mechanical and Production Engineers
Data Scientist	Management and Organisation Analysts	Other Information and Organisation Professionals	Insurance, Money Market and Statistical Clerks
Web Developer	Graphic and Web Designers, and Illustrators	Electrical Engineering Draftspersons and Technicians	Artistic Directors, and Media Producers and Presenters
ICT Support Technician	Industrial, Mechanical and Production Engineers	Security Officers and Guards	Information Officers
Network Professionals	Other Information and Organisation Professionals	Industrial, Mechanical and Production Engineers	Research and Development Managers

Note: Occupations are at 4-digit ANZSCO level. Skill match scores are the share of the tech occupations Top 20 commonly-required skills which are also required by the non-tech occupation. If a non-tech occupation has a skill match of 80%, this means 80% of the Top 20 skills commonly required for the non-tech occupation. 'Commonly required' is defined by the number of job ads which explicitly state the skill as a requirement. Source: Burning Glass; Accenture analysis

Experienced workers tend to do short courses or postgrad degrees to develop ICT skills required to retrain or upskill

Workers who are retraining or upskilling generally do short courses or postgraduate degrees

Percentage of student types completing higher education IT (2016) or VET courses and subjects (2020)
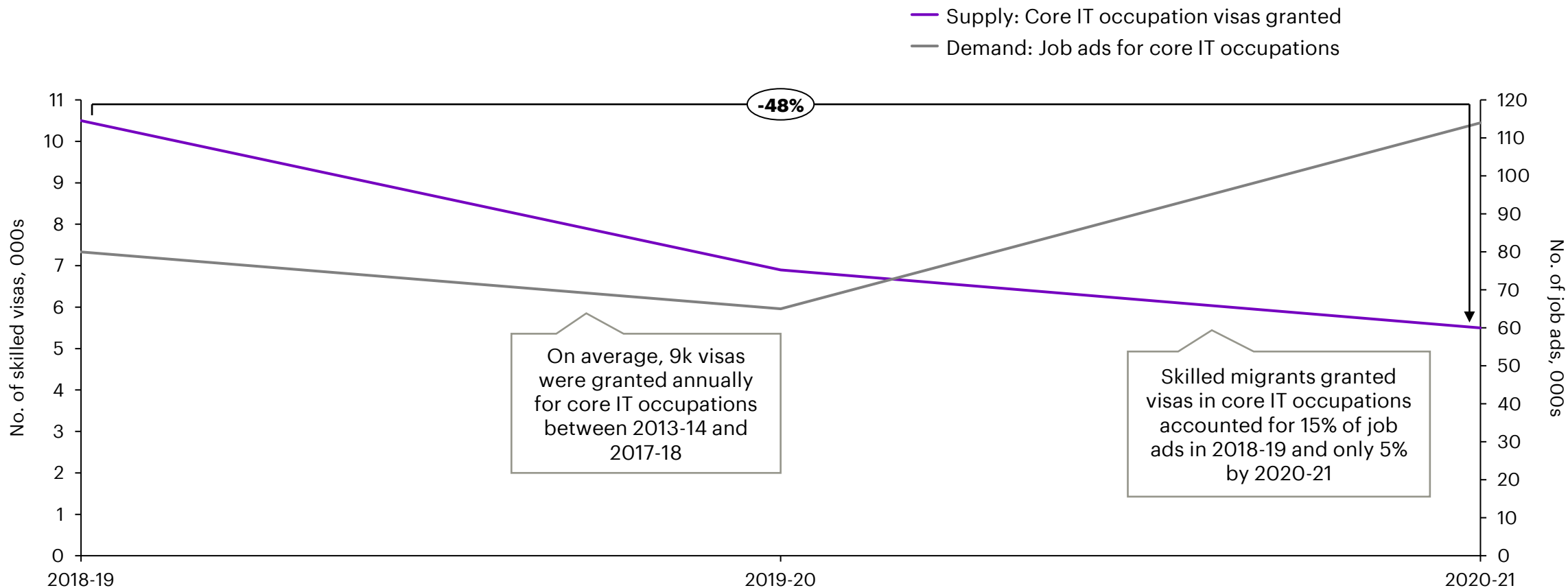
■ School leaver   ■ Experienced worker   ■ Other

	School leaver	Experienced worker	Other
Unaccredited short course*	24%	56%	20%
Postgraduate degree	0%	70%	30%
Cert III & IV	22%	50%	28%
Grad dip/dip	26%	44%	30%
Cert I & II	39%	31%	30%
Bachelors' degree	63%	30%	7%

Note: *Unaccredited short courses refer to training package qualifications offered at the VET level. An experienced worker is defined as someone who was previously in the labour force prior to completing one of the above-listed qualifications. Source: NCVER, DESE, ABS

Skilled migrants make up a small and declining portion of the ICT workforce, with the number of visas granted down 48% in the last two years

Skilled visas granted for tech occupations fell while demand rose dramatically in the last three years

Number of skilled visas granted for tech occupations, 000s

—— Supply: Core IT occupation visas granted
—— Demand: Job ads for core IT occupations

-48%

On average, 9k visas were granted annually for core IT occupations between 2013-14 and 2017-18

Skilled migrants granted visas in core IT occupations accounted for 15% of job ads in 2018-19 and only 5% by 2020-21

No. of skilled visas, 000s

No. of job ads, 000s

2018-19 — 2019-20 — 2020-21

Note: Proportion of temporary skilled migrants making up the ICT sector is calculated by applying the proportion of temporary skilled visas granted for tech occupations to the number of temporary skilled migrants in the country as of the financial year of interest. 2021 skills visas reported here are from FY2020-21
Source: Department of Home Affairs, Burning Glass, Accenture analysis

Together these sources of supply are expected to support the ICT workforce to grow to just over a million by 2030, leaving a gap of 186,000

Projected ICT sector workers in 2030

Number of ICT sector workers, '000

Waterfall chart values:
- Existing ICT workers (2021): 861
- ICT workers retiring/leaving the ICT workforce[4]: -314
- School leavers with ICT-related qualifications (university and VET)[1]: 132
- Reskilling individuals from non-ICT sectors and outside the labour force[3]: 217
- Newly arriving skilled migrants in ICT roles[2]: 119
- Projected ICT worker supply (2030): 1,014
- Expected workforce shortage: 186
- Projected ICT worker demand (2030): 1,200

Key observations

- Based on forecasts for the supply of workers, there will **be just over 1 million ICT** workers by 2030

- It is expected that **314,000 ICT workers will retire or change jobs** between now and 2030

- **132,000 graduates from university and VET** are expected to join the workforce

- **217,000 existing workers** are expected to upskill or reskill into ICT sector jobs

- **Skilled migrants** are projected to fill **119,000 roles** in the ICT sector

Note: See appendix for NSW figures; 1. Measured as the number of graduates expected between now and 2030 from university degrees or VET qualifications in 'Information Technology'; 2. Estimate based on the average number of skilled visas granted per year between 2015 and 2019 to workers in tech occupations, defined as a subset of ANZSCO codes, plus an estimate of international students who join the tech workforce and are not otherwise counted; 3. Estimate calibrated with reference to longitudinal Census data and *Deloitte Access Economics, ACS Australia's Digital Pulse 2021*; 4. ABS Census Longitudinal Dataset, based on share of ICT professionals in 2011 in other occupations in 2016 and an estimate of the number of retiring workers.
Source: Department of Education, Skills and Employment (2021) uCube, NCVER (2021), Total VET students and courses 2020, Department of Home Affairs (2021) Temporary Residents (skilled) visas granted pivot table, ABS Census Longitudinal Dataset, Accenture (2021) *The economic contribution of Australia's tech sector*, Accenture analysis

With many ICT jobs already experiencing severe labour shortages, the sector is likely to face particular challenges filling these roles

High | **Medium** | **Low**

8 technical occupations have a high shortage index
Occupation rank by shortage index and measure

Shortage index	Role	No. of job ads	Vacancy rate	Growth in demand*
1	Network Development Engineer	2	2	2
2	IT Support Engineer	5	3	1
3	Software Engineer	1	6	3
4	Database Administrator	3	4	6
5	Cybersecurity Specialist	6	5	5
6	Front-end Developer	7	9	4
7	IT Support Technician	7	9	4
8	Data Scientist	15	1	13
9	Electrical Engineer	8	13	9
10	Engineering Manager	13	7	11
11	Electrical Engineering Draftsperson / Technician	9	10	14
12	Electronics Engineer	12	12	10
13	Other Engineering Professionals	17	15	8
14	Electronic Equipment Technician	10	17	16
15	Telecommunications Technician	11	18	17
16	IT Trainer	16	14	18
17	Quality Controller	18	16	15

4 non-technical occupations have a high shortage index
Occupation rank by shortage index and measure

Shortage index	Role	No. of job ads	Vacancy rate	Growth in demand*
1	IT Business Analyst	1	1	1
2	UX Designer	4	2	2
3	Product Manager	2	3.5	5.5
4	IT Project Manager	6	3.5	5.5
5	Advertising & PR	5	7	3
6	Graphic / Web Designer	3	7	3
7	Customer Support Officer	5	5	4
8	Human Resources	9	8	6
9	Accountant	10	10	7
10	IT Sales Professional	8	6	7
11	Technical Sales Representative	7	8	8
12	Finance Manager	11	11	10

The shortage index identifies priority occupations based on level of job demand, vacancy rates and growth in demand for the occupation

VET courses could be well positioned to increase supply in a number of these occupations. These include ICT support technician, network professionals, software and applications programmers, database administrator, web developer, graphic/web designer, business analyst and ICT project manager[1]

Note: Growth in demand is for 2020-2025; 1. See appendix for list of VET qualifications matched to relevant occupations
Source: Burning Glass, ABS, National Skills Commission, Accenture analysis

Reskilling workers from outside the ICT sector into ICT roles is going to be crucial to meet the workforce gap

An additional 186,000 workers are needed to address the shortfall; workers will come from 3 sources

Projected number of ICT sector workers needed to meet demand, '000

186			
Shortfall by 2030	42 **School leavers with ICT-related qualifications (university and VET)**	101 **Reskilling individuals from non-ICT sectors and outside the labour force**	43 **Newly arriving skilled migrants in ICT roles**

> Reskilling workers from outside the ICT sector as well as Individuals from outside the labour force[1] will be the biggest source of ICT workers in the next few years
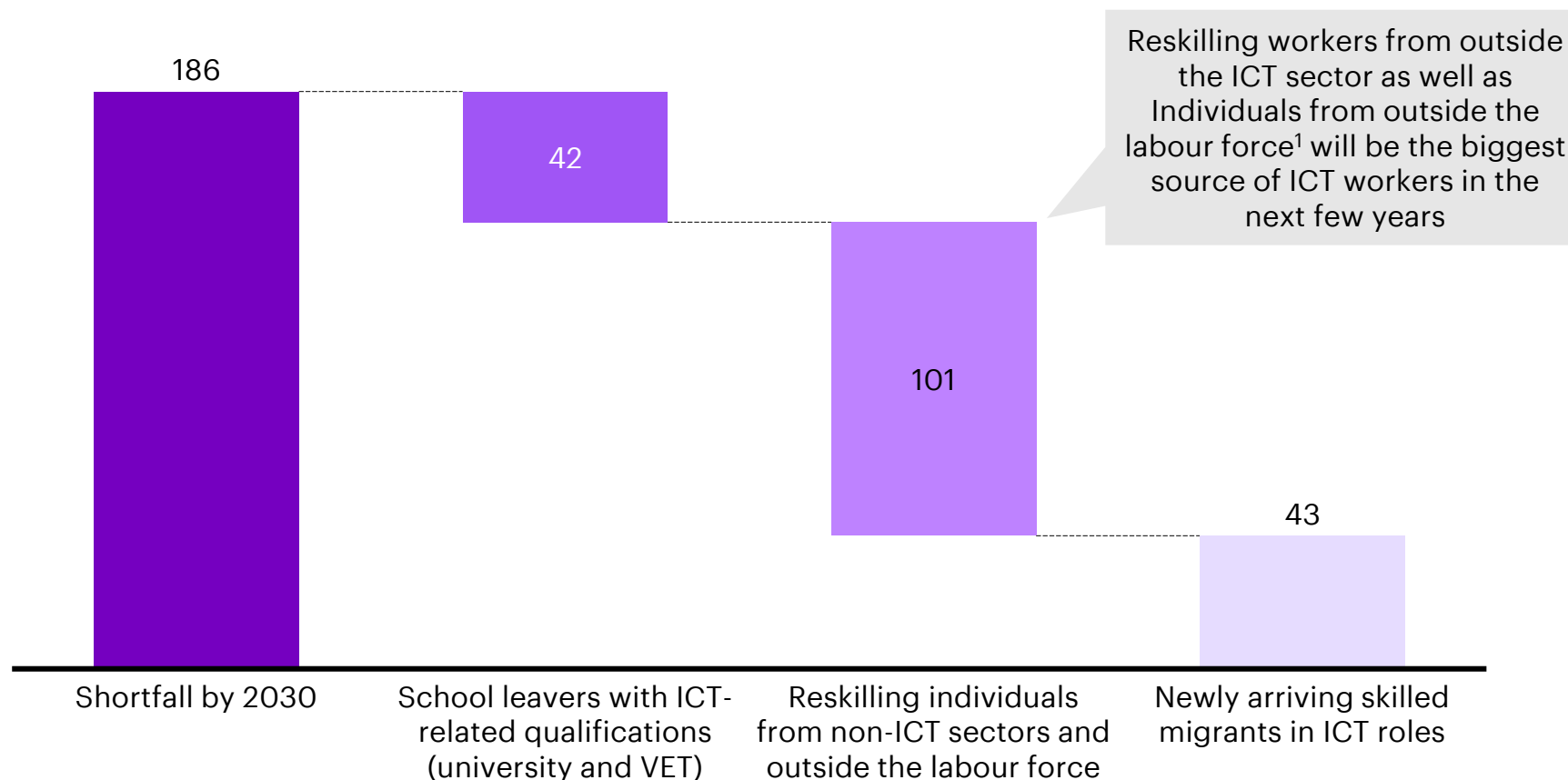
Key observations

- To reach 1.2m jobs by 2030, there will need to be an **additional 186,000 ICT workers** above our 2030 business-as-usual prediction

- It is expected that 314,000 tech workers will retire or change jobs over the next 10 years which contributes to this shortfall

- To meet the employment targets, the ICT sector will need to employ the following over the next decade:
  - An additional 42,000 graduates will be required, on top of the expected 132,000 graduates from VET and tertiary institutions.
  - An additional **101,000 Australians will need to move into tech roles, through reskilling and upskilling**. This could include employing individuals from a broader range of training and educational backgrounds who have core skills needed by the sector (e.g. statistics, engineering, sales) or individuals outside the labour force

- An additional 43,000 skilled migrants will be required, above the typical intake.

Note: See appendix for NSW figures; examples include parents returning to the workforce or previously incarcerated individuals. Source: Department of Education, Skills and Employment (2021) uCube, NCVER (2021), Total VET students and courses 2020, Department of Home Affairs (2021) Temporary Residents (skilled) visas granted pivot table, ABS Census Longitudinal Dataset, Accenture (2021) *The economic contribution of Australia's tech sector*, Accenture analysis

There are four key factors driving digital skills shortages including low diversity, negative perceptions, poor awareness and high switching costs
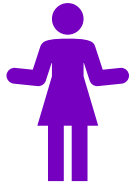
Low diversity limits the pool of candidates

- Women are nearly 2x less likely to enter the tech workforce[1]

- Female students are less interested and less confident in STEM school subjects, and twice as many male students would like a STEM career compared to females[2].

- Women make up 21% of total tertiary STEM completions[2].

Negative perceptions of STEM and tech

- 48% of female students and 34% of male students report a lack of interest in technology subjects[3].

- Top reasons for students not intending to pursue STEM include it not relating to the career they want, and beliefs that STEM is too hard for them[3].

- STEM's predominantly male cohort and workforce serves as a deterrent for female students when considering a STEM career[4].

Poor awareness of STEM roles available

- Information barriers about options can prevent individuals from pursuing training and employment[5].

- Data scientists, cybersecurity specialists and similar newer tech roles do not appear on the Australian and New Zealand Standard Classification of Occupations (ANZSCO).

- Job advertisements for digital roles are often not specific in describing the required skills[6], and instead primarily refer to software tools needed.
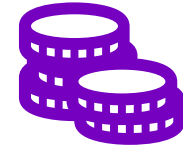
High switching costs

- 93% of non-tech workers have only a limited or moderate skills match to tech jobs and will need to invest in retraining.

- Australians over 45 indicate cost as being the key factor that deters them from participating in training[7].

- When cost barriers were reduced, individuals between ages 25-54 had a greater uptake of VET training that is relevant to high shortage occupations[8].

3
Potential responses to the ICT workforce shortage

There is scope for NSW Government, VET and industry to address the workforce gap by focussing on retraining individuals from non-ICT sectors and from outside the labour force **and new workforce entrants**
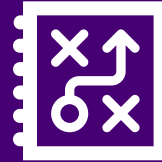
There is a broad range of existing activity already in place to address the workforce gap with less activity currently in retraining

International examples highlight potential for further initiatives to reskill and improve the pipeline of graduates and trainees

We used a three step approach to identify potential NSW Govt, VET and industry responses to the expected ICT workforce shortage

1

Identify focus areas

2

Identify existing initiatives and gaps in response

3

Explore examples from global peers

Identify the key sources of labour supply and assess which ones NSW Govt, VET and industry can most influence to identify focus areas to address shortages

Categorise types of response to focus areas. Identify existing initiatives in Australia against types of possible response by NSW Govt, VET and industry to identify areas of potential gaps in current activity in Australia

Explore further examples of global initiatives that NSW Govt, VET and industry could take inspiration from to develop actions in areas where gaps may exist

NSW Govt, VET and industry should focus on retraining individuals and developing a pipeline of graduates and trainees to boost ICT worker supply

– – – – – – Suggested NSW govt., VET and industry focus areas

	New ICT workers			Existing ICT workers	
	1. Retraining individuals from other sectors and outside the labour force	**2. Developing a pipeline of graduate & trainee school leavers**	**3. Supporting skilled migration**	**4. Retaining existing ICT workers**	**5. Upskilling ICT existing workers**
Description	ICT occupations can be filled by retraining: a. Non-ICT workers from other sectors b. Individuals outside the labour force	A strong pipeline of school leavers entering ICT graduate and trainee roles can help fill labour shortage gaps in ICT occupations	Skilled migrants can fill in labour shortage gaps in ICT occupations	A shortage of ICT workers can be reduced if retention rate is high	ICT workers will need to continue upskilling to ensure that their skills remain relevant in the industry
Scope for NSW Govt, VET & industry to close the workforce gap	🟢 **High** a. NSW government, VET and industry are well-placed to retrain non-ICT workers from other sectors b. NSW government is well positioned to work with industry and VET provide targeted support to workers outside the labour force to improve equity of opportunity and boost participation	🟡 **Medium** While VET completions have been declining (in contrast to university), there is opportunity for more targeted vocational training to high school leavers and partnerships with industry and higher ed.	🔴 **Low** There is limited ability to influence skilled migration which falls to the Commonwealth	🔴 **Low** Retaining existing workers is a key responsibility of individual employers. While this will not fill the workforce gap, it will avoid the gap becoming larger	🔴 **Low** The existing workforce will need to be continually upskilled to meet the changing industry needs. While VET and industry can support this, it is not sufficient to close the workforce gap

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31

We have examined a range of different sources to identify current ICT workforce initiatives and areas of potential gaps

Reviews of industry skill reports and data analysis on digital skill shortages and challenges
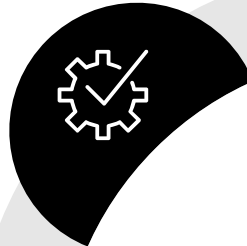
Existing stakeholder consultation with industry, government and educational institutions

Proposed initiatives for NSW Government, VET and industry to explore

Scans of international best practice in developing digital skills
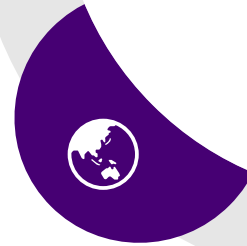
Analysis of existing digital skill initiatives from government, industry and educational institutions
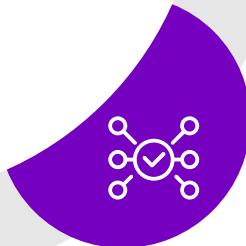
A scan of existing initiatives shows significant action is already underway to boost ICT worker supply by retraining and developing graduates & trainees

Initiatives split by new supply source (not exhaustive)[1]

Number of initiatives, by new supply source, includes initiatives from Cth Govt, State Govt, VET and industry

47

46

Current initiatives scanned indicate a strong focus on boosting new supply through **retraining and graduates & trainees**

Retraining individuals from other sectors and outside the labour force

Developing a pipeline of graduate & trainee school leavers
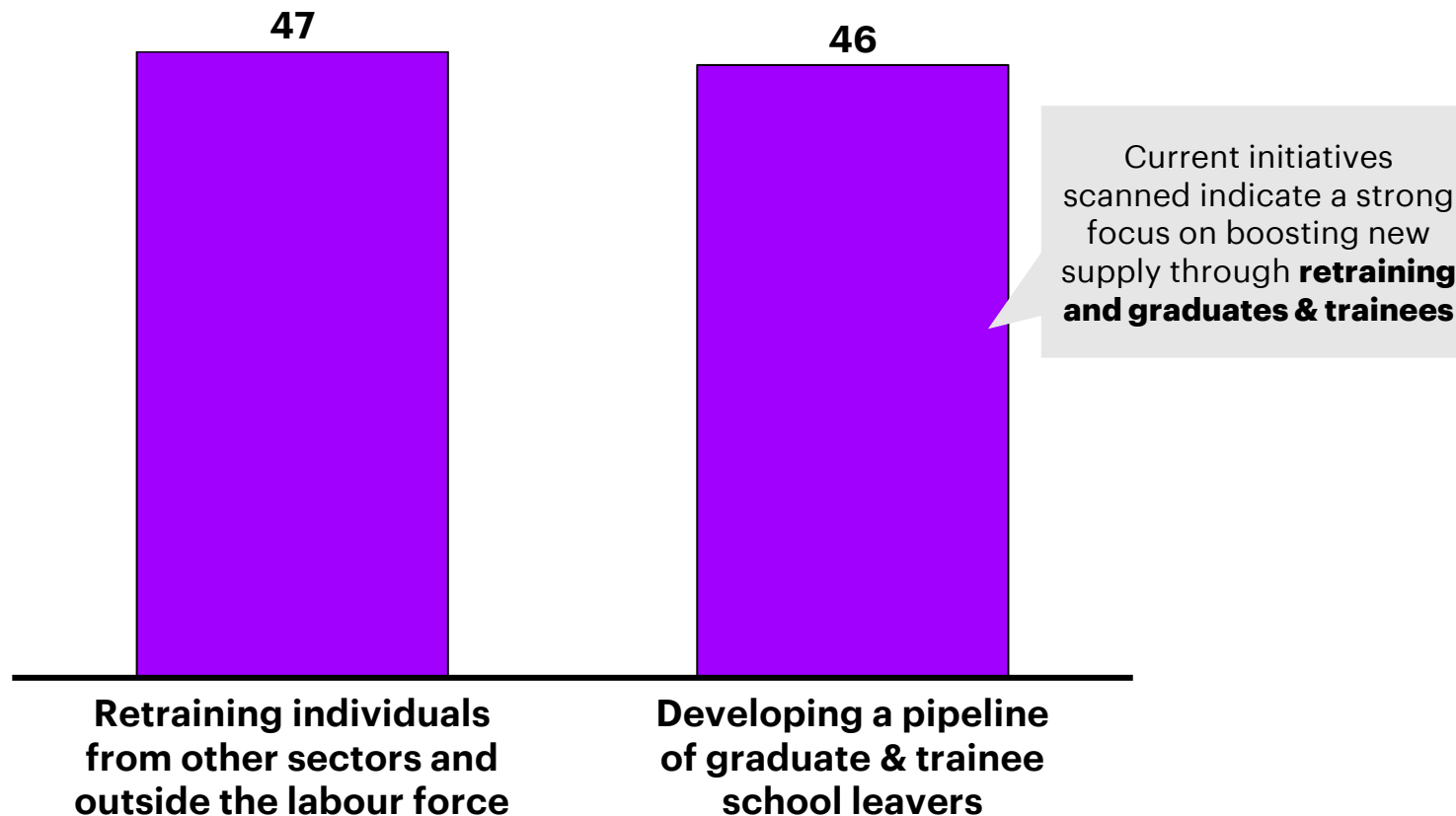
Stakeholder involvement in initiatives[2]

Percentage of initiatives each stakeholder is involved in. allowing for the involvement of multiple parties in some programs

Education Providers [2]

31%

54%

15%

Industry
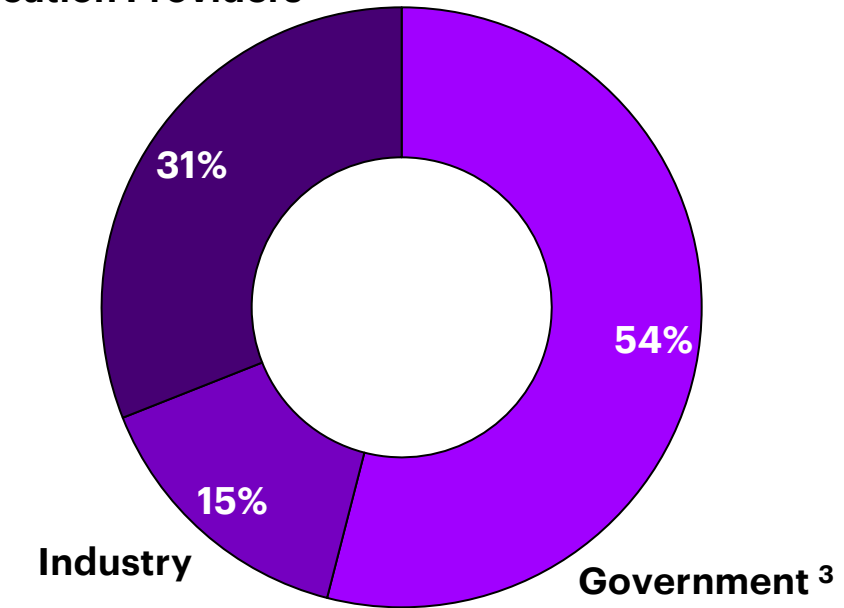
Government [3]

2/3 of scanned initiatives involved **more than 2 stakeholders** indicating strong collaboration between government, industry and the education sector

Note: 1. Initiatives can address multiple pathways; 2. Education providers includes primary and secondary schools, higher education and VET; 3. Government includes Commonwealth and NSW Government's
Source: Accenture analysis

There are seven main types of initiatives to retrain workers from other sectors, with room for further action, despite some existing coverage

Coverage:[1] 🟩 Higher 🟧 Medium 🟥 Lower ----- Suggested NSW govt., VET and industry focus initiatives

Initiative type	Summary	Rationale	Coverage by existing initiatives[5]	Existing initiative examples
Awareness of digital opportunities				
1 **Increase awareness of digital opportunities for workers in other sectors**	Increase awareness among existing workers in other sectors about different opportunities within ICT including current digital skill programs	Lack of awareness of opportunities and preconceptions that traditional education offerings can be timely and costly are key factors in people not reskilling	🟥	Blockchain Roadmap
2 **Develop platforms to inform and match individuals to relevant digital skills and jobs**	Develop a central platform for workers from other sectors to assess current skills, match to training opportunities and apply for industry accredited training experiences and relevant ICT occupations	83% of Australians don't feel equipped to learn the digital skills needed by business right now[2]	🟧	APS Career Pathfinder, APSC Digital Careers Pathways Tool, Skill Finder Platform
3 **Incentivise businesses and individuals to retrain**	Provide incentives to businesses and individuals to retrain into ICT roles (e.g. training credits and tax incentives)	28% of workers in tech occupations were in a non-tech role five years earlier[3]	🟩	JobTrainer Fund, Empowering Business to Go Digital Program (Navii), Driving Digital Skills Pilot
Access to digital skills and training				
4 **Increase participation among underrepresented groups for workers in other sectors**	Develop programs and incentives to increase employment in the ICT sector from underrepresented groups to increase diversity and tap into new sources of labour supply (e.g. women, rural, youth, disabled workers)	Women are nearly 2x less likely to enter the tech workforce[3]	🟧	Advancing Women in STEM Strategy and 2020 Action Plan, Women in STEM and Entrepreneurship Program, Digital Career Compass, government procurement requirements
5 **Expand alternative industry training pathways for workers in other sectors**	Define and expand alternative industry training pathways for in demand roles (e.g. cadetships, micro-credentials and ramp on programs)	89% of job ads for high Shortage Index occupations require Bachelors degrees. Yet industry feel alternatives exist that upskill in months not years[3]	🟧	Accenture Adelaide Cyber Security Traineeship, Microsoft Australia Traineeship Program, TAFE NSW Digital Careers Program
Equipped with relevant, recognisable skills				
6 **Allow digital skills to be more easily recognised**	Allow for digital skills to be verifiable such as a digital skills passport to verify and credentialise training and experiences	To help the individual feel more confident in their capabilities and to signal to industry that they have proof in a capability	🟥	National Credentials Platform
7 **Explore new delivery models for learning in the formal education sector for workers in other sectors**	Develop short-form training programs and vocational-focused learning experiences for formal education such as VET to get individuals into high-demand roles with relevant skills	People will need to rebuild their skillsets up to 15 times throughout their career to keep pace with this level of change[4]	🟧	Cyber Workforce Professionalisation Stream, AISC Digital Transformation Project, AustCyber, Institute of Applied Technology (IAT)

Note: 1. Lower coverage includes 0-5 initiatives; medium coverage includes 6-10 initiatives, higher coverage includes 11+ initiatives; 2. Digital Skills Index 2022; 3. Accenture analysis; 4. Telstra; 5. Initiatives can fall into multiple types; Source: Accenture analysis; Women Love Tech (2022), Telstra (2020)

There are currently limited initiatives to target individuals outside the labour force, presenting a missed opportunity

While retraining workers from non-ICT sectors is important, **retraining individuals from outside the labour force will also be a source of labour supply for the ICT sector.** This could include groups such as stay at home mothers looking to re-enter the labour force, as well as other disadvantaged groups who may be outside the labour force such as veterans, people with a disability, older people, as well as Aboriginal and Torres Strait Islanders. With the **unemployment rate currently at 4%**, the ICT sector will have to look to new sources of labour to boost supply. **Retraining these individuals will require a different approach** compared to retraining workers from non-ICT sectors. These retraining **initiatives are specific to individuals outside the labour force**; however, other retraining initiatives mentioned on the previous page could also be relevant for these individuals as well.

Coverage:[1] 🟩 Higher 🟧 Medium 🟥 Lower ┅┅┅ Suggested NSW govt., VET and industry focus initiatives

	Initiative type	Summary	Rationale	Coverage by existing initiatives[5]	Existing initiative examples
Awareness of digital opportunities	**1** **Increase awareness and support surrounding digital opportunities for individuals outside the labour force**	Increase awareness among individuals outside the labour force about different opportunities in the ICT sectors and provide support to these groups through coaching and mentoring	Lack of awareness of opportunities and preconceptions that traditional education offerings can be timely and costly are key factors in people not reskilling There were 1.1 million people who wanted a job or work with more hours and were available but not looking[2]	🔴	Advancing Women in STEM Strategy and 2020 Action Plan, Mid Career Checkpoint, Skills Checkpoint for Older Workers Program
Access to digital skills and training	**2** **Incentivise individuals from outside the labour force to retrain**	Provide incentives to individuals outside the workforce to retrain into ICT roles (e.g. subsidised training)	66% of people who were not in the labour force, unemployed or underemployed stated that getting a job that matches their skills and experience were important incentives to join or increase participation in the labour force[2]	🟡	JobTrainer Fund[5], Mature Age Workers
Equipped with relevant, recognisable skills	**3** **Provide baseline digital literacy and return to work skills for individuals outside the labour force**	Provide programs to develop baseline digital literacy and return to work skills for individuals outside the labour force to boost digital knowledge and develop foundations for further retraining	A survey of Australian workers found that 87% required digital skills for their role[3]	🔴	Be Connected Initiative, Smart and Skilled, Skills for Education and Employment
	4 **Expand alternative industry training pathways for individuals outside the labour force**	Define and expand alternative industry training pathways for in demand roles (e.g. cadetships, micro-credentials and ramp on programs)	89% of job ads for high Shortage Index occupations require Bachelors degrees. Yet industry feel alternatives exist that upskill in months not years[4]	🔴	Relaunch@Capgemini, Digital Career Compass, Indigenous Technology Academy, Accenture WithYouWithMe Tech Traineeships program

Note: 1. Lower coverage includes 0-5 initiatives; medium coverage includes 6-10 initiatives, higher coverage includes 11+ initiatives; 2. ABS; 3. Deloitte; 4. Accenture analysis; 5. Initiative 2 treated as medium coverage due to the scale of JobTrainer
Source: Accenture analysis; ABS (2022); Deloitte (2021)

There are five main types of initiatives to boost the number of graduates and trainee workers, with less activity currently in updating course content

Coverage:[1] 🟩 Higher 🟧 Medium 🟥 Lower ┅┅┅ Suggested NSW govt., VET and industry focus initiatives

	Initiative type	Summary	Rationale	Coverage by existing initiatives[5]	Existing initiative examples
Awareness of digital opportunities	**1** Increase awareness of digital opportunities	Increase awareness among students about different opportunities within ICT including current initiatives and funding available through different digital skill programs (e.g. through awareness campaigns)	Awareness of opportunities and preconceptions that traditional education offerings can be timely and costly are key factors in people reskilling[2]	🟢	Digital Careers, Digital Skills Finder Program, National Credentials Platform, Microcredentials Marketplace
	2 Provide early exposure to digital skills	Provide early exposure to digital skills in primary and secondary schools (e.g. curriculum redesign and digital programs)	Only 1 in 5 initial teacher training courses prepare teachers to embed technology in non-technology core subjects[2]	🟢	CSIRO digital careers, Questacon Cyber Education Programs, Curious Minds (Summer School for STEM students), Digital Technologies in Focus, AustCyber
Access to digital skills and training	**3** Increase engagement among underrepresented groups	Develop programs to increase engagement among underrepresented groups such as women to tap into new sources of labour and increase diversity for the ICT sector	Women are nearly 2x less likely to enter the tech workforce; girls lose interest by 6; they are bored in class by 14; and their grades drop in STEM by age 15[3]	🟢	Women in STEM Cadetships and Advanced Apprenticeships Program, Digital Technologies in Focus, Indigenous Technology Academy, Indigenous Girls STEM Academy
	4 Expand alternative industry training pathways for graduates and trainees	Define and expand alternative industry accredited pathways for in demand roles (e.g. cadetships, micro-credentials and ramp on programs)	66% of IT graduates move into non-tech roles or overseas after their studies[2]	🟠	Microsoft Australia Traineeship Program, Accenture Adelaide Cyber Security Traineeship, Australian Defence Force Cyber Gap Program, Digital Skills Cadetship Trial, NSW Government IT Traineeships, JobTrainer Fund
Equipped with relevant, recognisable skills	**5** Update course content to provide high-demand digital skills	Update current VET course content to ensure students are equipped with relevant skills demanded by industry	National enrolment in VET Information and Communications Technology training packages has declined from 97,100 in 2016 to 60,600 in 2020[4]	🟠	Cyber Workforce Professionalisation Stream, Digital Skills Organisation Pilots, Australian Industry and Skills Committee (AISC) Digital Transformation Project, Institute of Applied Technology

Note: significant progress is already underway with the formation of industry clusters and new qualification structures from 2023 for VET

Note: 1. Lower coverage includes 0-5 initiatives; medium coverage includes 6-10 initiatives, higher coverage includes 11+ initiatives; 2. Accenture analysis; 3. Swinburne University of Technology; 4. NCVER; 5. Initiatives can fall into multiple types
Source: Accenture analysis; Swinburne University of Technology (2022); NCVER Table Builder

36

Case Study: Microsoft Australia and MEGT provide a program integrating paid work and formal study

Microsoft's Traineeship Program
Organisation: Microsoft and MEGT
Initiative: Microsoft Traineeship Program

Initiative overview: Trainees are employed through MEGT's Group Training program and are placed with an employer within the Microsoft network.

Case study: The program was introduced in order to address the expected future shortfall of workers in the ICT sector[1]. It aims to increase the diversity of IT professionals, the pathways into IT, and the number of ICT certifications[2].

The 2-year program enables participants to gain paid IT work experience, industry recognised Microsoft Certifications (e.g. a specialisation in Cloud Skills), and a Certificate IV in Information Technology from TAFE.

As of October 2020, 119 students and 55 host employers had participated in the program. 39% of the 119 trainees were female, which is significantly higher than the 17% proportion of women in domestic IT course enrolments. Additionally, 4% of trainees were Indigenous, and 10% had a disability.

The program proved successful in increasing completion rates and transitioning participants into further study or work. The completion rate of the program was 75%, in contrast to the 39% completion rate of the Certificate IV in IT outside of the program. Upon completion, 85% of trainees transition into employment and further study, compared to the 78% of graduates from other IT vocational courses. Finally, 89% of trainees said they believe they would pursue a career in IT following the completion of the program, and 89% of host employers responded they would or may employ their trainee after the program.

Graduate salary upon completion of relevant course [2]
Comparison of trainee's salaries after the Microsoft program with salaries after finishing comparable programs, in AUD

Microsoft Australia Traineeship Program	$75,000
Certificate IV in IT	$48,550
Undergraduate computing and information systems degree	$65,000
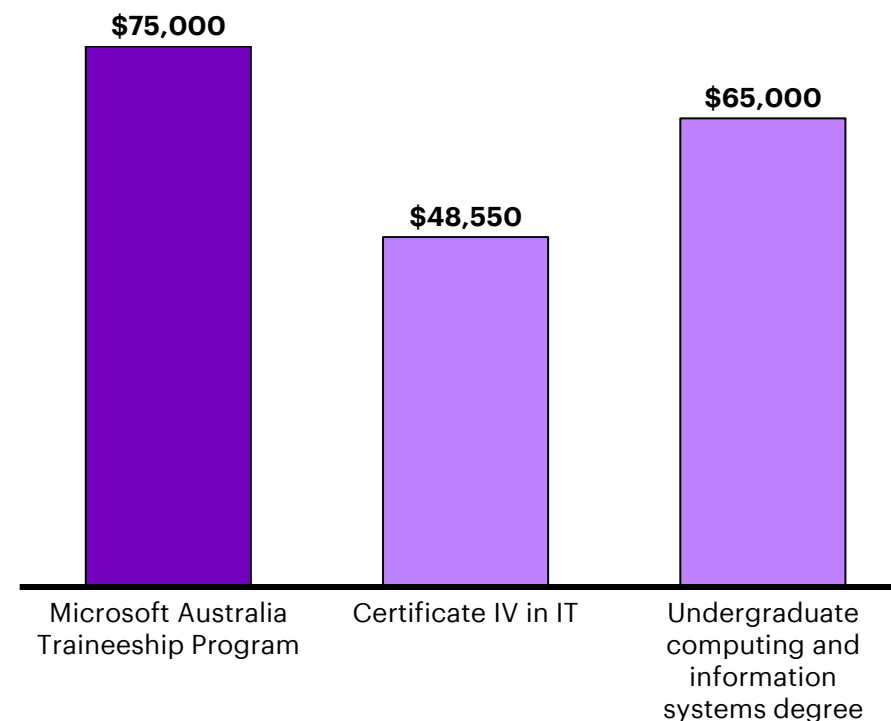
Peer countries provide examples of potential initiatives to retrain non-ICT workers in six focus initiative areas based on gap analysis

Focus initiatives identified from gap analysis

Focus initiatives | **International examples**

Stage	#	Focus initiatives	International examples
Awareness of digital opportunities	**1**	Increase awareness of digital opportunities for workers in other sectors	- Local Digital Skill Partnerships is a UK initiative and is designed to build regional capacity to improve digital skills capability at all levels. The partnerships bring together and connect stakeholders from the public, private and third sectors to upskill the current workforce, advance digital inclusion, and raise awareness of the importance of digital skills regionally. - The British Army, which was facing a recruitment shortage, held a nation-wide advertising campaign to motivate more people to join the army. After a month, 141% of the application target was reached.
	2	Develop platforms to inform and match individuals to relevant digital skills and jobs	- Singapore's SkillsFuture is a movement supported by a single platform to provide Singaporeans with a summary of the opportunities and recommended providers to upskill. - Danish Skills Anticipation System provides data on job opportunities for ~850 occupations by region, covering entire labour market.
Access to digital skills and training	**3**	Incentivise businesses and individuals to retrain	- Singapore's SkillsFuture Credit was launched in 2016 and offers all Singapore Citizens a one-off credit of 500 Singapore dollars when they turn 25 as well as a directory of over 25,000 government approved courses to use the credits on. - Germany's voucher system enables workers deemed eligible to receive a voucher covering training fees for thousands of certified courses from the KURSNET database[1] - Poland's Loans for Education program enables adults to receive an interest free loan of up to PLN 100,000 to finance further study for courses.[2] - Poland's National Training Fund (KFS) is part of a broader Labour Fund that is partially financed by a levy on employers. Any employer can apply to the KFS for an up to 80% reimbursement of employee training costs.[2]
	4	Increase participation among underrepresented groups for workers in other sectors	- Malaysia's #MyDigitalWorkforce Work in Tech (MYWiT) program provides training and salary subsidies to encourage employers to hire people who are unemployed for digital tech and services jobs. - The UK's government program, the National Institute of Adult Continuing Education (NIACE), empowers older workers to seek out new opportunities for growth by offering career coaching. - The UK's £1 million Digital Skills Innovation Fund helps people from underrepresented groups gain the skills they need to work in digital roles. An additional £400,000 will help older and disabled people get life-changing digital skills.
	5	Expand alternative industry training pathways for workers in other sectors	- The UK's Tech Skills, is an industry backed trade association and creates and promotes industry-valued pathways into digital careers. - Indian non-profit, the National Association of Software and Service Companies (NASSCOM), partnered with Edcast to reskill 2M+ professionals and potential employees on IT skills in the next 5 years.
Equipped with relevant, recognisable skills	**6**	Allow digital skills to be more easily recognised	- Singapore's Skills Passport allows Singaporeans to document skills, certificates and licences on MySkillsFuture and showcase these to employers. The Credential Engine is a US non-profit organisation dedicated to bringing credibility and coherence to the vast network of credentials in the US. - Germany's ValiKom project enables adults who acquired skills through work to receive certification of their competencies, which enables easier access to further learning opportunities
	7	Explore new delivery models for learning in the formal education sector for workers in other sectors	- UK 'Institute of Coding' (IoC), aims to enhance education and employability of individuals, and ensure that employers and individuals across the UK can access the skills they need to compete in the global digital economy. The Institute brings together industry, universities, training providers and professional bodies to address digital skills gaps, through short courses and accredited degree schemes.

Case study: Singapore Government develops SkillsFuture Program to upskill, retrain and track credentials

SKILLS*future* SG

Singapore Government develops SkillsFuture Program to upskill, retrain and track credentials
Organisation: Singaporean Government
Initiative: Singapore SkillsFuture Program

Initiative overview: SkillsFuture is a national movement to provide Singaporeans with the opportunities to develop their fullest potential throughout life, regardless of their starting points. SkillsFuture provides Singaporeans with resources to continuously learn at all stages in life including schooling years, early career, mid-career or silver years.

Case study: In 2010, strengthening workforce development and career support became a key priority for the Singaporean Government. In response, the government launched the SkillsFuture movement in 2014. The main aims of SkillsFuture are:

- To help individuals make well informed decisions on education, training or careers
- To provide an integrated, high-quality system of education and training to respond to evolving needs
- To promote employer recognition and career development based on skills and mastery
- To foster a culture of lifelong learning for everyone

Two key features of the SkillsFuture program include the SkillsFuture Credit system and the Skills Passport. The SkillsFuture Credit was launched in 2016 and offers all Singapore Citizens a one-off credit of 500 Singapore dollars when they turn 25 as well as a directory of over 25,000 government approved courses to use the credits on. In 2019, 16% of those eligible for the credit had made use of it. The Skills Passport allows Singaporeans to document skills, certificates and licences on MySkillsFuture and can be showcased to potential employers.

The program has had significant success. The percentage of adults aged 35-64 participating in continuing education has increased from 30% to 48% between 2014 and 2019. Additionally, the program has also improved the perception of vocational education in Singapore. In 1997, only 37% of Singaporeans viewed ITE favourably, compared to 69% in 2010. The popularity of the program has also continued to grow. Between 2020 and 2021, the number of Singaporeans using the program increased by 22%.

Singaporeans who used SkillsFuture

Singaporeans who took part in SkillsFuture initiatives, '000, 2020-2021

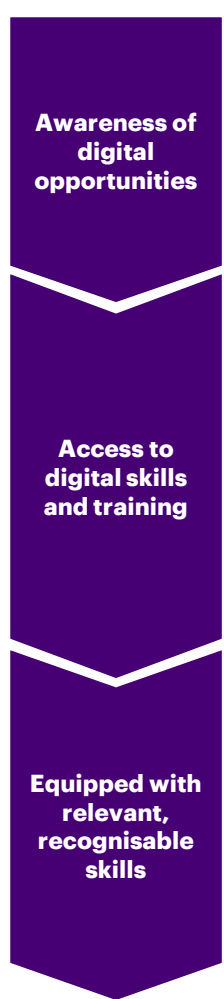Took part in SkillsFuture initiatives
Used SkillsFuture Credit
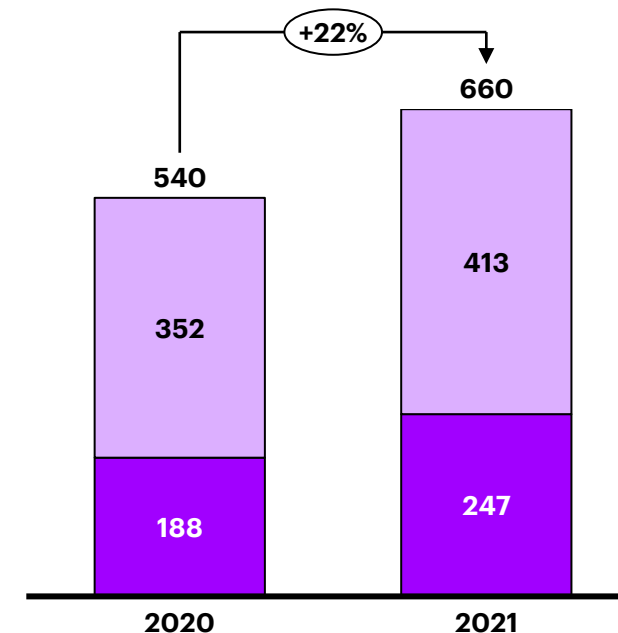
+22%

540
352
188
2020

660
413
247
2021

Peer countries provide examples of potential initiatives to retrain individuals from outside the labour force in four focus initiative areas

Focus initiatives identified from gap analysis

Initiative type		Summary[1]
Awareness of digital opportunities	**1** **Increase awareness and support surrounding digital opportunities for individuals outside the labour force**	• Local Digital Skill Partnerships is a UK initiative and is designed to build regional capacity to improve digital skills capability at all levels. The partnerships bring together and connect stakeholders from the public, private and third sectors to upskill the current workforce, advance digital inclusion, and raise awareness of the importance of digital skills regionally. • The US New Orleans Works program offers training and employment connections to adults with low skills, focusing on retraining for in-demand occupations including information technology. Recruitment was done at a variety of venues and central city locations.[2]
Access to digital skills and training	**2** **Incentivise individuals from outside the labour force to retrain**	• Singapore's SkillsFuture program was launched in 2010 and offers a range of courses for individuals to reskill and upskill in. During the pandemic, individuals who were out of work were able to undertake courses to prepare them for re-entry into the workforce.[3] • Germany's voucher system enables workers deemed eligible to receive a voucher covering training fees for thousands of certified courses from the KURSNET database.[4] • The US Valley Initiative for Development and Advancement (VIDA) provides unemployed or low-income adults financial support with full-time enrolment in an education program. Participants attend weekly group and individual counselling sessions to address key barriers to success in education or the labour market.[5]
	3 **Provide baseline digital literacy and return to work skills for individuals outside the labour force**	• New Zealand's Digital Literacy Programme for Seniors provides digital literacy training for 4,700 older people • The Digital Poland of Equal Opportunities project utilises 2600 local certified volunteers called 'Lighthouse Keepers' to meet with local adults over 50 in order to provide participants with baseline digital skills • Poland's Local Centres of Knowledge and Education pilot project has reached 3700 parents with low skills living in disadvantaged areas through their children, helping participants improve their labour market prospects.[6]
Equipped with relevant, recognisable skills	**4** **Expand alternative industry training pathways for individuals outside the labour force**	• Salesforce and Hiring Our Heroes have partnered in the US to provide transitioning members, veterans, and military spouses to participate in 12-week fellowships for certified Salesforce professionals. The practical, hands-on experience offered through the program prepares fellows for a smooth transition into Salesforce careers.[7] • UK's Kickstart Scheme is a £2 billion fund that subsidises new placements with employers for young people currently receiving Universal Credit who are at risk of long term unemployment.[8] • IBM India's Tech Re-Entry Program is for experienced professionals who have taken a minimum 2 year break from the workforce. It provides participants with mentorship and technology training, along with a paid job.[9]

Peer countries provide examples of potential initiatives to boost the number of graduates and trainees in one focus initiative area from gap analysis

	Initiative type	International examples
Awareness of digital opportunities	**1** **Increase awareness of digital opportunities**	▪ The EU's STEM Alliance has reached over 122,000 students across Europe as part of their awareness campaigns about STEM education and work opportunities[1].
	2 **Provide early exposure to digital skills**	▪ The UK's Micro:bit Educational Foundation partnered with the UK government to provide 57,000 devices to UK primary school children to help improve digital literacy among younger audiences. The organisation creates pocket-sized a BBC micro:bit computer which helps students create, learn and code.[2]
Access to digital skills and training	**3** **Increase participation among underrepresented groups**	▪ In2Science is a UK based organisation that provides young people from low-income and disadvantaged backgrounds an opportunity to gain practical insight into the STEM sector as well as the knowledge and confidence to progress to university. Each year, the programs gives an opportunity to 500 participants, and 75% of participants progress onto STEM degrees.
Equipped with relevant, recognisable skills	**4** **Expand alternative industry accredited pathways for graduates and trainees**	▪ Tech Skills, is a UK, industry backed trade association, creates and promotes industry-valued pathways into digital careers. It brings together employers and educators in partnership to develop the digital talent industry needs. The association also has an Employer Board which brings together industry leaders from across the economy to provide industry leadership for Tech Skills' work. ▪ Germany's Dual VET programs enable students to participant in up to 6 month internships whilst undergoing formal study, with industry partners including Siemens, Deutsche Telekom, and Volkswagen.
	5 **Update course content to provide high-demand digital skills**	▪ Israel undertook a major review of computing at school which led to its development of the most rigorous computer science high school program in the world. This has been supported by the Machshava Israeli National Computer Science Teaching Centre, which is considered the professional home for all Israeli computer science teachers. ▪ Poland introduced changes in early 2019 to the funding algorithm for VET schools, to ensure that courses that correspond with high shortage occupations received more funding (for example, mechatronics courses receive more funding).[3] ▪ The Polish region Malopolska has established a Partnership for Lifelong Learning program, which facilitates collaboration between VET schools and local employers to better match vocational qualifications to labour market needs.[3] ▪ In Germany, optional 8 week electrical and mechatronics qualifications in high demand skills such as IT based plant modifications and manufacturing procedures have been introduced, allowing new apprentices to gain certification in specific competencies.[4]

Focus initiatives identified from gap analysis

Case study: UK digital literacy receives 57,000 micro:bit coding devices donated to primary schools

micro:bit

57,000 micro:bit coding devices donated to UK primary schools to boost digital literacy
Organisation: Micro:bit Educational Foundation
Initiative: UK micro:bit partnership with UK government

Initiative overview: The Micro:bit Educational Foundation is a not-for-profit organisation founded in the UK in 2016. Micro:bit was originally created by the BBC in collaboration with 29 other leaders in business and academia as part of the BBC's Make It Digital initiative. The organisation provides digital education for young people through:

- Hardware and software to allow students to better understand technology
- Free, user-friendly educational resources to support teachers in delivering engaging and creative lessons
- High-impact educational programmes

Case study: Research has shown that the UK is losing out on £63 billion in GDP annually due to digital skills gaps. Additionally, research from micro:bit and Nominet found that 61% of UK primary teachers responsible for teaching computing have no background in the subject and 60% cite lack of resources as a barrier to teaching computing and digital skills.

In 2022, Micro:bit Education Foundation partnered with Nominet and the Scottish Government to address the long-term digital skills gap in the UK. The partnership will see the donation of 57,000 coding devices to UK primary schools to provide more exposure to digital creativity and coding. The project will be supported by comprehensive teaching resources and online Continuing Professional Development courses. 3,000 UK primary schools will receive around 20 devices each, with devices prioritised to schools which need them most.

The roll out will also be complemented with a three-phase research program to assess, monitor and address any challenges, concerns and successes faced by the primary school teachers.
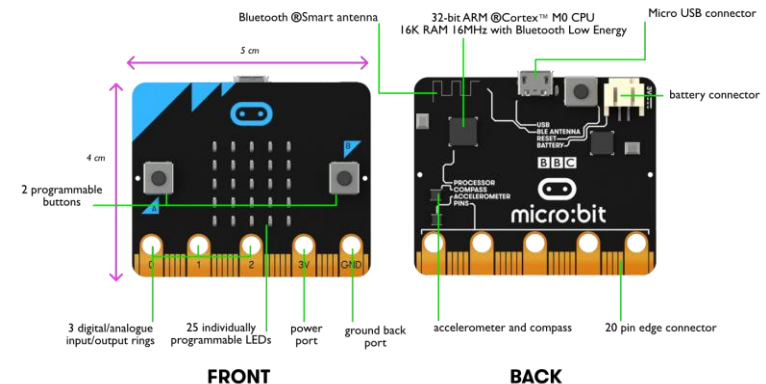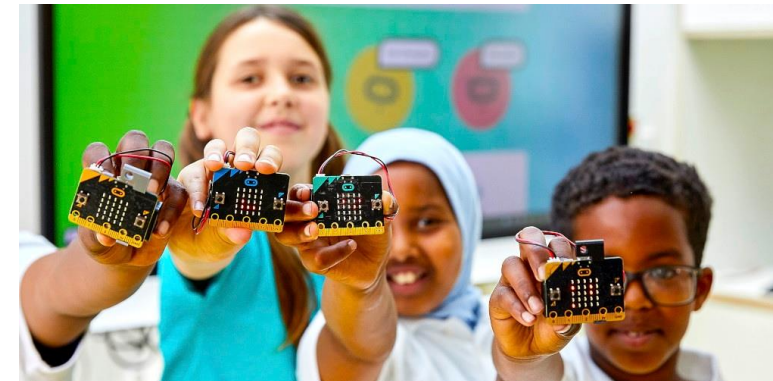
There are currently 6 million BBC micro:bits being used by children all over the world, including most UK secondary schools

Appendix

For domestic students, university graduates are an increasing source of ICT labour supply, with postgrad completions up 100% while VET is decreasing

The number of ICT course completions at the Bachelors level has increased 39% in the last five years; TAFE completions are declining

Number of course completions, post-secondary, '000s, domestic students, 2016-2020
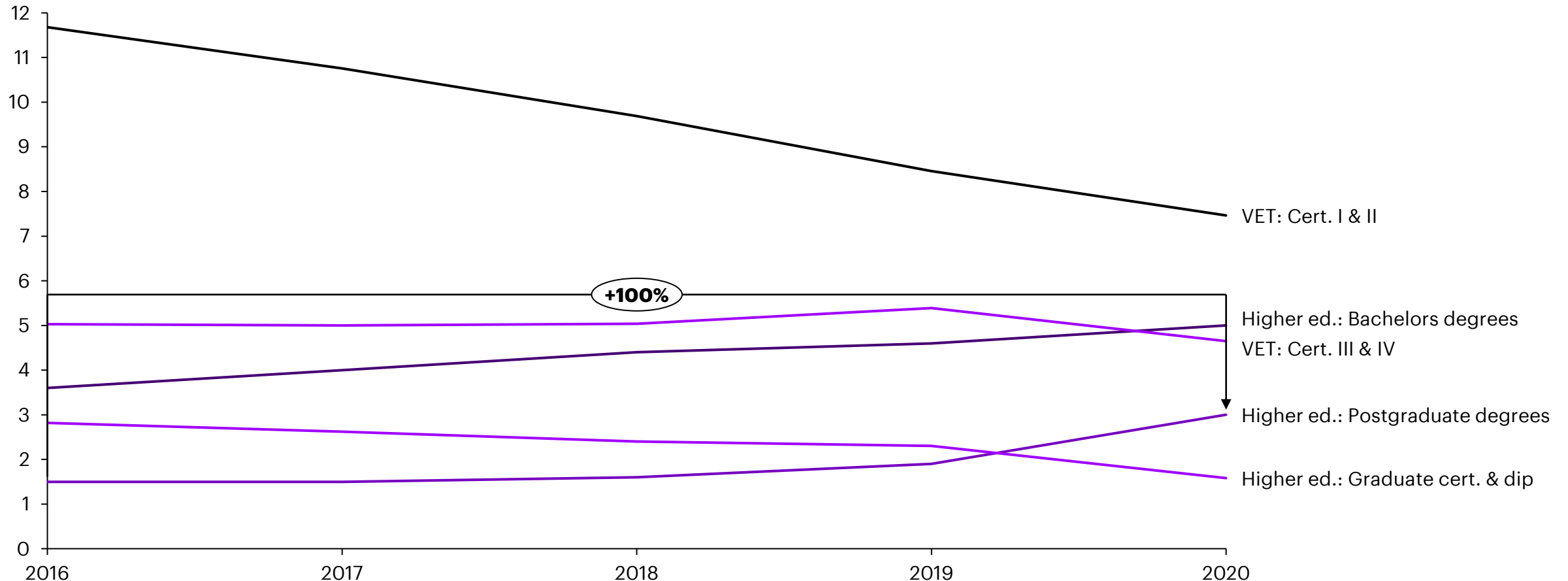
+100%

VET: Cert. I & II

Higher ed.: Bachelors degrees

VET: Cert. III & IV

Higher ed.: Postgraduate degrees

Higher ed.: Graduate cert. & dip

Note: VET completions (Certificates, Advanced Diplomas and Diplomas) are those graduating with qualifications which NCVER defines as matching the closest matching ANZSCO occupations (4 digit) for high shortage occupations. Bachelors degrees are those categories in 'Information Technology' as the primary broad field of education by the Department of Education, Skills and Employment. Source: NCVER, DESE, ABS, Accenture analysis

In NSW, university qualified graduates are an increasing source of ICT labour supply, with postgrad completions up 160% while VET has fallen

The number of ICT course completions in NSW at the Bachelors level has increased 87% in the last five years; VET completions have declined

Number of course completions, post-secondary, domestic and international students, 2016-2020
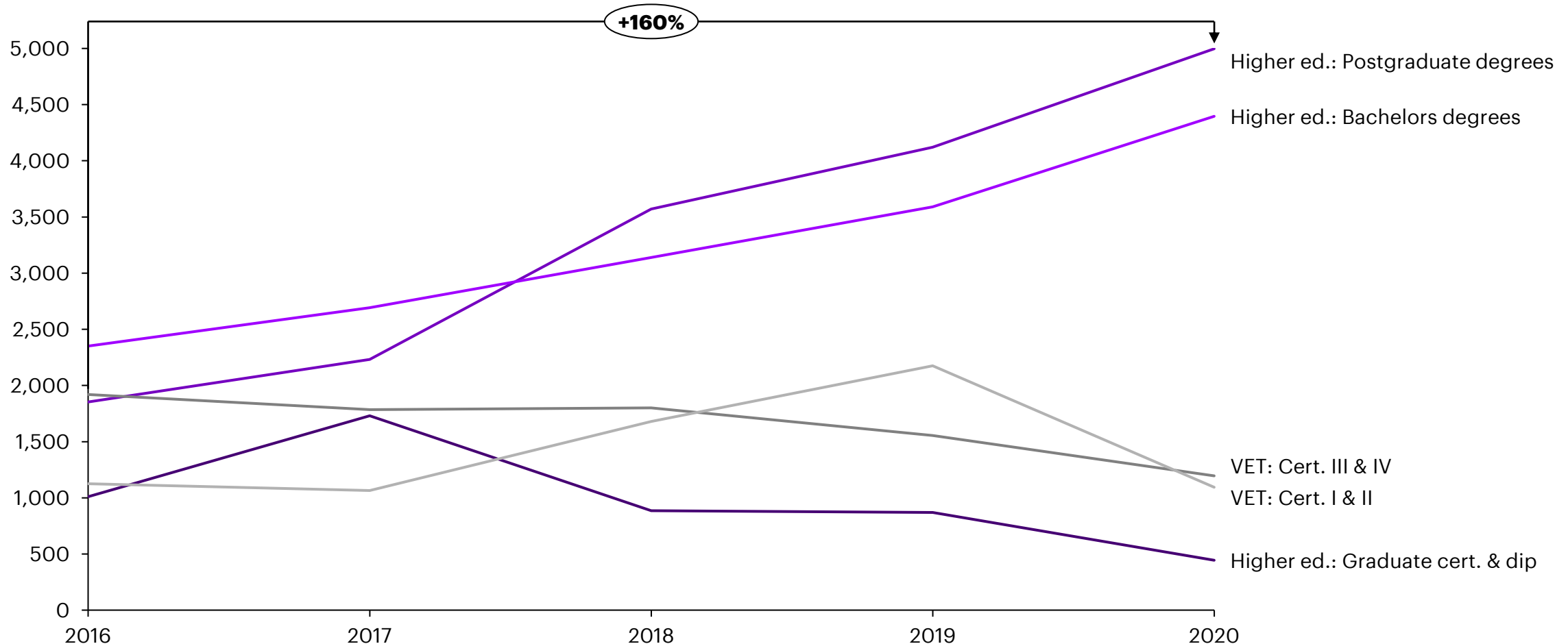
Note: VET completions (Certificates, Advanced Diplomas and Diplomas) are those graduating with qualifications which NCVER defines as matching the closest matching ANZSCO occupations (4 digit) for high shortage occupations. Bachelors degrees are those categories in 'Information Technology' as the primary broad field of education by the Department of Education, Skills and Employment. Source: NCVER, DESE, ABS, Accenture analysis

In NSW, current sources of supply are expected to support the ICT workforce to grow to 392,000 by 2030, leaving a gap of 85,000

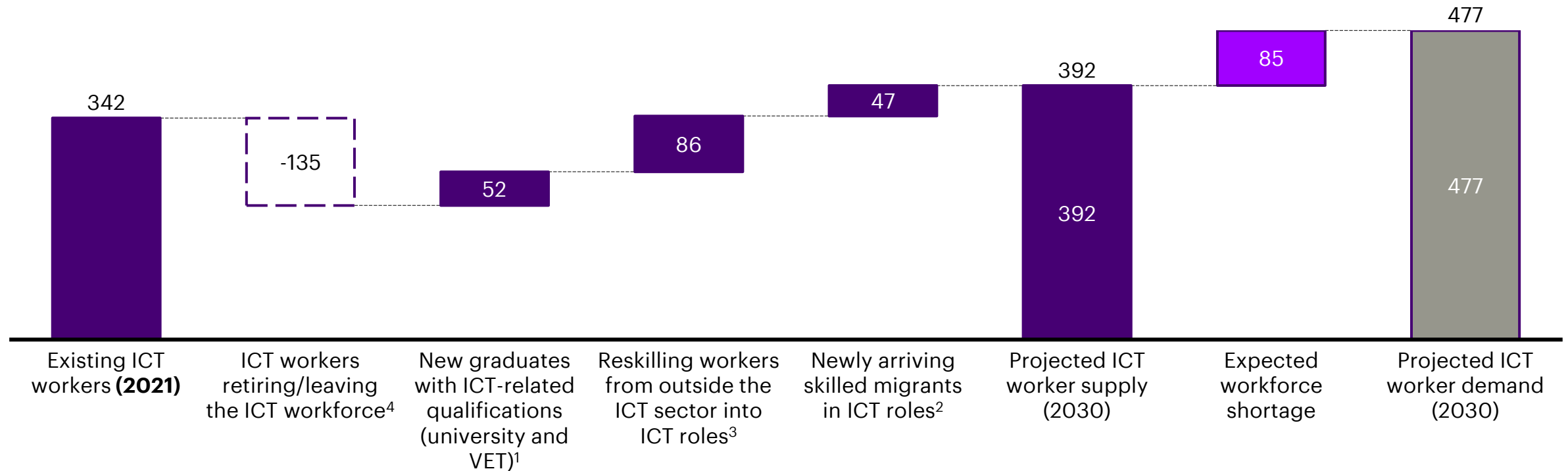**Projected NSW ICT sector workers in 2030**

Number of ICT sector workers in NSW, '000

Value	Category
342	Existing ICT workers **(2021)**
-135	ICT workers retiring/leaving the ICT workforce[4]
52	New graduates with ICT-related qualifications (university and VET)[1]
86	Reskilling workers from outside the ICT sector into ICT roles[3]
47	Newly arriving skilled migrants in ICT roles[2]
392	Projected ICT worker supply (2030)
85	Expected workforce shortage
477	Projected ICT worker demand (2030)

Note: 1. Measured as the number of graduates expected between now and 2030 from university degrees or VET qualifications in 'Information Technology'; 2. Estimate based on the average number of skilled visas granted per year between 2015 and 2019 to workers in tech occupations, defined as a subset of ANZSCO codes, plus an estimate of international students who join the tech workforce and are not otherwise counted; 3. Estimate calibrated with reference to longitudinal Census data and *Deloitte Access Economics, ACS Australia's Digital Pulse 2021*; 4. ABS Census Longitudinal Dataset, based on share of ICT professionals in 2011 in other occupations in 2016 and an estimate of the number of retiring workers.

Source: Department of Education, Skills and Employment (2021) uCube, NCVER (2021), Total VET students and courses 2020, Department of Home Affairs (2021) Temporary Residents (skilled) visas granted pivot table, ABS Census Longitudinal Dataset, Accenture (2021) *The economic contribution of Australia's tech sector*, Accenture analysis

A number of VET courses could help to boost supply in high-shortage occupations including ICT support technician and network professionals

High-shortage occupation	Relevant VET qualifications	Total VET completions (2020)[1]
ICT Support Technician	Cert III in Information, Digital Media and Technology, Cert IV in Information Technology, Cert IV in Web-Based Technologies, Cert IV in Information Technology Support, Cert IV in Computer Systems Technology, Diploma of Information Technology, Advanced Diploma of Information Technology	6,255
Network Professionals	Cert IV in Information Technology Networking, Diploma of Information Technology Networking, Diploma of Systems Analysis and Design, Advanced Diploma of Computer Systems Technology	1,775
Software and Applications Programmers	Cert IV in Programming, Diploma of Software Development	820
Electronic Equipment Technician	Cert III in Telecommunications Technology	790
Database Administrator	Diploma of Information Technology Systems Administration, Diploma of Database Design and Development, Diploma of Information Technology, Advanced Diploma of Network Security	565
Web Developer	Cert IV in Digital and Interactive Games, Diploma of Website Development, Diploma of Digital and Interactive Games	510
Graphic / Web Designer	Cert IV in Digital Media Technologies, Diploma of Digital Media Technologies	190
Business Analyst	Advanced Diploma of Information Technology Business Analysis	180
ICT Project Manager	Graduate Certificate in Information Technology and Strategic Management, Advanced Diploma of Information Technology Project Management	90
Telecommunications Technician	Cert III in Telecommunications Network Build and Operate	25

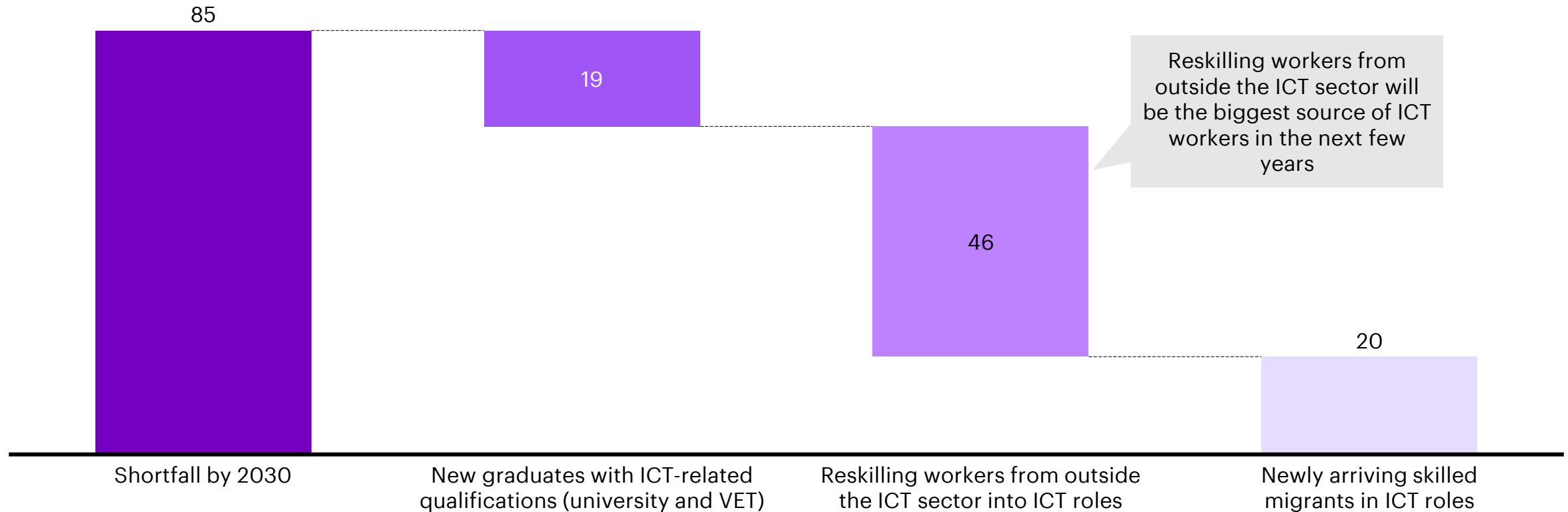Legend: ■ Technical roles ■ Non-technical roles

Note: 1. National VET completions; occupations are at 4-digit ANZSCO level; includes ICT training packages offered by VET; ANZSCO naming has been tweaked, see appendix for reference
Source: NCVER; Accenture analysis

In NSW, reskilling workers from outside the ICT sector into ICT roles is going to be crucial to meet the workforce gap

An additional 85,000 workers in NSW are needed to address the shortfall; workers will come from 3 sources
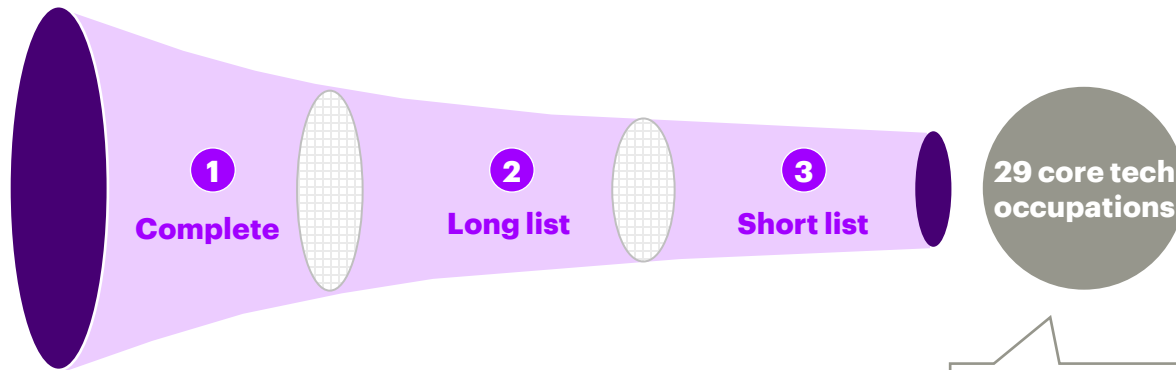
Projected number of ICT sector workers needed to meet demand, '000

Reskilling workers from outside the ICT sector will be the biggest source of ICT workers in the next few years

85	19	46	20
Shortfall by 2030	New graduates with ICT-related qualifications (university and VET)	Reskilling workers from outside the ICT sector into ICT roles	Newly arriving skilled migrants in ICT roles

These "core" ICT occupations were identified through analysis and industry consultation—resulting in 29 occupations which will be the focus of this report

These core ICT occupations meet the following criteria

These 29 occupations include technical and non-technical occupations

| ① **Complete** | ② **Long list** | ③ **Short list** | **29 core tech occupations** |

Output

| **332 occupations that are employed by the ICT sector directly through four sub-industries or the technology-focused roles included across the economy.** | **60 long list occupations which includes the 60 largest 4-digit ANZSCO occupations by number of people employed in 2021, in the ICT sector.** | **29 short list occupations produced by removing:**
• **very senior roles (e.g. Chief Executives)**
• **occupations with very broad skills ('General Clerks')**
• **occupations with less than 1% of employment unless highlighted through industry consultation** | These 29 core occupations account for 78% of ICT sector employment* |

Technical occupations (17)

Cybersecurity Specialist
Data Scientist
Database Administrator
Electrical Engineer
Electrical Engineering Draftspersons and Technician
Electronic Equipment Technician
Electronics Engineers
Engineering Manager
Front-end Developer
IT Support Engineer
IT Support Technician
Network Development Engineer
Other Engineering Professionals
Quality Controller
Software Engineer
Telecommunications Technician
Telecommunications Trainer

Non-technical occupations (12)

Account Executive
Account Manager
Accountants
Advertising & PR
Customer Support Officer
Finance Managers
Graphic / Web Designer
Human Resources
IT Business Analyst
IT Project Manager
Product Manager
UX Designer

Note: *ICT sector employment includes total employment in four core sub-industries and in technology roles across the economy, see Appendix for further detail

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List of initiatives identified

- Cyber Security National Workforce Growth Program
- Cyber Skills Partnership Innovation Fund
- Longitudinal Data Collection
- Cyber Workforce Professionalisation Stream
- Next Generation Artificial Intelligence Graduates Program
- Next Generation Emerging Technologies Graduates Program
- Blockchain Roadmap
- Empowering Business to Go Digital Program (Navii)
- Digital Skills Finder Platform
- Digital Directors Program
- Questacon Cyber Education Programs
- Australian Small Business Advisory Services (ASBAS) Digital Solutions
- Entrepreneurs Programme - Digital Solutions Service
- Digital Careers
- Advancing Women in STEM Strategy and 2020 Action Plan
- Women in STEM Ambassador
- Indigenous Girls STEM Academy
- Women in STEM and Entrepreneurship Program
- Girls in STEM Toolkit
- DTA Emerging Talents Program - Apprenticeship, Cadetship, and Graduate Program
- APS Digital Careers Framework
- APS Career Pathfinder (Prototype)
- ASD Cyber Skills Framework
- Australian Defence Force Cyber Gap Program
- Foundation Skills for Your Future
- Jobs and Education Data Infrastructure Portal (JEDI)
- Digital Skills Organisation Pilots
- Digital Skills Cadetship Trial

- Australian Industry and Skills Committee (AISC) Digital Transformation Project
- AISC Training Package Development for the ICT sector – Training support materials
- Skilling Australians Fund
- JobTrainer Fund
- Pathways in Technology (P-TECH) Pilot
- Women in STEM Cadetships and Advanced Apprenticeships Program
- Collaboration Pilot - Industry 4.0
- National Credentials Platform
- Microcredentials Marketplace
- Curious Minds (Summer School for STEM students)
- Supporting AI in Schools
- The Digital Technologies Hub
- Digital Technologies in Focus
- Digital Foundations for Agriculture Strategy
- Global Talent Visa Program
- Global Business and Talent Attraction Taskforce
- Skilled Migration Program
- Business Investment and Innovation Program (BIIP)
- Be Connected Initiative
- National Digital Health Workforce and Education Roadmap
- National Digital Health Workforce and Education Capability Action Plan
- National Nursing & Midwifery Digital Health Capabilities Framework
- National Digital Health Capabilities Framework for Medicine
- AustCyber
- Mining Equipment, Technology and Services Growth Centre

- Food and Agribusiness Growth Centre
- Advanced Manufacturing Growth Centre
- CSIRO digital careers
- APSC digital careers pathways tool
- Economy wide SFIA licence - APSC
- Smart and Skilled
- Mature Age Workers
- Skills for Education and Employment
- Mid Career Checkpoint
- NSW Govt IT Traineeships
- Institute of Applied Technology
- Driving Digital Skills Pilot
- TechCentral
- NSW Cyber Security Strategy
- TAFE NSW Digital Careers Program
- Microsoft Australia Traineeship Program
- Accenture Adelaide Cyber Security Traineeship
- Relaunch@Capgemini
- Indigenous Technology Academy
- Skills Checkpoint for Older Workers Program
- Digital Career Compass

Notes

Occupational Mappings

ANZSCO code	ANZSCO name	Display name	Job titles included (non-exhaustive)
2241	Actuaries, Mathematicians and Statisticians*	Data Scientist	Data Analyst
2631	Computer Network Professionals*	Network Professionals	Network Engineers, Network Administrators, Network Analysts, Cloud Engineer, Cloud Developer
2632	ICT Support and Test Engineers*	ICT Support Engineer	
2621	Database and Systems Administrators, and ICT Security Specialists (ICT Security excluded to remove overlap with Cybersecurity Specialist category)*	Database Administrator	Data Engineer
2611	ICT Business and Systems Analysts*	Business Analyst	
2613	Software and Applications Programmers*	Software and Applications Programmers	Software Engineer, App Developer, Mobile App Developer
1332	Engineering Managers	Engineering Manager	
2612	Multimedia Specialists and Web Developers*	Web Developer	
1351	ICT Manager* (Product managers split out)	ICT Project Manager	
1351	ICT Manager* (Project managers split out)	Product Manager	
3123	Electrical Engineering Draftspersons and Technicians	Electrical Engineering Draftsperson / Technician	
5412	Information Officers	Customer Support Officer	
3131	ICT Support Technicians*	ICT Support Technician	
2254	Technical Sales Representatives	Technical Sales Representative	
2334	Electronics Engineers	Electronics Engineer	
2333	Electrical Engineers	Electrical Engineer	
2232	ICT Trainers	ICT Trainer	
2324	Graphic and Web Designers, and Illustrators	Graphic / Web Designer	
2330	Engineering Professionals nfd	Other Engineering Professionals	
8393	Product Quality Controllers	Quality Controller	
3423	Electronics Trades Workers	Electronic Equipment Technician	
3424	Telecommunications Trades Workers	Telecommunications Technician	
2252	ICT Sales Professionals	ICT Sales Professionals	
2251 & 1311	Advertising and Marketing Professionals & Advertising, Public Relations and Sales Managers	Advertising, Marketing & PR	
2231 & 1321	Human Resource Professionals & Human Resource Managers	Human Resources	
2211	Accountant	Accountant	
1322	Finance Manager	Finance Manager	
N/A	N/A	UX Designer	
N/A	N/A	Cybersecurity Specialist	

Note: * indicates occupations included in skills analysis.

Thank you