
Industry Skills Forecast and Proposed Schedule of Work

Information and Communications Technology

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Communications
Technology*

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*Industry Skills
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Work*

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The Industry Skills Forecast and Proposed Schedule of Work presented here sets out the training product development priorities for the Information and Communications Technology Industry Reference Committee (IRC) through to June 2021. It is based on research, analysis and consultations with IRC members and other stakeholders. This document was written with a particular focus on the Council of Australian Government (COAG) principles for training package development:

- **Reflect identified workforce outcomes.** We have used the most recent data available in this report to come to evidence based conclusions.
- **Support national (and international) portability of skills and competencies, including reflecting licensing and regulatory requirements.** Where applicable, we advocate for nationally recognised skills in the vocational education and training (VET) sector, and realise the value of a nationalised system.
- **Reflect national agreement about the core transferable skills and core job-specific skills required for job roles as identified by industry.** Industry, through the IRCs, has given us invaluable feedback throughout the consultation process. Their input forms a key part of our findings particularly as it relates to recognising and responding to the fact individuals are unlikely to remain in the same job for life.
- **Be flexible enough to meet the diversity of individual and employer needs, including the capacity to adapt to changing job roles and workplaces.** Our approach is to look to the future, and where we can, address issues proactively including the recognition that technology and other disruptors will change employer priorities and consequently skills needs.
- **Facilitate recognition of an individual's skills and knowledge, and support movement between the school, VET, and higher education sectors.** Accessing vocational education from school or reskilling should be a simple and effective process. Access to education always plays a major role in our recommendations.
- **Support interpretation by training providers and others through the use of simple, concise language and clear articulation of assessment requirements.** Plain English communication shows true understanding of the subject matter. We strive to deliver clarity on complex, technical issues.

This Industry Skills Forecast and Proposed Schedule of Work has been prepared by PwC's Skills for Australia and the Information and Communications Technology IRC.

Yours sincerely,

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Executive summary

In developing this Industry Skills Forecast and Proposed Schedule of Work, PwC's Skills for Australia and the ICT IRC aim to refocus the discussion of skills and training to ensure that training design is centred on what will equip learners with the right knowledge and know-how to pursue fulfilling careers. This requires setting a clear narrative from sector trends, to skills needs, and through to specific training requirements. To do this requires three key elements (as reflected in the structure of this Industry Skills Forecast and Proposed Schedule of Work):

- **Understanding the sector** (*Sector overview*) – What activities make up the sector that training is being designed for? What are the sub-sectors within the broader sector and how different or similar are they? Who are the employers and where are they located? Who is undertaking training in the sector and where is that training being undertaken?
- **Understanding the trends shaping the sector and the skills priorities they lead to** (*Skills outlook*) – What is impacting on the sector? From how global trends in demographics and digital change are impacting on activities in the sector; how domestic economic conditions are influencing growth; to sector specific trends. How do these trends influence skills needs within the sector? What are employers telling us about their engagement with VET (vocational education and training) and the skills acquired by learners?
- **Implications for training** (Proposed Schedule of Work) – What does the current Training Package look like and does it align with the trends and skills priorities identified? Are there any gaps and what needs to change? How should these training products be reviewed?

The views of businesses, learners and other stakeholders in the ICT sector are critical to understanding the skills needs in the workforce and therefore the approach to training product review. This Industry Skills Forecast and Proposed Schedule of Work represents an update to the 2016 4-Year Work Plan. Over the next year, PwC's Skills for Australia will engage with businesses, learners and other key stakeholders to understand how skills and training needs have changed, building content for a detailed refresh of this document in 2018.

What is the ICT sector?

The ICT sector is broad and encompasses a range of different businesses and sub-sectors including those that provide information technology (IT) products and services, retail IT, helpdesk, telecommunication services and other professional ICT services.

The sector can be viewed as broadly grouped into three sub-sectors: information technology, which covers all areas related to processing, manipulating, and managing information; telecommunications technology, which includes cabling, wireless, switching, transmission, radio frequency, and optical communications, media and internet protocol networks; and digital media, which includes the design and production of multimedia and games for platforms including PC, console, online and mobile. Although the sector can be viewed as representing these three areas, it is important to note that they are increasingly converging, particularly in roles at higher skill levels. Businesses hiring for highly skilled ICT roles are increasingly looking for workers who are skilled in competencies across all three sub-sectors. Integration of these three sub-sectors is integral for the delivery of a more connected, digital infrastructure.

What are employers telling us?

Drawing from existing employer surveys and feedback, and initial consultation with employers in the industry, there are three key messages:

- **Employers are less likely to use the VET system and are using unaccredited training.** Feedback relayed by ICT IRC members indicates that employers in the sector are not relying on VET qualifications and they are reporting that they use unaccredited training, even when there is comparable nationally recognised training.¹ This unaccredited training is likely to be vendor-certified training courses that are generally preferred by many ICT employers.
- **Instead of requiring qualifications, employers are only looking for registrations and competencies to meet regulatory requirements.** For example, several ICT IRC members have indicated that employers are seeking experienced registered cablers with relevant registrations and competencies but relatively few are specifically seeking workers who are trade qualified (i.e. Certificate III level).²
- **Employers are filling most vacancies, with experience being one of the most important employment criteria.** Employers are successfully filling most positions. While there are large number of applicants who hold formal, relevant qualifications, employers prefer not to hire inexperienced candidates.³
- **Poor employee proficiency is affecting the sector.** Employers are also reporting that poor employee proficiency in ICT has a greater impact on their organisation's performance than in other sectors. The consequences of poor employee proficiency in ICT are varied and include delays in developing new products or services, difficulties in meeting customer service objectives and withdrawal of certain products and services all together.⁴

What are learners telling us?

Drawing from a range of existing surveys and research, such as the National Centre for Vocational Education Research (NCVER) student outcomes survey and data from the Australian Bureau of Statistics, there are two key messages:⁵

- **Employment prospects are worse for ICT graduates than for average VET graduates.** Student outcome data reports that employment prospects are worse for ICT Training Package graduates. Only 50 per cent are employed six months after training, down 5 per cent from last year, and significantly lower than the 78 per cent average across all VET graduates.
- **Benefits gained from training are also lower than average.** Student outcomes data shows that ICT graduates are less satisfied with training than other VET graduates and training does not seem to have a strong ability to improve employment outcomes.

Trends shaping the sector

Stakeholder feedback, combined with research and analysis, indicates that the following trends will be shaping current and future skills needs.

¹ National Centre for Vocational Education Research (2015) *Survey of Employers' Use and View of the VET system 2015*. For example, **54** per cent of sector employers used unaccredited training compared to an all industry average of 49 per cent, **86** per cent of sector employers used informal training compared to an all industry average of 78 per cent and **35** per cent of sector employers had a VET qualification as a job requirement compared to an all industry average of 36.6 per cent

² National Centre for Vocational Education Research (2015) *Survey of Employers' Use and View of the VET system 2015*

³ Department of Employment (2014) *Labour Market Research – Electrotechnology and Telecommunications Trades*

⁴ National Centre for Vocational Education Research (2015) *Survey of Employers' Use and View of the VET system 2015*

⁵ National Centre for Vocational Education Research (2016) *Total VET Activity 2015*

1. Emerging digital technologies

The rapid pace of digital change is requiring ICT workers to develop skills in new, emerging technologies to support the growth and productivity of Australian businesses. Among a wide range of new technologies and developments in the ICT sector, several key growth areas are emerging, including data analytics, cyber security, Internet of Things (IoT), cloud computing, application development, automation, blockchain, and augmented and virtual reality. Keeping up with the pace of current and emerging digital technologies will require a skilled workforce with specialist knowledge in these emerging growth areas, a trend supported by our consultations with ICT IRC members. Additionally, digital change in other sectors and areas of the economy will lead to skills overlaps between industries, requiring strong links with other training packages. For example, links are likely to be necessitated for the ICT and Culture and Related Industries training packages given the relationship between the ICT industry and broadcast television and radio.

2. More connected economy

Australian businesses are increasingly able to embrace digital connectivity as a core part of their operations, particularly with the implementation of the National Broadband Network (NBN). This is also supported by improvements in other mobility technologies such as wireless moving to 5G and the proliferation of mobile devices. It is estimated that 74 per cent of Australians were using smartphones as of May 2014, with this projected to increase to 91 per cent by 2017.⁶ In analysing these trends, it is important to note the relationship between the infrastructure necessary to set up a more connected economy, such as the NBN and 5G network, and the use and development of digital technologies. For example, these platforms are necessary for the ever increasing interconnectedness of our devices, infrastructure and other goods through the IoT. These interdependencies and their implications for skills development will be explored in more detail in the 2018 Industry Skills Forecast and Proposed Schedule of Work refresh.

Digital connectivity presents four key opportunities that change the way Australians will work and how they will offer their services in the future. Firstly, digital connectivity is enabling consumers to engage with businesses and brands online beyond a purely commercial relationship, to provide them with an enhanced and personalised customer experience. This is increasing the demand for ICT workers to possess well developed customer (client) centric skills. Secondly, with the increased uptake of cloud computing services, demand for traditional in-house IT maintenance roles is declining, creating opportunities for ICT workers to be involved in business innovation and commercialisation. Thirdly, connected technology is increasingly enabling people with disabilities to perform tasks they could not otherwise do, to perform tasks more easily, safely and securely and reach their maximum potential at home, in their community and in the workplace. Finally, the connected economy may mean geographic disruption of ICT services— both fragmentation through start-ups and aggregation through outsourcing of support services which will require ICT workers to have skills in working in virtualised teams and networks.

3. Changing workplace roles

The disruption caused by emerging technologies is resulting in significant changes in the employment landscape. This will impact both the types of skills required in the ICT sector as well as how future jobs will be undertaken.

Organisations are driving innovation through business process redesign, platform upgrades, and increased ICT investments, providing ICT professionals with opportunities to contribute to organisational strategy. This is reflected in the rising prominence of roles such as Chief Information Officer, Chief Information Security Officer and Chief Data Scientist, and new roles such as Director of Mobility. The integration of ICT services and reliance on connectivity and data is also creating a significant challenge in integrating cyber resistance into enterprise-wide risk management and governance processes, increasing availability of jobs in these areas.

⁶ Australian Communications and Media Authority (2016) 5G and mobile network developments— Emerging issues
<<http://www.acma.gov.au/theACMA/Library/researchacma/Occasional-papers/5g-and-mobile-network-developments-emerging-issues-occasional-paper>
accessed> 22/8/16

4. Supporting the automation of roles

Computerisation and automation is predicted to impact the whole Australian economy. These technological advancements present exciting opportunities for new roles and skills development in the ICT sector. It provides opportunities for the ICT workforce to be part of industries where technology is being harnessed to create efficiencies and enhance existing processes, for example, in the health, mining and agriculture sectors. The move towards automation of manual processes will require specialists in computing, systems and diagnosis, and skilled workers to service and maintain the technology. In addition, these roles will require workers to have good operational knowledge and detailed knowledge of the automated systems.

Skills priorities

To enable a flexible and skilled workforce and adapt to the trends shaping the sector, the ICT IRC have identified the following skills priorities.

1. Digital and digital literacy skills

These are technical and computational thinking skills and knowledge required to understand and work with current and emerging technologies such as data analytics, cyber security, Internet of Things, cloud computing, application development and automation.

2. Skills for working in virtual teams

Connective technologies make it easier than ever to work, share ideas and be productive despite physical separation. Working across virtualised teams and networks would require new capacities in leadership and team management, as well as new ways of managing performance and motivating staff.

3. Customer (client) centric skills

A specific approach to doing business that focuses on understanding customer needs and concerns, and putting the customer at the centre of the business's philosophy, operations and ideas in real and online environments. ICT is moving from the back office to front of house and integrated into business strategy. ICT roles are now client facing and workers will need to collaborate with larger groups of people in different settings.

4. Strategic shaping and thinking

Strategic thinking involves the generation and application of unique business insights and opportunities intended to create a competitive advantage for a firm or business. Greater importance of ICT input into organisational strategy is reflected in rising prominence of roles such as Chief Information Officer and Chief Information Security Officer.

Proposed Schedule of Work

Our mandate as an Skills Services Organisation (SSO) to our Industry Reference Committee (IRC), as set by the Australian Industry Skills Committee (AISC), is to review all Units of Competency (UoCs) in the Information and Communications Technology Training Package within the four years from 2017-18 to 2020-21. The Proposed Schedule of Work presents projects that comprise the review of all these UoCs through to June 2021. The SSO and IRC drew on the above analysis of trends and skills to determine Training Package development priorities.

The Information and Communications Technology IRC endorsed eight 2016-17 projects to be submitted to the AISC. Table 1 outlines the status of each 2016-17 project. For the full list of UoCs under review for each of these projects, please see *the Information and Communications Technology 4-Year Work Plan – September 2016*.

Table 1: Status of 2016-17 Projects

Year	Status	Project code	Project name	Number of UoCs		
				Native	Imported	Total
2016-17	Project completed	1a	Review qualifications and UoCs related to NBN specific requirements	4	0	4
2016-17	Project completed	1b	Align UoCs related to telecommunications cabling with the ACMA's standards	2	0	2
2016-17	Project completed	1c	Reinstate element 5 of ICTNWK405 Build a Small Wireless Local Area Network	1	0	1
2016-17	Case for change submitted to and approved by AISC.	1d	Review, update and remove skill sets to reflect NBN skills demand	36	0	36
2016-17	Case for change submitted to and approved by AISC. Consultations near completion.	1e	Review of qualifications that may not be fit for purpose	178	5	183
2016-17	Case for change submitted to and approved by AISC. Consultations near completion.	1f	Review all Certificate I to IV qualifications relating to Telecommunications Technology	189	16	205
2016-17	Matter resolved in consultation with Department	3a	Government provided action on ZWV40305 Certificate IV in Humanitarian Services (Programming)	N/A	N/A	N/A
2016-17	Matter resolved in consultation with Department	3b	Government provided action on ZWV50305 Diploma of Humanitarian Services (Programming)	N/A	N/A	N/A

Note: as a small amount of UoCs necessarily fit in more than one project (approximately 240 UoCs or 30 per cent of the Training Package), the total of all project within a year may not sum to the year total, and the combination of years may not sum to the total for the Training Package.

Note 2: native UoCs include current native UoCs in old related Training Packages (ICT10, ICT02 and ICA05), therefore total native UoCs is slightly higher than just those in the ICT Training Package.

A summary of all projects in the Proposed Schedule of Work is shown in Table 2 (2017-18 onwards projects). The rationale for each project, as well as the principles used for prioritisation and scheduling are included with the full Proposed Schedule of Work in Section F.

Table 2: Summary of Proposed Schedule of Work 2017-18

Year	Project code	Project name	Number of UoCs		
			Native	Imported	Total
2017-18	1g	Review UoCs related to application development	146	10	156
2017-18	1h	Review UoCs related to computer systems and telecommunications networking	75	9	84
2017-18	1i	Review UoCs related to ICT security	24	6	30
2017-18	1j	Review UoCs related to strategic management and planning, project management and ICT business	76	23	99
2017-18	1r	Review need for virtual reality and augmented reality related training products	N/A	N/A	N/A
2017-18	1t	Review need for IoT related training products	N/A	N/A	N/A
Total UoCs planned to be reviewed in year 1			312	48	360
2018-19	1k	Review UoCs related to customer service	25	3	28
2018-19	1l	Review UoCs related to web development	46	2	48
Total UoCs planned to be reviewed in year 2			71	5	76
2019-20	1m	Review UoCs related to interactive media and game development	53	29	82
2019-20	1n	Review of remaining generalist ICT UoCs	31	0	31
2019-20	1p	Review imported first aid and Occupational Health and Safety (OH&S) UoCs	0	13	13
Total UoCs planned to be reviewed in year 3			100	42	142
2020-21	1q	Review of all UoCs updated in 2016-17 for currency	Unknown		
Total UoCs planned to be reviewed in year 4			N/A	N/A	N/A
Total UoCs planned to be reviewed in all years			680	95	775

Note: as a small amount of UoCs necessarily fit in more than one project (approximately 240 UoCs or 30 per cent of the Training Package), the total of all project within a year may not sum to the year total, and the combination of years may not sum to the total for the Training Package.

Note 2: native UoCs include current native UoCs in old related Training Packages (ICT10, ICT02 and ICA05), therefore total native UoCs is slightly higher than just those in the ICT Training Package.

Note 3: Project 1o (as defined in the 2016 Training Product Review Plan) has been actioned and removed from the proposed schedule of work.

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A. Administrative information

About PwC's Skills for Australia

PwC's Skills for Australia supports the Information and Communications Technology (ICT) Industry Reference Committee (IRC).

As a Skills Service Organisation (SSO), PwC's Skills for Australia is responsible for working with industry and our IRC to:

- Research what skills are needed in our industries and businesses, both now and in the future, to provide the right skills to match our job needs; helping us to stay at the forefront of global competitiveness and support continued economic prosperity.
- Identify and understand current and emerging trends in the global and domestic economy and how they impact on Australia's skills needs.
- Revise our vocational qualifications and training content to better match what people will learn with the skills needs of our industries and businesses, giving our population the best possible chance of developing work ready skills.

About the Industry Reference Committee

The Information and Communications Technology IRC membership was constituted in 2016. The 2017 Industry Skills Forecast and Proposed Schedule of Work has been reviewed and approved by this IRC as of April 2017. The AISC has endorsed a new IRC membership, which will commence in June 2017.

The Information and Communications Technology IRC includes **13** members (noting that new members for the IRC are currently being assessed by the Department):

Name	Organisation	Title	IRC role
Ros Eason	Communications Workers Union Australia	Senior Industrial Research Officer	IRC Chair
Jim Wyatt	Optimi Digital	Principal	IRC Deputy Chair
Melanie Brenton	Industry Skills Advisory Council NT	Industry Engagement Officer	IRC Member
Emma Broadbent	Cisco Networking Academy and Social Innovation Group ANZ and Pacific Islands	Regional Manager	IRC Member
Patrick Emery	Australian Communications Media Authority	Manager, Technical Regulation	IRC Member
Rob Fitzpatrick	Australian Information Industry Association	Chief Executive Officer	IRC Member
Stephen Harding	Lightmare Studios	Director	IRC Member
Jason Martin	National Broadband Network	Learning and Development Specialist	IRC Member
Allyn Radford	Australian Computer Society	Director, Education	IRC Member
Dominic Schipano	CITT	National Executive Officer	IRC Member
Colin Thompson	Telstra	Learning and OD Advisory Lead	IRC Member
Reggie Vega	EMC2 Education Services	Sales Manager	IRC Member
Alison Wall	National Broadband Network	Industry Capability Lead, Curriculum	IRC Member

B. Sector overview

The sector at a glance

The ICT sector is broad and encompasses a range of different businesses and sub-sectors including those that provide information technology (IT) products and services, retail IT, helpdesk, telecommunication services and other professional ICT services.

The ICT sector employs over 600,000 workers in Australia, down 7 per cent on last year. It comprises 5 per cent of total national employment, and is expected to grow strongly over the next five years.^{7 8}

The ICT sector as referred to in this report is broadly defined as the workforces served by the ICT Training Package. The Training Package is made up of a variety of qualifications that can be broadly grouped as follows:

- Information Technology has 25 qualifications from Certificate I to Graduate Certificate
- Telecommunications Technology has 15 qualifications from Certificate II to Graduate Diploma
- Digital media has 4 qualifications from Certificate IV to Diploma.

More detail of the ICT Training Package, including an overview of enrolment levels, is included after the sub-sector descriptions.

Sub-sector descriptions

To understand the wide variety of workers and employers in the ICT sector it is helpful to use sub-sectors. Figure 1 shows one way of organising the ICT sector into three primary sub-sectors, with a variety of qualifications serving each of these sub-sectors (see Appendix A for a more detailed mapping of individual qualification and occupational outcomes).

Although the sector can be viewed as representing these three areas, it is important to note that they are increasingly converging, particularly roles at higher skill levels. Businesses hiring for highly skilled ICT roles are increasingly looking for workers who are skilled in competencies across all three sub-sectors. Integration of these three sub-sectors is integral for the delivery of a more connected, digital infrastructure.

⁷ Based on mapping of qualifications to ANZSCO occupations. The respective 'Employment Level to November 2016' for these ANZSCO occupations was used for the calculations. The ICT employment growth projection is a weighted average of Department of Employment ANZSCO occupation projections covered by the Training Package. Department of Employment (2016) *2016 Occupational Projections Five Years to November 2020*.

⁸ ICT occupations (ANZSCO occupations that are mapped to qualifications in the ICT Training Package) employed approximately 484,000 workers or 4 per cent of total national employment as of November 2016. More detailed analysis of ANZSCO occupation list identified other ICT related occupations that are not mapped to any qualifications of the ICT Training Package (Appendix A).

Figure 1: Composition of the ICT sector

Sector	Information Communication and Technology			
Sub-sector	Information Technology		Telecommunications Technology	Digital Media
Qualification areas	Business Analysis	IT Strategy and Strategic Management	Rigging Installation	Digital Media and Interactive Games
	Computer Software and Systems Development	Programming	Network Building and Operations	
	Data Entry	Project Management	Network Planning and Design	
	Database Design and Development	System Analysis and Design	Telecommunications Engineering	
	IT Infrastructure/ Network	Testing	Telecommunications Network Engineering	
	IT Operations and Support	Web-based Technologies	Strategic Management	
	IT Security			

Information Technology

Information Technology covers all areas related to processing, manipulating, and managing information. Businesses in the sub-sector provide expertise in information technology through writing, modifying and testing software and providing user support for software, hardware and cloud technologies. In all, the sub-sector contains 49,165 businesses ranging from micro employers to large companies with \$47.1 billion total annual revenue in 2016-17, a \$2.1 billion increase from last year.⁹ It is important to note that this will not include IT occupations that are embedded in, and providing support to, non-IT organisations.

As a sub-sector, IT still includes a range of occupations and specialities. For example, even in the specific area of IT Security Consulting, there are currently 3,189 businesses with total annual revenue of \$3.7 billion,¹⁰ or in Smartphone App Development there are 658 businesses with total annual revenue of \$1.5 billion,¹¹ and in Web Design Services there are another 3,108 businesses with total annual revenue of \$1 billion.¹² Although there will be some large players, a lot of these businesses will be micro or small employers, with only a few staff.

Telecommunications Technology

Telecommunications technology includes cabling, wireless, switching, transmission, radio frequency, and optical communications, media and internet protocol networks. Telecommunication technology workers are likely to either work as contractors or be embedded in a large telecommunication company and therefore it is

⁹ IBISWorld (September 2016) *IBISWorld Industry Report M7000 Computer System Design Services in Australia*

¹⁰ IBISWorld (August 2016) *IBISWorld Industry Report OD4050 IT Security Consulting in Australia*

¹¹ IBISWorld (August 2016) *IBISWorld Industry Report OD5150 Smartphone App Developers in Australia*

¹² IBISWorld (August 2016) *IBISWorld Industry Report OD5166 Web Design Services in Australia*

hard to measure or accurately describe the workforce at an occupational level. Noting this, there are three major companies in the Australian telecommunications services industry, together making up just under 70 per cent of the industry of \$43.4 billion annual revenue, over 3 per cent increase from last year, and 51,000 workers.¹³

Digital media

The digital media sub-sector includes the design and production of multimedia and games for platforms including PC, console, online and mobile. Australian consumer spend on these games is expected to be \$3.2 billion in 2020, with considerable growth coming from mobile games in particular (average annual revenue growth of 9 per cent per year 2016 to 2020).¹⁴ New platforms for distribution of games are lowering barriers to entry to the sub-sector and making the path to market quicker, which is attracting new entrants at a high rate. A 2016 Senate inquiry into the future of the video game development industry made eight recommendations to support the sub-sector's future, including a refundable tax offset for games development.¹⁵

State by state overview

In developing ICT training, it is important to ensure that there is a direct linkage from a learner's training to their employment in the sector. One of the factors influencing the strength of these linkages is the geographical distribution of learners and their employers, with learners ideally located in the same region as their employers. Therefore, to understand the sector, it is important to consider a state and territory lens. Key differentiating factors between the states and territories include:

- **Economic drivers** shape the composition of any industry, including the ICT sector. Given this influence, it is unsurprising that the number of workers and learners differs on a state and territory basis, and may have a higher/lower representation comparative to the population. Given that ICT occupations are embedded in many organisation types across a range of industries, the drivers of each of these industries will have a clear effect on the ICT sector.
- **Nature of the sub-sector.** Some sub-sectors necessitate clustering in certain locations. For example, digital media, as a smaller and more agile sub-sector, may be more likely to cluster together.

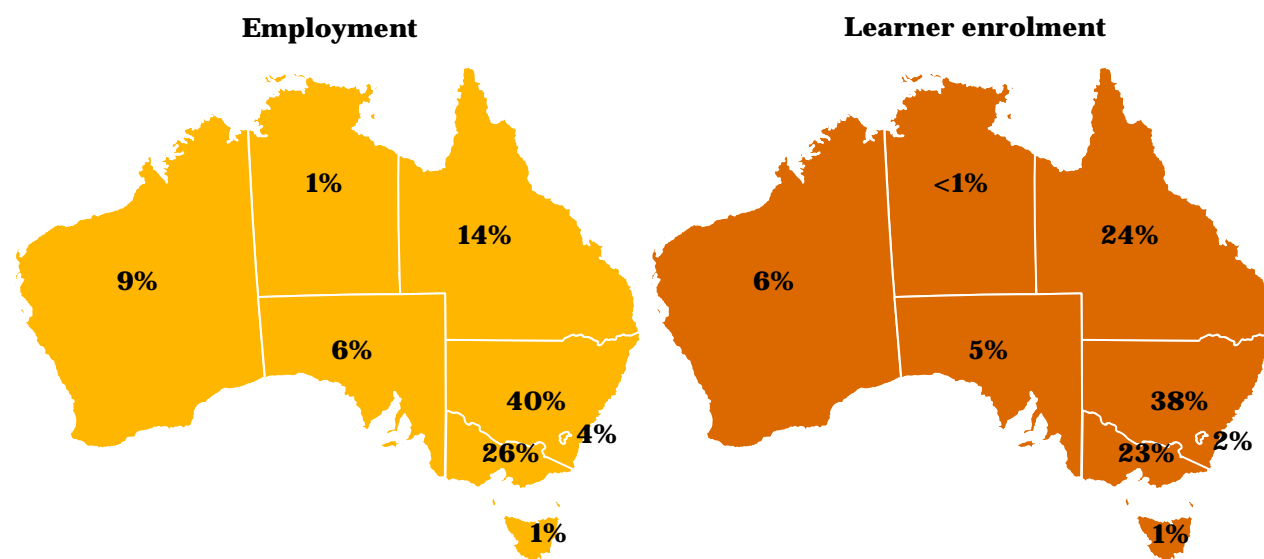
Figure 2 below shows the current geographical distribution of domestic learners currently enrolled in the ICT Training Package, alongside the distribution of employment in typical ICT occupations.

¹³ IBISWorld (October 2016) *IBISWorld Industry Report J5800 Telecommunications Services in Australia*

¹⁴ PwC (2016) *Australian Entertainment and Media Outlook 2016-2020*

¹⁵ Senate Environment and Communications References Committee (2016) *Game on: more than playing around, the future of Australia's video game development industry*. The inquiry received 111 public submissions, demonstrating the industry's engagement

Figure 2: Geographic spread of ICT workers and learners



Source: ABS 6291.0.55.003 - Labour Force, Australia, Detailed (by occupation) November 2016, NCVER (2016) Total VET Activity 2015
Note: Excludes all enrolments in Certificate I and II qualifications, as these qualifications are primarily used as VET in Schools training and do these do not lead as directly to occupational outcomes. The ICT sector has been defined by 18 individual occupations at the ANZSCO unit level (4 digit). This definition has been based upon taxonomy mapping and occupational outcomes of ICT qualifications.
Note 2: data presented at an indicative level and jurisdictions may not sum due to rounding.

Given that ICT occupations are essential to a broad range of industries and organisations, it is expected that employment and learners will be spread across the country in line with the general population. However, there are still notable differences between the states and territories, and key drivers of these differences, including the following:

- **New South Wales** has the largest proportion of employment in the sector at 40 per cent, up from 37 per cent in 2015 and significantly above the state's proportion of national employment in all industries (32 per cent).¹⁶ This indicates that the state is a hub for ICT employment, either because a sub-sector (potentially digital media) is concentrated there, or because the state is a hub for large organisations in other industries that may run their national ICT departments out of their headquarters in Sydney and surrounds. The State has a similar number of learner enrolments (38 per cent) to the proportion of sector employment.
- **Victoria** has the next highest level of sector employment at 26 per cent, down from 29 per cent and now equal to their proportion of national employment in all industries (26 per cent).¹⁷ However, Victoria has a lower proportion of learners (23 per cent). This could mean that learners move to Victoria after training from jurisdictions with potential oversupply of learners (such as Queensland), or it could indicate a potential gap in graduating learners joining the sector.
- **Queensland** has 14 per cent of ICT sector employment, below the 20 per cent of employment the state represents in all industries,¹⁸ likely due to the clustering in New South Wales and Victoria. However, the state has a noticeably higher proportion of learners (24 per cent), suggesting some potential oversupply of graduates or potential future growth of the state's sector.

¹⁶ ABS (Nov 2017) *Labour Force, Australia, Detailed, Quarterly Catalogue 6291.0.55.003*

¹⁷ ABS (Nov 2017) *Labour Force, Australia, Detailed, Quarterly Catalogue 6291.0.55.003*

¹⁸ ABS (Nov 2017) *Labour Force, Australia, Detailed, Quarterly Catalogue 6291.0.55.003*

- **Western Australia** has 6 per cent of sector learners and 9 per cent of sector employment which are both below the state's proportion of employment in all industries (11 per cent).¹⁹ This is likely due to the clustering of the sector in east coast states. However, the lower proportion of learners may suggest some potential undersupply of graduates.
- **South Australia** has 6 per cent of sector employment and 5 per cent of learners which is generally in line with their contribution to national employment for all industries.
- **Tasmania** has a small level of employment and learners in the sector, but this is broadly aligned with the population and proportion of national employment in all industries.
- **Northern Territory** has a small level of employment and learners in the sector, but this is broadly aligned with the population and proportion of national employment in all industries.
- **Australian Capital Territory** has 4 per cent of sector employment, which is notably higher than the 2 per cent of employment in all industries that the territory represents.²⁰ This is possibly due to the federal government being a large employer of ICT occupations, as well as a clustering of industries servicing the government sector in Canberra that will also employ ICT occupations. However, the ACT only represents 2 per cent of sector learners, suggesting a potential local undersupply of graduating learners.

ICT Training Package profile

There are 44 qualifications in the ICT Training Package (see Table 3). Of the 4.5 million learners enrolled in VET qualifications in 2015, **99,400 learners were enrolled in the ICT Training Package**, comprising 2.2 per cent of all learners.²¹ The number of total enrolments has not changed materially since 2014. Table 3 shows the number of enrolments in each qualification in the ICT Training Package Release 3.0. Please note that in 2015, a number of learners were enrolled in ICT qualifications which have since been superseded and are not included in Table 3 below.

Table 3: Scale of qualification involvement

Qualifications	Qualification code	Enrolments (2015)
Information Technology		
Certificate I in Information, Digital Media and Technology	ICT10115	3,439
Certificate II in Information, Digital Media and Technology	ICT20115	1,714
Certificate III in Information, Digital Media and Technology	ICT30115	1,049
Certificate IV in Information Technology	ICT40115	459
Certificate IV in Information Technology Support	ICT40215	99
Certificate IV in Web-Based Technologies	ICT40315	162
Certificate IV in Information Technology Networking	ICT40415	420
Certificate IV in Programming	ICT40515	110
Certificate IV in Information Technology Testing	ICT40615	N/A
Certificate IV in Systems Analysis and Design	ICT40715	N/A
Certificate IV in Computer Systems Technology	ICT41015	21
Diploma of Information Technology	ICT50115	896
Diploma of Information Technology Systems Administration	ICT50315	65
Diploma of Information Technology Networking	ICT50415	701

¹⁹ ABS (Nov 2017) *Labour Force, Australia, Detailed, Quarterly Catalogue 6291.0.55.003*

²⁰ ABS (Nov 2017) *Labour Force, Australia, Detailed, Quarterly Catalogue 6291.0.55.003*

²¹ National Centre for Vocational Education Statistics (2016) *Learners and courses 2015* This figure includes all enrolments across the ICT Training Package in 2015, this includes enrolments in qualifications which have since been superseded.

Diploma of Database Design and Development	ICT50515	96
Diploma of Website Development	ICT50615	513
Diploma of Software Development	ICT50715	157
Diploma of Systems Analysis and Design	ICT50815	101
Advanced Diploma of Information Technology	ICT60115	28
Advanced Diploma of Network Security	ICT60215	109
Advanced Diploma of Information Technology Business Analysis	ICT60315	125
Advanced Diploma of Information Technology Project Management	ICT60415	51
Advanced Diploma of Computer Systems Technology	ICT60515	19
Graduate Certificate in Information Technology and Strategic Management	ICT80115	N/A
Graduate Certificate in Information Technology Sustainability	ICT80215	N/A
Telecommunication Technology		
Certificate II in Telecommunications Network Build and Operate	ICT20215	N/A
Certificate II in Telecommunications Technology	ICT20315	N/A
Certificate III in Telecommunications Digital Reception Technology	ICT30215	N/A
Certificate III in Telecommunications Rigging Installation	ICT30315	N/A
Certificate III in Telecommunications Network Build and Operate	ICT30415	N/A
Certificate III in Telecommunications Technology	ICT30515	N/A
Certificate IV in Telecommunications Network Design	ICT41115	N/A
Certificate IV in Telecommunications Engineering Technology	ICT41215	N/A
Diploma of Telecommunications Engineering	ICT51015	N/A
Diploma of Telecommunications Planning and Design	ICT51115	N/A
Advanced Diploma of Telecommunications Network Engineering	ICT60615	N/A
Graduate Certificate in Telecommunications	ICT80315	15
Graduate Certificate in Telecommunications Network Engineering	ICT80615	N/A
Graduate Diploma of Telecommunications and Strategic Management	ICT80515	20
Graduate Diploma of Telecommunications Network Engineering	ICT80415	4
Digital Media		
Certificate IV in Digital Media Technologies	ICT40815	28
Certificate IV in Digital and Interactive Games	ICT40915	30
Diploma of Digital and Interactive Games	ICT50215	364
Diploma of Digital Media Technologies	ICT50915	122

Source: National Centre For Vocational Education Research (2016) *Total VET activity 2014-15, enrolments and completions*;

Note: enrolments in 2015 – this is the most up to date data as of April 2017. N/A indicates that no data was available on this qualification. In most cases data was not available because the qualification was introduced after Total VET activity reporting. The intent of Table 13 is to show, indicatively, the current enrolment profile across the ICT Training Package and therefore the table does not include all qualifications in use from superseded versions of the Training Package nor qualifications that were in the process of being superseded under transition arrangements.

Licencing, regulatory or industry standards issues

Work in the ICT sector, particularly relating to cabling, high risk work and assessment, is subject to licensing, regulations and registration requirements.

Cabling

The installation and maintenance of telecommunications cabling is the responsibility of either the network owner (e.g. NBN or Telstra) or the customer, depending on which side of the 'network boundary' the cabling is located. The network boundary point is typically the first phone socket within the customer premises. For example, in the case of NBN, the network boundary point will be located on the Network Termination Device (NTD) which is typically installed inside each customer premises. The installation and maintenance of customer premises cabling/wiring may only be undertaken by a registered cabling provider. The installation and maintenance of network cabling is the responsibility of the network provider/carrier, subject to occupational health and safety requirements and other Commonwealth, State or Territory legislation.

The Australian Communications and Media Authority (ACMA) is responsible for regulating and monitoring telecommunications customer cabling in Australia. All cabling work performed from the NTD on the customer premises side is subject to provisions set out in the ACMA's *Telecommunications Cabling Provider Rules 2014*

(CPRs). The CPRs require the installer to be registered, and the connection, installation or maintenance (repair) of customer cabling to comply with AS/CA S009 (the Wiring Rules).

Under the ACMA registration there are three types of registrations – Open, Restricted and Lift. To work in both commercial and domestic premises, a cabler will require Open registration. To work only in domestic premises, a cabler will require a Restricted registration. A cabler undertaking specialised cabling work (for example, broadband or structured cabling work) must hold the necessary competency/ies for that work. Table 4 provides a summary of ACMA registration types.

Table 4: ACMA registration types

Registration Type	Description
Open	<ul style="list-style-type: none"> This registration allows a cabler to undertake all types of cabling work from simple cabling in homes to complex structured cabling in commercial multi-storey buildings.
Restricted	<ul style="list-style-type: none"> This registration restricts a cabler to do work where the network boundary point is a simple socket or a NTD which is typically found in domestic homes and small businesses, not in large commercial buildings. Cablers may also undertake work in multi-storey and campus-style premises where cabling is performed behind a compliant device (for example, alarm panel or modem).
Lift	<ul style="list-style-type: none"> This registration type is for installing and maintaining communications cables in lifts and lift wells.

Source: Australian Communications and Media Authority (2014) *Pathways to ACMA Cabling Provider Rules – Cabling Registration*

Cabling work must comply with the industry standard *AS/CA S009:2013 Installation requirements for customer cabling* (wiring rules). The wiring rules detail the minimum requirements for cabling installations to ensure that network integrity and the health and safety of end-users, other cablers and carrier personnel is protected. Table 5 lists the UoCs in the ICT Training Package that are required for ACMA registrations.

Table 5: Licence and regulatory requirements

ACMA Registration	Required UoCs for registration
Restricted Registration	<ol style="list-style-type: none"> <ul style="list-style-type: none"> ICTCBL236 Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule <p>OR</p> <ol style="list-style-type: none"> <ul style="list-style-type: none"> ICTCBL201 Install customer cable support systems, and ICTCBL202 Place and secure customer cable, and ICTCBL203 Terminate metallic conductor customer cable, and ICTCMP201 Organise and monitor cabling to ensure compliance with regulatory and industry standards

Open Registration	<ol style="list-style-type: none"> 1. <ul style="list-style-type: none"> • ICTCBL236 Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule, and • ICTCBL237 Install, maintain and modify customer premises communications cabling: ACMA Open Rule OR 2. <ul style="list-style-type: none"> • ICTCBL201 Install customer cable support systems, and • ICTCBL202 Place and secure customer cable, and • ICTCBL203 Terminate metallic conductor customer cable, and • ICTCBL204 Install functional and protective telecommunications earthing system, and • ICTCBL206 Alter services to existing cable system, and • ICTCMP201 Organise and monitor cabling to ensure compliance with regulatory and industry standards
Lift Registration	<ul style="list-style-type: none"> • ICTCBL238 Install, maintain and modify customer premises communications cabling: ACMA Lift Rule
The following UoCs align with regulatory requirements for specialised cabling work: ²²	
Structured Cabling	<ul style="list-style-type: none"> • ICTCBL301 Install, terminate and certify structured cabling installation
Optical Fibre	<ul style="list-style-type: none"> • ICTCBL302 Install and terminate optical fibre cable on customer premises
Coaxial Cable	<ul style="list-style-type: none"> • ICTCBL303 Install and terminate coaxial cable
Aerial	<ul style="list-style-type: none"> • ICTCBL205 Joint metallic conductor cable on customer premises, and • ICTCBL309 Construct aerial cable supports, and • ICTCBL310 Install aerial cable
Underground	<ul style="list-style-type: none"> • ICTCBL205 Joint metallic conductor cable on customer premises, and • ICTCBL307 Install underground enclosures and conduit, and • ICTCBL308 Install underground cable

High Risk Work

The ICT Training Package includes UoCs associated with high risk work. These units may be either specified in a qualification or selected as elective units under the packaging rules. High risk work may include scaffolding work, rigging and dogging work, crane and hoist operation and forklift operation.

Under section 6 of the *Australian Workplace Safety Standards Act 2005*, the Australian Safety and Compensation Council has produced the *National Standard for Licensing Persons Performing High Risk Work*. These standards specify the requirements and restrictions for:

- the training and assessment for a person performing high risk work
- the arrangement for issuing a licence to a person performing high risk work.

Therefore, training in relation to high risk work should refer to these national standards while also ensuring that training follows appropriate work health and safety legislation and regulations. Age restrictions are applied to high risk work, so some UoCs with these restrictions may not be appropriate for learners enrolled in senior secondary Certificates of Education. Table 6 lists the UoCs (includes imported UoCs from other Training

²² Competencies are specialised competency requirements under the Cabling Provider Rules (CPRs) that allow cablers to undertake specialised cabling work such as structured, coax or fibre cabling.

Packages) that fall into the definition of high risk work and therefore must be delivered and assessed accordance with the national standard.

Table 6: UoCs in the ICT Training Package listed in legislation related to high risk work

Training Package		UoCs
Imported UoCs	Construction, Plumbing and Services Training Package	<ul style="list-style-type: none"> • CPPCCM2007B Use explosive power tools • CPCCDES3014A Remove non-friable asbestos • CPCCLDG3001A Licence to perform dogging • CPCCLRG3001A Licence to perform rigging basic level • CPCCLRG3002A Licence to perform rigging intermediate level • CPCCLRG4001A Licence to perform rigging advanced level • CPCCOHS1001A Work safely in the construction industry • CPCCOHS2001A Apply OHS requirements, policies and procedures in the construction industry
	Resources and Infrastructure Industry Training Package	<ul style="list-style-type: none"> • RIIWHS204D Work safely at heights • RIIHAN301D Operate elevating work platform
	Transport and Logistics Training Package	<ul style="list-style-type: none"> • TLID2010A Operate a forklift • TLID3035A Operate a boom type elevating work platform
Native UoCs	Information and Communications Technology Training Package	<ul style="list-style-type: none"> • ICTWHS201 Provide telecommunications services safely on roofs • ICTWHS203 Work safely near power infrastructure • ICTBWN304 Work safely with live fibre to test and commission a fibre to the x installation • ICTTCR201 Use rigging practices and systems on telecommunications network structures • ICTTCR202 Use operational safety in a telecommunications rigging environment • ICTTCR203 Use safe rigging practices to climb and perform rescues on telecommunications network structures

Licence or regulatory requirements for assessors

Assessors for some of the UoCs of the ICT Training Package must meet industry specific statutory, licensing and other requirements as stated in Table 7, in addition to the mandatory VET assessor requirements.

Table 7: Assessor requirements

ACMA Registration	License/Registration	Recommendation
Restricted Registration	<ul style="list-style-type: none"> • ICTCBL236 Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule • ICTWHS204 Follow work health and safety and environmental policy and procedures • ICTCBL201 Install customer cable support systems • ICTCBL202 Place and secure customer cable • ICTCBL203 Terminate metallic conductor customer cable • ICTCMP201 Organise and monitor cabling to ensure compliance with regulatory and industry standards • ICTWHS204 Follow work health and safety and environmental policy and procedures 	Restricted Registered Cabler TITAB ²³ registered assessor
Open Registration	<ul style="list-style-type: none"> • ICTCBL236 Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule • ICTCBL237 Install, maintain and modify customer premises communications cabling: ACMA Open Rule • ICTWHS204 Follow work health and safety and environmental policy and procedures • ICTCBL201 Install customer cable support systems • ICTCBL202 Place and secure customer cable • ICTCBL203 Terminate metallic conductor customer cable • ICTCBL204 Install functional and protective telecommunications earthing system • ICTCBL206 Alter services to existing cable system • ICTCMP201 Organise and monitor cabling to ensure compliance with regulatory and industry standards • ICTWHS204 Follow work health and safety and environmental policy and procedures 	Open Registered Cabler TITAB registered assessor
Lift Registration	<ul style="list-style-type: none"> • ICTCBL238 Install, maintain and modify customer premises communications cabling: ACMA Lift Rule 	Lift Registered Cabler TITAB registered assessor

²³ TITAB Australia Cabler Registry Services is a not-for-profit, ACMA accredited cabler registry service for the telecommunication industry. TITAB provide cablers and businesses with direct access to qualified training providers and assessors. Information about TITAB Australia is available at <<http://www.titab.com.au>>.

The following UoCs align with regulatory requirements for specialised cabling work: ²⁴		
Structured Cabling	<ul style="list-style-type: none"> ICTCBL301 Install, terminate and certify structured cabling installation 	Open Registered Cabler TITAB registered assessor
Optical Fibre	<ul style="list-style-type: none"> ICTCBL302 Install and terminate optical fibre cable on customer premises 	Open Registered Cabler TITAB registered assessor
Coaxial Cable	<ul style="list-style-type: none"> ICTCBL303 Install and terminate coaxial cable 	Open Registered Cabler TITAB registered assessor
Aerial	<ul style="list-style-type: none"> ICTCBL205 Joint metallic conductor cable on customer premises ICTCBL309 Construct aerial cable supports ICTCBL310 Install aerial cable 	Open Registered Cabler TITAB registered assessor
Underground	<ul style="list-style-type: none"> ICTCBL205 Joint metallic conductor cable on customer premises ICTCBL307 Install underground enclosures and conduit ICTCBL308 Install underground cable 	Open Registered Cabler TITAB registered assessor

²⁴ Competencies are specialised competency requirements under the Cabling Provider Rules (CPRs) that allow cablers to undertake specialised cabling work such as structured, coax or fibre cabling.

Challenges and opportunities

The views of businesses, learners and other key stakeholders in the ICT sector are critical to understanding the skills needs in the workforce. The approach to training product review taken in this Industry Skills Forecast and Proposed Schedule of Work is centred on this feedback and their views of the challenges and opportunities in their sector and sub-sectors. Table 8 identifies some of the key stakeholders relevant to the sector.

Table 8: Stakeholders in the ICT sector

Stakeholder groups	Key stakeholders
Training Product Development	<ul style="list-style-type: none"> Australian Industry and Skills Committee (AISC) Information Communications and Technology IRC Other IRCs TITAB Australia
Government	<ul style="list-style-type: none"> Australian Skills Quality Authority (ASQA) Federal, State and Territory Departments National Centre for Vocational Education Research (NCVER) National Broadband Network (NBN) Innovation Australia Australian Communications and Media Authority (ACMA) Australian Safety and Compensation Council
Employee representatives	<ul style="list-style-type: none"> Communications Workers Union Australia Unions Australian Computer Society (ACS)
Employer representatives	<ul style="list-style-type: none"> Australian Information Industry Association (AIIA) Australian Digital and Telecommunications Industry Association Business Council of Australia Australian Chamber of Commerce and Industry Australian Industry Group Other industry groups
Registered training organisations (RTOs)	<ul style="list-style-type: none"> Technical and Further Education institutions (TAFEs) Private and community RTOs Secondary schools that also have RTO status Universities that operate as dual sector institutions
Workers	<ul style="list-style-type: none"> ICT Managers ICT Professionals ICT Support Technicians Telecommunications workers Administrative and Clerical Workers Organisation directors in the sector
Learners	<ul style="list-style-type: none"> Domestic learners International learners

These initial views are drawn from research and interviews by the SSO and IRC, and a range of reports that represent the views of learners and industry participants.

In addition to face-to-face consultation and research, PwC's Skills for Australia has conducted a number of surveys. In 2016, we created our Industry Voice Survey to facilitate broader consultation and engagement with employers across a variety of industries. There were 193 complete responses to the survey, which was open from the 19th of May to the 30th of June 2016. We received 79 responses from employers in the ICT sector. Since then, we have reached out to stakeholders through a number of targeted surveys, asking for input and advice on specific training product development projects. In total, we have had 197 respondents to these surveys. These surveys have formed a valuable part of our consultation process, supplementing face-to-face consultations, interviews and open forums, and allowing us to reach a broader audience. See Appendix D for more information. Please note the interviews are important in allowing us to target stakeholders that may be underrepresented in open forums or survey responses, thus providing a balanced view of trends needs in the sector.

Please also note that the initial view presented below will continue to be verified and expanded through wide consultation with industry, employers and learners in our development of cases for change and other ongoing work.

Employer challenges and opportunities

Drawing from existing employer surveys, such as the NCVER *Survey of Employers' Use and View of the VET system 2015*, and initial consultation with employers in the industry, there are four key messages:

- **Employers are less likely to use the VET system and are using unaccredited training**
- **Instead of requiring qualifications, employers are only looking for registrations and competencies to meet regulatory requirements**
- **Employers are filling most vacancies, with experience being one of the most important employment criteria**
- **Poor employee proficiency is affecting the sector**

Due to current data availability and definitions, employer view analysis is currently heavily focussed on the telecommunications sub-sector. In ongoing consultation and data collections, this will be expanded to be more comprehensive of the whole ICT sector.

Employers are less likely to use the VET system and are using unaccredited training

Due to the amount of regulation in the sector, training (particularly to achieve competencies and licences) is required to get someone sufficiently skilled to operate effectively and comply with regulation within the sector. However, employers are not using VET to provide that training, even where there are no perceived gaps in VET qualifications. Information, media and telecommunications industry employers surveyed in 2015 showed lower reliance on VET and higher reliance on other types of training, particularly informal training but also unaccredited training, compared to all industries average.²⁵

In other industries, a preference towards unaccredited training indicates that there is no comparable nationally recognised training. Only 12.6 per cent of employers who use unaccredited training report that nationally recognised training is available. However, this is not the case in the ICT sector, with 27 per cent of industry employers (which is increasing over time) who used unaccredited training reporting that this was in spite of comparable nationally recognised training.²⁶ This could indicate that employers prefer unaccredited training such as vendor certifications (for example CISCO certification).

One of the reasons for people doing vendor certification is to make sure the warranty of the product [they are servicing] is satisfied by a certified technician.

PwC Skills for Australia interview with ICT employer

²⁵ National Centre for Vocational Education Research (2015) *Survey of Employers' Use and View of the VET system 2015*. For example, **54** per cent of sector employers used unaccredited training compared to an all industry average of 49 per cent, **86** per cent of sector employers used informal training compared to an all industry average of 78 per cent and **35** per cent of sector employers had a VET qualification as a job requirement compared to an all industry average of 36.6 per cent

²⁶ National Centre for Vocational Education Research (2015) *Survey of Employers' Use and View of the VET system 2015*

Instead of requiring qualifications, most employers are only looking for registrations and competencies to meet regulatory requirements

The focus of training seems to be on the requirement to attain registrations and competencies to meet regulatory requirements. In a 2015 survey of employers who had recently advertised positions for telecommunications trade workers, most employers were seeking experienced ACMA registered cablers with relevant registrations and competencies but relatively few were specifically seeking workers who were trade qualified (at, for example, a Certificate III level).

Over 90 per cent of sector employers prefer smaller training programs or skill sets over full qualifications, compared to 55 per cent across all industries and only 10 per cent of sector employers use nationally recognised training for full qualifications.²⁷ It is likely that many employers are only accessing nationally recognised training so that their employees are able to meet government legislative and regulatory requirements.

It is recognised that a number of employers use full qualifications for traineeships and apprentices, however the proportion of employers doing so appears to be a relatively small. In 2015, only 11 per cent of employers in the sector reported that they have apprentices or trainees, compared to 24 per cent across all industries covered by VET.²⁸

Employers are filling most vacancies, with experience being one of the most important employment criteria

Employers in the sector are finding it easier to fill positions than they have historically.

- Of employers who had advertised positions for telecommunication trade workers in 2016, 71 per cent had successfully filled that position (up from 50 per cent in 2011). They received 24.4 applications on average per vacancy (up from 6.6 in 2011) and had 3.3 suitable applicants per vacancy (up from 1.2 in 2011).²⁹
- The time taken to fill an ICT role increased from around 20 days in 2012³⁰ to 50 days in 2015. This is a reflection on the value employers are putting on experience of employees, with 56 per cent of employers looking for more than 4 years experience.³¹

This has not always been the case. In a 2009 survey of employers, some respondents indicated problems finding people with telecommunications training or qualifications and that there was a struggle to get enough learners into training.³² In most cases there are now sufficient applicants for telecommunications vacancies with employers advertising vacancies in a broad range of businesses in the telecommunications, civil construction and building installation sectors for occupations of telecommunications technicians, telecommunications cable joiners and data and telecommunications cablers. However, it is recognised in particular areas there are difficulties in recruiting highly specialist workers and workers with appropriate levels of experience. For example consultations suggest that some delivery partners of the NBN are having difficulty recruiting highly experienced workers.³³ It should also be noted that future construction and the resulting operation and maintenance of the NBN network will require a growing number of workers in the coming years.

The main reason for a telecommunications trade worker candidate not being found suitable was inadequate experience, followed by lack of relevant registrations or competencies, both of which were prioritised over

²⁷ National Centre for Vocational Education Research (2015) *Survey of Employers' Use and View of the VET system 2015*

²⁸ National Centre for Vocational Education Research (2015) *Survey of Employers' Use and View of the VET system 2015*

²⁹ Department of Employment (2016) *Labour Market Research – Electrotechnology and Telecommunications Trades*

³⁰ Information Technology Contract and Recruitment Association (2013) *Trends Report and SkillsMatch Dashboard Snapshot: Indicators and statistics for recruitment, ICT recruitment and ICT industry*

³¹ Information Technology Contract and Recruitment Association (2015) *Australia's ICT Recruitment Sector Employment Market Update Q2, 2015*

³² Innovation & Business Skills Australia (2009) *Applied Research Project: Telecommunications Industry – the impact of the NBN on VET and future skills requirements*

³³ Department of Employment (2015) *Occupational skill shortage report: Telecommunications Trade Workers*

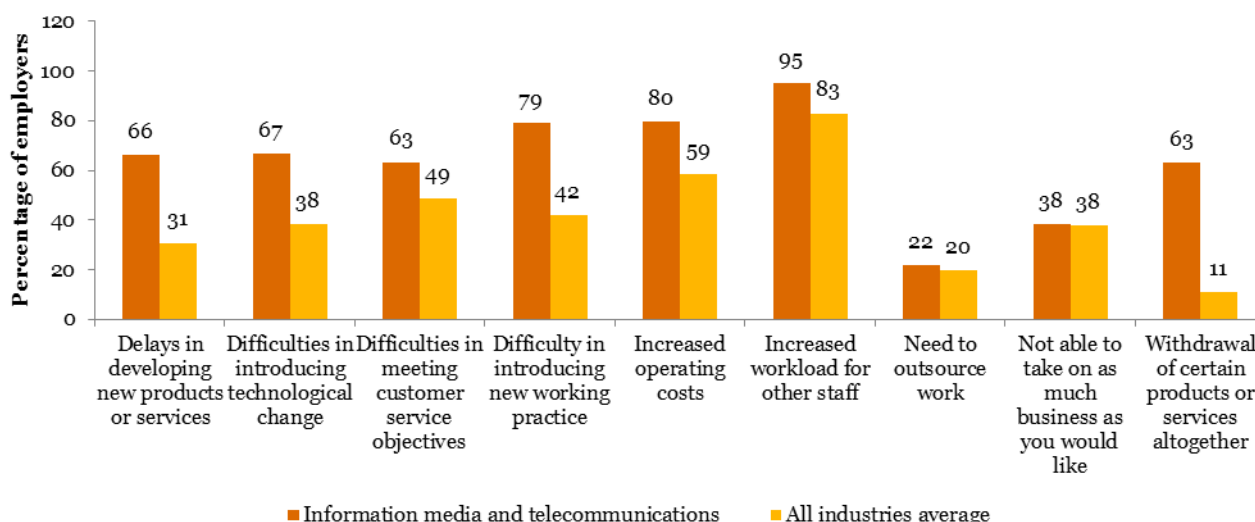
qualifications. A number of employers stated that they would only hire candidates who fully met their registration and endorsement requirements, which for some was due to the expense of training, especially for regional employers who may need to cover accommodation and training costs.³⁴

For employers of ICT occupations, inadequate experience was also the main reason for considering candidates to be unsuitable, with other common reasons being lack of security clearance or poor communication skills. Only employers who were specifically seeking qualified applications would not consider applications without formal qualifications. Overall, proven experience was deemed to be more important than formal qualifications.³⁵

Poor employee proficiency is affecting the sector

Employee proficiency as reported by information, media and telecommunications employers is higher than the average across all industries (72.8 per cent of employers reporting all employees are proficient compared to 66.2 per cent all industry average). However, this was a reduction from 78 per cent in 2013, in a time where the average proficiency across all industries is rising.³⁶ Employers (over 80 per cent) are also reporting that poor employee proficiency in ICT has a greater impact on their organisations performance that in other sectors. These are shown below in Figure 3.

Figure 3: Impacts of poor employee proficiency, information media and telecommunications compared to all industry average



Source: National Centre for Vocational Education Research (2015) *Survey of Employers' Use and View of the VET system 2015*

³⁴ Department of Employment (2015) *Occupational skill shortage report: Telecommunications Trade Workers*

³⁵ Department of Employment (2014) *Information and Communications Technology Labour Market Indicators report*

³⁶ National Centre for Vocational Education Research (2015) *Survey of Employers' Use and View of the VET system 2015*

What do employers need?

<p>Strong signals to recognise completion of specific subjects</p>	<ul style="list-style-type: none"> • The strongest needs from employers are relevant experience and competencies for regulatory requirements. • Currently employers are not using full VET qualifications and of those employers that are still using nationally recognised training, the vast majority (over 90 per cent) rely on specific UoCs or skill sets rather than full qualifications. • If these regulatory requirements are what employers need, a clear market signal such as appropriate use of skill sets that are formally recognised on statements of attainment, could allow graduates to highlight skills to employers more effectively.
<p>Training tailored to specific needs</p>	<ul style="list-style-type: none"> • Employers in the sector are not relying on VET qualifications and they are reporting that they use unaccredited training, even when there is comparable nationally recognised training. This unaccredited training is likely to be vendor-certified training courses that are generally preferred by many ICT employers. • Given the prevalence of vendor specific training demand, an investigation of how VET qualifications are aligning to industry needs could be required and whether there may be merit in mapping the vendor specific training to ICT Training Package content, where that does not already occur.

Learner challenges and opportunities

To give learners the best possible opportunity to get fulfilling jobs, and to help our country to succeed, it is important to understand the outcomes learners receive from training. It is first useful to understand a basic profile of learners and graduates in the ICT Training Package. A typical learner in the ICT Training Package is:

- **Younger than average.** The most represented age group in current enrolments across all subsectors is 19 and under. 46.5 per cent of the ICT learners are 19, a 3.5 per cent decrease from last year, and under compared to 28 per cent across all training packages.³⁷
- **Predominantly male.** Male learners account for 74 per cent enrollees in the ICT Training Package, compared to 52 per cent across all training packages.³⁸ This trend is consistent with the statistics regarding women in the ICT workforce. Workplace Gender Equality Agency's November 2016 Report *Australia's Gender Equality Scorecard* shows that female percentage of the workforce across all industries is 49.7 per cent, an increase from 48.5 per cent last year. In the Information Media and Telecommunications and the Professional, Scientific and Technical Services sectors, the female participation levels are below the national level at 39 and 39.4 per cent respectively.³⁹
- **Learning part-time.** The majority of learners (73 per cent) enrolled in the ICT Training Package are part-time.⁴⁰ This may suggest that a large portion of VET learners could be people who are already in the workforce that are seeking to upskill or reskill in technology related areas.
- **More likely to identify themselves as having a disability.** 8.5 per cent of the ICT learners have identified themselves as having a disability, compared to 5.4 per cent across all Training Packages.⁴¹

³⁷ National Centre for Vocational Education Research (2016) *Learners and courses 2015*

³⁸ National Centre for Vocational Education Research (2016) *Learners and courses 2015*

³⁹ Australian Government Workforce Gender Equality Agency (2016) *Australia's Gender Equality Scorecard – Key Findings from the Workplace Gender Equality Agency's 2015-16 reporting data*

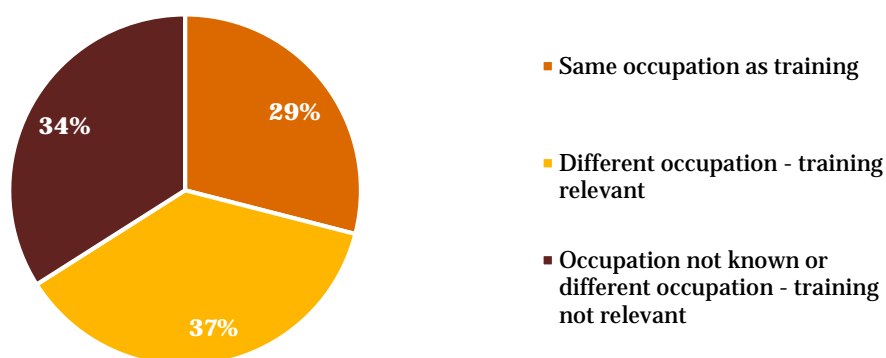
⁴⁰ National Centre for Vocational Education Research (2016) *Learners and courses 2015*

⁴¹ National Centre for Vocational Education Research (2016) *Total VET activity 2015. Note: this is the first year that Total VET activity data has been collected rather than just government funded activity data.*

Drawing from the National Centre of Vocational Education and Research 2016 *Total VET activity* data, a typical graduate from the ICT Training Package is:⁴²

- **Less likely to be employed after training.** 50 per cent of total VET learners in the sector are employed within six months of completing their training, down 5 per cent from last year, noting that the 2015 data excluded non-government funded graduates, and significantly lower than the 78 per cent average across all VET graduates.⁴³
- **Less likely to be employed in the area they trained in.** 28.8 per cent of graduates reported they were working in the same occupation as they trained in, a slight increase on last year, but still lower when compared to 37.8 per cent for all VET graduates.⁴⁴ Figure 4 provides a more detailed representation of the occupational destinations of graduates six months after completing their training.
- **Earning a median annual income of about \$53,700.** Annual income six months after training for graduates employed full-time is \$53,700 compared to the \$56,000 for all VET sectors.⁴⁵
- **More likely to go on to further training.** A number of recent graduates from qualifications in the ICT Training Package will go on to undertake more training. Of graduates across all qualifications, 11 per cent will go on to take a Certificate III or IV, 9 per cent will go on to take a Diploma or Advanced Diploma, and 8 per cent will undertake a Bachelors degree or above..⁴⁶ This suggests that learners are taking a step by step approach to achieving qualifications.

Figure 4: Occupational destinations of graduates



Source: National Centre for Vocational Education Research (2016) *Total VET activity*

It is also important to understand which aspects of training are serving learners well and which aspects can be improved. Drawing from current student outcomes, there are two key messages:

- **Employment prospects are worse for ICT graduates than for average VET graduates**
- **Benefits gained from training are lower than average**

⁴² Note: in the 2016 4-Year Work Plan, the figures used in this section only included government funded graduates. Therefore, care should be taken when comparing these statistics to data for all VET learners.

⁴³ National Centre for Vocational Education Research (2016) *Total VET activity 2015*

⁴⁴ National Centre for Vocational Education Research (2016) *Total VET activity 2015*. Note: This figure may be affected by poor data mapping or by not considering ICT occupations in other businesses

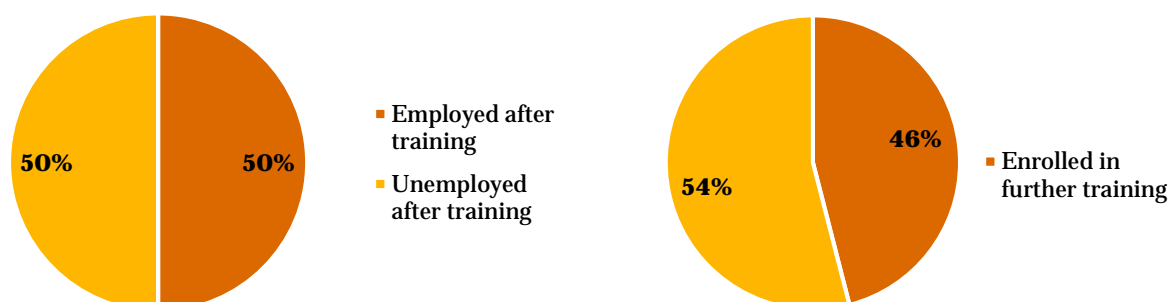
⁴⁵ National Centre for Vocational Education Research (2016) *Total VET activity 2015*

⁴⁶ National Centre for Vocational Education Research (2016) *Total VET activity 2015*

Employment prospects are worse for ICT graduates than for average VET graduates

ICT graduates are less likely to be employed than other VET graduates – 50 per cent, compared to 78 per cent across all VET graduates. Figure 5 show graduate destinations six months after training.

Figure 5: ICT graduate destinations six months after training



Source: National Centre for Vocational Education Research (2016) *Total VET activity*

ICT graduates who do get a job have below average salaries. The median salary for all VET graduates six months after training is \$56,000 but for ICT graduates it is \$53,700.⁴⁷

Benefits gained from training are lower than average

Table 9 shows graduate employment and achievement of key benefits from training.

Table 9: Graduate satisfaction and benefits achievement

	ICT graduates	All VET graduates
All graduates		
Employed after training	49.7%	77.6%
Achieved main reason for undertaking training	74.0%	83.2.2%
Graduates employed before training		
Employed after training	81.4%	90.0%
Achieved main reason for undertaking training	79.5%	86.4%
Graduates who were not employed before training		
Employed after training	25.9%	45.3%
Achieved main reason for undertaking training	70.7%	75.2%

Source: National Centre for Vocational Education Research (2016) *Total VET activity*

The results show that:

- ICT graduates are less satisfied with training than other VET graduates.
- Training does not appear to strongly improve employment outcomes, with post training employment appearing to be reliant on pre training employment.

⁴⁷ National Centre for Vocational Education Research (2016) *Total VET activity*

What does this mean for the ICT workforce?

Skills need	<ul style="list-style-type: none">• There needs to be more focus in tailoring the qualifications to employer needs in the occupation they are training for. This is illustrated by the low amount of graduates able to obtain employment.• Practical experience and skills are of vital importance to the ICT workforce.
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C. Employment

The purpose of this section is to provide a broad overview of the magnitude and growth of employment in the ICT sector, and to discuss the factors which are likely to influence the supply of ICT graduates to fill positions in the sector. It provides an understanding of scale of the sector and ICT occupations. This is used to provide context for more targeted analysis of the specific trends influencing the sector, which flow through to skills priorities and training needs (discussed in later sections).

The Department of Education and Training provided these employment statistics and forecasts for the 2016 4-Year Work Plan. The Department has since advised that updated statistics will be provided to SSOs as part of the detailed Industry Skills Forecast and Proposed Schedule of Work refresh in 2018. PwC's Skills for Australia is working with the Department and IRC to build on this section, working to better reflect employment conditions specific to ICT graduates, thus showing a deeper understanding of the current labour market.

Please also note that the employment data was provided for occupations mapped to qualifications in both ICT and ICT10 Training Packages. However, as the ICT10 has been largely superseded and contains no current qualifications, and this analysis is forward looking, only occupation data mapped to the ICT Training Package version 3.0 is discussed in this section. As with any empirical analysis of employment, there are limitations in the representativeness of employment data. As such, the limitation of any data are presented in addition to the analysis.

Industry employment outlook

Employment projections at an industry level are confined to specific industry definitions (as defined in ANZSIC).⁴⁸ But employment of ICT workers discussed in this report are not confined to a single industry, rather workers can be embedded within organisations across industries. However, employment levels and projections in the 'Information Media and Telecommunications' industry division provided by the Federal Department of Education and Training can provide an indicative view of the level and growth in employment in the ICT sector.

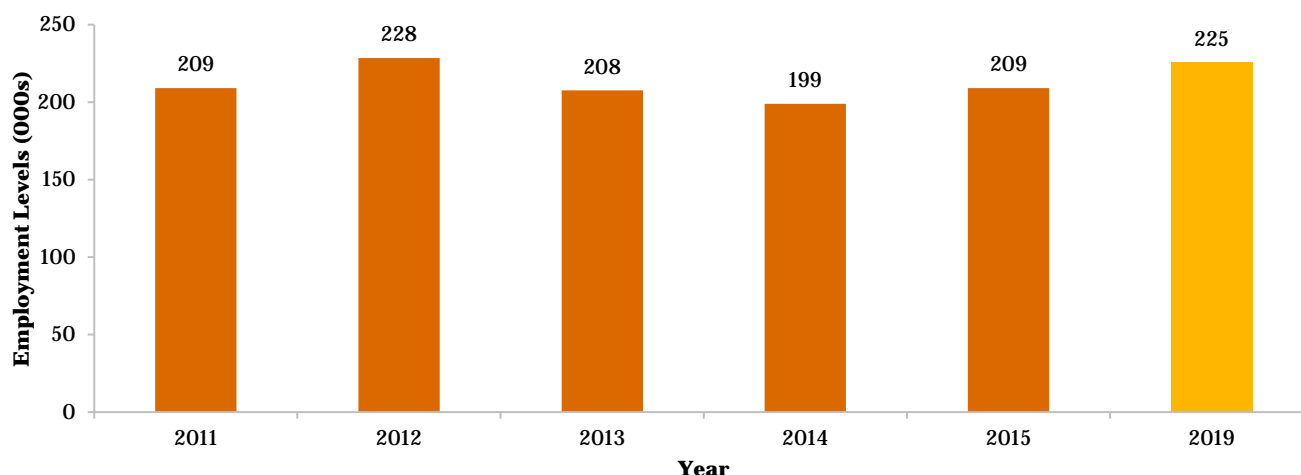
Figure 6 shows both historical and forecast employment of the 'Information Media and Telecommunications' industry division. However before interpreting this data, it is important to recognise the limitations in the scope of this industry definition, namely:

- The 'Information Media and Telecommunications' industry division is quite diverse and includes some industries where ICT workers are highly concentrated such as 'Telecommunications Services' and 'Internet service providers, Web Search Portals and Data Processing Services' industries. But, this industry division also included industries where relatively few ICT workers are likely to operate for example: 'Motion Picture and Sound Recording Activities' or 'Publishing'. As such, the employment levels and growth shown in Figure 6 should be treated as only broadly indicative of the sector.
- The industry division is unlikely to capture all parts of the ICT sector. Services such as computer programming, and computer systems design are captured in other industry divisions (e.g. Professional, Scientific and Technical Services).

Recognising the limitations of the historical employment levels and projections provided to us by the Federal Department of Education and Training, employment in the broader 'Information Media and Telecommunications' industry division is expected to grow by approximately 1.9 per cent per annum over four years to 2019.

⁴⁸ Australian Bureau of Statistics (2006) *Australian and New Zealand Standard Industrial Classification Cat. No. 1292.0*

Figure 6: Employment levels - Information, Media and Telecommunications



Source: Department of Education and Training provided graphics, based on data from the Federal Department of Employment Labour Market Information Portal.

Note: Figures are displayed at the ANZSIC Division level J. The graph includes current and historical employment levels, as well as a projected employment level to 2019

The key driver of this forecast is likely to include the increasing importance of digital technology in the work and personal lives of Australians. The increasing penetration of digital technologies is likely to increase the need for ICT workers. ICT workers will be required to implement, use, maintain and connect an increasing number of digital devices, products and services (see Section D).

Occupational employment outlook

The employment landscape can also be analysed at the occupation level (classified by the ABS under ANZSCO).⁴⁹ Viewing the ICT sector as a set of related occupations serviced by the ICT Training Package is more consistent with both the view of employers and the definitions of the sector used in this report. However, in doing so, analysis of employment is complicated by the need to refer to a large number of occupations, which may be quite different in nature. In order to simplify discussion, analysis in this subsection is focused on the largest five occupations in the ICT sector, as provided by the Federal Department of Education and Training.

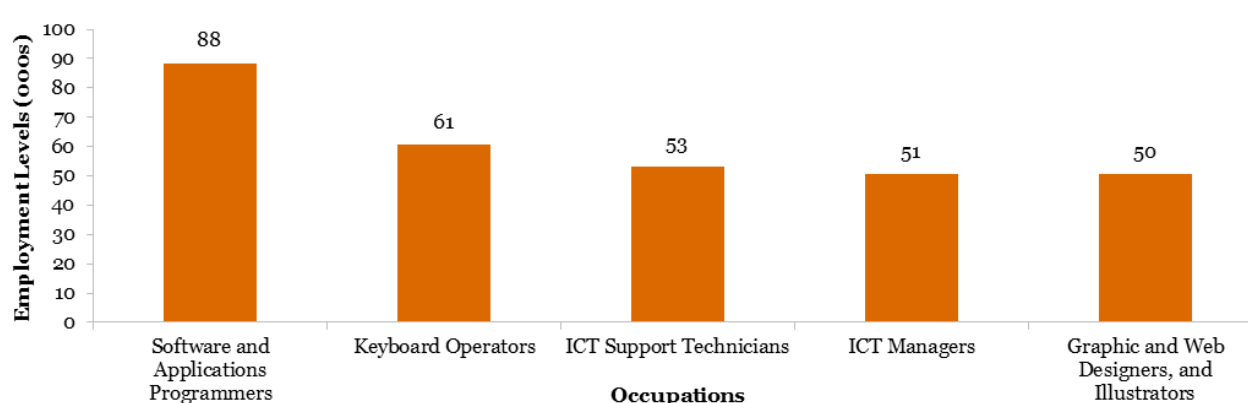
The occupations which make up the ICT sector currently collectively employ around 3.6 per cent of all workers in Australia.⁵⁰ Although the five ICT related occupations shown in Figure 7 below do not show a complete view of this employment (with telecommunications occupations not shown), it does show an indicative view of the scale of employment in the sector at key occupational levels.⁵¹ Please note that although 'Keyboard Operators' are included in Figure 8, workers in these occupations may not require specialist ICT training and that occupation is only mapped to qualifications at Certificate I and II levels which are often to learners undertaking senior secondary Certificates of Education.

⁴⁹ Australian Bureau of Statistics (2006) *Australian and New Zealand Standard Classification of Occupations Cat. No. 1220.0*

⁵⁰ Australian Bureau of Statistics (2016) *Labour Force, Australia, Detailed, Quarterly, May 2016* Cat No. 6291.0.55.003

⁵¹ Australian Bureau of Statistics (2016) *Labour Force, Australia, Detailed, Quarterly, May 2016* Cat No. 6291.0.55.003 NB. Employment in the ICT sector has been defined by 18 individual occupations at the ANZSCO unit level (4 digit). This definition has been based upon ANZSCO qualification classifications, taxonomy mapping and occupational outcomes of BSB qualifications (given at 6 digit level). This figure includes all of the top 5 occupations listed in Figure 7, with the exception of 'Keyboard Operators', in addition to other occupations identified as being serviced by the ICT Training Package.

Figure 7: Employment levels – top 5 key occupations by size (annual average 2010-15)



Source: Department of Education and Training provided graphics, using historical employment growth from the Australian Bureau of Statistics (ABS) and projected employment growth from the Federal Department of Employment.

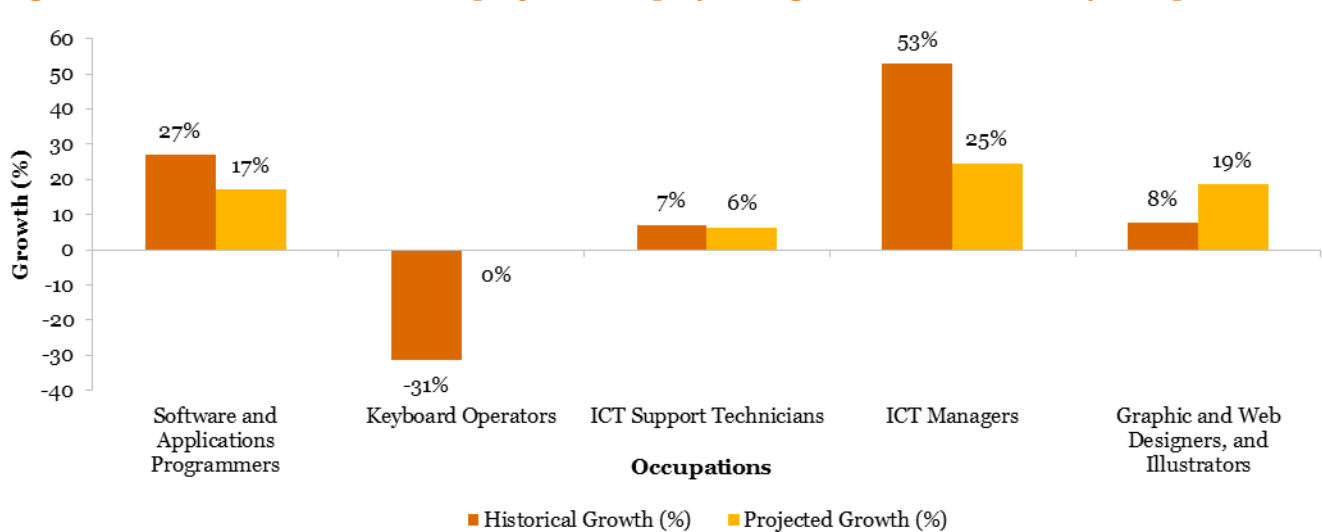
Note: Occupations are at the four digit ANZSCO code. The historical employment is the five year growth rate to 2015 and the projected employment growth rate is the expected growth rate to 2019. Rates are based on figures that include all employed in the occupation across the economy, not just the relevant industry.

To inform discussion of the future employment in the ICT sector, current employment levels need to be read alongside projected employment growth. Figure 8 below shows this projected employment growth for the same five major occupations in ICT.

However, before interpreting the provided employment data and projections in Figure 8, it is important to understand some of the limitations, namely:

- Occupation level employment is inherently difficult to project forward. Employment is heavily dependent upon the growth of industries which employ ICT workers. However, because ICT workers are employed in a range of Australian businesses, growth of ICT occupations is dependent upon a variety of industry specific and macroeconomic factors, which cannot easily be forecast.
- Future employment will also depend on the level of technological change taking place in that occupation. However, such technological change and its influence on employment is difficult to predict. Improvements to cloud computing services for example may reduce the need for locally based ICT support technicians (see Section D).

Figure 8: Historical (2010-15) and projected employment growth (2015-19) – key occupations



Source: Department of Education and Training provided graphics, based on data from the Federal Department of Employment Labour Market Information Portal and historical employment growth from the Australian Bureau of Statistics (ABS)

Note: Occupations are at the four digit ANZSCO code. The historical employment is the five year growth rate to 2015 and the projected employment growth rate is the expected growth rate to 2019. Rates are based on figures that include all employed in the occupation across the economy, not just the relevant industry

Using the employment growth projections provided to us (as shown in Figure 8) applied to the current employment levels in Figure 7, the weighted average growth in these five occupations has historically been 2.4 per cent per annum and forecast is forecast to be 3.1 per cent per annum over the next five years. This figure does not appear unreasonable in aggregate, however this growth rate may not be reflective of particular occupations or segments of the ICT sector.

Supply side challenges and opportunities

An important consideration in determining the magnitude and growth of employment in the ICT sector is the supply of graduates trained for work in the sector. Although employment is projected to grow, a full understanding of the future industry direction should also consider how employment demand will be met. This requires an understanding of the factors which are likely to influence the decisions of learners to enrol in ICT training and the supply of workers with training in ICT.

Table 10 lists some of the factors which may influence the decision of workers to undertake ICT training and enter a role within the sector. These listed influences many not be applicable to every occupation but rather are only applicable to the average of ICT occupations. However, it is noted that not all occupation and education decisions are made on a rational basis and it can be inherently difficult for an individual to weigh up these long term factors. Emotion and perception are likely to play a large part in the career decisions of workers, rather than explicit analysis of the factors listed in Table 10.⁵² Further, it is noted that the decisions of RTOs to offer training may also influence the supply of graduates trained for work in the sector.

Table 10: Supply side influences – challenges and opportunities

Supply side influence	Details
Reputation	<p>ICT occupations tend to be viewed by society as relatively favourable, with a weighted average 'socioeconomic index' of approximately 74, where the average occupation score is approximately 50 and scores range from 0 (low status) to 100 (high status).⁵³</p> <p>The good reputation of the sector presents an opportunity to encourage participation in the ICT workforce.</p>
Wages	<p>ICT VET graduates tend to receive similar starting wages to VET learners in generally, with significant opportunity for wage growth.</p> <ul style="list-style-type: none"> ICT VET graduates receive a median annual salary of \$53,700, 6 months after graduation, compared to an average of \$56,000 for all VET graduates.⁵⁴ ICT occupations also offer significant opportunities in terms of wage growth with workers in ICT occupations offering a weighted average salary of approximately \$96,000 in 2014.⁵⁵ <p>Favourable wages presents an opportunity to encourage participation in the ICT workforce.</p>
Working conditions	<p>IT occupations have generally good working conditions, offering employment opportunities with a diverse range of employers. Given that IT occupations are embedded in many businesses, workers are not limited to employment with a particular employer or industry. However, this may be less so in telecommunications roles with more manual labour and employment available with a smaller number of more specialised employers.</p>

⁵² Jim Bright, Robert Pryor, Sharon Wilkenfeld, & Joanna Earl (2005) - *The Role of Social Context and Serendipitous Events in Career Decision Making*- International Journal for Educational and Vocational Guidance Vol 5 (1): 19-36

⁵³ Julie McMillan, Adrian Beavis, & Frank L. Jones, (2009) *The AUSEI06: A new socioeconomic index for Australia* Journal of Sociology. Vol 45(2): 123-149

⁵⁴ National Centre for Vocational Education Research (2016) *Total VET activity*

⁵⁵ Australian Bureau of Statistics (2014) *Employee Earnings and Hours, Australia, May 2014* Cat. No. 6306.0. (weighted by employment level)

	Good working conditions presents an opportunity to encourage participation in the ICT workforce.
Lateral movement	<p>IT skills are generally able to be applied to many different industries. Given a core set of skills, IT workers are able to move between industries and related occupations, updating peripheral skills as needed. However, lateral movements are more restrictive in telecommunications roles, compared with IT roles as employment is concentrated in a small number of employers and is more reliant on contractors.</p> <p>Flexibility and lateral movement represents an opportunity to attract workers, provided they are able to upskill as required.</p>
Funding	<p>Funding of VET is a complex and constantly changing area. Programs to assist learners undertake training exist at both a state and federal level. For example, the federally funded VET-FEE HELP program provides loans to pay tuition fees for some VET qualifications. State and Territory governments also have various programs in place to assist learners undertake training. These programs vary by jurisdiction, qualification, provider and background of the learner undertaking training.</p> <p>Some examples of state and territory based funding programs which identify ICT qualifications on 'priority skills lists' (enabling access to additional government subsidies or concessions) include:</p> <ul style="list-style-type: none"> • New South Wales – 19 ICT qualifications are listed on the 'Jobs of tomorrow scholarships eligible qualifications list'.⁵⁶ Additionally, the 'NSW Skills List V5.0' lists 28 ICT qualifications.⁵⁷ • Victoria – A significant number (over 70) of ICT qualifications are listed on the 'Funded Course Report', although a large proportion are superseded versions of qualifications.⁵⁸ • Queensland – 16 ICT qualifications are listed under the 'Queensland Training Subsidies List', although some are superseded versions of qualifications.⁵⁹ Additionally, this list also includes five ICT skill sets. • Western Australia – Six ICT qualifications are listed under Future Skills WA 'Priority industry qualifications list'.⁶⁰ • South Australia – The South Australian 'Subsidised Training List' currently lists available places in 17 ICT qualifications (including some superseded).⁶¹ Subsidies available for ICT qualifications may change following the release of the South Australian Skills and Training Commission's Industry Priority Qualifications report in March 2016. This report found 10 ICT qualifications should be ranked in priority tiers 1 and 2 for the SA economy (ranking was out of five tiers). • Tasmania – Currently, 21 ICT qualifications are listed in the Skills Tasmania 'User Choice – Tasmanian Apprenticeships and Traineeships Listing'.⁶²

⁵⁶ NSW Government (2016) *Smart and Skilled Jobs of Tomorrow Scholarships Eligible qualifications* <https://smartandskilled.nsw.gov.au/documents/45617011/63890955/jobs_of_tomorrow_qualifications_list.pdf> Accessed 26/07/16

⁵⁷ NSW Government (2016) *Smart and Skilled: 2016 NSW Skill List – V5.0* <http://www.training.nsw.gov.au/forms_documents/smartandskilled/skills_list/2016_skills_list.pdf> Accessed 26/07/16

⁵⁸ Victorian Government (2016) *Skills Victoria Training System – Funded Course Report* <<http://www.education.vic.gov.au/svts/>> Accessed 26/07/16

⁵⁹ Queensland Government (2016) *Queensland Training Subsidies List (2015-16 Annual VET Investment Plan)* <<http://www.skillsgateway.training.qld.gov.au/content/user/subsidy/SUBSIDIES-LIST.pdf>> Accessed 26/07/16

⁶⁰ Western Australian Government (2016) *Future Skills WA – Priority Industry Qualification List* <<http://www.futureskillswa.wa.gov.au/trainingcourses/Documents/Priority%20industry%20qualifications%20list.pdf>> Accessed 26/07/16

⁶¹ South Australian Government (2016) *Work Ready Subsidised Training List 2.0* <http://www.skills.sa.gov.au/dmx?Command=Core_Download&EntryId=2779> Accessed 26/07/16

⁶² Tasmanian Government (2016) *Skills Tasmania Tasmanian Apprenticeships and Traineeships Listing* <<http://laureldw.statelibrary.tas.gov.au/default.aspx>> Accessed 26/07/16

	<ul style="list-style-type: none">• Northern Territory – Currently the Northern Territory Apprenticeship table lists 4 funded ICT qualifications. Qualifications linked to ICT are also listed on the NT Occupation priority list.⁶³• Australian Capital Territory – Currently, there are a 12 ICT qualifications listed on the 'ACT Skills Need List'.⁶⁴ <p>The availability of subsidies represents an opportunity to build a skilled ICT workforce.</p>
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As shown in Table 10 above, the supply side influences are generally positive in ICT occupations (though potentially more so for the IT sub-sector than telecommunications). Although occupational choice and education decisions tend not to be made on a rational basis which can make it difficult to determine the future supply of graduates trained for work in the sector, this does imply that there are less likely to be supply challenges in meeting the employment projections presented.

However, having the right number of people entering the labour market for certain occupations is different to those people having the right, future fit, skills. The following section analyses the trends affecting these potential workers and how training can ensure this supply of workers is skilled correctly to meet future demand.

⁶³ Northern Territory Government (2015) *Direct consultation with the Northern Territory Department of Business – Training NT*

⁶⁴ Australian Capital Territory Government (2016) *ACT Skills Need List* <<https://www.skills.act.gov.au/?q=act-skills-needs-list>> Accessed 26/07/16

D. Skills outlook

Understanding the global and domestic forces driving change in the Australian job market is crucial to workforce planning, and therefore a critical step in mapping the skills that should be prioritised in the ICT sector.

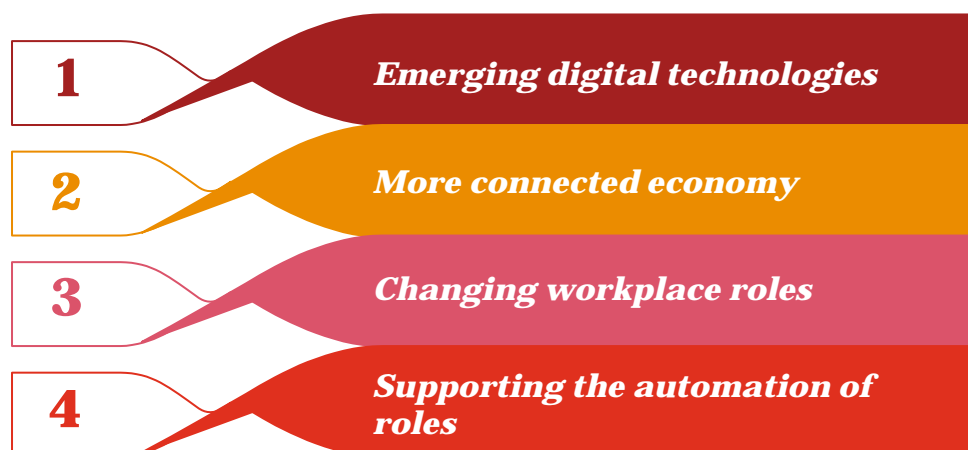
Global and domestic environment

The past two decades has seen the rise of Asian economies, such as China and India, and sluggish growth in developed countries as they struggle to recover from the aftermath of the global financial crisis. Australia has capitalised on emerging market growth to date, and has been largely sheltered from the decline in developed countries, with much of Australia's mining boom attributable to an increasingly urbanised China's demand for natural resources. As a result, Australia have enjoyed nearly 24 years of solid economic growth at an average annual growth rate of 3.3 per cent (far above the G7 average of 1.6 per cent over the same period).⁶⁵

Australia now faces challenges in maintaining this level of growth. Our economy is in transition from a period of resource driven growth to services based growth. In 2015, real living standards actually declined and unless Australia have a flexible skilled labour force ready to adapt to changes in the labour market, the transition of the economy will continue to drag on our standard of living.⁶⁶

Trends shaping the sector

This section outlines **four key trends** shaping the ICT workforce over the medium to long term.



Over the past year, a number of additional forces have also shaped the sector particularly emerging technologies such as blockchain, the IoT, and augmented or virtual reality. Underpinning these trends is a general movement towards the creation of an increasingly digitised economy, with an industry ecosystem supported by with end-to-end digitisation, often termed the creation of "Industry 4.0".⁶⁷ PwC's Skills for Australia intends to consult with industry, workers, and other stakeholders to understand the implications of these trends for the 2018 Industry Skills Forecast and Proposed Schedule of Work refresh.

⁶⁵ Australian Bureau of Statistics (2015) *National Accounts: National Income, Expenditure and Product, cat. No. 5206.0 September 2015*, OECD Economic Outlook: Statistics and Projections, *Real GDP forecast, Annual growth rate 1992-2015*.

⁶⁶ Australian Bureau of Statistics (2015) *National Accounts: National Income, Expenditure and Product, cat. No. 5206.0 September 2015*, GDP per capita (seasonally adjusted, chain volume measures) decreased by 0.2 per cent in the June 2015 quarter

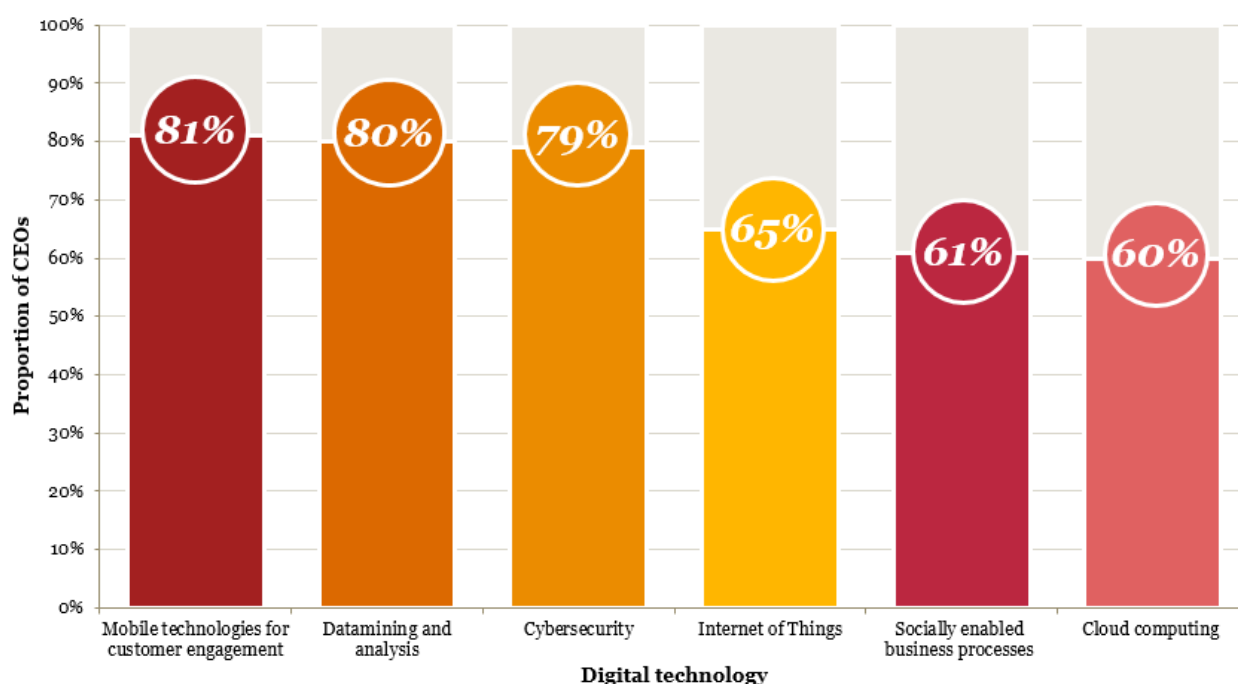
⁶⁷ PwC (2017), *Industry 4.0: An opportunity to shine for Canadian manufacturers*

1. Emerging digital technologies

ICT workers who create, maintain and implement this digital technology play a vital role in supporting the growth and productivity of businesses and the Australian economy more broadly. The rapid pace of digital change means that ICT workers must often update their skills to align with emerging technology. An example of this rapid change has been smartphones. This technology has only become widespread in the last 5 to 10 years and now is seen as vitally important to business strategy by 81 per cent of CEOs.⁶⁸ Moreover, as technology progresses and continues to be adopted across within numerous industries, there will be more interdependencies between ICT and other Training Packages.

Figure 9 displays the emerging digital technologies considered strategically important by CEOs.

Figure 9: Emerging digital technologies important to CEOs



Source: PwC (2015) *Global CEO Survey*

Among a wide range of new technologies and developments in the ICT sector, several key growth areas are emerging:

- **Data analytics.** Rapid technological change is creating exponentially increasing amounts of data. In 2016 it was estimated that an additional 2.5 quintillion bytes of data is created every year and 90 per cent of the data currently in existence was created in the last two years.⁶⁹ Businesses are placing growing emphasis on the capture, storage and utilisation of this data. New roles are being created in this field, for example, data warehouse management and maintenance.
- **Cyber security.** Exponential growth in the amount of data being created and stored, including confidential data, raises significant concerns about privacy and security.⁷⁰ The media regularly reports on new cases of leaked data and hacked computer systems.⁷¹ This is only likely to continue and grow as society becomes more connected and more data is stored electronically. This is likely to result in increased needs for ICT security specialists.

⁶⁸ PwC (2015) *Global CEO Survey*

⁶⁹ IBM Research (2016) *How big is big data?*

⁷⁰ CSIRO (2016) *Tomorrow's digitally enabled workforce*

⁷¹ Australian Cyber Security Centre (2015) *Australian Cyber Security Centre 2015 Threat Report*

- **Internet of Things (IoT).** A ‘thing’ in the IoT can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tyre pressure is low or any other nature or man-made object that can be assigned an Internet Protocol (IP) address. IoT is providing the ability to transfer data over a network without human-to-human or human-to-computer interaction. IoT will lead to digitalisation of the world, which makes it more controllable. IoT is likely to have an application in, or be used by, every vertical segment in the economy. The impact will vary, but overall it will create opportunities to optimise the physical world in such a way that has never been previously possible. Cisco estimates that 50 billion ‘things’ will be connected to the internet by 2020.⁷²
- **Cloud computing.** Cloud computing is changing the way computing services are delivered. Rather than delivering computing services locally within businesses, services are increasingly being delivered using a shared pool of resources from a remote location.⁷³ Implementing these services within businesses is likely to require ICT managers with experience in managing organisational change (in this case the process of moving employees’ work to the cloud) and also workers with experiencing maintaining and operating data-centres where the ‘cloud’ is based.⁷⁴
- **Application development.** Digital technology is becoming an inherent part of our economy. Rapid increases in device connectivity, data storage and processing speed has meant that computer systems are becoming a part of a large number of processes which did not previously involve computers.⁷⁵ In 2017, there are over 5 million mobile apps across Google Play and the Apple App Store alone.⁷⁶ This could result in increased demand for ICT workers experienced in application development.
- **Automation.** Increasingly, digital technology is able to automate process oriented tasks and some roles within organisations.⁷⁷ To automate these tasks, especially those non-standard tasks which may be specialised to an individual business, ICT workers will be needed to implement and maintain this automation technology.
- **Blockchain.** Blockchains are electronic public ledgers of transactions which can be distributed across a peer-to-peer network, encrypted to de-identify individuals and allow for the verification of transactions, removing the need for intermediaries. A 2016 PwC report stated that “...blockchain represents the next evolutionary jump in business process optimisation technology...blockchain will allow entire industries to optimise business processes further by sharing data between businesses that have different or competing economic objectives”.⁷⁸ Blockchain has the potential to disrupt business processes and industries, including ICT. As noted in a 2016 Accenture Outlook report, “So far, blockchain has gained the most traction in the financial services industry...But blockchain also has the potential to become a general-purpose technology - a breakthrough, like the steam engine, electricity or the Internet, that changes how society and the economy work”.⁷⁹
- **Augmented or virtual reality.** Augmented Reality (AR) is “augmentation” of the real world through the addition of information and images.⁸⁰ Virtual Reality (VR) is the simulation or re-creation of an image or environment, within a confined space, that users can interact with.⁸¹ Augmented and virtual reality were identified as two of the “Essential Eight technologies” that will be the most influential on businesses in the coming years. In 2016, augmented reality and virtual reality investment reached \$1.1 billion.⁸² In this emerging environment, there is the potential for these areas to overlap with the

⁷² Cisco Internet Business Solutions Group (2016) *The Internet of Things: How the Next Evolution of the Internet is Changing Everything*

⁷³ CSIRO (2016) *Tomorrow's digitally enabled workforce*

⁷⁴ IDC Information and Data (2012) *Climate Change: Cloud's Impact on IT Organizations and Staffing. White Paper*

⁷⁵ CSIRO (2016) *Tomorrow's digitally enabled workforce*

⁷⁶ Statista (2017) *Number of apps available in leading app stores as of March 2017*

⁷⁷ CSIRO (2016) *Tomorrow's digitally enabled workforce*

⁷⁸ PwC (2016) *Blurred lines: How FinTech is shaping Financial Services*

⁷⁹ Accenture (2016) *What every CEO should know about blockchain*

⁸⁰ PwC (2016) *Tech breakthroughs megatrend: how to prepare for its impact*

⁸¹ PwC (2016) *Tech breakthroughs megatrend: how to prepare for its impact*

⁸² PwC's Skills for Australia (2016) *Augmented Reality's Path to success*

Culture and Related Industries Training Package, thereby requiring links between the two industry skill areas.

Keeping up with the pace of current and emerging digital technology will require a skilled workforce, able to adapt to change and stay at the forefront of knowledge. Creating an ICT workforce with highly relevant skills in light of rapid digital change will likely require true lifelong learning, whereby ICT practitioners continually update their skills in emerging fields and refine their existing skills.

Emerging digital technologies have implications for skills needs in a number of sectors. For example, the Queensland Trucking Association provided advice that cloud computing and real-time data analytics are driving a number of new skills in warehouse and logistics management solutions, and improvements in business to business/consumer transactions (such as blockchain) are increasing demand for road freight, boosting overall demand for skilled workers. In addition to these opportunities, the QTA noted that ICT adoption in the industry is slow, in spite of its growing importance. Understanding these cross-sector skills implications is important in the development of training products and the facilitation of cross-sector learning. PwC's Skills for Australia has, and will continue to, engage with participants in a range of industries to understand cross-sector impacts and training product development implications.

What does this mean for the ICT workforce?

Job demand	<ul style="list-style-type: none">Increased demand for specialist ICT jobs in data analytics, cyber security, cloud computing, application development and automation.
Skills needs	<ul style="list-style-type: none">Digital and digital literacy skills relating to current and emerging technologies such as data analytics, cloud computing, Internet of Things, automation, application development and cyber security.Digital competence needs to be a priority in lifelong learning given the rapid pace of change in digital technologies.Adaptability to understand and embrace new technologies and ways of working in a digital era.Training will need to be adapted to meet both younger and older learners, new learners, more and less digitally capable learners, and re-skilling older learners.

2. More connected economy

More economic and social activity relies on online connectivity and Australian businesses are increasingly able to embrace this connectivity as a core part of their operations.⁸³ Access to high speed broadband is rapidly increasing. As of August 2016, the NBN was available to 3 million premises, with this number expected to increase to 5.4 million by 30 June 2017 and over 9 million by 30 June 2018.⁸⁴ This is also supported by improvements in other mobility technologies such as wireless moving to 5G and the proliferation of mobile devices. It is estimated that 74 per cent of Australians were using smartphones as of May 2014, with this projected to increase to 91 per cent by 2017.⁸⁵ This is changing the way Australians work and the way businesses offer their services, these technologies are allowing more Australians to work remotely and more services to be delivered remotely.

This includes:

- **Enhancing consumer experience.** Consumers are becoming more connected, consuming services and shopping online more than ever before. Online shopping in Australia is valued at over \$18 billion and has grown at 16.2 per cent per annum from 2012 to 2017.⁸⁶ Although consumers are spending an increasing amount online, this is not the full extent of the influence which digital change has had. Consumers are seeking to engage with businesses and brands online beyond a purely commercial relationship. For example, Shoes of Prey uses mass customisation and ICT infrastructure to provide an enhanced customer experience and a personalised shoe product.⁸⁷
- **Creating business impact beyond efficiencies.** Digital connectivity enables businesses to save time and money by boosting productivity, improving collaboration and promoting innovation. For example, cloud computing helps businesses grow without having in-house IT infrastructure and facilitates all types of information sharing, such as email services, application hosting, web-based phone systems and data storage. This will enable businesses to focus less on their own infrastructure and operating costs and more on areas of business intelligence, innovation and performance.
- **Creating inclusive communities.** Connected technology is increasingly enabling people with disabilities to perform tasks they could not otherwise do, to perform tasks more easily, and to perform them more safely and securely. It allows them to reach their potential at home, in their community and in the workplace. For example, the National Disability Insurance Agency's proposed strategy for the provision of Assistive Technology is using technological advancements and digital disruption to open up opportunities and create new roles for people with disabilities to enhance their economic and community participation.⁸⁸ This may be particularly relevant given that 8.5 per cent of ICT learners have identified themselves as having a disability.⁸⁹
- **Changing the geography of ICT services.** The connected economy may mean geographic disruption of ICT services, both fragmentation through start-ups and aggregation through outsourcing of support services. ICT workers will have to work across virtualised teams and networks which requires a greater emphasis on leadership and team work, as well as new ways of managing performance and motivating staff. In addition, careful consideration should be given to the impact working in virtualised teams has on occupational health and safety, cyber security and data confidentiality and the need for ICT workers to be skilled in managing these issues.

⁸³ Australian Communications and Media Authority (2016) *The connected citizen* < <http://www.acma.gov.au/theACMA/Library/researchacma/Occasional-papers/the-connected-citizen-occasional-paper> > accessed 22/8/16

⁸⁴ National Broadband Network (2016) *Corporate Plan 2017*, p.27

⁸⁵ Australian Communications and Media Authority (2016) *5G and mobile network developments— Emerging issues* < <http://www.acma.gov.au/theACMA/Library/researchacma/Occasional-papers/5g-and-mobile-network-developments-emerging-issues-occasional-paper> > accessed 22/8/16

⁸⁶ IBISWorld (November 2016) *IBISWorld Industry Report X0004 Online Shopping in Australia*

⁸⁷ Shoes of Prey is an Australian founded company that manufactures shoes designed by the customer online.

⁸⁸ National Disability Insurance Agency (2015) *Assistive Technology Strategy*. Assistive Technology is an umbrella term used by the National Disability and Insurance Agency to describe the large and diverse group of products, systems, services, devices and technologies used by people with a disability to support and enhance their economic and social participation

⁸⁹ National Centre for Vocational Education Research (2016) *Learners and courses 2015*

- **Facilitating start-ups.** The ICT industry has seen the proliferation of start-ups in recent years, with a high proportion of start-ups being technology businesses or start-up businesses that leverage new technologies. As written by PwC in 2013, “The Australian tech startup sector has the potential to contribute \$109 billion or 4% of GDP to the Australian economy and 540,000 jobs by 2033 with a concerted effort from entrepreneurs, educators, the government and corporate Australia”.⁹⁰ In this environment, more work needs to be done to understand the skills needs and potential role for vocational education in training this segment of the ICT industry.

As the demand for traditional in-house IT maintenance roles declines this creates opportunities for ICT workers to be involved in business innovation and commercialisation to promote digital products, services and technologies.

What does this mean for the ICT workforce?

Job demand	<ul style="list-style-type: none"> • Increased demand for new fields of ICT roles relating to cyber security, data management and data confidentiality. • Increased demand for ICT professionals to work in virtual teams. • Increased demand for ICT involvement in business development, commercialisation and innovation. • Increased jobs and roles for people with disabilities with the use of Assistive Technology.
Skills needs	<ul style="list-style-type: none"> • Digital and digital literacy skills relating to cyber security, data management and data confidentiality. • Virtual collaboration skills to work productively, drive customer engagement and innovation and demonstrate presence as a member of a virtual team. • Innovation, commercialisation and entrepreneurial skills to promote an individual's or enterprise's optimal likelihood of commercial success in digital products, services and technologies.

3. Changing workplace roles

The disruption caused by emerging technologies is resulting in significant changes in the employment landscape. This will impact the types of skills required in the ICT sector as well as how future jobs will be undertaken.

Examples of changing nature of workplace roles within the ICT sector include:

- **Greater input into organisational strategy.** Applications of these technologies will contribute significantly to organisational strategies and innovation and will form a substantial part of business process redesign and development. Greater importance of ICT input into organisational strategy is reflected in rising prominence of roles such as Chief Information Officer, Chief Information Security Officer and Chief Data Scientist, and new roles such as Director of Mobility.
- **Increased role in risk management.** ICT professionals such as a Chief Information Security Officer will play a significant role in integrating cyber resistance into enterprise-wide risk management and governance processes. The Chief Information Security Officer role will also have the responsibility to integrate cyber security implications into the broad set of enterprise governance functions such as confidential data management, vendor management, regulatory compliance and human resources.

⁹⁰ PwC (2013) *The startup economy: How to support tech startups and accelerate Australian innovation*

What does this mean for the ICT workforce?

Job demand	<ul style="list-style-type: none">• Increased demand for strategic and managerial roles.• Increased demand for ICT professionals who specialise in security, compliance and risk management.
Skills needs	<ul style="list-style-type: none">• Understanding of regulations and up to date knowledge regarding regulatory changes.• Understanding of principles of corporate governance and risk management.• Ethics and professional integrity as increased regulation heightens implications for businesses of worker non-compliance.• Communication, organisational understanding and teaming skills.• Strategic thinking.

4. Supporting the automation of roles

Computerisation and automation is predicted to impact the whole of the Australian economy. In the next ten years, it is anticipated that the impact of computerisation, robotics and automation will be felt in all aspects of human activity. PwC has estimated that 44 per cent (5.1 million) of Australian jobs are at high risk of being affected by computerisation and technology over the next 20 years.⁹¹ The capacity of machines to replicate aspects of human thought is set to reshape the future of work. These advances mean that activities previously considered outside the scope of programming are increasingly being undertaken by computers.

It is important to recognise that the purpose of automating various processes or job roles is to add incremental improvements and efficiencies for business. A strong management team along with talented and skilled workers are needed to develop, operate, maintain and manage the automation of these processes. This presents exciting opportunities for new roles and developments in the ICT sector. It provides opportunities for the ICT workforce to be part of industries where technology is being harnessed to create efficiencies and enhance existing processes. Examples include:

- **Mining.** Autonomous trucks in the Pilbara region created demand for core ICT skills for the design process and the subsequent operation of an autonomous fleet with remote supervision.

‘as we move forward with automation systems, we will need specialists in computing, systems and diagnosis, and upskilling of maintenance people to service and maintain the technology’⁹²

This suggests an increased focus for ICT services to support operations and supply chain management. As ICT becomes increasingly embedded in operations, priority will need to be given to retraining existing workers to understand and work with these new technologies and digital driven processes.

- **Manufacturing.** Automation is significantly impacting manufacturing speeds, volume and employment.
- **Engineering.** The application of robotics is impacting the engineering sector.

⁹¹ PwC (2015) *A Smart Move*

⁹² Committee of Economic Development of Australia (2015) *Australia's future workforce?*

- **Agriculture.** The application of robotics and automation has become increasingly important with AgriTech initiatives, where technological advancements are being used to assist sustainable agriculture and rural development. These developments provide a growing role for ICT workers, setting new expectations for what is possible and creating new performance standards and needs.

The move towards automation of many currently manual processes will require specialists in computing, systems and diagnosis, and skilled workers to service and maintain the technology. These future workers will need good operational and systems knowledge of automated processes and systems. This will enable them to troubleshoot, conduct investigations, generate meaningful corrective actions, manage continuous improvement, and contribute to operational procedures and training materials. To match the programming and analytical skills, there will be a need for industry experienced employees who can validate and interpret data to challenge both operational and system behaviours.

What does this mean for the ICT workforce?

Job demand	<ul style="list-style-type: none">• Increased demand for specialist ICT roles in the areas of computing, systems, diagnosis, service and maintenance.
Skills needs	<ul style="list-style-type: none">• Priority on reskilling existing workers in supporting ICT services, enabling them to understand and integrate with embedded digital technologies and processes.• Technical skills for operation, service and maintenance of automated systems.• Ability to understand and translate data to assist companies in manipulating their service environments and enhance their customer interactions.• Resilience to cope with automation of roles and changing workplace roles.

Creating a future fit workforce

Using the feedback gained from stakeholders and the data available, the IRC has identified five priority skills for the ICT Training Package (see Table 11). The fundamental skills offered by the ICT Training are important, and it is vital to ensure that these skills are up to date and future fit. Although it is recognised that these skills are cultivated to varying extents in the sector, but feedback received suggests they have ongoing critical importance.

Table 11: Priority skills in Information Communications and Technology

Skill	Definition	Rationale
1 Digital and digital literacy skills	High level technical and computational thinking skills and knowledge required to understand and work with current and emerging technologies such as data analytics, cyber security, Internet of Things, cloud computing, application development and automation.	<ul style="list-style-type: none"> Hiring and recruiting activity that occurred on LinkedIn in 2015 uncovered the hottest skills in 2015 and more than 90 per cent of these were digital related. Robert Cohen, a senior fellow at the Economic Strategy Institute states that as many as 25 million jobs will be created around Big Data in the next 15 years, but acknowledges that the process 'will require several stages of rebuilding to add more capabilities'.⁹³ The ability to translate vast amounts of data into abstract concepts and to understand data-based reasoning is important for future ICT roles. This will enable manipulation of service environments and enhancement of customer interactions. Incorporating more sophisticated computer simulations and scenario analysis into routine work will become core to a person's role and feature regularly in discourse and decision-making.⁹⁴ For example, HR departments that currently value applicants who are familiar with basic applications, such as the Microsoft Office suite, will shift their expectations, seeking out resumes that include statistical analysis and quantitative reasoning skills.⁹⁵ ICT workers need to be aware of the limitations of digital and digital literacy skills. For example, ICT workers must remain able to act in the absence of data and not become paralysed when lacking an algorithm for every system to guide decision making. They also need to understand that data models are only as good as the data inputs. Technical skills in operation, service and maintenance are required when working with automated systems and robots. The future workers of the ICT sector will need to become adept at reorganising the kind of thinking that these tasks require, and making adjustments to their work environments that enhance their ability to incorporate these new skills and knowledge to their roles.

⁹³ Fortune magazine (2016) *25 Million New Jobs Coming to America, Thanks to Technology*

⁹⁴ Institute for the Future for the University of Phoenix Research Institute (2011) *Future Work Skills 2020*

⁹⁵ Institute for the Future for the University of Phoenix Research Institute (2011) *Future Work Skills 2020*

2	Skills for working in virtual teams	Ability to work productively, drive engagement, and demonstrate presence as a member of a virtual team.	<ul style="list-style-type: none"> Connective technologies make it easier than ever to work, share ideas and be productive despite physical separation. Working across virtualised teams and networks would require new capacities in leadership and team management, as well as new ways of managing performance and motivating staff. As a member of a virtual team, ICT workers need to develop strategies for engaging and motivating a dispersed group. Examples of competencies include virtual presentation skills, communication skills, organising and running virtual meetings.
3	Customer (client) centric skills	A specific approach to doing business that focuses on understanding customer needs and concerns.	<ul style="list-style-type: none"> This approach is now adapted by many businesses, putting the customer at the centre of the business's philosophy, operations and ideas. Increasingly ICT workers are moving from the back office to client facing roles and will need to collaborate with larger groups of people in different settings. Competencies include strong communication skills, social and emotional intelligence. Tachi Yamada, President of the Gates Foundation's Global Health Program, talks about social and emotional intelligence in the <i>New York Times</i>, explaining what he looks for when he interviews job applicants: 'Intelligence is often more displayed in..... complex abstract thinking, and there is nothing more complex and abstract than human relationships. And if they can work their way through a human relationship problem intelligently, my guess is that they're very smart people'.⁹⁶ Socially and emotionally intelligent workers are able to quickly assess the emotions of those around them and adapt their words, tones and gestures accordingly.
4	Strategic shaping and thinking	When applied in an organisational strategic management process, strategic thinking involves the generation and application of unique business insights and opportunities intended to create a competitive advantage for a firm or business.	<ul style="list-style-type: none"> Greater importance of ICT input into organisational strategy is reflected in rising prominence of roles such as Chief Information Officer and Chief Information Security Officer. ICT workers would therefore need skills in organisational strategic management and be able to contribute effectively to the strategic direction of organisations. An additional key competency relating to this priority skill area would be risk management skills. ICT related risks contribute significantly to the enterprise-wide risk management and governance processes.

In addition to skill priorities identified in this section, the IRC is required to rank a supplied list of 12 generic workforce skills supplied by the Federal Department of Education and Training in order of importance to relevant employers. For the ICT sector, these skills have been ranked below in Table 12.

All skills listed in Table 12 are important. Low ranking does not imply that the skill is not important, but rather lower ranking only indicates that these skills are not critical priorities for the ICT sector. Further, Table 12 also only shows rankings of importance as an average across the whole sector, some skills may have higher or lower

⁹⁶ Adam Bryant, The interview with Tachi Yamada (2010) *Talk to Me. I'll Turn off My Phone*, New York Times, February 27, 2010

importance for particular organisations and particular sub-sectors within the ICT sector. Note that these skills are read in line with definitions provided to us by the Federal Department of Education and Training.

Table 12: Importance of generic workforce skills

Importance	Generic workforce skill
1	Technology
2	Science, technology, engineering and maths (STEM)
3	Design mindset / Thinking critically / System thinking / Solving problems
4	Learning agility / Information literacy / Intellectual autonomy and self-management
5	Communication / Virtual collaboration / Social intelligence
6	Language, literacy and numeracy (LLN)
7	Customer service / Marketing
8	Entrepreneurial
9	Data analysis
10	Managerial / Leadership
11	Financial
12	Environmental and sustainability

E. Other relevant skills-related insights for this sector

IRC consultation drew attention to the shortage of software engineers and developers in the ICT industry. Many employers are engaging 457 visa holders to address the skills gap in this area. Given recent changes to visa and skilled migration policies, it is particularly important that the training products relating to software engineering and development are accessible and meet the needs of the cohorts likely to be using them for employment outcomes.

F. Proposed Schedule of Work - 2017-18 to 2020-21

Our mandate as an SSO to our IRCs, as set by the AISC, is to review all UoCs in the ICT Training Package every four years. The Proposed Schedule of Work presents a four year rolling schedule for the review of these UoCs, to be revised and submitted to the AISC each year.

This section is structured into three parts:

- **Progress on 2016-17 projects**
- **Proposed Schedule of Work – 2017-18 to 2019-2021**
- **Rationale for projects in the Proposed Schedule of Work**

Progress on 2016-17 projects

The Information and Communications Technology IRC endorsed eight 2016-17 projects to be submitted to the AISC. Table 13 outlines the status of each 2016-17 project. For the full list of UoCs under review for each of these projects, please see *Information and Communications Technology 4-Year Work Plan – September 2016*.

Table 13: Status of 2016-17 projects

Year	Project type	Project code	Project name	Status
2016-17	Immediate action	1a	Review qualifications and UoCs related to NBN specific requirements	Project completed.
2016-17	Training product development	1b	Align UoCs related to telecommunications cabling with the ACMA's standards	Project completed.
2016-17	Training product development	1c	Reinstate element 5 of ICTNWK405 Build a Small Wireless Local Area Network	Project completed.
2016-17	Training product development	1d	Review, update and remove skill sets to reflect NBN skills demand	Case for change submitted to and approved by AISC.
2016-17	Training product development	1e	Review of qualifications that may not be fit for purpose	Case for change submitted to and approved by AISC. Consultations near completion.
2016-17	Training product development	1f	Review all Certificate I to IV qualifications relating to Telecommunications Technology	Case for change submitted to and approved by AISC. Consultations near completion.

2016-17	Government provided urgent action	3a	Government provided action on ZWV40305 Certificate IV in Humanitarian Services (Programming)	Matter resolved in consultation with Department.
2016-17	Government provided urgent action	3b	Government provided action on ZWV50305 Diploma of Humanitarian Services (Programming)	Matter resolved in consultation with Department.

Proposed Schedule of Work – 2017-18 to 2020-21

Table 14 presents the ICT IRC Proposed Schedule of Work through to June 2021. Specifically, it contains the activities endorsed by the IRC through to June 2020 in the previous Work Plan, and an action to review all 2016-17 projects for currency in 2020-21. Previously endorsed projects have been reviewed to ensure alignment with AISC and COAG Industry and Skills Ministers' priorities, following advice from the Department. Specifically, the Department asks that the review of UoCs is aligned to the qualifications that form part of the VET Student Loans Program, review of qualifications with low or no enrolments, reduction of duplication across the system, creation of cross-industry UoCs and great recognition of skill sets. Additionally, two new projects (1r and 1t) have been proposed based on IRC and industry engagement relating to the need for training products that facilitate skill development in the areas of augmented/virtual reality and the Internet of Things (IoT). Please note that project 1o (as defined in the 2016 Training Product Review Plan) has been completed and removed from the Proposed Schedule of Work.

Because projects have been defined on a UoC basis, only indicative qualifications have been included to show where a project has a focus aligned with a qualification. This does not mean that all the UoCs from that qualification are included in the project, nor that they are the only qualifications that contain the included units. However, the UoCs listed on each project are exact, and the qualifications (along with the rationales contained in Table 15) can be used to further understand the project. This means that not all qualifications are included in this table, but as all UoCs are reviewed in the period, the content of all qualifications in the Training Package will be reviewed.

Table 14: Proposed Schedule of Work

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
1g Review UoCs related to computer systems and telecommunications networking	2017-18	ICT	Information and Communications Training Package	ICT60515	Advanced Diploma of Computer Systems Technology	ICTCBL238	Install, maintain and modify customer premises communications cabling: ACMA Lift Rule
				ICT50415	Diploma of Information Technology Networking	ICTICT504	Confirm transition strategy for a new system
						ICTICT516	Test telecommunications network using virtual instruments
						ICTICT815	Manage automated ICT system applications using enterprise wide operating system
				ICT60615	Advanced Diploma of Telecommunications Network Engineering	ICTNPL401	Apply business acumen to network planning
						ICTNPL402	Plan the deployment of access network architectures
						ICTNPL403	Evaluate the capability of access networks
						ICTNPL404	Evaluate the planning requirements for provisioning a telecommunications building facility
				ICT80615	Graduate Certificate in Telecommunications Network Engineering	ICTNPL405	Develop provisioning of telecommunications building works project
						ICTNPL406	Evaluate core network architectures
						ICTNPL407	Plan the deployment of core network
						ICTNPL408	Produce planning specifications for end-to-end service delivery
						ICTNPL409	Apply knowledge of regulation and legislation for the telecommunications industry
						ICTNPL410	Plan the telecommunications access network for an estate
						ICTNPL411	Apply compliance requirements to telecommunications work
						ICTNPL501	Develop planning strategies for core network design
						ICTNPL502	Develop planning strategies for access network design
						ICTNPL503	Apply service measures and demand forecasting to products and

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
							services planning
						ICTNPL504	Develop planning strategies for building environment design
						ICTNPL601	Plan the development and growth of the telecommunications network
						ICTNPL602	Forecast service demand
						ICTNPL603	Undertake network performance analysis
						ICTNWK301	Provide network systems administration
						ICTNWK302	Determine and action network problems
						ICTNWK303	Configure and administer a network operating system
						ICTNWK304	Administer network peripherals
						ICTNWK305	Install and manage network protocols
						ICTNWK306	Evaluate characteristics of cloud computing solutions and services
						ICTNWK401	Install and manage a server
						ICTNWK402	Install and configure virtual machines for sustainable ICT
						ICTNWK404	Install, operate and troubleshoot a small enterprise branch network
						ICTNWK405	Build a small wireless local area network
						ICTNWK406	Install, configure and test network security
						ICTNWK407	Install and configure client-server applications and services
						ICTNWK408	Configure a desktop environment
						ICTNWK409	Create scripts for networking
						ICTNWK410	Install hardware to a network
						ICTNWK411	Deploy software to networked computers
						ICTNWK412	Create network documentation
						ICTNWK414	Create a common gateway interface script
						ICTNWK416	Build security into virtual private networks
						ICTNWK417	Build an enterprise wireless network
						ICTNWK418	Implement backbone technologies in a local area network
						ICTNWK419	Identify and use current virtualisation technologies
						ICTNWK501	Plan, implement and test enterprise communication solutions
						ICTNWK504	Design and implement an integrated server solution
						ICTNWK505	Design, build and test a network server
						ICTNWK506	Configure, verify and troubleshoot WAN links and IP services in a medium enterprise network
						ICTNWK507	Install, operate and troubleshoot medium enterprise routers
						ICTNWK508	Install, operate and troubleshoot medium enterprise switches
						ICTNWK514	Model preferred system solutions
						ICTNWK515	Develop configuration management protocols
						ICTNWK516	Determine best-fit topology for a local network
						ICTNWK517	Determine best-fit topology for a wide area network
						ICTNWK518	Design an enterprise wireless local area network
						ICTNWK521	Install, configure and test a payment gateway
						ICTNWK522	Build decks using wireless markup language
						ICTNWK524	Install and configure network access storage devices
						ICTNWK525	Configure an enterprise virtual computing environment
						ICTNWK526	Install an enterprise virtual computing environment

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
						ICTNWK527	Manage an enterprise virtual computing environment
						ICTNWK529	Install and manage complex ICT networks
						ICTNWK531	Configure an internet gateway
						ICTNWK532	Identify and resolve network problems
						ICTNWK533	Configure and manage advanced virtual computing environments
						ICTNWK534	Monitor and troubleshoot virtual computing environments
						ICTNWK535	Install an enterprise virtual computing environment
						ICTNWK603	Plan, configure and test advanced internetwork routing solutions
						ICTNWK604	Plan and configure advanced internetwork switching solutions
						ICTNWK605	Design and configure secure integrated wireless systems
						ICTNWK606	Implement voice applications over secure wireless networks
						ICTNWK608	Configure network devices for a secure network infrastructure
						ICTNWK610	Design and build integrated VoIP networks
						ICTNWK611	Configure call processing network elements for secure VoIP networks
						ICTNWK612	Plan and manage troubleshooting advanced integrated IP networks
						ICTNWK613	Develop plans to manage structured troubleshooting process of enterprise networks
						ICTNWK615	Design and configure desktop virtualisation
						ICTNWK617	Configure and manage a storage area network
						ICTOPN401	Install and test a dense wavelength division multiplexing system
						ICTOPN402	Use advanced optical test equipment
						ICTOPN403	Prepare activity plans and specifications for a fibre to the x installation
						ICTOPN501	Plan and configure dense wavelength division multiplexing systems
						ICTOPN502	Perform acceptance and commissioning tests on optical network
						ICTOPN503	Plan for an optical system upgrade and cut over
						ICTOPN504	Test and commission a dense wavelength division multiplexing transmission system
						ICTOPN505	Test the performance of specialised optical devices
						ICTOPN506	Analyse and integrate specialised optical devices in the network
						ICTOPN601	Manage optical ethernet transmission
						ICTOPN602	Manage dense wavelength division multiplexing transmission system
						ICTOPN603	Design a dense wavelength division multiplexing system
						ICTOPN604	Analyse optical transmission systems
						ICTRFN501	Test cellular handset enhancements and international roaming agreements
						ICTRFN502	Test and measure cellular phone and network equipment performance
						ICTRFN503	Evaluate and analyse radio frequency signal coverage plots
						ICTRFN601	Monitor the capacity of and recommend changes to the cellular mobile network
						ICTRFN602	Produce and evaluate architecture designs for WiMAX networks
						ICTRFN801	Produce a radio link budget
						ICTRFN802	Analyse a cellular mobile network system
						ICTRFN803	Analyse a satellite communications system

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
						ICTSAS307	Install, configure and secure a small office or home office network
						ICTSAS406	Implement and hand over system components
						ICTSAS425	Configure and troubleshoot operating system software
						ICTSAS512	Review and manage delivery of maintenance services
						ICTSAS517	Use network tools
						ICTSAS518	Install and upgrade operating systems
						ICTSUS501	Implement server virtualisation for a sustainable ICT system
						ICTTEN302	Install telecommunications network equipment
						ICTTEN416	Install, configure and test an internet protocol network
						ICTTEN417	Install, configure and test a router
						ICTTEN501	Provide consultancy and technical support in the customer premises equipment sector
						ICTTEN503	Design an electronic system for a telecommunications network
						ICTTEN504	Acceptance test new systems and equipment
						ICTTEN505	Commission telecommunications network equipment
						ICTTEN506	Integrate new systems and equipment into the telecommunications network
						ICTTEN507	Cut over new and replacement network equipment
						ICTTEN508	Locate, diagnose and rectify complex faults
						ICTTEN509	Provide expert advice and support on complex faults
						ICTTEN510	Undertake planned outage management
						ICTTEN511	Administer a data communications network
						ICTTEN512	Design and implement an enterprise voice over
						ICTTEN513	Install, configure and test a local area network switch
						ICTTEN515	Dimension and design a radio frequency identification system
						ICTTEN517	Plan a wireless mesh network
						ICTTEN601	Undertake qualification testing of new or enhanced equipment and systems
						ICTTEN602	Undertake system administration
						ICTTEN603	Undertake network traffic management
						ICTTEN604	Coordinate fault rectification and restoration of service following network outages
						ICTTEN605	Implement planned network changes with minimal impact to the customer
						ICTTEN606	Manage a common channel signalling network
						ICTTEN607	Analyse and organise repair of highly complex telecommunications network faults
						ICTTEN608	Verify new software and hardware releases
						ICTTEN609	Produce and evaluate architecture designs for convergent cellular mobile networks
						ICTTEN610	Design and configure an IP-MPLS network with virtual private network tunnelling
						ICTTEN611	Produce an ICT network architecture design
						ICTTEN612	Design and manage internet protocol TV in a service provider network
						ICTTEN801	Plan a transmission network

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
1h Review UoCs related to application development	2017-18	ICT	Information and Communications Training Package	ICT40515	Certificate IV in Programming	ICTTEN802	Manage alignment of systems with product and technology strategy
						ICTTEN803	Translate domain and solution architectures into platform requirements and designs
						ICTTEN804	Manage end to end architectural solutions across multiple domains
						ICTTEN806	Manage application layer solutions
						ICTTEN807	Manage voice, data and internet protocol network solutions
						ICTTEN808	Manage network testing strategies
						ICTTEN809	Analyse business specifications to produce technical solutions
						ICTTEN812	Evaluate and apply digital signal processing to communications system
						ICTTEN813	Produce engineering solutions using numerical computations and simulation
						ICTTEN814	Manage development and application of testing artefacts
						CPCCCM2007B	Use explosive power tools
						CPCCDE3014A	Remove non-friable asbestos
						CPCCLDG3001A	Licence to perform dogging
						CPCCLRG3001A	Licence to perform rigging basic level
						CPCCLRG3002A	Licence to perform rigging intermediate level
						CPCCLRG4001A	Licence to perform rigging advanced level
						CPCCOHS1001A	Work safely in the construction industry
						RIIHAN301D	Operate elevating work platform
						TLID2010A	Operate a forklift
						TLID3035A	Operate a boom type elevating work platform
				ICT50715	Diploma of Software Development	ICTDBS401	Identify physical database requirements
						ICTDBS402	Complete database backup and restore
						ICTDBS403	Create basic databases
						ICTDBS404	Identify and resolve common database performance problems
						ICTDBS407	Monitor physical database implementation
						ICTDBS408	Link an RFID system to a database
						ICTDBS409	Monitor and administer a database
						ICTDBS412	Build a database
						ICTDBS501	Monitor and improve knowledge management system
						ICTDBS502	Design a database
						ICTDBS503	Create a data warehouse
						ICTDBS601	Build a data warehouse
						ICTDBS602	Develop a knowledge management strategy
						ICTDBS603	Determine suitability of database functionality and scalability
						ICTICT210	Operate database applications
						ICTICT211	Identify and use basic current industry specific technologies
						ICTICT305	Identify and use current industry specific technologies
						ICTICT405	Develop detailed technical design
						ICTICT406	Build a graphical user interface
						ICTICT421	Connect, maintain and configure hardware components
						ICTICT501	Research and review hardware technology options for organisations

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
						ICTICT503	Validate quality and completeness of system design specifications
						ICTICT504	Confirm transition strategy for a new system
						ICTPRG301	Apply introductory programming techniques
						ICTPRG401	Maintain open-source code programs
						ICTPRG402	Apply query language
						ICTPRG403	Develop data-driven applications
						ICTPRG404	Test applications
						ICTPRG405	Automate processes
						ICTPRG406	Apply introductory object-oriented language skills
						ICTPRG407	Write script for software applications
						ICTPRG409	Develop mobile applications
						ICTPRG410	Build a user interface
						ICTPRG412	Configure and maintain databases
						ICTPRG413	Use a library or pre-existing components
						ICTPRG414	Apply introductory programming skills in another language
						ICTPRG415	Apply skills in object-oriented design
						ICTPRG416	Manage a software component re-use library
						ICTPRG417	Apply mathematical techniques for software development
						ICTPRG418	Apply intermediate programming skills in another language
						ICTPRG419	Analyse software requirements
						ICTPRG425	Use structured query language
						ICTPRG426	Prepare software development review
						ICTPRG427	Use XML effectively
						ICTPRG428	Use regular expressions in programming languages
						ICTPRG501	Apply advanced object-oriented language skills
						ICTPRG502	Manage a project using software management tools
						ICTPRG503	Debug and monitor applications
						ICTPRG504	Deploy an application to a production environment
						ICTPRG505	Build advanced user interface
						ICTPRG506	Design application architecture
						ICTPRG507	Implement security for applications
						ICTPRG508	Create mashups
						ICTPRG509	Build using rapid application development
						ICTPRG510	Maintain custom software
						ICTPRG511	Monitor and support data conversion to new ICT system
						ICTPRG512	Prepare for the build phase of an ICT system
						ICTPRG513	Coordinate the build phase of an ICT system
						ICTPRG514	Prepare for software development using rapid application development
						ICTPRG515	Review developed software
						ICTPRG516	Develop integration blueprint for ICT systems
						ICTPRG517	Install, test and evaluate pilot version of ICT system
						ICTPRG518	Monitor the system pilot
						ICTPRG520	Validate an application design against specifications

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
1i Review UoCs related to ICT security	2017-18	ICT	Information and Communications Training Package	ICT60215	Advanced Diploma of Network Security	ICTPRG523	Apply advanced programming skills in another language
						ICTPRG524	Develop high-level object-oriented class specifications
						ICTPRG525	Build Java applets
						ICTPRG526	Maintain functionality of legacy code programs
						ICTPRG527	Apply intermediate object-oriented language skills
						ICTPRG528	Perform ICT data conversion
						ICTPRG529	Apply testing techniques for software development
						ICTPRG601	Develop advanced mobile multi-touch applications
						ICTPRG602	Manage the development of technical solutions from business specifications
						ICTPRG604	Create cloud computing services
						ICTSAS406	Implement and hand over system components
						BSBCRT401	Articulate, present and debate ideas
						BSBCRT501	Originate and develop concepts
						BSBDES401	Generate design solutions
						BSBDES402	Interpret and respond to a design brief
						BSBDES403	Develop and extend design skills and practice
						BSBDES501	Implement design solutions
						BSBDES502	Establish, negotiate and refine a design brief
						BSBDES601	Manage design realisation
						BSBDES602	Research global design trends
						ICTNWK403	Manage network and data integrity
						ICTNWK416	Build security into virtual private networks
						ICTNWK502	Implement secure encryption technologies
						ICTNWK503	Install and maintain valid authentication processes
						ICTNWK509	Design and implement a security perimeter for ICT networks
						ICTNWK510	Develop, implement and evaluate system and application security
						ICTNWK511	Manage network security
						ICTNWK513	Manage system security
						ICTNWK519	Design an ICT security framework
						ICTNWK520	Design ICT system security controls
						ICTNWK601	Design and implement a security system
						ICTNWK602	Plan, configure and test advanced server-based security
						ICTNWK605	Design and configure secure integrated wireless systems
						ICTNWK606	Implement voice applications over secure wireless networks
						ICTNWK607	Design and implement wireless network security
						ICTNWK608	Configure network devices for a secure network infrastructure
						ICTNWK609	Configure and manage intrusion prevention system on network sensors
						ICTNWK611	Configure call processing network elements for secure VoIP networks
						ICTNWK614	Manage ICT security
						ICTNWK616	Manage security, privacy and compliance of cloud service deployment
						ICTSAS418	Monitor and administer security of an ICT system
						ICTTEN811	Evaluate and apply network security

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
1j Review UoCs related to strategic management and planning, project management and ICT business	2017-18	ICT	Information and Communications Training Package	ICT60415	Advanced Diploma of Information Technology Project Management	ICTWEB408	Ensure basic website security
						ICTWEB423	Ensure dynamic website security
						CPPSEC3009A	Prepare and present evidence in court
						CPPSEC5003A	Assess security risk management options
						CPPSEC5004A	Prepare security risk management plan
						CPPSEC5005A	Implement security risk management plan
						CPPSEC5006A	Determine strategy for the implementation of biometric technology
						CPPSEC5007A	Assess biometric system
				ICT60315	Advanced Diploma of Information Technology Business Analysis	ICTDBS602	Develop a knowledge management strategy
						ICTICT402	Determine project specifications and secure client agreement
						ICTICT412	Coordinate and maintain ICT work teams
						ICTICT416	Contribute to the development of strategic plans
						ICTICT418	Contribute to copyright, ethics and privacy in an ICT environment
						ICTICT505	Determine acceptable developers for projects
						ICTICT506	Implement process re-engineering strategies
				ICT80115	Graduate Certificate in Information Technology and Strategic Management	ICTICT507	Select new technology models for business
						ICTICT508	Evaluate vendor products and equipment
						ICTICT509	Gather data to identify business requirements
						ICTICT510	Determine appropriate ICT strategies and solutions
						ICTICT511	Match ICT needs with the strategic direction of the enterprise
						ICTICT512	Plan process re-engineering strategies for business
						ICTICT514	Identify and manage the implementation of current industry specific technologies
				ICT80515	Graduate Diploma of Telecommunications and Strategic Management	ICTICT601	Develop ICT strategic and action plans
						ICTICT603	Manage the use of appropriate development methodologies
						ICTICT604	Identify and implement business innovation
						ICTICT605	Implement a knowledge management strategy
						ICTICT606	Develop communities of practice
						ICTICT609	Lead the evaluation and implementation of current industry specific technologies
						ICTICT610	Manage copyright, ethics and privacy in an ICT environment
						ICTICT801	Lead research into identifying new marketplace opportunities
						ICTICT802	Direct ICT services
						ICTICT803	Endorse business plan components for a new initiative
						ICTICT804	Direct ICT in a supply chain
						ICTICT805	Direct ICT procurement
						ICTICT806	Direct outsourced ICT services
						ICTICT807	Direct research and business response to new ICT technology
						ICTICT808	Direct the development of a knowledge management strategy for a business
						ICTICT809	Facilitate business analysis
						ICTICT810	Synchronise ICT projects
						ICTICT811	Manage an information architecture project
						ICTICT812	Develop a business intelligence framework

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
						ICTICT813	Manage ICT services
						ICTICT814	Develop cloud computing strategies for a business
						ICTPMG401	Support small scale ICT projects
						ICTPMG501	Manage ICT projects
						ICTPMG502	Develop customer premises equipment installation project plans
						ICTPMG503	Prepare a project brief
						ICTPMG504	Prepare project specifications
						ICTPMG601	Establish ICT project governance
						ICTPMG602	Manage ICT project initiation
						ICTPMG603	Manage ICT project planning
						ICTPMG604	Manage ICT project delivery
						ICTPMG605	Manage ICT project closure
						ICTPMG606	Manage ICT project quality
						ICTPMG607	Manage and control ICT project risks
						ICTPMG608	Manage ICT project systems implementation
						ICTPMG609	Plan and direct complex ICT projects
						ICTPMG610	Develop a project management plan
						ICTPMG611	Prepare a detailed design brief
						ICTPMG801	Manage a telecommunications workplace
						ICTPMG802	Manage a telecommunications project
						ICTPMG803	Undertake a telecommunications project
						ICTPMG804	Evaluate and use telecommunications management networks
						ICTPRG502	Manage a project using software management tools
						ICTSAD503	Minimise risk of new technologies to business solutions
						ICTSAD504	Implement quality assurance processes for business solutions
						ICTSAD505	Develop technical requirements for business solutions
						ICTSAD601	Perform ICT-focused enterprise analysis
						ICTSAD603	Plan and monitor business analysis activities in an ICT environment
						ICTSAD604	Manage and communicate ICT solutions
						ICTSAD607	Manage assessment and validation of ICT solutions
						ICTSAS405	Identify and evaluate ICT industry vendor technologies
						ICTSAS409	Manage risks involving ICT systems and technology
						ICTSAS422	Scope implementation requirements
						ICTSAS507	Implement and evaluate systems for regulatory and standards compliance
						ICTSAS510	Review and develop ICT maintenance strategy
						ICTSAS601	Implement change management processes
						ICTSUS602	Establish a business case for sustainability and competitive advantage in ICT projects
						ICTTEN426	Design network projects
						ICTTEN502	Design a telecommunications project
						ICTTEN805	Manage solution architecture and impacts in line with organisational processes
						ICTTEN810	Investigate the application of cloud networks in telecommunications

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
							switching
						ICTTEN815	Manage project requirements and process implementations
						ICTTEN816	Scope project requirements and process solutions
						BSBFIM501	Manage budgets and financial plans
						BSBINN601	Lead and manage organisational change
						BSBINN801	Lead innovative thinking and practice
						BSBIPR301	Comply with organisational requirements for protection and use of intellectual property
						BSBLDR402	Lead effective workplace relationships
						BSBLDR803	Develop and cultivate collaborative partnerships and relationships
						BSBMGT401	Show leadership in the workplace
						BSBMGT608	Manage innovation and continuous improvement
						BSBPMG517	Manage project risk
						BSBPMG521	Manage project integration
						BSBPMG522	Undertake project work
						BSBSMB305	Comply with regulatory, taxation and insurance requirements for the micro business
						BSBSMB306	Plan a home based business
						BSBSMB401	Establish legal and risk management requirements of small business
						BSBSMB405	Monitor and manage small business operations
						BSBSMB407	Manage a small team
						BSBSUS301	Implement and monitor environmentally sustainable work practices
						BSBSUS401	Implement and monitor environmentally sustainable work practices
						BSBSUS501	Develop workplace policy and procedures for sustainability
						BSBWOR301	Organise personal work priorities and development
						BSBWOR404	Develop work priorities
						BSBWOR502	Lead and manage team effectiveness
						FNSORG506	Prepare financial forecasts and projections
1r Review need for virtual reality and augmented reality related training products	2017-18	ICT	Information and Communications Training Package	N/A	N/A	N/A	
1t Review need for Internet of Things (IoT) related training products	2017-18	ICT	Information and Communications Training Package	N/A	N/A	N/A	
1k Review UoCs related to customer service	2018-19	ICT	Information and Communications Training Package	N/A	N/A	ICTEDU301	Train customers in new technology
						ICTEDU501	Develop and deliver training associated with new and modified products
						ICTICT209	Interact with ICT clients
						ICTICT301	Create user documentation
						ICTICT307	Customise packaged software applications for clients
						ICTICT401	Determine and confirm client business requirements
						ICTICT402	Determine project specifications and secure client agreement

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
11 Review UoCs related to web development	2018-19	ICT	Information and Communications Training Package	ICT40315	Certificate IV in Web-Based Technologies Diploma of Website Development	ICTICT413	Relate to clients on a business level
						ICTICT415	Provide one-to-one instruction
						ICTICT515	Verify client business requirements
						ICTICT602	Develop contracts and manage contracted performance
						ICTICT608	Interact with clients on a business level
						ICTPRO501	Develop training, marketing and sales resources for telecommunications products
						ICTSAD401	Develop and present feasibility reports
						ICTSAD506	Produce a feasibility report
						ICTSAD605	Elicit ICT requirements
						ICTSAD606	Analyse stakeholder requirements
						ICTSAS204	Record client support requirements
						ICTSAS305	Provide ICT advice to clients
						ICTSAS410	Identify and resolve client ICT problems
						ICTSAS411	Assist with policy development for client support procedures
						ICTSAS412	Action change requests
						ICTSAS502	Establish and maintain client user liaison
						ICTSAS505	Review and update disaster recovery and contingency plans
						ICTSAS509	Provide client ICT support services
						BSBCMM101	Apply basic communication skills
						BSBCUS201	Deliver a service to customers
						BSBCUS402	Address customer needs
						ICTDBS504	Integrate database with a website
						ICTICT407	Maintain website information standards
						ICTWEB201	Use social media tools for collaboration and engagement
						ICTWEB301	Create a simple markup language document
						ICTWEB302	Build simple websites using commercial programs
						ICTWEB303	Produce digital images for the web
						ICTWEB401	Design a website to meet technical requirements
						ICTWEB402	Confirm accessibility of websites for people with special needs
						ICTWEB403	Transfer content to a website using commercial packages
						ICTWEB404	Maintain website performance
						ICTWEB405	Monitor traffic and compile website traffic reports
						ICTWEB406	Create website testing procedures
						ICTWEB407	Conduct operational acceptance tests of websites
						ICTWEB408	Ensure basic website security
						ICTWEB409	Develop cascading style sheets
						ICTWEB410	Apply web authoring tool to convert client data for websites
						ICTWEB411	Produce basic client-side script for dynamic web pages
						ICTWEB412	Produce interactive web animation
						ICTWEB413	Optimise search engines
						ICTWEB414	Design simple web page layouts
						ICTWEB415	Produce server-side script for dynamic web pages
						ICTWEB416	Customise content management system

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
1m Review UoCs related to interactive media and game development	2019-20	ICT	Information and Communications Training Package	ICT40815	Certificate IV in Digital Media Technologies	ICTWEB417	Integrate social web technologies
						ICTWEB418	Use development software and ICT tools to build a basic website
						ICTWEB419	Develop guidelines for uploading information to a website
						ICTWEB420	Write content for web pages
						ICTWEB421	Ensure website content meets technical protocols and standards
						ICTWEB422	Ensure website access and useability
						ICTWEB423	Ensure dynamic website security
						ICTWEB424	Evaluate and select a web hosting service
						ICTWEB425	Apply structured query language to extract and manipulate data
						ICTWEB429	Create a markup language document to specification
						ICTWEB501	Build a dynamic website
						ICTWEB502	Create dynamic web pages
						ICTWEB503	Create web-based programs
						ICTWEB504	Build a document using eXtensible markup language
						ICTWEB505	Develop complex web page layouts
						ICTWEB506	Develop complex cascading style sheets
						ICTWEB507	Customise a complex ICT content management system
						ICTWEB508	Develop website information architecture
						ICTWEB509	Use site server tools for transaction management
						ICTWEB510	Analyse information and assign meta tags
						ICTWEB511	Implement quality assurance process for websites
						ICTWEB512	Administer business websites and servers
						ICTWEB515	Implement and use web services
						ICTWEB516	Research and apply emerging web technology trends
						BSBEBU401	Review and maintain a website
						BSBEBU501	Investigate and design e-business solutions
				ICT40915	Certificate IV in Digital and Interactive Games	ICTDMT401	Create visual design components for digital media
						ICTDMT402	Produce interactive animation
				ICT50215	Diploma of Digital and Interactive Games	ICTDMT403	Produce and edit digital images
						ICTDMT501	Incorporate and edit digital video
				ICT50915	Diploma of Digital Media Technologies	ICTGAM301	Apply simple modelling techniques
						ICTGAM302	Design and apply simple textures to digital art
						ICTGAM303	Review and apply the principles of animation
						ICTGAM401	Produce an interactive game
						ICTGAM402	Identify and apply principles of games design and game playing
						ICTGAM403	Create design documents for interactive games
						ICTGAM404	Apply artificial intelligence in game development
						ICTGAM405	Write story and content for digital games
						ICTGAM406	Create visual design components for interactive games
						ICTGAM407	Write scripts for interactive games
						ICTGAM408	Use 3-D animation interface and toolsets
						ICTGAM409	Create 3-D characters for interactive games
						ICTGAM410	Develop 3-D components for interactive games
						ICTGAM412	Design interactive media

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
						ICTGAM413	Design and create 3-D digital models
						ICTGAM414	Create audio for digital games
						ICTGAM415	Develop simple environments for 3-D games
						ICTGAM416	Prepare and complete image rendering processes
						ICTGAM417	Apply digital effects to interactive products
						ICTGAM418	Use simple modelling for animation
						ICTGAM419	Build a database to support a computer game
						ICTGAM501	Create design concepts for digital games and 3-D media
						ICTGAM503	Create a complex 3-D interactive computer game
						ICTGAM504	Manage interactive media production
						ICTGAM506	Create complex code for mobile game devices
						ICTGAM507	Develop intermediate 3-D software for games and interactive media
						ICTGAM508	Develop complex 3-D software for games and interactive media
						ICTGAM509	Design interactive 3-D applications for scientific and mathematical modelling
						ICTGAM510	Prepare games for different platforms and delivery modes
						ICTGAM511	Manage testing of games and interactive media
						ICTGAM512	Create and implement designs for a 3-D games environment
						ICTGAM514	Design and create models for a 3-D and digital effects environment
						ICTGAM515	Design and create advanced particles, fluids and bodies for 3-D digital effects
						ICTGAM516	Animate a 3-D character for digital games
						ICTGAM517	Produce a digital animation sequence
						ICTGAM518	Animate physical attributes of models and elements
						ICTGAM519	Manage technical art and rigging in 3-D animation
						ICTGAM520	Create and combine 3-D digital games and components
						ICTGAM521	Create interactive 3-D environments for digital games
						ICTGAM522	Complete digital editing for the 3-D and digital effects environment
						ICTGAM523	Collaborate in the design of 3-D game levels and environments
						ICTGAM524	Integrate multiple data sources into interactive 3-D environments
						ICTGAM525	Apply digital texturing for the 3-D environment in digital games
						ICTGAM526	Create complex 3-D characters for games
						ICTGAM527	Integrate database with online game
						ICTGAM528	Create games for mobile devices
						ICTGAM529	Analyse business opportunities in the digital games environment
						ICTGAM530	Develop and implement physics in a 3-D digital game
						ICTGAM531	Complete compositing to create elements for the 3-D and digital effects environment
						CUAANM301	Create 2D digital animations
						CUAANM302	Create 3D digital animations
						CUAANM303	Create 3D digital models
						CUAANM402	Create digital visual effects
						CUACAM201	Assist with a basic camera shoot
						CUACAM301	Shoot material for screen productions

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
						CUADIG201	Maintain interactive content
						CUADIG301	Prepare video assets
						CUADIG302	Author interactive sequences
						CUADIG303	Produce and prepare photo images
						CUADIG304	Create visual design components
						CUADIG401	Author interactive media
						CUADIG502	Design digital applications
						CUADIG503	Design e-learning resources
						CUADIG504	Design games
						CUADIG507	Design digital simulations
						CUADRA201	Develop drawing skills
						CUAPHI504	Employ specialised imaging technologies
						CUAPOS201	Perform basic vision and sound editing
						CUAPOS401	Edit screen content for fast turnaround
						CUAPOS402	Manage media assets
						CUAPPM407	Create storyboards
						CUASOU202	Perform basic sound editing
						CUASOU304	Prepare audio assets
						CUASOU307	Record and mix a basic music demo
						CUASOU407	Edit sound
						CUASOU504	Produce sound recordings
						ICPDMT321	Capture a digital image
						ICPDMT346	Incorporate video into multimedia presentations
In Review of remaining generalist ICT UoCs	2019-20	ICT	Information and Communications Training Package	N/A	N/A	ICTICT101	Operate a personal computer
						ICTICT102	Operate word-processing applications
						ICTICT103	Use, communicate and search securely on the internet
						ICTICT104	Use digital devices
						ICTICT105	Operate spreadsheet applications
						ICTICT106	Operate presentation packages
						ICTICT107	Use personal productivity tools
						ICTICT108	Use digital literacy skills to access the internet
						ICTICT201	Use computer operating systems and hardware
						ICTICT203	Operate application software packages
						ICTICT204	Operate a digital media technology package
						ICTICT205	Design basic organisational documents using computing packages
						ICTICT207	Integrate commercial computing packages
						ICTICT208	Operate accounting applications
						ICTICT212	Incorporate Indigenous needs and perspectives into ICT environment
						ICTICT308	Use advanced features of computer applications
						ICTICT409	Develop macros and templates for clients using standard products
						ICTICT422	Participate in ICT services
						ICTSAD602	Conduct knowledge audits
						ICTSAS201	Maintain inventories for equipment, software and documentation
						ICTSAS202	Apply problem-solving techniques to routine ICT malfunctions

Project code and name	Planned review start (year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
						ICTSAS205	Maintain ICT system integrity
						ICTSAS206	Detect and protect from spam and destructive software
						ICTSAS207	Protect and secure information assets
						ICTSAS208	Maintain ICT equipment and consumables
						ICTSAS209	Connect and use a home based local wireless network
						ICTSAS306	Maintain equipment and software
						ICTSAS426	Locate and troubleshoot ICT equipment, system and software faults
						ICTSAS501	Develop, implement and evaluate an incident response plan
						ICTSAS506	Update ICT system operational procedures
						ICTSAS511	Prioritise ICT change requests
						BSBWHS201	Contribute to health and safety of self and others
1p Review imported first aid and Occupational Health and Safety (OH&S) UoCs	2019-20	ICT	Information and Communications Training Package	N/A	N/A	BSBWHS304	Participate effectively in WHS communication and consultation processes
						BSBWHS403	Contribute to implementing and maintaining WHS consultation and participation processes
						BSBWHS501	Ensure a safe workplace
						BSBWHS504	Manage WHS risks
						CPCCOHS1001A	Work safely in the construction industry
						CPCCOHS2001A	Apply OHS requirements, policies and procedures in the construction industry
						CPCPCM2043A	Carry out WHS requirements
						CPCPCM2055A	Work safely on roofs
						HLTAID001	Provide cardiopulmonary resuscitation
						HLTAID002	Provide basic emergency life support
						HLTAID003	Provide first aid
1q Review UoCs updated in 2016-17 for currency	2020-21	ICT	Information and Communications Training Package			RRIWHS204D	Work safely at heights
						No training Package content specified. The scope of this update will be determined before the 2018 submission of the Industry Skills Forecast and Proposed Schedule of Work.	

Rationale behind projects and scheduling in the Proposed Schedule of Work

The Federal Department of Education and Training has advised that the AISC will use the recommendations made by all IRCs, together with an analysis of the relevant Industry Skills Forecast and Proposed Schedule of Work, to develop a national schedule of all UoCs across Training Packages. In developing this schedule, the AISC will consult the IRC Industry Skills Forecast and Proposed Schedule of Work, taking account of: regulatory need, strategic industry and government priorities, economic impact, current levels of VET activity, risk, and available budget. To assist the AISC develop this schedule, Table 15 presents rationales to support the scope, content and timing of these projects, drawing on the above factors where relevant.

Table 15: Rationales for projects

Item code	Year	Title	Rationale
1g	2017-18	Review UoCs related to application development	Digital technology is becoming an inherent part of our economy. Rapid increases in device connectivity, data storage and processing speed has meant that computer systems are becoming a part of a large number of processes which did not previously involve computers. ⁹⁷ Therefore, digital literacy and digital skills including high level technical and computational thinking skills, application design, programming skills and data mining and analysis have been identified as priorities in the ICT sector. The need for this project has also been highlighted in Section D <i>Skills Outlook- Trends shaping the sector</i> . UoCs related application development are planned for review in light of this trend. Therefore, this review will be conducted in 2017-18, in line with the scheduling principles discussed previously. Based on the outcomes of this project, existing UoCs may be updated and new UoCs may be developed as appropriate.
1h	2017-18	Review UoCs related to computer systems and telecommunications networking	Access to high speed broadband is rapidly increasing. As of October 2015, 1.3 million Australian homes and businesses are able to connect to the NBN, with this number expected to increase to 5.6 million by late 2018. ⁹⁸ This is also supported by improvements in other mobility technologies such as wireless moving to 5G. This is changing the way Australians work and the way businesses offer their services. Widespread high-speed internet access allows more Australians to work remotely and more services to be delivered remotely. For example, cloud computing can help business grow without having to invest in in-house IT infrastructure and facilitate a greater level of information sharing. The review of UoCs related to both computer systems and telecommunications networking has been scheduled in light of this trend. Therefore this review is scheduled for 2017-18, in line with the scheduling principles discussed previously. Based on the

⁹⁷ CSIRO (2016) *Tomorrow's digitally enabled workforce*

⁹⁸ Department of Communications and the Arts (2015) *nbn Speeds Towards 9.5 Million Homes and Businesses*

			outcomes of this project, existing UoCs may be updated and new UoCs may be developed as appropriate to meet the future demand of ICT networking related jobs. The need for this project has also been highlighted in Section B <i>Sector Overview</i> and Section D <i>Skills Outlook</i> .
1i	2017-18	Review UoCs related to ICT security	<p>Exponential growth in the amount of data being created and stored, including confidential data, raises significant concerns about privacy and security.⁹⁹ This is only likely to continue to grow as society becomes more connected and more data is stored electronically. Therefore, cyber security skills will be pertinent to securing the interconnected globe of the future.</p> <p>Given this need for security skills, this review will occur as a priority in 2017-18. This review will assess all ICT security UoCs for their currency and in light of the changes occurring in the ICT security industry and the changing skills needs. It will also consider the speed to market of training, the relation of training to industry competency standards and the impact of training on workforce capability. Based on the outcomes of this project, existing UoCs may be updated, consolidated and new UoCs may be developed as appropriate.</p> <p>This project is subject to change and correspondence with the AISC regarding the timing and scope of this project. The need for this project has also been highlighted in Section B <i>Sector Overview</i> and Section D <i>Skills Outlook</i>.</p>
1j	2017-18	Review UoCs related to strategic management and planning, project management and ICT business	<p>Greater importance of ICT input into organisational strategy and planning has been reflected in rising prominence of roles such as Chief Information Officer and Chief Information Security Officer. ICT workers would therefore need skills in organisational strategic management and planning, project management and general business skills. ICT IRC members have suggested this should be a key area of focus for the future of ICT workforce planning.</p> <p>Given this emerging trend and the feedback received from ICT IRC members, this review of UoCs related to strategic management and planning, project management and ICT business is scheduled for 2017-18. Based on the outcomes of this project, existing UoCs may be updated and new UoCs may be developed as appropriate. The need for this project has also been highlighted in Section B <i>Sector Overview</i> and Section D <i>Skills Outlook</i>.</p>
1r	2017-18	Review need for virtual and augmented reality related training products	In the process of updating this Industry Skills Forecast and Proposed Schedule of Work, and through other projects, the emergence of virtual and augmented reality technologies was raised and should be considered in 2017-18.

⁹⁹ IBM Research (2016) *How big is big data?*

			Virtual and augmented reality technologies are of growing importance for the Information and Communications Technology industry. Whilst the full impact of these technologies on the job market still remains to be seen, ICT IRC members have indicated that this is an area that should be considered for review.
1t	2017-18	Review need for IoT related training products	<p>In the process of updating this Industry Skills Forecast and Proposed Schedule of Work, and through other projects, the emergence of IoT technologies was raised and should be considered in 2017-18.</p> <p>IoT technologies are of growing importance for the Information and Communications Technology industry. Whilst the full impact of these technologies on the job market still remains to be seen, ICT IRC members have indicated that this is an area that should be considered for review.</p>
1k	2018-19	Review UoCs related to customer service	<p>Increasingly ICT workers are moving from the back office to client facing roles and will need to collaborate with range of people in different settings. Customer (client) centric skills including competencies in strong communication abilities, social and emotional intelligence have been identified as skills priorities by the ICT IRC for the ICT sector.</p> <p>Given this priority and alignment with emerging trends, this review has been scheduled for 2018-19. This review will assess UoCs specifically targeted at customer service provision and the extent to which these current UoCs are addressing skills needs, in particular social and emotional intelligence. Based on the outcomes of this project, existing UoCs may be updated and new UoCs may be developed as appropriate. The need for this project has also been highlighted in Section B <i>Sector Overview</i> and Section D <i>Skills Outlook</i>.</p>
1l	2018-19	Review UoCs related to web development	<p>Consumers are becoming more connected, consuming services and shopping online more than ever before. Online shopping in Australia is valued at over \$15 billion and has grown at 18.6 per cent per annum from 2011 to 2016.¹⁰⁰ Although consumers are spending an increasing amount online, this is not the full extent of the influence which digital change has had. Consumers are seeking to engage with businesses and brands online beyond a purely commercial relationship.</p> <p>In order to plan, produce and maintain such websites, web developers would require vast array of skills including digital literacy, programming, data analytics and problem resolution skills.</p> <p>Consistent with scheduling principles agreed to by ICT IRC members, this review has been scheduled for 2018-19 as it aligns with emerging trends for the sector. The review</p>

¹⁰⁰ IBISWorld (March 2016) *IBISWorld Industry Report X0004 Online Shopping in Australia*

			will assess web development UoCs for their currency in light of the changes occurring as a result of more connected economy and the resulting skills needs, revising and introducing new UoCs as appropriate. The need for this project has also been highlighted in Section B <i>Sector Overview</i> and Section D <i>Skills Outlook</i> .
1m	2019-20	Review UoCs related to interactive media and game development	<p>The development of computer games and designing of interactive media requires a balanced mix of creative skills along with technical programming and application development skills. In other words, game development and design of interactive media are specialisations that learners can choose to undertake after gaining a core set of ICT application development and programming skills.</p> <p>However, consultations with industry¹⁰¹ and analysis have not established any fundamental changes in the skills needs in the area of game development and interactive media. In fact, research and our consultations with an ICT IRC member have indicated that the delivery market for the fundamental subject areas of interactive media and game development is relatively mature. Anecdotal evidence suggests that educational offerings for these subject areas are of good quality and responsive to learner needs. In addition, as they build on the skills of application development and programming skills they should not be reviewed until after those core skills (which are scheduled for 2017-18). In order to be informed by the review of the core skills and because of the lack of impetus for early review, this project is scheduled for 2019-20, in line with scheduling principles agreed to by IRC members. Based on the outcomes of this project, existing UoCs may be updated, consolidated and new UoCs may be developed as appropriate</p>
1n	2019-20	Review of remaining generalist ICT UoCs	Generalist ICT UoCs are generally lower level skills to operate or install basic software and are not strategic or complex in nature. Throughout consultations with ICT IRC Members and analysis, no fundamental changes in the skills needs covered by these UoCs have been identified. However, it is important to regularly review units for their currency and alignment to current industry best practice. Therefore, these UoCs (all generalist ICT UoCs that are not elsewhere reviewed) will be reviewed in 2019-20. Based on the outcomes of this project, existing UoCs may be updated, consolidated and new UoCs may be developed as appropriate. IRC members and analysis in this report have not identified a strong need to review remaining generalist ICT UoCs. As such, this project has been scheduled for 2019-20, in line with scheduling principles agreed to by IRC members.
1o	2019-20	Consolidation of old Training Package UoCs	There are 16 'current' UoCs in the ICT10 Training Package, ICT02 Training Package and ICA05 Training Package. A cursory review of these UoCs was unable discern why they exist within ICT10, ICT02 and ICA05 instead of ICT. These UoCs have no linked

¹⁰¹ Discussions with ICT IRC members at IRC and SSO formal meeting, July 2016.

			<p>qualifications or skill sets attached to them. It is important to the structure of the training package system that these UoCs are consolidated into the current ICT Training Package structure, however this is likely that reviewing this units will have limited education impact. Therefore, this review has been allocated to years 2019-20 to simplify and promote consistency of training content on the National VET Register. It is anticipated that this review will lead to the alignment of the content in the old Training Package UoCs to the new ICT Training Package resulting in the removal of those old UoCs.</p> <p>Please note that has the Federal Department of Education and Training has indicated a desire to update these 'current' UoCs in old Training Packages in a separate process and should they wish to pursue this, this review may occur before 2019-20.</p>
1p	2019-20	Review imported first aid and Occupational Health and Safety (OH&S) UoCs	<p>The ICT Training Package imports a number of UoCs related to first aid and OH&S. These are imported from the following Training Packages:</p> <ul style="list-style-type: none"> • BSB – Business Services Training Package • CPC08 – Construction, Plumbing and Services Training Package • HLT – Health Training Package • RII – Resource Infrastructure Industry Training Package <p>While these have not been identified by ICT IRC members as immediate priorities for review in light of any trends, or structural issues, it is important to regularly review these units to determine whether it is fit for purpose and meets the ICT sector needs. As such, and in line with scheduling principles agreed to by ICT IRC members, this review will assess a small number of UoCs related to first aid and OH&S in 2019-20. Based on the outcomes of this project, existing UoCs may be consolidated and new UoCs may be imported and developed as appropriate. As such, this project is scheduled for review in 2019-20 in line with scheduling principles agreed to by ICT IRC members. The importance of health and safety is highlighted in Section B <i>Sector Overview- ICT Training Package profile</i> and Section D <i>Skills Outlook- Trends shaping the sector</i>.</p>
1q	2020-21	Review of all UoCs updated in 2016-17 for currency	<p>AISC requires that all UoCs in the ICT Training Package are reviewed every four years. Pursuant to this mandate, the SSO and IRC proposes to review UoCs updated in 2016-17 in 2020-21. The timing and scope of these projects will be detailed in the 2018 submission of the Industry Skills Forecast and Proposed Schedule of Work.</p>

G. IRC signoff

This Industry Skills Forecast and Proposed Schedule of Work was agreed to by:

A handwritten signature in black ink, appearing to read 'RE', with a long horizontal stroke extending to the right.

Ros Eason

Chair

Information and Communications Technology IRC

28/04/2017

Appendix A Occupation classifications

Defining and classifying occupations can be difficult in any sector. In the vocational education and training context, using classifications that are too general can lose the nuance of skill levels or technical details acquired in each qualification. However, using classifications that are too specific can make general trends identification or commentary impossible.

This Industry Skills Forecast and Proposed Schedule of Work has largely drawn on terminology used in the Training Package, as published in version 3.0 of the Information and Communications Technology Training Package on training.gov.au. However, there are other occupational classifications that are publically available and set out in Table 16:

- Australia and New Zealand Standard Classification of Occupations (ANZSCO) developed by the ABS. These occupations have been mapped to qualifications by NCVER and are used for Department of Employment forecast projections. Therefore ABS and NCVER data is consistent with ANZSCO definitions. The limitation of these definitions is that they are somewhat narrow and therefore may not be an accurate representation of all parties within the sector.
- Taxonomy developed by the former ISCs, mapped qualifications in Training Packages to occupations. However, these occupations are not mapped to ABS or NCVER data collection, and therefore do not provide any quantitative information as to the size of the workforce.

Table 16: Different occupation classifications

Qualification area	Qualification level	ANZSCO mapping	Taxonomy mapping
Data Entry	Certificate I in Information, Digital Media and Technology	Keyboard Operators	Data Entry Operator
	Certificate II in Information, Digital Media and Technology	Keyboard Operators	Data Entry Operator
IT Operations and Support	Certificate III in Information, Digital Media and Technology	ICT Support Technicians	Client Support Officer, Help Desk Officer, IT Technician, Customer Service Representative (ICT), User Support Specialist
	Certificate IV in Information Technology	ICT Support Technicians	Software Support Technician, Technical Officer, Network Operations Technician, Client Support Officer, Computer Technician
	Certificate IV in Information Technology Support	ICT Customer Support Officer	IT Technician, Help Desk Specialist, User Support Specialist, Client Support Officer (ICT), Database Support Officer, Help Desk Officer
	Diploma of Information Technology	ICT Support Technicians	IT Office Manager, General Application Support Officer
	Diploma of Information Technology Systems Administration	Systems Administrator	Website Administrator, Database Administrator, Systems Administrator

	Advanced Diploma of Information Technology	ICT Support Technicians	Enterprise Application Integration Consultant, Knowledge Manager, Enterprise Architecture Manager, Software Manager, eLearning Manager
Business Analysis	Advanced Diploma of Information Technology Business Analysis	ICT Business Analyst	Business Analyst
Programming	Certificate IV in Programming	Developer Programmer	Web Programmer, Middlewear Programmer, Analyst Programmer, Games Programmer
IT Strategy and Strategic Management	Graduate Certificate in Information Technology and Strategic Management	Chief Information Officer	Information Systems Manager
	Graduate Certificate in Information Technology Sustainability	Chief Information Officer	IT Sustainability Systems Consultant
Web-based Technologies	Certificate IV in Web-Based Technologies	Web Administrator	Assistant Webmaster, Website Administrator, Website Designer
	Diploma of Website Development	Web Developer	eCommerce Architect, Web Master, WAP Designer, Web Developer, Website Administrator, Website Group Manager, Web Development Manager, Information Architect, eBusiness Development Officer, Web Production Manager, Web Business Development Manager, Intranet Engineer, Web Usability Engineer
Computer Software and Systems Development	Diploma of Software Development	Developer Programmer	Middle Programmer, Software Developer, Analyst Programmer, Games Programmer, Games Designer
IT Security	Advanced Diploma of Network Security	ICT Security Specialist	Network Security Consultant, Software Engineer
Project Management	Advanced Diploma of Information Technology Project Management	ICT Project Manager	ICT Project Manager
IT Infrastructure/ Network	Certificate IV in Information Technology Networking	Network Administrator	Network Administrator, Network Manager, Network Technician
	Certificate IV in Computer Systems Technology	ICT Support Technicians	Network Technician
	Diploma of Information Technology Networking	Computer Network Professionals	Network Engineer, Network Manager
	Advanced Diploma of Computer Systems Technology	Computer Network and Systems Engineer	IT Administrator
System Analysis and Design	Certificate IV in Systems Analysis and Design	Systems Analyst	IT Analyst
	Diploma of Systems Analysis and Design	Computer Network and Systems Engineer	Integration Analyst, IT Analyst, Solutions Architect, Database Designer, Senior Systems Analyst/Programmer
Testing	Certificate IV in Information Technology Testing	Software And Applications Programmers Nec	Games Tester, Tester (IT)

Database Design and Development	Diploma of Database Design and Development	Database Administrator	Assistant Database Designer/Developer, Data Warehouse Consultant, Database Developer, Database Designer
Rigging Installation	Certificate III in Telecommunications Rigging Installation	None available	Telecommunications Rigger Technician
Network Building and Operations	Certificate II in Telecommunications Network Build and Operate	None available	NBN Optical Fibre Linesworker/Installer, NBN Infrastructure Linesworker, Broadband Network Cabling Installer, NBN Installer, Broadband Network Infrastructure Installer
	Certificate II in Telecommunications Technology	None available	Telecommunications Cable Joiner, Antennae Equipment Installer, NBN Installer, IP Based Network Installer, Telecommunications Network Access Worker, Radio Telecommunications Equipment Installer, Field and Applications Cabler (Video and Broadband), Data Cabler, Cable TV Service Technicians, NBN Infrastructure Linesworker, Digital Reception Equipment Installer
	Certificate III in Telecommunications Digital Reception Technology	None available	Data and Voice Communications Cabler, Telecommunications Cable Joiner, Communications Linesperson, Optical Access Broadband Network Installer
	Certificate III in Telecommunications Network Build and Operate	None available	NBN Optical Fibre Linesworker/Installer, Broadband Network Cabling Installer, NBN Optical Fibre Splicer, NBN Installer, Broadband Network Infrastructure Installer, NBN Infrastructure Linesworker
	Certificate III in Telecommunications Technology	None available	Optical Access Broadband Network Installer, Telecommunications Technician, NBN Optical Fibre Linesworker/Installer, Telecommunications Cable Joiner, NBN Optical Fibre Splicer, Broadband Network Infrastructure Installer, Underground Cable Installation Tradesperson/ Technician, Cable TV Service Technicians, Telecommunications Technical Officer, Telecommunications Computer Systems Technician, Communications Linesperson, Data and Voice Communications Officer
Network planning and Design	Certificate IV in Telecommunications Network Design	None available	Telecommunications Technician Designer, Telecommunications Network Planner
	Diploma of Telecommunications Planning and Design	None available	Service Provider Network Planning Specialist
Telecommunications Engineering	Certificate IV in Telecommunications Engineering Technology	None available	Information and Communications Technology (ICT) Technician, Radio Communication Technician, Telecommunications Computer Systems Technician, IP Based Radio Network Installation Technician, Home Network Installation Technician, Telecommunications Field Engineer, Electronics Technician (Computer Systems), Optical Network Infrastructure Installation Technician, Telecommunications Technician
	Diploma of Telecommunications Engineering	None available	Telecommunications Photonics Technical Officer, Radio Frequency Telecommunications Technical Specialist, Specialist Network Infrastructure Installer, Telecommunications Computer Systems Technician, Telecommunications Business Manager, Telecommunications Technical Specialist (Optical Networking), Senior Specialist Technician (Telecommunications), Telecommunications Field Engineer, Telecommunications Technical Officer, Telecommunications Engineer

Telecommunications Network Engineering	Advanced Diploma of Telecommunications Network Engineering	None available	Telecommunications Technical Officer, Optical Network Manager, Senior Specialist Technician (Telecommunications), Telecommunications Engineer, Senior Technical Officer (Telecommunications Engineering), IP Convergence Integrator, Senior Technical Officer (Electronic Technology)
	Graduate Certificate in Telecommunications	Telecommunications Network Engineer	Information Systems Manager, Telecommunications Engineer, Information Services Manager, Telecommunications Network Planner, Organisational Learning Manager, Operations Manager, Optical Network Manager, Telecommunications Business Manager, Project Manager (industry specific), Network Engineer, Network Manager, Telecommunications Network Engineer, Project Director, Telecommunications Field Engineer
	Graduate Diploma of Telecommunications Network Engineering	Telecommunications Network Engineer	Telecommunications Network Engineer
	Graduate Certificate in Telecommunications Network Engineering	None available	Telecommunications Network Engineer
Strategic Management	Graduate Diploma of Telecommunications and Strategic Management	Telecommunications Network Engineer	Optical Network Manager, Telecommunications Network Planner, Project Manager (industry specific), Telecommunications Network Engineer, Telecommunications Engineer, Operations Manager, Telecommunications Business Manager, Information Services Manager, Information Systems Manager, Organisational Learning Manager, Project Director, Telecommunications Field Engineer, Network Manager, Network Engineer
Digital Media and Interactive Games	Certificate IV in Digital Media Technologies	Multimedia Designer	Multimedia Developer, Multimedia Designer, Animation Assistant
	Certificate IV in Digital and Interactive Games	Multimedia Specialist	Animation Assistant, 3D Games Animator, Games Designer
	Diploma of Digital and Interactive Games	Multimedia Specialist	Instructional Designer, Multimedia Designer, Software Engineer, Games Tester, 3D Games Animator, Interactive Digital Media Developer, Games Designer, Multimedia Developer, Animator
	Diploma of Digital Media Technologies	Multimedia Designer	Digital Media Designer

Source: Australian Government (2015) *Information and Communications Technology Training Package, version 3.0*

Appendix B VET and other training in the sector

Australians wishing to acquire new skills in the ICT sector can choose from many education and training options, varying from formal training to on the job learning. Factors driving the decision to enrol in VET, rather than take an alternative learning pathway, include funding availability, reputation and quality of the training, the learner's previous education and experience, and employer preferences.

Reviewing the ICT Training Package effectively requires understanding of how the Training Package is used to skill learners to excel in the ICT sector. A thorough understanding of the training landscape helps answer two questions important to Training Package design:

- Why are learners choosing to enrol in qualifications and courses in the ICT Training Package over other training, both now and into the future?
- Will changes to the ICT Training Package fill a training gap or provide better accessibility of training compared to other options?

Important dynamics to consider include the substitutability and competition (influenced by funding and availability) of the options, the relevance of the different forms of training to particular sub-sectors, and employer preferences. To answer these questions, we will analyse the dynamics between Training Package enrolments and the following education and training options:

- **higher education**
- **accredited VET** (non-training package accredited programs of study which lead to a nationally recognised vocational course or qualification)
- **unaccredited training** (training which does not lead to a nationally recognised qualification)
- **schooling.**

Before beginning this analysis, it is important provide a brief overview of the training which the ICT Training Package offers, so as to give a baseline when making comparisons to other training options.

ICT Training Package

The ICT Training Package comprises:

- **44** qualifications
- **50** skill sets
- **663** native and **95** imported Units of Competency (UoCs).

UoCs are defined as either core or elective units, depending on the packaging rules of each qualification in which they are included. Learners can also complete 'skill sets', which are groups of UoCs that are designed to give the learner a particular skill.

Funding is an important consideration and can influence the cost and availability of training and hence a person's decision to enrol in an ICT Training Package qualification over other training options. In many cases learners have access to VET FEE-HELP which provides access to government provided income-contingent concessional loans for the payment of tuition fees. Depending on the learners choice of qualification and personal circumstances, government subsidies may also be available.

Higher education

Higher education qualifications, such as bachelor degrees can offer learners a close substitute to higher level VET qualifications. The most recent enrolment figures indicate that approximately 57,000 learners enrolled in 'Information Technology' higher education courses, compared with approximately 99,000 enrolments in the ICT Training Package.^{102 103} There are several considerations which influence the level of substitutability and comparative enrolment levels. These considerations include the costs and availability of places, employer views of training and the career opportunities which training can provide, each of which is briefly discussed below.

University education generally provides skills at a higher skill level than that typically offered by VET. However, in ICT this is less true in some areas where Graduate Certificates and Graduate Diplomas are offered in the ICT Training Package (though data is not yet available on who widely these qualifications are being enrolled in). This may enable graduates to enter some higher skill level occupations which may not be easily accessible for VET trained learners. However, the inverse is also true for some roles that are regulated where only the VET qualifications meet certain standards that will be requirements for employment.

Accredited VET

In addition to training package qualifications, RTOs may also deliver 'accredited courses', which are nationally recognised but do not exist directly within the ICT training package. Accredited courses can be developed by many parties, including RTOs and often complement training in the ICT Training Package. However, courses can only be accredited if they:

- meet an industry, enterprise, educational, legislative or community need; and
- do not duplicate an existing training product under a training package.

Typically these qualifications do not attract the same level of government support which VET attracts (such as VET FEE-HELP), although subsidised training may be available in some cases.

Although there are a large number of accredited courses (1,353),¹⁰⁴ they make up a relatively small part of the overall training landscape. As of 2014, there were approximately 660,000 enrolments in accredited courses, out of total 3.9 million learners enrolled in all VET.¹⁰⁵ In the ICT sector, there are currently only eight accredited courses which have been identified as covering skills gaps in the ICT sector, as shown in Table 17 (although this list is not necessarily exhaustive). In some cases, for example in Victoria, there are accredited courses that map directly to vendor specific training and certification.

Table 17: Current accredited courses in ICT fields

Course code	Course name
10180NAT	Graduate Diploma of Virtualisation Technologies
10198NAT	Graduate Certificate in Networking and Cyber Security
10343NAT	Advanced Diploma of Professional Game Development
22263VIC	Certificate IV in Integrated Technologies
22289VIC	Certificate II in Integrated Technologies

¹⁰²Department of Education and Training (2016) *Higher Education Statistics Collections – ucube*. Domestic and international learners enrolled in 'information technology' degrees as of 2014.

¹⁰³National Centre for Vocational Education Research (2015) *Learners and courses 2014*

¹⁰⁴Department of Industry (2014) *Review of Training Packages and accredited courses – discussion paper*

¹⁰⁵National Centre for Vocational Education Research (2014) *Total VET Activity*. Note: 663,115 enrolments recorded in nationally or locally accredited qualifications in 2014. This figure does not include locally or nationally accredited skillsets

Course code	Course name
52589WA	Graduate Certificate in Data Communications, HSE, and Management of Industrial Automation Projects
52703WA	Advanced Diploma of Games Development
52782WA	Advanced Diploma of Industrial Data Communication, Networking and IT

Given that accredited courses are designed to cover gaps in training packages or address training in new or emerging areas, it is useful to review current accredited courses to identify areas of training that should be included in the ICT Training Package. As mentioned above government support such as VET FEE-HELP is generally not available for accredited courses, so including them in the ICT Training Package where necessary and relevant may increase the affordability of, and access to particular training.

Unaccredited training

Unaccredited training essentially encompasses all other forms of formal training in the sector. In the ICT sector, the following types of training are prevalent:

- professional association training
- vendor training
- other privately developed courses.

Specifically, vendor training is anecdotally known to be widely used by industry¹⁰⁶ as it is likely that vendors and suppliers are on the forefront of new technologies and concepts, and therefore must be relied on for training in those areas before they are adopted by broad industry employers and RTOs. Also, these courses traditionally offer more flexibility because unaccredited training is not subject to the same level of regulation as accredited qualifications. Therefore, training can often offer niche skills or be tailored to an individual's or organisation's needs to a degree not available in accredited training. This can include the development of specific training material for an organisation or a niche piece of technology.

It is clear that unaccredited training is frequently used by employers as a way to meet their workforce training needs. In 2015, 54 per cent of employers operating in the information, media and telecommunications industry (the most indicative data of ICT employers available) used unaccredited training in the last 12 months.¹⁰⁷

However there are drawbacks in using unaccredited courses. Although these courses are often more customisable and flexible than accredited training, unaccredited training is not quality assured or accredited by vocational education and training authorities. As such, these qualifications cannot be formally nationally recognised, are often not nationally portable, and are generally not supported by government funding.

Schooling

Schooling typically precedes VET or higher education, providing learners with the right skills to move to the next stage of their education or enter the workforce. However, high school learners have the option of gaining skills relevant to the ICT sector while in school. This can be achieved either through a formal VET in Schools program (VETiS) where they complete a lower level ICT qualification or through taking non-vocational classes developed by the relevant state curriculum authority which relate to ICT.

¹⁰⁶ Discussion with IRC members

¹⁰⁷ National Centre for Vocational Education Research (2015) – *Survey of employers use and views of VET*

Non-vocational classes

Currently most Australian States and Territories offer non-vocational courses related to technology as a part of their school certificates. Although these classes do not typically have a strong industry focus, they usually provide a basic understanding of theoretical and practical aspects of ICT. These courses may offer a substitute for lower level ICT VET qualifications, although availability of these classes may be influenced by state curriculum authorities, independent and Catholic school decisions as well as funding.

VET in Schools

Vocational training in ICT can be undertaken by school learners as a part of their senior secondary school certificate. Within VETiS learners can either undertake school-based apprenticeships and traineeship, or VET as a part of their school curriculum. VET in schools (VETiS) enrolments typically make up a small proportion of total enrolments (in 2014, about 20 per cent across the whole Training Package), with VETiS enrolments concentrated in lower level qualifications. Note that decisions to offer certain qualifications offered through VETiS are influenced by state curriculum authorities, independent and Catholic school decisions as well as funding.

Implications for the ICT Training Package

The ICT Training Package plays an important role in the training of workers in the sector, in some occupation grouping more than others. ICT VET is likely to continue to play an important role in training in the sector.

Analysis of non-Training Package learning has revealed a low number of accredited courses but high reliance on unaccredited courses. Given this it will be important to work with employers and vendor to determine if the scope of the Training Package should be expanded to include variations of some of these qualifications, making them more accessible and nationally consistent.

Appendix C Review of the Training Package structure

This appendix makes an initial assessment of the Training Package structure and considers how qualifications, skill sets, and UoCs could be better constructed, ensuring better communication of skills attainment to industry and better skills outcomes for learners. Our initial review in the 2016 4-Year Work Plans raised a number of clear issues:

- **Evaluating use of electives**
- **Duplication of qualifications**
- **Potential for better use of skill sets**

This section considers how the current Training Package is structured and how it is performing against these review areas and discusses possible changes to its structure. The practicalities and impacts of any potential change will also be considered. PwC's Skills for Australia has already begun working with our IRC and stakeholders to address some of these training package issues, especially in relation to duplication. Over the next year, we will continue to work to improve the Training Package, with updated Training Package issues and improvements to be included in the 2018 Industry Skills Forecast and Proposed Schedule of Work.

Evaluating use of electives

Another potential issue is the large amount of variance in number of UoCs available for selection in different qualifications. While a high number of UoCs means that learners will have a high degree of choice to tailor their learning to their particular needs, it also means that graduates with the same qualification may have very different skills and have completed very different units. This creates a challenge in signalling actual skills to potential employers. Qualifications with a lower number of electives, conversely, allow less flexibility but give employers a greater ability to understand what training those graduates have actually completed. Even those qualifications with a low number of listed electives can have packaging rules that allow learners to choose elective units from any similar level of qualification in ICT Training Package.

- For example, learners enrolled in a Certificate IV in Information Technology must complete five core UoCs and 15 electives which must be selected from a list of 134 possible electives and up to five can be chosen more broadly from elsewhere in the ICT Training Package or other Training Packages.
- Learners enrolled in a Certificate IV in Systems Analysis and Design must complete seven core UoCs and 15 electives which can be selected from a list of 19 possible electives and up to four can be chosen elsewhere in the ICT Training Package or other Training Packages.

Most ICT qualifications have packaging rules that allow learners to select elective units from elsewhere in the ICT Training Package and any other Training Packages or accredited course with limited guidance as to which elective units would be most suited in achieving certain skills. This could create confusion for learners and make it difficult to signal skills and specialisations to potential employers.

Duplication of qualifications

Multiple qualifications with potentially similar occupational outcomes have been identified. Further review is required to determine whether separate qualifications are justified.

The streamlining of qualifications and removal of duplication was a key recommendation of the COAG Skills and Workforce Development Sub Group *VET Products for the 21st Century* report in 2009.¹⁰⁸ Preliminary analysis has revealed that several qualifications with similar occupational outcomes exist within the ICT Training Package.

Given the prominence of vendor-certified training courses in the sector, it is important that these are taken into consideration when reviewing the qualifications of the ICT Training Package.

Potential for better use of skill sets

Often learners will not need nor want to complete an entire qualification. Of those learners who discontinue study before completing a qualification, it is estimated that 23 per cent leave because they have acquired the skills they sought.¹⁰⁹ Employers are also indicating that a whole qualification is not needed to achieve relevant skills with 54 per cent of employers in the sector favouring specific subjects or modules.¹¹⁰ An alternative for these learners is to complete a skill set.

Skill sets are sets of units of competency which learners can be given recognition for on their statement of attainment.¹¹¹ Skill sets are also available to learners who complete a full qualification, in recognition of the particular elective choices that were made. However, feedback from learners has indicated that most learners and employers were unaware that completing certain groups of units of competency could be formally recognised.¹¹²

ICT employer surveys have suggested that the strongest need from employers are relevant experience and competencies for regulatory requirements. VET qualifications are underutilised in the ICT sector and of those employers that are using nationally recognised training, the vast majority now rely on specific subject or modules rather than full qualifications. Given this, appropriate use of skill sets that are formally recognised on statements of attainment would allow graduates to better align with required skills.

Currently 50 skill sets are available for learners in the ICT Training Package ranging from Basic Computing Application Fundamentals Skill Set to specialist skill sets such as Certified Security Architect Specialist and skill sets that are specific to ACMA cabling registrations.

Early consultations with ICT IRC members and research have queried the relevance of some qualifications as a full qualification rather than being a skill set. For example, the ICT IRC has queried the need for having the Diploma of Database Design and Development as a qualification and preferred for this to be a skill set.

What does this mean for the ICT workforce?

Training alignment with skills

- Employers cannot easily identify when a learner has a set of skills in a priority area.
- Learners cannot easily signal to employers their particular skills attained through their choice of elective UoCs.
- Skill sets may not actually be available to learners completing a qualification, as skill sets are not always compatible with qualification packaging rules.

¹⁰⁸ COAG Skills and Workforce Development Sub Group (2009) *VET Products for the 21st Century*

¹⁰⁹ Productivity Commission (2012) *Research report: Impacts of COAG Reforms – Business Regulation and VET*

¹¹⁰ National Centre For Vocational Education Research (2015) *Survey of employer's use and views of the VET system*

¹¹¹ Australian Skills Quality Authority (2015), *Fact Sheet: Sample AQF documentation*, accessed at <<http://www.asqa.gov.au/news-and-publications/publications/fact-sheets/sample-aqf-documentation.html>>

¹¹² Department of Industry (2014) *Review of Training Packages and Accredited Course – Discussion Paper*

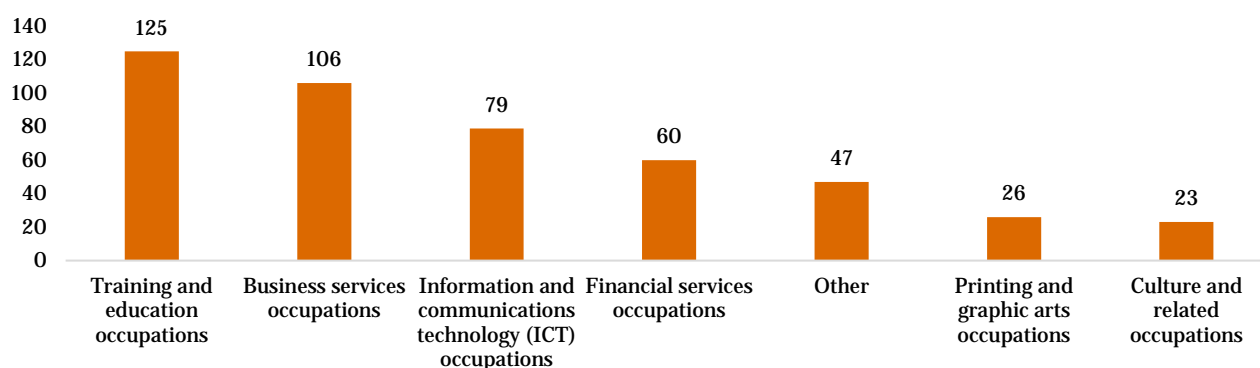
Appendix D Stakeholder Surveys

PwC's Skills for Australia has engaged with hundreds of stakeholders as an SSO, reaching out to a broad range of individuals, business and organisations through open forums, interviews, focus groups, and surveys. Surveys are an important way for us to hear the views of a wide and diverse array of stakeholders. In 2016, we created our Industry Voice Survey to facilitate broader consultation and engagement with employers across a variety of industries, hearing from nearly 200 respondents. Since then, we have reached out to further 400 stakeholders through a number of targeted surveys, asking for input and advice on specific training product development projects. With the changing Australian economy and emergence of Industry 3.0 and Industry 4.0, it will be important for future surveys to engage businesses in these areas to ensure future trends in ICT application across the industry are incorporated. PwC's Skills for Australia will continue to assess these emerging trends and seek broad industry engagement.

Industry Voice Survey

Our Industry Voice Survey was created to facilitate consultation and engagement with employers in a variety of industries. There were 193 complete responses to the survey, which was open from the 19th of May to the 30th of June 2016. The composition of these responses is set out in Figure 10.

Figure 10: Organisations that hire for these occupations (multiple responses allowed)



Source: PwC's Skills for Australia *Industry Voice Survey 2016* – all respondents (n=193)

Figure 11 and Figure 12 illustrate the distribution of these respondent organisations by size and location. Note that all respondents identified having all or some influence over training in their organisation.

Figure 11: Size of respondent organisation

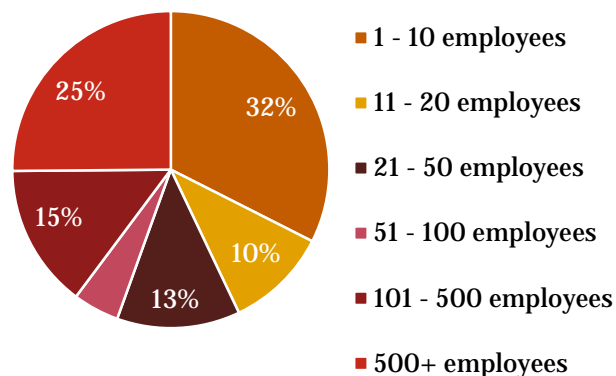
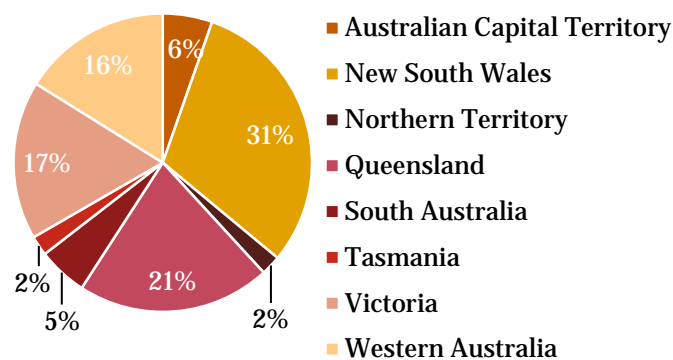


Figure 12: Primary state or territory



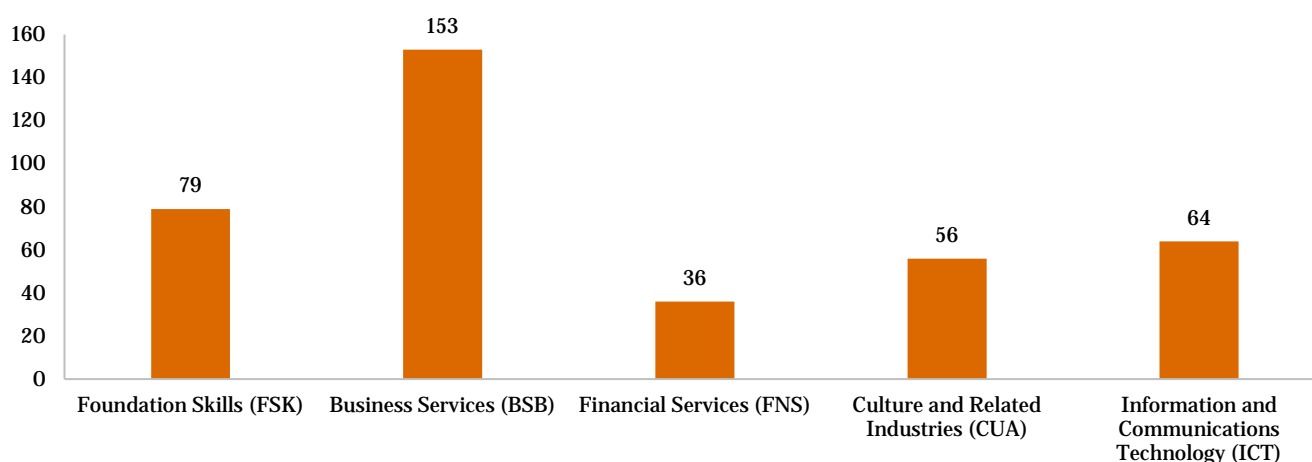
Source: PwC's Skills for Australia *Industry Voice Survey 2016* – all respondents (n=193)

There were 79 responses from employers in the ICT sector. It is recognised that this sample is too small to assume that the views of these respondents are indicative of the views of the broader sector. Therefore analysis of these responses has been omitted in this Industry Skills Forecast and Proposed Schedule of Work. Despite this, the information still provides a valuable insight into the views of employers that are engaging with PwC's Skills for Australia, which will inform discussions with other ICT employers and it is hoped this information will be built on going forwards.

Training Product Development Project Survey

Our Training Product Development Project Survey was created to receive input from both training organisations and industry participants on 2016-17 training product development projects. There were 197 complete responses to the survey, which was conducted in late 2016. Each survey participant could choose the Training Packages they wished to provide feedback on. The composition of these responses is set out in Figure 13.

Figure 13: Respondent feedback by Training Package (multiple responses allowed)



Source: PwC's Skills for Australia Training Product Development Project Survey 2016. Note: there was no survey for the Training and Education (TAE) and Printing (ICP) Training Packages

Figure 14 and Figure 15 illustrate the distribution of these respondent organisations by type and location. Note that all respondents identified having all or some influence over training in their organisation.

Figure 14: Type of respondent organisation

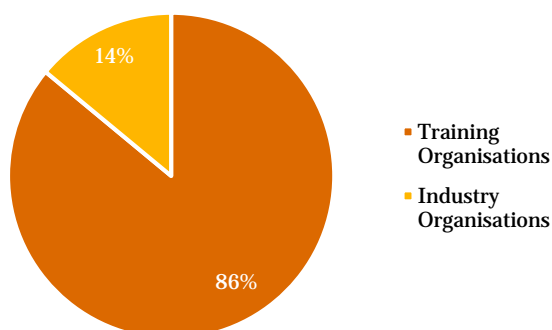
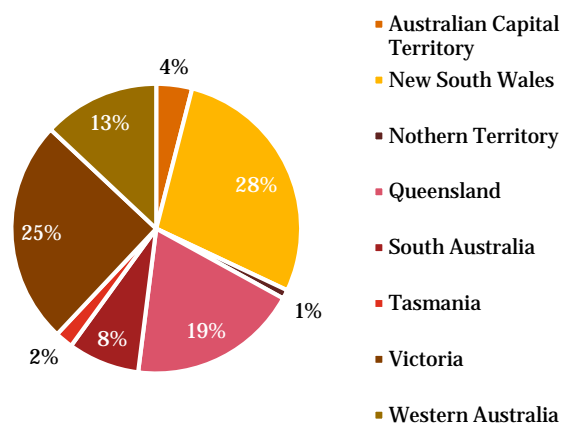


Figure 15: Primary state or territory



Source: PwC's Skills for Australia Training Product Development Project Survey 2016

