ICT Industry Skills Forecast and Proposed Schedule of Work

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Information and Communications Technology

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The Information and Communications Technology (ICT) 2018 Industry Skills Forecast and Proposed Schedule of Work represents an important step in identifying both the present and future skill needs of the ICT industry.

Rapid technological advances are reshaping the ICT industry in Australia and those who work in it.

From IoT to cloud computing, cyber security to blockchain and developments within the telecommunications industry, the pace of change has meant that education providers must carefully and strategically consider what learners are (and are not) taught to prepare for the jobs required by these industries.

With 100,000 ICT learners, vocational education and training (VET) is a critical part of the system, and the affixed 2018 Industry Skills Forecast and Proposed Schedule of Work outlines the changes required of the VET system to meet the skills needs for the future. It is provided to you to offer insights into the work being planned and undertaken in both IT and telecommunications; and as an update on what is shaping the profile of skills required in Australia, both within and external to these industries.

The insights and recommendations found in this document are based on analysis of historical and current data, extensive industry consultation, input from the ICT Industry Reference Committee (IRC), broader stakeholder engagement activities, and public feedback. It is also used by the Federal Government to update stakeholders of the necessary ICT skills needed across the Australian workforce and often informs funding considerations. We hope that you also find value in the insights provided to inform your own work and planning.

The key changes proposed, and driving trends underpinning these suggestions, can be found in Section 3 of this document.

The ICT IRC and PwC's Skills for Australia will continue to strive to enhance the ICT Training Package to best meet the needs of industry and to better skill the ICT workforce of tomorrow.

Yours sincerely,

Sara Caplan
CEO
PwC's Skills for Australia

James Wyatt
Chair
Information and Communications Technology IRC

Executive summary

The Vocational Education and Training (VET) industry is a critical pillar of the Australian education and training system, providing learners with job ready skills for the labour force and training pathways to progress their careers and employability. The Information and Communications Technology (ICT) Training Packages are critical elements in this system, equipping approximately 100,000 learners enrolled in one of the 44 ICT VET qualifications with future-ready ICT skills and knowledge, ready to begin or further a successful ICT career.

However, the role of the ICT VET sector in Australian society is evolving in response to fast emerging industry trends due to rapid technology changes and needs. Key demands impacting the ICT sector and, subsequently its workforce, include:

- **Emerging digital technologies**: Industry demand for emerging skills due to new technological trends are drastically increasing. In particular, cyber security, data analytics, cloud computing and related technologies, as well as emerging and maturing software development methodologies and practices, are areas of greatest need for industry;

- **More connected economy:** The integration of ICT services, new wireless technologies and as well as the reliance on large-scale connectivity and data, is prompting better IT integration strategies, moves towards cloud databases, a greater awareness of consumer trends and new risk-mitigation strategies. Subsequently, a heightened need for project and change management skills, as well as an understanding of how to implement or manage these functions, in a virtual team, is required.

- **Changing workplace roles:** 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. With these workplace changes, ICT roles have an elevated emphasis on creative problem solving skills, changed management, as well as ICT enterprise and soft skills (such as teamwork and communication);

- **Supporting the automation of roles:** Computerisation and automation is predicted to impact Australia's economy, providing opportunities for the ICT workforce to create efficiencies and enhancing existing processes across multiple 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.

In spite of the growing need for ICT skills, job prospects for ICT VET graduates fall below the average VET graduate[1]. Currently, student outcome data reports that employment prospects are below average for ICT Training Package graduates with only 60 per cent of learners being employed six months after training, compared to the 78 per cent average across all VET graduates[2]. Benefits gained from ICT training courses are also lower than average. Student outcomes data shows that ICT graduates are less satisfied with training than other VET graduates, and only 75 per cent of graduates achieved their main reason for undertaking training, compared to an average of 84 per cent across all training packages[3].

In response to these industry drivers and the pressing need for the ICT VET sector to better its employment outcomes, the ICT Industry Reference Committee (IRC) has proposed a review of the ICT Training Package. The parameters of the review will include an assessment of the structure and content of the ICT Training Package to ensure learners are appropriately prepared for jobs for the future. Creation of new subject areas and

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[1] National Centre for Vocational Education Research (2017) *Total VET Activity 2017*

[2] National Centre of Vocational Education and Research (2017) VET graduate outcomes

[3] National Centre of Vocational Education and Research (2017) VET graduate outcomes

qualifications are proposed in response to new technological advancements clearly identified as skill and knowledge shortages within industry. This Industry Skills Forecast and Proposed Schedule of Work (ISFPSW) therefore provides the basis for this review to provide new career options and pathways into employment across a range of business and industries as a result of gaining an ICT VET qualification. This is delineated in the following segments:

1. **Sector Overview** – This section summarizes the parameters of the ICT workforce, including geographical employment overviews, the activities undertaken, and the challenges and opportunities faced by learners and workers.

2. **Employment and Skills Outlook** – The section outlines current and future employment projections in the VET sector and factors that may influence the supply of graduates to fill these positions are discussed to understand future supply and demand within the sector. The skills needs and job roles of these learners and workers are considered through a lens of the trends affecting the VET industry as a whole. This assessment is central to informing an understanding of future job roles and necessary skills needs within the sector more broadly, as well as the specific elements that may need inclusion in the ICT Training Package.

3. **Key Drivers for Change and Proposed Responses** – This section serves as the ICT Case for Change Project 3 scheduled for 2018-19. It outlines the factors driving change in the ICT workforce, including the growing industry demand for emerging skills and workers, elevated importance of enterprise and soft skills within IT and the heightened demand to have new and better ways of incorporating student learning with industry experience through vendor certifications and higher apprenticeship pathways. These factors are changing the jobs within IT, therefore the ICT Training Package requires an update to reflect the skill and capability requirements of future roles.

4. **Proposed Schedule of Work** –Drawing on the above analysis and implication of trends and skills needs, the Proposed Schedule of Work articulates the training product development priorities within the ICT Training Package. The purpose of the schedule is to ensure that learners are appropriately skilled to enter a sector affected by the above trends. A summary of this schedule of work is presented in Table 1 below.

Proposed Schedule of Work

The ICT IRC has scheduled two projects, as set out in Table 1, for 2018 - 2019 to be submitted to the AISC, with the overarching intention of reviewing all qualifications within the ICT VET sector between 2017 and 2021. Drawing on the above, the rationale for each project, as well as the principles used for prioritisation and scheduling will be extrapolated in full in this Proposed Schedule of Work.

Table 1: 2017-19 Summary of Proposed Schedule of Work

Year	Project type	Status	Project code	Project name	Number of Native UoCs
2017-18	Case for change activities	IRC commissioned development of a case for change	2	Getting a job in IT	184
2018-19	Case for change activities	IRC commissioned development of a case for change	3	Getting a better/more specified job in IT	223
Total UoCs in scope of review in 2018-2020					407

Contents

1   Sector overview

1.1   The sector at a glance

Employing nearly 450,000 Australians, the ICT sector is both an agent and subject of technological change. As the ICT sector grows and changes over the next 5 years, so too will the ICT skills required by employers to meet the challenges of a transforming economy.

Within this report, the ICT sector encompasses telecommunications (products and services), and IT (products, services, retail, helpdesk, and other professional ICT services), and is served in Australia by the ICT Training Package 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 1 to Graduate Certificate
- Digital Media has 4 qualifications from Certificate IV to Diploma

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 Installations	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 $48.7 billion total annual revenue in 2017-18, a $1.6 billion increase from last year. 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 3,304 businesses with total annual revenue of $4.1 billion, or in Smartphone App Development there are 702 businesses with total annual revenue of $1.7 billion, and in Web Design Services there are another 3,139 businesses with total annual revenue of $1.1 billion. Although there will be some large players, a lot of these businesses with be micro or small employers, with only a few staff.

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 percent per year 2016 to 2020). 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.

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 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 64 percent of the industry. Overall the industry had $43.3 billion annual revenue for the 2017-18 financial year, and employed almost 50,000 workers.

1.2   Overview by location

One of the main factors linking a learner's training to their employment in the sector is the geographical distribution of learners and their employers, with learners ideally located in the same region or state as their employers. Key differentiating factors between the states and territories include:

- **Economic drivers.** Economic factors shape the composition of any industry, including the ICT sector. Demand for ICT occupations is further affected by the performance of other industry sectors, because these occupations are often embedded into non-IT organisations.

- **Policy and funding arrangements.** Many states and territories have a digital strategy or focus for the ICT sector with funding arrangements varying between jurisdictions.

- **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.

Figure 2: Geographic spread of ICT workers and learners
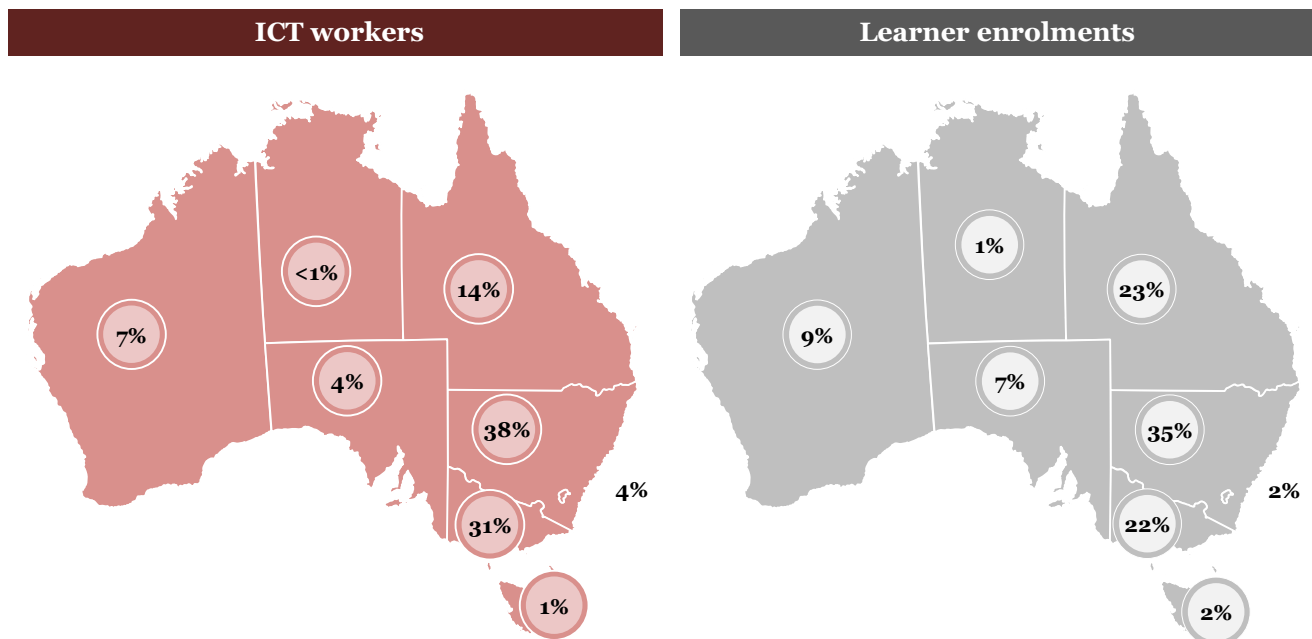
Source: ABS 6291.0.55.003 - Labour Force, Australia, Detailed (by occupation) November 2017, NCVER (2017) Total VET Activity 2016
Note: Excludes all enrolments in Certificate I and II qualifications, as these qualifications are primarily used as VET in Schools training and do not lead as directly to 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 38 percent. 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 NSW. The State has a similar number of learner enrolments (39 percent) to the proportion of sector employment.

- **Victoria** has the next highest level of sector employment at 31 percent, up from 26 percent. However, Victoria has a lower proportion of learners (19 percent). This could mean that learners move to Victoria after training from jurisdictions with potential oversupply of learners (such as Queensland).

- **Queensland** has 14 percent of employment, below the 20 percent of employment the state represents in all industries, likely due to the clustering in New South Wales and Victoria. However, the state has a noticeably higher proportion of learners (27 percent), suggesting some potential oversupply of graduates or potential future growth of the state's sector.

- **Western Australia** has 7 percent of sector learners and 7 percent of sector employment which are both below the state's proportion of employment in all industries (11 percent). This is likely due to the clustering of the sector in east coast states.

- **South Australia** has 4 percent of sector employment and 5 percent 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 percent of sector employment, which is notably higher than the 2 percent of employment in all industries that the territory represents. 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. However, the ACT only represents 2 percent of sector learners, suggesting a potential local undersupply of graduating learners.

1.3   ICT Training Package profile

There are 44 qualifications in the ICT Training Package. Of the 4.2 million learners enrolled in VET qualifications in 2016, approximately **99,200 learners were enrolled in the ICT Training Package,** comprising 2.4 percent of all learners. For details of student enrolments, see **Appendix B.**

1.4   Challenges and opportunities

The views of businesses, learners and other key stakeholders are critical to understanding the skills needs in the ICT workforce. The approach to training product review taken in this Industry Skills Forecast and Proposed Schedule of Work is centred on stakeholder views of the challenges and opportunities. Table 2 identifies some of the key stakeholders in the ICT sector.

Table 2: Stakeholders in the ICT sector

Stakeholder groups	Key stakeholders
Training Product Development	- Australian Industry and Skills Committee (AISC) - Information Communications and Technology IRC - Other IRCs - TITAB Australia
Government	- Australian Skills Quality Authority (ASQA) - Federal, State and Territory Departments (incl. Chief Government Information Officer) - National Centre for Vocational Education Research (NCVER) - National Broadband Network (NBN) - Innovation Australia - Australian Communications and Media Authority (ACMA) - Australian Safety and Compensation Council - Digital Transformation Agency
Employee representatives	- Communications Workers Union Australia - Unions - Australian Computer Society (ACS)
Employer representatives	- Australian Information Industry Association (AIIA) - Australian Digital and Telecommunications Industry Association - Business Council of Australia - Australian Chamber of Commerce and Industry (ACCI) - Australian Industry Group - Game Developers' Association of Australia (GDAA) - Other industry groups
Registered training organisations (RTOs)	- Technical and Further Education institutions (TAFEs) - Private and community RTOs - Secondary schools that also have RTO status - Universities that operate as dual sector institutions

Stakeholder groups	Key stakeholders
Workers	• ICT Managers • ICT Professionals • ICT Support Technicians • Telecommunications workers • Administrative and Clerical Workers • Organisation directors in the sector
Learners	• Domestic learners • International learners

1.5 Employer challenges and opportunities

Drawing from existing employer surveys, such as the NCVER *(2017) Survey of Employers' Use and View of the VET system 2017,* and ongoing consultation with industry, a number of key challenges have been identified:

1   More employers are increasing looking for graduates with vendor certifications

A total of 54.8 percent of ICT employers surveyed in 2017 said they used non-accredited training (an increase of 1.3 percent since 2015), demonstrating a greater reliance on non-accredited training than the all industries average. Employers reported that vendor certifications have become an industry standard and expectation. As many as 92.5 percent of IT employers reported satisfaction with non-accredited training (above the national industries average). This feedback prompted the creation of a Vendor Certification Working Group, reporting to the ICT IRC. **Section 3** recommends consideration on how vendor certifications might be better accommodated in the national training system.

2   Employers have not found the VET system to be traineeship/apprenticeship friendly

ICT employers are less likely to hire apprentices or trainees than most other industry sectors. Even so, last year, ICT employers hiring new apprentices or trainees grew from 10.7 percent in 2015 to 13.8 percent. However, satisfaction among IT employers who have an apprentice/trainee dropped from 50.6 percent to 42.7 percent from 2015 to 2017 (35 percent lower than the national industry average). **Section 3** recommends modifying the ICT Training Package to be more apprenticeship and traineeship friendly.

3   Employers are struggling to source employees with relevant ICT skills

ICT employees reported difficulty sourcing employees as a common issue. A PwC survey of global cyber security professionals found that half reported that fewer than 25 percent of applicants were qualified with the skills needed for the job[4]. Microsoft has previously found that as many as 63 percent of IT business leaders have expressed concern about the skills gap in cyber security[5]. The difficulty of finding skilled applicants is protracted by its global nature – across the Asia-Pacific region, 31 percent of IT businesses report difficulty finding cyber security qualified professionals and 35 percent identified it as an area of focus for their business last year.[6] **Section 3** considers how the ICT Training Package could be amended to deal with these challenges.

Learners and graduates

To give learners the best possible opportunity to get fulfilling jobs, it is important to understand the profile of learners and the outcomes received from training. 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. 42 percent of the ICT learners are 19 and under.

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[4]   Previous PwC case for change – check referencing

[5]   Microsoft (2016), survey **complete**

[6]   Global Knowledge Training (2017), *IT Skills and Salary Report: A Comprehensive Study from Global Knowledge.*

- Predominantly male. Male learners account for 78 percent enrollees in the ICT Training Package, compared to 50 percent across all training packages.

- Learning part-time. The majority of learners (70 percent) enrolled in the ICT Training Package are part-time.

- Less likely to be employed after training. 60 percent of total VET learners in the sector are employed within six months of completing their training, up 10 percent from last year, and significantly lower than the 78 percent average across all VET graduates.

- Less likely to be employed in the area they trained in. 36 percent of graduates reported they were working in the same occupation as they trained in, up from 29 last year, but still lower when compared to 39 percent for all VET graduates.

- Earning a median annual income of about $55,400. Annual income six months after training for graduates employed full-time is $55,400 compared to the $55,00 for all VET sectors.

- 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, 15 percent will go on to take a Certificate III or IV, 13 percent will go on to take a Diploma or Advanced Diploma, and 9 percent will undertake a Bachelors degree or above. This suggests that learners are taking a step by step approach to achieving qualifications.

Figure 3: ICT VET student learning outcomes
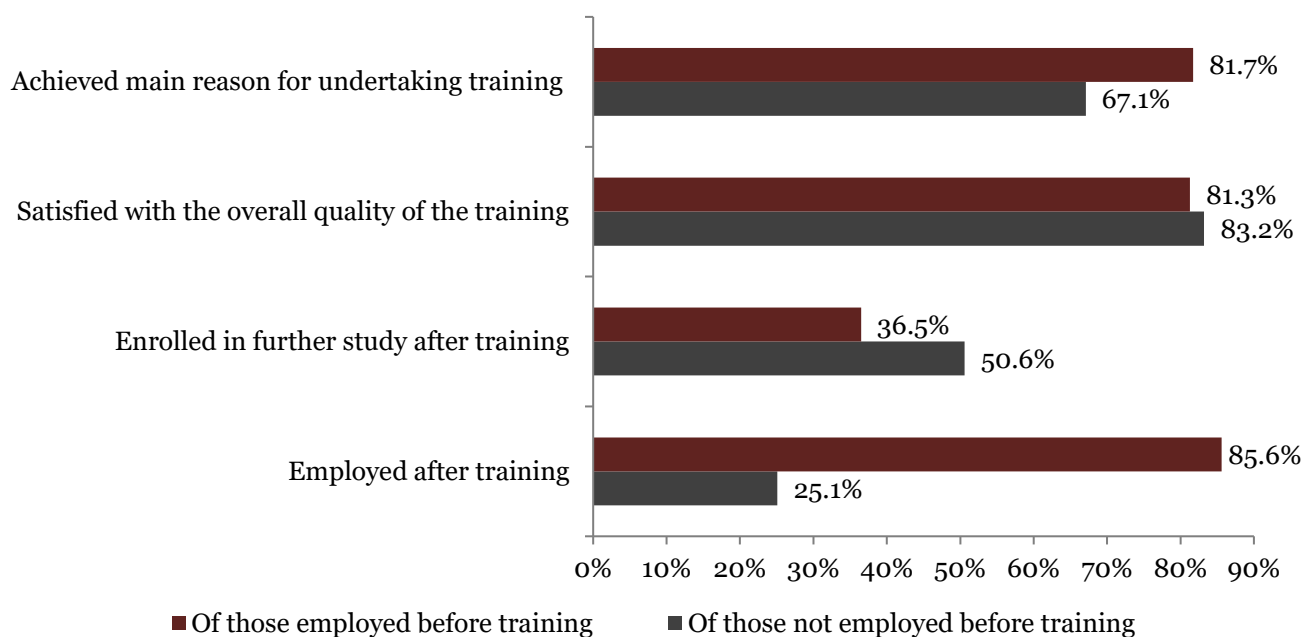
1.6 Opportunities for collaboration in training development across industry sectors

Training packages are not always developed in a way that recognises the importance of skills in multiple sectors and which can be used to their full potential in various industry contexts. The AISC has identified several cross sector skill areas where opportunities exist to create flexible and transferable package components that will benefit industry, learners and the broader VET sector.

PwC's Skills for Australia has been commissioned to develop training package components that address skill needs across industries in four cross sector skill areas: Cyber Security, Big Data, Teamwork and Communication, and Inclusion of People with Disability in VET. The expected outcomes of these cross sector projects include:

- significant reduction in the level of duplication across the national training system
- better support for individuals to move between related occupations
- improved flexibility and efficiency in Australia's VET system.

Table 3 below identifies opportunities for linkages between existing cross sector project work and the ICT Training Package.

Table 3: Training development opportunities across industry sectors

Cross sector projects	Project description	Link to ICT training package
Automation	Identify related skill and knowledge needs in automated processes and the use of robotics, drones and remote operations systems shared by multiple industry sectors.	This project may affect related ICT UoCs in scope, including cybersecurity, cloud computing management, workflow automation, project management and managing co-located teams. The programming of automated products could further be impacted and/or developed in future projects as per relevance to the ICT Training Package.
Cyber Security	Identify related skill and knowledge needs in information security, data protection and privacy shared by multiple industry sectors.	The AISC approved the cross sector Case for Change for Cyber Security in February 2018. The training product development work was determined to be within the remit of the ICT IRC. This work will involve stakeholders from diverse industries. See Section 3 for further context.
Big Data	Identify related skill and knowledge needs in data management, data analytics and data driven decision-making that apply across multiple industries.	The AISC approved the cross sector Case for Change Big Data in February 2018. The training product development work was determined to be within the remit of the ICT IRC. This work will involve stakeholders from diverse industries. See Section 3.
Consumer Engagement through Online and Social Media	Identify related skill and knowledge needs in cultural awareness, customer service, marketing, communication and social media skills shared by multiple industry sectors.	Programming, coding, app development and web design units will be impacted by the growing commercial need to integrate social media and consumer engagement with front end design products. Potential overlap identified with the growing impact of digital marketing and online advertising with IT business skills.
Digital Skills	Identify related skill and knowledge needs in digital literacy, 3D printing/additive manufacturing and coding skills that apply across multiple industries.	Per Section 3, Project 3 will build upon the digital literacy skills taught throughout ICT Cert I - IV (as developed in Project 2), and form a platform from which learners can specialise and explore further digital skills, as per the ICT Training Package.
Environmental Sustainability	Identify related skill and knowledge needs in environmentally friendly products, manufacturing and waste processes, and sustainable energy production that apply across multiple industries.	May impact ICT installation and testing units as sustainability and environmental standards and procedures change.

Cross sector projects	Project description	Link to ICT training package
Supply Chain	Identify related skill and knowledge needs in traditional supply chain management practices as enabling services for the economy that apply across multiple industry sectors.	Currently no identified overlap, however any unit created as part of the project will be considered for importation into the ICT Training Package where they are relevant and required by the industry.
Inclusion of People with Disability in VET	Develop training package components that can be used by multiple industries to build the capability of VET educators and employers to foster greater inclusion of people with disability in vocational education and training, employment, and customer service contexts.	This project will consider the implications of the ICT Training Package to learners with disabilities. Compliant standards will be adhered to in order to accommodate a more inclusive Training Package for all learners.
Teamwork and Communication	Develop common teamwork and communication units that address common skill and knowledge needs and can be contextualised across multiple industries.	A Case for Endorsement has been prepared with the support of a cross-sector project reference group (PRG). The ICT IRC has representation on this PRG and intends to leverage these units as appropriate.

2 Employment and Skills Outlook

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). 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.

2.1 Industry employment outlook

Employment projections at an industry level are confined to specific industry definitions (as defined in ANZSIC). [7]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. Figure 7 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 includes industries where relatively few ICT workers are likely to operate for example: 'Motion Picture and Sound Recording Activities' or 'Publishing'.

- 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).

2.2 Occupational employment outlook

The employment landscape can also be analysed at the occupation level (classified by the ABS under ANZSCO).

Table 4: Employment levels

Occupation	Employment levels - May 2017 ('000s)	Projected employment levels - May 2022 ('000s)	Projected employment growth - 5 years to May 2022 ('000s)
ICT Managers	62.8	76.4	+21.6
Graphic and Web Designers, and Illustrators	59.2	68.7	+16.1
ICT Business and Systems Analysts	26.1	27.0	+3.5

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

Occupation	Employment levels - May 2017 ('000s)	Projected employment levels - May 2022 ('000s)	Projected employment growth - 5 years to May 2022 ('000s)
Multimedia Specialists and Web Developers	8.8	9.0	+1.7
Software and Applications Programmers	104.0	119.0	+14.5
Database and Systems Administrators, and ICT Security Specialists	36.7	41.0	+11.8
Computer Network Professionals	22.6	23.2	+2.6
Telecommunications Engineering Professionals	12.5	15.0	+19.9
ICT Support Technicians	53.3	59.2	+11.0
Telecommunications Technical Specialists	5.0	5.4	+6.1
Keyboard Operators	57.7	55.0	-4.6
ICT occupations (overall)	**448.7**	**498.9**	**+11.2**

Source: Department of Jobs and Small Business (2017). 2017 Occupational Projections – five years to May 2022

Note 1: the occupations displayed in the above table are identified as the most relevant occupations. The categories do not represent an exhaustive list of all occupations in the sector.

2.3 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. Table 5 lists some of the factors which may influence the decision of workers to undertake ICT training and enter a role within the sector.

Table 5: Supply side influences – challenges and opportunities

Supply side influence	Details
Reputation	• ICT occupations tend to be viewed as relatively favourable, with a weighted average 'socioeconomic index' of approximately 74, where the average occupation score is approximately 50. Scores range from 0 (low status) to 100 (high status).[8] • The good reputation of the sector presents an **opportunity** to encourage participation.

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

Supply side influence	Details
Wages	• ICT VET graduates tend to receive similar starting wages to VET learners in generally, with significant opportunity for wage growth.[9] • Favourable wages present an **opportunity** to encourage participation.
Working conditions	• IT occupations have generally good working conditions, offering employment opportunities with a diverse range of employers. • Good working conditions presents an **opportunity** to encourage participation.
Lateral movement	• Given a core set of skills, IT workers are able to move between industries and related occupations, updating peripheral skills as needed. • Flexibility and lateral movement represents an **opportunity** to attract workers.
Funding	State and territory based funding programs identify ICT qualifications on 'priority skills lists' (enabling access to additional government subsidies or concessions), including: • **New South Wales** -20 ICT qualifications are listed on the 'Jobs of tomorrow scholarships eligible qualifications list'.[10] Additionally, the 'NSW Skills List V6.0' lists 28 ICT qualifications.[11] • **Victoria** - A significant number (over 60) of ICT qualifications are listed on the 'Funded Course Report', although a large proportion are superseded versions of qualifications.[12] • **Queensland** - 12 ICT qualifications are listed under the 'Queensland Training Subsidies List', although some are superseded versions of qualifications.[13] • **Western Australia** - Eight ICT qualifications are listed under Future Skills WA 'Priority industry qualifications list'.[14] • **South Australia** - The South Australian 'Subsidised Training List' currently lists available places in 29 ICT qualifications (including some superseded).[15] • **Tasmania** - Currently, 14 ICT qualifications are listed in the Skills Tasmania 'User Choice - Tasmanian Apprenticeships and Traineeships Listing'[16] • **Northern Territory** - Currently the Northern Territory Apprenticeship table lists 3 funded ICT qualifications. Qualifications linked to ICT are also listed on the NT Occupation priority list.[17] • **Australian Capital Territory** - Currently, there are a 13 ICT qualifications listed on the 'ACT Skills Need List'.[18] The availability of subsidies represents an **opportunity** to build a skilled ICT workforce.

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[9] National Centre for Vocational Education Research (2017) *Total VET activity*

[10] NSW Government (2017) *Smart and Skilled Jobs of Tomorrow Scholarships Eligible qualifications* <https://smartandskilled.nsw.gov.au/__data/assets/pdf_file/0015/105234/jobs-of-tomorrow-qualifications-list.pdf> Accessed January 2018

[11] NSW Government (2018) *Smart and Skilled: 2016 NSW Skill List – V6.0* <http://www.training.nsw.gov.au/forms_documents/smartandskilled/skills_list/2016_skills_list.pdf> Accessed February 2018

[12] Victorian Government (2017) *Skills Victoria Training System – Funded Course Report* <http://www.education.vic.gov.au/svts/> Accessed January 2018

[13] Queensland Government (2017) *Queensland Training Subsidies List (2016-17 Annual VET Investment Plan)* <http://www.dtwd.wa.gov.au/sites/default/files/uploads/vetcpr-priority-ind-payment-table-2017.pdf> Accessed January 2018

[14] Western Australian Government (2017) *Future Skills WA – Priority Industry Qualification List* <http://www.futureskillswa.wa.gov.au/trainingcourses/Documents/Priority%20industry%20qualifications%20list.pdf> Accessed January 2018

[15] South Australian Government (2017) *Work Ready Subsidised Training List 2.0* <http://www.skills.sa.gov.au/dmx?Command=Core_Download&EntryId=2779> Accessed January 2018

[16] Tasmanian Government (2017) *Skills Tasmania Tasmanian Apprenticeships and Traineeships Listing* <http://laureldw.stategrowth.tas.gov.au/default.aspx> Accessed January 2018

[17] Northern Territory Government (2017) *Direct consultation with the Northern Territory Department of Business – Training NT*

[18] Australian Capital Territory Government (2017) *ACT Skills Need List* <https://www.skills.act.gov.au/?q=act-skills-needs-list> Accessed January 2018

2.4   Trends shaping the sector

This section outlines **four key trends** shaping the ICT workforce. Over the past year, a number of additional forces have 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 end-to-end digitisation, often termed the creation of "Industry 4.0".[19]

01	Emerging digital technologies
02	More connected economy
03	Changing workplace roles
04	Supporting the automation of roles

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. 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 percent of CEOs.[20] In fact, the speed at which technology is changing and its impact on businesses is seen as a rising concern for 38 percent of CEO's in 2018, up from 29 per cent in 2017. Moreover, as technology progresses and continues to be adopted across within numerous industries, there will be more interdependencies between ICT and other Training Packages

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.[21] Businesses are creating new roles involving data warehouse management and maintenance.

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

[20]   PwC (2015) *Global CEO Survey*

[21]   IBM Research (2016) *How big is big data?*

- **Cyber security**. Exponential growth in the amount of data being created and stored, including confidential data, raises significant concerns about privacy and security.[22] The media regularly reports on new cases of leaked data and hacked computer systems.[23] This is increasing the need for ICT security specialists.

- **Artificial intelligence (AI)**. AI is a collective term for computer systems that can sense their environment, think, learn, and take action in response to what they're sensing and their objectives.[24] The growth of AI as an emerging digital technology provides opportunities for innovation and differentiation across all areas of business.[25]

- **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 assignment 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. Cisco estimates that 50 billion 'things' will be connected to the internet by 2020.[26]

- **Cloud computing**. Rather than delivering computing services locally they are increasingly being delivered using a shared pool of resources from a remote location.[27] 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.[28]

- **Application development**. 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.[29] In 2017, there were over 5 million mobile apps across Google Play and the Apple App Store alone.[30]

- **Automation**. Increasingly, digital technology is able to automate process oriented tasks and some roles within organisations.[31] 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 which can be distributed across a peer-to-peer network, encrypted to de-identify individuals and allow for the verification of transactions. Blockchain has the potential to disrupt business processes and industries, including ICT. A 2016 Accenture Outlook report noted that blockchain has gained traction in financial services, but "has the potential to become a general-purpose technology [...] like the steam engine, electricity or the internet, that changes how society and the economy work".[32]

- **Augmented and virtual reality**. Augmented Reality (AR) is "augmentation" of the real world through the addition of information and images.[33] Virtual Reality (VR) is the simulation or re-creation of an image or environment, within a confined space, that users can interact with.[34] 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.

[22] CSIRO (2016) *Tomorrow's digitally enabled workforce*

[23] Australian Cyber Security Centre (2015) *Australian Cyber Security Centre 2015 Threat Report*

[24] PwC (2017) *Sizing the prize What's the real value of AI for your business and how can you capitalise?*

[25] https://www.pwc.com.au/consulting/data-possibilities/global-artificial-intelligence.html

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

[27] CSIRO (2016) *Tomorrow's digitally enabled workforce*

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

[29] CSIRO (2016) *Tomorrow's digitally enabled workforce*

[30] *Statista* (2017) *Number of apps available in leading app stores as of March 2017*

[31] CSIRO (2016) *Tomorrow's digitally enabled workforce*

[32] Accenture (2016) *What every CEO should know about blockchain*

[33] PwC (2016) *Tech breakthroughs megatrend: how to prepare for its impact*

[34] PwC (2016) *Tech breakthroughs megatrend: how to prepare for its impact*

Emerging digital technologies have implications for skills needs in a number of sectors. For example, the Queensland Trucking Association (QTA) 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. 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	• Increased demand for specialist ICT jobs in data analytics, cyber security, cloud computing, application development and automation.
Skills needs	• 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.[35] Access to high speed broadband is rapidly increasing. As of June 2017, the NBN was available to 5.7million premises, with this number expected to increase to 8 million homes and businesses by 2020.[36] This is also supported by improvements in other mobility technologies such as wireless moving to 5G and the proliferation of mobile devices. There were approximately 26.3 million mobile handset subscribers as at 30 June 2017, a 3.4 per cent increase since December 2016.[37] 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. These technologies are allowing more Australians to work remotely and more services to be delivered remotely.

This includes:

- **Enhancing consumer experience**. Online shopping in Australia is valued at over $20 billion and has grown at 13.5 per cent per annum from 2013 to 2018.[38] 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.[39]

- **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.

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[35] 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

[36] National Broadband Network (2017), Annual Report 2017

[37] ABS (2017) 8153.0 - Internet Activity, Australia, June 2017 <http://www.abs.gov.au/ausstats/abs@.nsf/0/00FD2E732C939C06CA257E19000FB410>

[38] IBISWorld (August 2017) *IBISWorld Industry Report X0004 Online Shopping in Australia*

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

- **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. 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.[40] This may be particularly relevant given that 8.5 per cent of ICT learners have identified themselves as having a disability.[41]

- **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.

- **Facilitating start-ups**. The ICT industry has seen the proliferation of start-ups in recent years. 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".[42] In this environment, more work needs to be done to understand the skills needs and potential role for vocational education.

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.

What does this mean for the ICT workforce?

Job demand	• 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	• 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 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.

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[40] 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

[41] National Centre for Vocational Education Research (2016) *Learners and courses 2015*

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

- **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.[43]

What does this mean for the ICT workforce?

Job demand	• Increased demand for strategic and managerial roles.
	• Increased demand for ICT professionals who specialise in security, compliance and risk management.
Skills needs	• 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

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.[44] 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 provides opportunities for the ICT workforce to be part of industries where technology is being harnessed to create efficiencies and enhance existing processes.

The move towards automation 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 to 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	• Increased demand for specialist ICT roles in the areas of computing, systems, diagnosis, service and maintenance.
Skills needs	• 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.

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[43]   PwC (2017), 21st CEO Survey 2018

https://www.pwc.com/gx/en/ceo-agenda/ceosurvey/2018/gx/business-threats.html

[44]   PwC (2015) *A Smart Move*

2.5   Creating a future fit workforce

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 6. All skills listed in Table 6 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.

Table 6: 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

3 Key Drivers and Proposed Responses

3.1 Overview

The Australian IT workforce is driving digital disruption, but technological change is also resulting in a fundamental transformation of the ICT industry itself and the skills required by this industry into the future. Employers consulted reported difficulty finding adequately skilled IT workers; while a number of RTOs used the consultation to report difficulty finding adequately skilled IT workers to deliver training.

Since 2012, online job advertisements for applicants at the Diploma or Advanced Diploma level have grown by 32% in Australia. Within the ICT industry, 5,980 job advertisement were posted for Software and Application Programmers - occupations in which technological advances are constant and frequent - and the Department of Employment predicts that an extra 29,900 ICT professionals will be required by 2020.

All of this underlines the significant responsibility of the ICT Training Package to respond to the skills demands of the IT industry. The process necessarily begins with the identification of key drivers of change. This section undertakes this task with a particular emphasis on Project 3 'getting a better job in IT', which is explored further in **Section 5**. Each key driver is accompanied by a proposed response. An analysis of the impacts of such a response, and cost of doing nothing are also considered below.

These key drivers and proposed responses have been informed by a literature and employment trends review, as well as extensive in-person, focus group, and survey consultation. A total of 46 individuals / organisations were consulted in phone-calls, focus groups, and meetings. Further, a survey was conducted with 79 respondents, constituting the PwC ICT Project 2 & 3 survey.

It is noted that the 2018 Cyber Security and Big Data Cross Sector Projects have been commissioned to produce units for generalists/ non-IT professionals, providing a holistic and industry-wide curriculum. Conversely the cyber security and data analytics units proposed above will be technically specific to ICT, as needed by industry, and so not to cause duplication. While the risk of overlap is acknowledged and will be proactively managed, the ICT IRC and PwC's SfA are clear on the important distinction between the requirements for the cross sector work and that of the ICT specific work.

3.2 Outline of key drivers and proposed responses

Driver	Explanation	Proposed Response *These responses fall within the scope of Project 3, 'getting a better job in IT'.*
Growing industry demand for emerging skills and workers		
1.1 Cyber security	Industry has consistently identified a skills shortage in cyber security – and 78 percent of survey respondents 'somewhat agree' or 'strongly agree' that there is a skills gap in cyber security among ICT VET graduates.[45] The emergence of a nationally accredited course outside of the ICT Training Package (22445VIC - Advanced Diploma of Cyber Security) is a proof point for industry	1.1.1. Amend 11 Units of Competency (UoCs) identified as related to cyber security *(e.g. ICTNWK509 Design and implement a security perimeter for ICT networks, ICTPRG507 Implement security for applications, and ICTNWK605 Design and configure secure integrated wireless systems).* 1.1.2. Develop 17 new UoCs in cyber security to ensure coverage of skill areas for

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[45] PwC's Skills for Australia (2018), *ICT Project 2 & 3 Survey Results*

Driver	Explanation	Proposed Response *These responses fall within the scope of Project 3, 'getting a better job in IT'.*
	demand. TAFE NSW also offers a Statement of Attainment in Cyber Security. While the Cyber Security Cross-Sector Project has been designed for general skills to be imported by other industries, this driver relates to specialised skills required by ICT professionals. Industry consultations highlighted that skills for non-entry-level ICT employees might include participation in a cyber security incident response team, active in preserving and providing evidence of attacker behaviour, and demonstrating how to remediate root causes. In sub-sectors such as web-design, stakeholders identified the ability "to understand the weaknesses introduced in coding internet facing services and identify ways code could be subverted to cause a cyber security incident", whereas in database, the ability to "identify, prioritise, and protect unharmed data when under attack" was seen as necessary.	non-entry level learners (listed in Appendix C) 1.1.3. Develop a new ICTCYS unit sector and specialisation within the ICT50115 Diploma of Information Technology. 1.1.4. Develop a new skillset dealing with specialist cyber security skills. 1.1.5. Update packaging rules of qualifications within scope to ensure adequate coverage of cyber security.
1.2 Data analytics	Data analytics has been consistently identified in stakeholder consultations as a priority area. 80 percent of survey respondents agreed or strongly agreed that there is a gap between the data analytics skills of ICT VET graduates and the industry skill demands[46]. Growth in cloud computing, the IoT (including a proliferation in sensors and drones), and AI growth has led to an increasing demand for workers skilled in data analytics. While a number of the units in the Big Data Cross-Sector Project are suitable for generalist skills, this driver identifies that there are additional specialised data analytics skills required by ICT professionals.	1.2.1. Amend 3 units of competency identified at nominal AQF level 5 or above that are relevant to developing data analytics skills. 1.2.2. Develop 3 new units of competency to deal with data analytics. Identified units of competency would fill gaps in the ICT Training Package (listed in Appendix C). 1.2.3. Where possible, leverage units from the Big Data Cross-Sector Project.
1.3 Cloud computing and related technologies (Saas, PaaS, IaaS, IoT, blockchain)	The explosive growth in cloud computing has meant that organisations are moving from a 'cloud first' strategy towards a 'cloud only' strategy[47] with Cisco estimating that by 2021 '94 percent of workloads and	1.3.1. Amend 3 existing units of competency dealing with cloud computing (ICTPRG604 Create cloud computing services, ICTNWK616 Manage security, privacy and compliance of cloud service deployment, ICTICT814 Develop cloud computing strategies for a business).

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[46] PwC's Skills for Australia (2018), *ICT Project 2 & 3 Survey Results*, Qualtrics.

[47] Anderson, C., 2017. Train to Accelerate Your Cloud Strategy.

Driver	Explanation	Proposed Response *These responses fall within the scope of Project 3, 'getting a better job in IT'.*
	compute instances will be processed by cloud data centres'[48]. Organisations are able to derive significant benefit from moving to cloud offerings however 28 percent of organisations have indicated that they struggle to find cloud computing candidates.[49] The breadth of cloud computing for the purposes of the ICT VET training package can be considered to include technologies such as Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS), and the Internet of Things (IoT). While cloud computing and IoT are distinct, they are linked through IoT's dependency on the processing requirements of the enormous quantities of data generated[50] and processing limitations inherent in many IoT devices[51], [52]. These changes within the industry are consistent with industry stakeholder responses[53] with 75 percent of respondents indicating that they either agree or strongly agree with the statement that there is a skills gap in cloud computing for ICT VET graduates, and 84 percent of respondents indicating the same for IoT.	1.3.2. Develop 6 new units of competency dealing with cloud system administration, deployment, data security, disaster recovery, and service level agreements, and the installation, implementation, design and testing of IoT devices and networks (listed in Appendix C). 1.3.3. Develop 3 new units of competency dealing with blockchain (listed in Appendix C). 1.3.4 Develop 6 new units of competency in dealing with installing, programing, connecting and analysing IoT networks, devices, systems and microcontrollers.
1.4 Emerging and maturing software development methodologies and practices	Industry requirements and demands for software development and web development roles are continually and significantly changing; such as the growth in DevOps[54] and Agile[55]. Beyond methodologies however the increased leveraging of libraries in software development and the use of application programming interfaces (APIs) in	1.4.1. Update nominal AQF levels 5 and 6 units of competency to require the use of a current software development methodology, the use or implementation of APIs, the use of external libraries, and the use of version control practices.

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[48] Cisco, 2017. Cisco Global Cloud Index: Forecast and Methodology, 2016–2021. https://www.cisco.com/c/en/us/solutions/collateral/service-provider/global-cloud-index-gci/white-paper-c11-738085.html

[49] Global Knowledge Training LLC, 2017. 2017 IT Skills and Salary Report. https://www.globalknowledge.com/us-en/content/salary-report/it-skills-and-salary-report/

[50] Trustlook, 2017. IoT Security: A Coming Crisis?. https://blog.trustlook.com/2017/09/26/survey-reveals-iot-security-is-falling-short/

[51] Flavio B., Rodolfo M., Jiang Z., and Sateesh A., 2012. Fog computing and its role in the internet of things. *In Proceedings of the first edition of the MCC workshop on Mobile cloud computing (MCC '12).* pp.13-16. http://dx.doi.org/10.1145/2342509.2342513

[52] Botta, A., De Donato, W., Persico, V. and Pescapé, A., 2016. Integration of cloud computing and internet of things: a survey. *Future Generation Computer Systems*, 56, pp.684-700.

[53] PwC's Skills for Australia (2018), *ICT Project 2 & 3 Survey Results,* Qualtrics.

[54] Puppet. 2017. 2017 State of DevOps Report. https://puppet.com/resources/whitepaper/state-of-devops-report

[55] VersionOne. 2017. 11th Annual State of Agile Report. https://explore.versionone.com/state-of-agile/versionone-11th-annual-state-of-agile-report-2

Driver	Explanation	Proposed Response *These responses fall within the scope of Project 3, 'getting a better job in IT'.*
	software design as identified by industry[56], [57]. For ICT graduates to be sufficiently adept at methodologies and practices as they emerge and mature, graduates must be exposed to current methodologies and practices within the ICT training package.	

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[56] PwC's Skills for Australia. 2018. ICT - IT Training Products - 'getting a job' and 'getting a better job' in IT survey.

[57] PwC's Skills for Australia. 2018. Personal interviews with various stakeholders.

Driver	Explanation	Proposed Response *These responses fall within the scope of Project 3, 'getting a better job in IT'.*
Elevated importance of enterprise skills in IT		
2.1 Communication, creative thinking and problem-solving	Stakeholder consultations identified enterprise and transferable skills as an existing deficiency. As many as 83 percent of survey respondents stated that ICT VET graduates are "not job ready" or "somewhat job ready".[58] Survey respondents repeatedly cite communication, creative thinking and problem-solving as skills that would improve the job-readiness of ICT VET graduates.[59] In fact, problem-solving was cited 36 times by survey respondents, with respondents citing "the ability to adapt and evolve, rapidly gaining skills and knowledge to solve specific problems."	2.1.1. Amend 151 units of competency through the lens of teamwork, problem-solving, communication skills within co-located and non-co-located teams, to ensure adequate coverage of soft skills within these units. 2.1.2. Update ICT units within ICT60415 Advanced Diploma of Information Technology of Project Management to ensure that modern project management practices and methodologies are embedded into current units of competencies, especially those within the core of the qualification. 2.1.3. Update 10 other qualifications within scope for this project (including elements, performance evidence and knowledge evidence of core units of competency) to ensure adequate coverage of soft skills, and where appropriate, whether the BSB Training Package or cross-sector Teamwork and Communications Units would meet industry demand. 2.1.4. Develop 3 new units of competency with coverage of the following skill areas that could be offered at the Diploma or Advanced Diploma level (also listed in Appendix C): • Utilising IT project management methodologies (e.g. Agile) • Lead a remote or virtual team (e.g. motivate workers, assess and select technologies) • Change management and impact analysis of digital disruption 2.1.5. Develop 1 new unit dealing with outsourcing management (listed in Appendix C).
2.2 Change management & project management	The IT industry is both a driver and subject of digital disruption. According to a study by the Committee for Economic Development of Australia (CEDA), up to 5.1 million jobs (or 44 percent) of the workforce are likely to be automated in the next 10-15 years.[60] This has resulted in demand uplift for occupations such as change managers who look at platform upgrades, business process improvements.[61] While there is an Advanced Diploma of Information Technology Project Management, enrolments are relatively low (264 people enrolled in 2016).[62] In fact, 77 percent of survey respondents 'somewhat agree' or 'strongly agree' that there is a skills gap in Agile project management among ICT VET graduates.[63] This shortage is protracted by regional demand – across the Asia-Pacific, 14 percent identified it as an area of focus for their business.[64]	
2.3	Virtual teams necessitate new capabilities such as team management	

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[58] PwC's Skills for Australia, (2018), *ICT Project 2 and 3 Case for Change Survey*

[59] PwC's Skills for Australia, (2018), *ICT Project 2 and 3 Case for Change Survey*

[60] CEDA (2015), *Australia's Future Workforce*, Online.

[61] Microsoft (2018), *Building Australia's future-ready workforce*, Online.

[62] NCVER, (2017), Enrolments by Qualifications, Online

[63] PwC's Skills for Australia, (2018), *ICT Project 2 and 3 Case for Change Survey*

[64] Global Knowledge Training LLC, 2017. 2017 IT Skills and Salary Report. https://www.globalknowledge.com/us-en/content/salary-report/it-skills-and-salary-report/

Driver	Explanation	Proposed Response *These responses fall within the scope of Project 3, 'getting a better job in IT'.*
Managing virtual teams	and leadership, and new strategies. TAFE Directors Australia has identified that high-level VET IT learners (at Certificate IV and above) need the ability to select and use appropriate collaborative tools in an IT environment, and to contribute to team strategies that maximise productivity in virtual and face-to-face environments.[65]	
Emergence of new ways of working		
3.1 Policy and industry demand for higher apprentices and trainees	Higher apprenticeships and traineeships have been in decline among non-trades with a 52 percent drop in non-trade apprenticeships between 2012 and 2014. In 2016, the Federal Government funded a Higher Apprenticeship and Traineeship Pilot, including ICT employers in the ACT, undertaking Diploma-level qualifications in the ICT Training Package. Significant feedback was given about the inflexibility of many of these qualifications to be delivered on-the-job, and to fit within employer needs. This was identified as an obstacle to participation by many IT employers. Earlier this year, the Federal Government announced the Skilling Australians Fund, including a commitment to support 20,000 'higher-level apprenticeships' at Diploma level or above (i.e. Higher Apprenticeships), including within a target of 300,000 new apprenticeships, pre-apprenticeships, traineeships etc. Government has identified digital technologies as a priority industry for these apprenticeships and traineeships.[66] Ensuring that the ICT Training Package is apprenticeship and traineeship 'friendly', will help facilitate greater uptake in on-the-job learning via apprenticeships and traineeships.	3.1.1 Update 11 qualifications within scope, with particular emphasis on performance and knowledge evidence to ensure that wherever adaptation to a workplace environment is possible, qualifications are capable of being offered in a traineeship or apprenticeship format.

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[65] TDA, (2017), *National Quality Initiative: ICT Project*, Provided

[66] Department of Education (2018), *Skilling Australians Fund Fact Sheet*, Online: https://docs.education.gov.au/system/files/doc/other/clean_skilling_australians_fund_fact_sheet_2202_ts.pdf

Driver	Explanation	Proposed Response *These responses fall within the scope of Project 3, 'getting a better job in IT'.*
3.2 Industry use of vendor certifications due to need for rapid training changes	Vendor certification is an accepted and prevalent instrument for skills development within the ICT industry. By obtaining a vendor certification, employees are able to gain or further their careers via industry-recognised credentials. These vendor certifications are increasingly preferred in the IT industry.[67] Where most industries prefer non-accredited training only when there is no comparable nationally recognised training (only 12.6 percent of employers who use non-accredited training report that nationally recognised training is available),[68] this is not the case in the ICT sector where as many as 27 percent of industry employers (increasing over time) who used non-accredited training report that this is in spite of comparable nationally recognised training. In fact, 84 percent of survey respondents said that "much more likely" or "somewhat more likely" to use the VET system or hire VET graduates if vendor certificates were embedded within qualifications.[69] As many as 94 percent of IT team members suggest their certified team members bring value above and beyond the cost of that certification.[70] In 2015, 54 percent of employers operating in the information, media and telecommunications industry (the most indicative data of ICT employers available) used non-accredited training in the last 12 months (compared with 35 percent using VET qualifications as a job requirement).[71] A 2014 survey for example,[72] found that 33 percent of respondents started a career in IT as a result of vendor certification, 20 percent got a promotion, 19 percent got a better job with a different company, and 30 percent received a salary increase of up to 20 percent.	3.2.1 Develop a new qualification at Diploma-level, and the ability to integrate a vendor certification. The ICT IRC recognises that this is a unique approach to project work, and a working group has been assembled to develop and consider options. These options will be further explored, consulted on, and developed during the training product development process.

[67] PwC's Skills for Australia (2017), *ICT Industry Skills Forecast and Schedule of Work 2017*, Online

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

[69] PwC's Skills for Australia (2018), *ICT Project 2 & 3 Survey Results*.

[70] Global Knowledge Training (2017), *IT Skills and Salary Report*, Online.

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

[72] Pearson VUE (2014) *Value of IT Certification Survey, Online*.

Driver	Explanation	**Proposed Response** *These responses fall within the scope of Project 3, 'getting a better job in IT'.*
	A significant number of survey respondents cited vendor certifications in their responses. For example, one respondent noted that "industry-driven options and Industry certification [like] Microsoft Certifications are valuable and will readily rank candidates through an application process. Australian Qualification Framework packages do provide alternatives for demonstrating skills and learning transfer, however, local offerings are not in line with digital transformation agenda nor industry products and certifications that enable adaptation of legacy systems to the digital economy." Importantly, they noted the speed with which these vendor certifications are updated.	

3.3 Risk of not proceeding with proposed response

The base case (the 'do nothing') option must be considered as an alternative to the proposed changes in order to enable effective comparison between the two scenarios. This option negates the need for investment in training products, however does not address the current state issues identified. The likely impacts of this option are outlined below.

Driver Number	Existing issue	Likely impact(s) if not addressed
1.1	*Existing training in cyber security is not suitable for the needs of the IT industry.*	Choosing not to review training in cyber security and create new units for its currency and relevance may delay review of these units for another four years, creating an increased skills gap in cyber security.
1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 3.1,	*VET learners unable to meet the demands of industry for new skill areas.*	Choosing not to review the content and structure of training in the IT industry will mean that graduates are not able to meet industry requirements and will require greater on the job training.
1.1	*Australia being unable to develop adequate cyber security professionals to protect itself from cyber security threats and adversaries.*	Cybercrime currently costs the Australian economy over $1 billion a year[73], and this cost will likely increase unless cyber security skills can be embedded for entry-level IT workers, as well as mid-to-senior IT workers. Currently, VET learners and employers must rely on nationally accredited courses, non-accredited courses and vendor certifications outside of the ICT Training Package.
2.1, 2.2, 2.3	*Existing training in soft skills and project management is not suitable for the needs of the IT industry.*	Choosing not to review training in soft skills and project management and create new units for its currency and relevance may delay review of these units for another four years, creating an increased skills gap in industry and

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[73] Department of Prime Minister and Cabinet, (2018), *Cyber crime, https://cybersecuritystrategy.pmc.gov.au/cyber-landscape/index.html*

Driver Number	Existing issue	Likely impact(s) if not addressed
		deplete IT industry uptake of VET ICT qualifications at higher-levels.
2.1, 2.2, 2.3	*VET learners unable to meet the demands of industry in soft skills and project management*	Choosing not to review the content and structure of training in the IT industry will mean that graduates are not able to meet industry requirements and will require greater on the job training.
3.2	*Existing training package takes approximately 4 years to update and is not immediately responsive to the needs of the IT industry – particularly when new technologies and skills emerge*	Choosing not to develop a new vendor-certification-friendly qualification means waiting between review periods for new units and qualifications to be developed. This can be a significant delay for industry and create skills gaps given the speed of technological change occurring within it. Importantly, this leaves ICT VET learners without critical skills and credentials demanded by industry.
1.1, 1.2, 3.1	*Employees at higher levels continue to use vendor certifications instead of the VET system to upskill, thereby missing out on the corollary benefits of the VET system*	Employees and employers will continue look towards non-accredited training, rather than the ICT Training Package, thereby missing out on the benefits of the VET system (including soft skills relating to team work and communication, and broader knowledge).
1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 3.1,	*Individual training providers are creating their own qualifications*	Large scale inconsistency between RTO offerings will make it unclear for employers and employees to understand the outcomes and students' abilities of completing a qualification

3.4 Occupations impacted by proposed responses

Each occupation is impacted by multiple factors. For simplicity, the following table includes a condensed overview of these occupations impacted and the referenced proposed response.

Table 7: Impact of proposed responses to IT drivers on IT occupations

	Cyber-security	Data analytics	Cloud computing		Software development methodologies	Creativity, communication and problem solving	Change/project management	Virtual teams management	Trainee and apprentices	Vendor certification
Change manager					☐		☐	☐		
Project manager					☐	☐	☐	☐		☐
Software engineer					☐					☐
Senior network engineer						☐	☐	☐		☐
IT managers and director						☐	☐	☐		☐
Senior analyst	☐				☐	☐	☐	☐		☐
Security specialist	☐		☐		☐					☐
Security analyst	☐		☐		☐					☐
Security systems architect	☐									☐
Security engineer	☐				☐					☐
Security IT manager and director	☐				☐		☐		☐	☐
Incident handler and investigator	☐	☐								☐
Chief information officer (CIO)	☐	☐					☐		☐	☐
Campaign reporting analyst		☐			☐					
Data engineer	☐	☐	☐		☐					
System/enterprise architect					☐	☐	☐	☐		☐
Chief information security officer (CISO)	☐	☐					☐		☐	☐
Data scientist		☐	☐							
Network engineer	☐				☐					☐
Network administrator	☐				☐		☐			☐
Network architect	☐		☐							☐
Data analyst or senior data analyst		☐	☐		☐					

3.5 Impacts of proposed changes on stakeholders

We have sought to gather multiple perspectives on impacts of the proposed changes to the training package, which are outlined below.
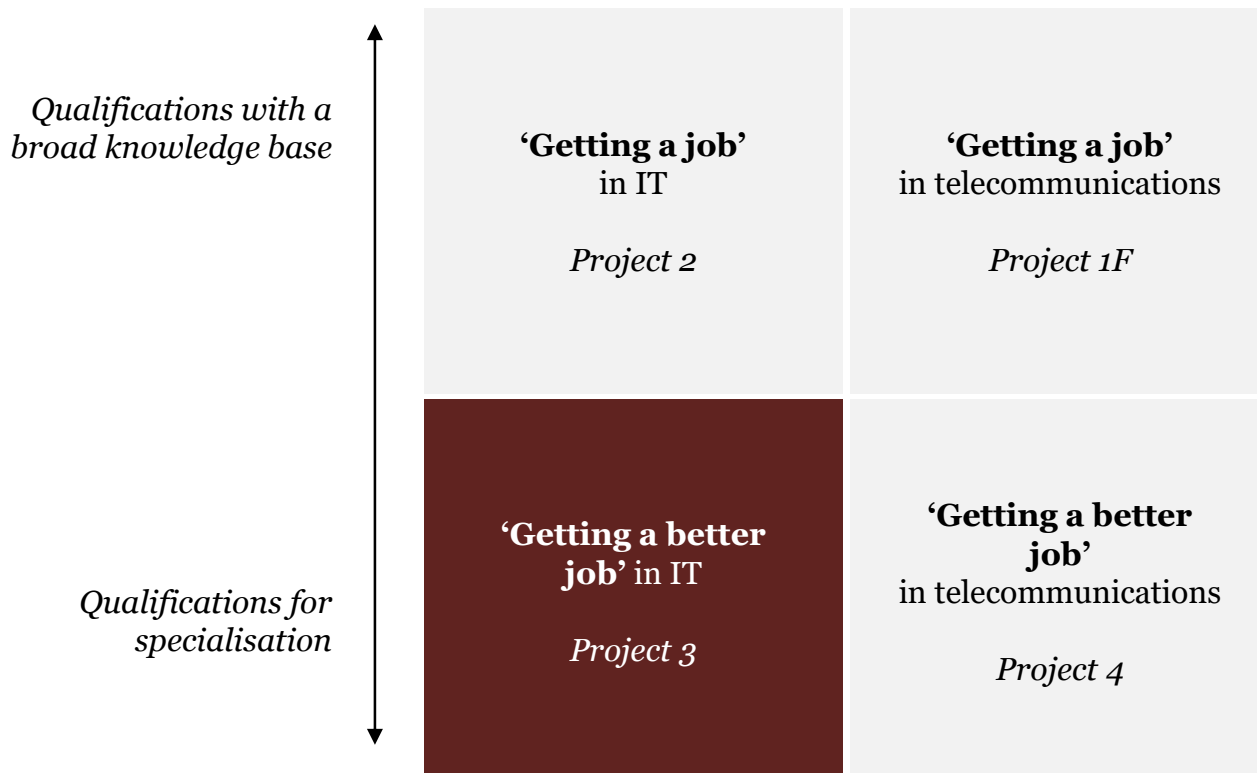
Stakeholder	Impact
Industry/Employers	• Successful recruiting outcomes with industry equipped candidates in cyber security, data analytics, cloud computing and/or enterprise skills or vendor certification • Less 'on-the-job' training and external vendor certifications required • Recruit a workforce with current and relevant soft skills, and the organisational ability to manage change programs and work in co-located teams • More confidence in ICT VET learners, and ability to hire vendor-certified professionals that have also benefited from the soft skills and other advantages of the VET ICT Training package • Improved options to upskill employees
Employees	• Improved employability and job readiness • Less 'on-the-job' training and external vendor certifications required • Improved options in upskilling and technical understanding, linked to higher salaries and greater chance of promotion
Learners	• Provide clear employment pathways with improved employability and job readiness • Increased awareness of current and relevant cyber security, data analytics, cloud computing, IoT, project management and enterprise skills • Maintain current and relevant soft skills demanded by industry • Improved options in upskilling and technical understanding, linked to higher salaries and greater chance of promotion
Vendors	• Reduces the effort, duplication, risk and cost of mapping vendor certifications to specific qualifications at RTOs in an ad hoc way (*referring to 3.3 driver only*)
Registered Training Organisations	• Increased ability to offer relevant, industry supported training nationally • Enables RTOs to deliver cybersecurity, data analytics and/or project management offering - including assessments - that fit within the ICT Training Package • Potential that more flexibility and/or different approaches will be required for integration of vendor certification • Trainers and assessors may need to acquire significantly new skills both in analytics and mathematical and statistical knowledge application (*referring to 1.2 driver only*)
Other IRC's/Training Packages	• No significant direct impacts are anticipated. It is likely that broader industries ultimately stand to benefit from an increasingly skilled ICT workforce given the critical role that ICT continues to play across all industries.

4 Proposed Schedule of Work - 2017-22

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 in order to improve employability outcomes for VET learners and industry employers alike. In September 2017, the ICT IRC re-designed the projects to be included in the Schedule of Work, favouring larger projects for improved efficiency and impact. The IRC also noted that the rapid emergence of new technologies is particularly acute in the ICT industry and that for the ICT Training Package to meet the skill demands of industry, an alternative review approach may ultimately need to be considered.

The Proposed Schedule of Work for 2017-19 is intended to reflect the way that qualifications and units of competency fit within different stages of a career lifecycle - separated into two categories as follows:

1   *Getting a job* - including Certificates I - IV, with a broad range of knowledge and fundamental skills, as a baseline for IT employability, and

2   *Getting a better/more specialised job* - including Diploma level and above, with a focus on specialisation and deepening of prior knowledge in order to upskill or secure a more specialised position

Qualifications with a broad knowledge base	**'Getting a job'** in IT *Project 2*	**'Getting a job'** in telecommunications *Project 1F*
Qualifications for specialisation	**'Getting a better job'** in IT *Project 3*	**'Getting a better job'** in telecommunications *Project 4*

It is worth pointing out, projects in telecommunications have been classified separately due to the differing stakeholder, career pathways and project scope. The increasing convergence of Information Technology and Telecommunications is acknowledged and will be considered carefully during the execution of ICT Training Package projects.

For project 2, Certificates I and II have a focus on computer and information literacy[74], a critical foundation for VET learners to develop before entering qualifications in IT at higher AQF levels. The intent for the use of the term computer and information literacy is to distinguish from the concept of digital literacy which describes the broad and fundamental set of literacies which individuals outside of ICT should possess[75]. Computer and information literacy in the context of skill outcomes of ICT VET graduates can be considered to be the set of ICT skills which differentiate ICT VET graduates from those graduates of other training packages.

Conversely, qualifications at the Diploma or Advanced Diploma level, as well as corresponding skill sets, are predominantly used by VET learners with some background in IT who are seeking to progress their careers or reskill into a new area of focus. Early discussions relating to the higher level training products have highlighted the importance of ongoing flexibility to accommodate technological developments and of emerging areas of industry growth such as cyber security, machine learning and the internet of things.

This section is structured into three parts:

- **Status of projects**

- **Proposed Schedule of Work - 2018-2022, including nature of proposed changes**

Table 8: Status of projects

Year	Project type	Project code	Project name	Status
2016-17	Training product development	1e	Review of IT qualifications that may not be fit for purpose	Case for Endorsement near completion.
2016-17	Training product development	1f	Review qualifications relating to Telecommunications Technology that may not be fit for purpose	Case for Endorsement near completion.
2017-18	Training product development	2	Getting a job in IT	Case for Endorsement commissioned.
2018-19	Training product development	3	Getting a better job in IT	Case for Change embedded within this Industry Skills Forecast.
2019-20	Training product development	4	Getting a better job in telecommunications	Training Product Development not yet commenced
2020-21	Training product development	5	Review training products originally in scope of 2017/2018 for currency and relevance	Training Product Development not yet commenced
2021-22	Training product development	6	Review the need for the creation of new training products to cater for new and emerging technologies and related skills	Training Product Development not yet commenced

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[74] Bruce, C.S., 1999. Workplace experiences of information literacy. International Journal of Information Management, 19(1), pp.33-47.

[75] Martin, A., and Grudziecki, J., 2006. DigEuLit: Concepts and Tools for Digital Literacy Development. Innovation in Teaching and Learning in Information and Computer Sciences, 5(4), pp.1-19

Project details

The follow outlines the proposed approach and proposed changes to the ICT training package as part of Project 3 getting a better job in IT. Table 14: Project 3 proposed approach and changes to the training package

	Occupations/skills impacted	Evidence of future workforce demand[76]	Evidence of VET training demand	Project outcomes
See sections for more information	Section 3 – *Implications of proposed response*	Section 2 - *Industry Employment Outlook*	Section 3 –*Key Drivers for change*	Section 3 – *Key Drivers for change*
Project 3: Getting a better job in IT	Anticipated to impact **22 occupations**. These include: • Security specialists • Data scientists • System architects • Network engineers	Substantial occupational growth is projected over the next five years with a **11.2% increase** in employment across ICT occupations overall	High enrolments: • **4,631** in Digital and Interactive Games. • **1,471** in Telecommunications Network Build and Operate. Current **gap in formal training** - employers and industry report "on the job" training is often required to upskill workers in basic industry knowledge and assessment requirements do not currently address the standards expected by industry.	Cyber security, data analytics, and cloud computing specialists will have improved and **technical skills** allowing them to keep up with the rapid changing demands of emerging technologies, upskilling, and reskilling relevant to the ICT industry. **An elevated importance of enterprise skills** in the ICT industry, with a particular focus on communication, problem solving, change & project management, and managing virtual teams. Learners will be equipped to respond to **emerging ways of working**, including managing virtual teams

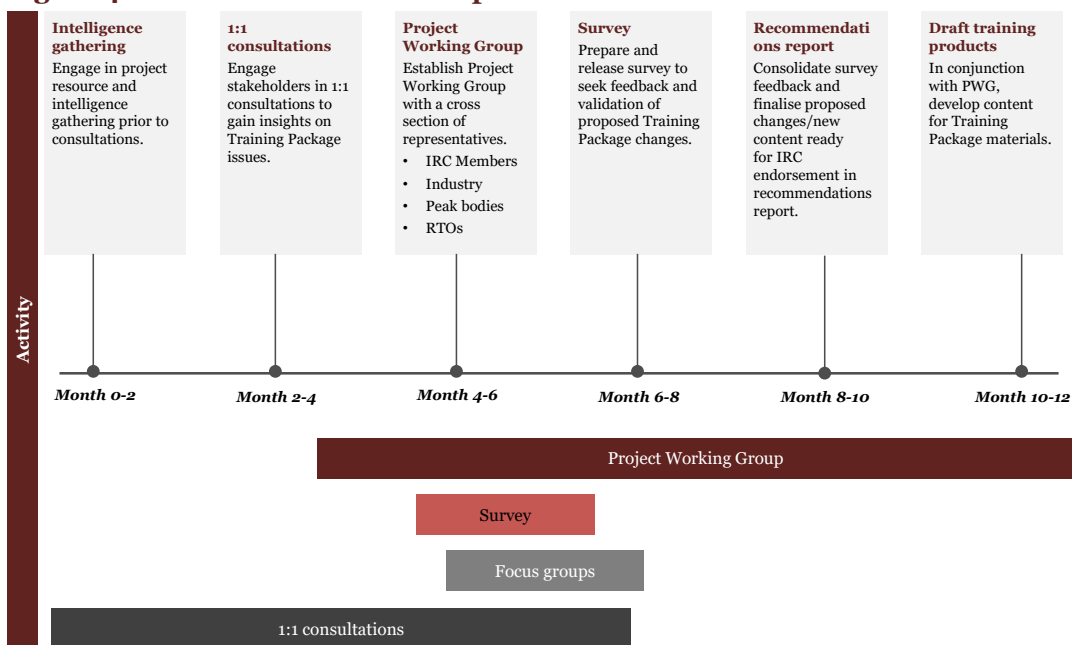| **Project 3 - Getting a better/more specialised job in IT**	
Description	Project 3 is a review of all Information Technology qualifications at AQF levels 5, 6, and 8.
Rationale	Key drivers for change include: • Growing industry demand for emerging skills and workers • Elevated importance of enterprise skills in IT

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[76] Please note employment projections at an industry level are confined to specific industry definitions (as defined by Australian Bureau of Statistics under ANZSCO), and therefore may not reflect industry terminology. For more information, please refer to Section C.

Project 3 - Getting a better/more specialised job in IT

- Emergence of new ways of working

See Section 3 of this document for more information on the rationale for this project.

Minister's Priorities	Reform	Evidence of reform being addressed
	Removing obsolete and superfluous qualifications from the training system	The training package components in the scope of this Case for Change are meeting skills needs for which no other training currently exists. There is a need to update with the intention to delete obsolete and/or superfluous ICT training package components as identified during industry consultations.
	Making more information available about industry's expectations of training delivery	Training package components will be written so they align with industry expectations for training delivery.
	Ensuring the training system better supports individuals to move easily from one related occupation to another	Training package components will be amended to ensure they are providing learners with skills that are transferable across industries and workplaces, as well as provide ongoing opportunities to upskill into new or different occupations.
	Improving the efficiency of the training system by creating units that can be owned and used by multiple industry sectors and housing these units in a work and participation bank	ICT units will be amended to ensure they provide training which is relevant across multiple industries. Units from other training packages, such as the BSB Training Package, will be considered for inclusion in training relevant to the ICT Training Package, especially around teamwork and communication.
	Fostering greater recognition of skill sets	Future training product development work will consider opportunities to develop skill sets.

Consultation Plan	The consultation plan has been designed with the foremost consideration for the engagement of the widest possible population of stakeholders including stakeholders from all states and territories, non-metropolitan regions, and small and medium sized organisations.
	The consultations will consist of a combination of data gathering methodologies including:
	- Inter-organisational and intra-organisational focus groups; in-person and via teleconference and video conference facilities
	- In-depth individual interviews; in-person and via teleconference and video conference facilities
	- Survey instruments open to the public; online
	- Public feedback on proposed changes; online
	These methodologies will be used to gather data from relevant stakeholders including:
	- Employers including both IT organisations and non-IT organisations
	- Peak bodies including industry and professional associations
	- Industry networks and subscriber based mailing lists
	- Industry Reference Committee members
	- Registered Training Organisations and trainers and assessors
	- State Training Authorities and Industry Technical Advisory Boards

Project 3 - Getting a better/more specialised job in IT

- Federal, state and territory government departments and government owned corporations
- Identified key stakeholders including individuals and organisations

Consultations will involve identifying the expertise of stakeholders and engaging them on the specific changes to the training package relevant to their expertise.

Figure 4: overview of stakeholder plan

Intelligence gathering	**1:1 consultations**	**Project Working Group**	**Survey**	**Recommendations report**	**Draft training products**
Engage in project resource and intelligence gathering prior to consultations.	Engage stakeholders in 1:1 consultations to gain insights on Training Package issues.	Establish Project Working Group with a cross section of representatives: • IRC Members • Industry • Peak bodies • RTOs	Prepare and release survey to seek feedback and validation of proposed Training Package changes.	Consolidate survey feedback and finalise proposed changes/new content ready for IRC endorsement in recommendations report.	In conjunction with PWG, develop content for Training Package materials.
Month 0-2	*Month 2-4*	*Month 4-6*	*Month 6-8*	*Month 8-10*	*Month 10-12*

Project Working Group

Survey

Focus groups

1:1 consultations

Table 9: Indicative approach to stakeholder consultation for this project.

Stage	Key activities	Outcomes
Research, establish and confirm Project Working Group	• Identification of Project Working Group member with relevant expertise and interest. • Establish feedback loops with Project Working Groups.	• Refined project scope based on the identified industry need. • Stakeholders identified for further industry consultation. • Key discussion points to be explored in further industry consultation activities.

Gather broad sector perspectives as to the issues faced and options to address	• Conversations with subject matter experts.
	• Gather industry views on how current training products are categorised:
	  - fit for purpose;
	  - requires review and/or update changes;
	  - no longer relevant/required;
	• Identify concerns and risks associated with the potential changes.
	• Develop public survey and make available online for completion by all interested stakeholders.
		• Tailored consultation.
		• Build basis and evidence for Case for Endorsement, associated risks, and proposed scope based on broad voice of industry.
		• Refined scope and direction of projects.
		• Increased transparency of work underway and opportunities to contribute.

Validate findings with	• Additional independent research and data analysis (as required)	• Case for Endorsement strengthened.

Project 3 - Getting a better/more specialised job in IT			
	Industry Reference Committee and build evidence base	to test and build evidence to support Case for Endorsement. • Ensure update have sufficient industry based evidence to support the Case for Endorsement and conduct additional consultation as required.	• Recommendations refined. • Broad consensus on actions and outcomes reached.
	Gather feedback to identify opportunities for improvement	• Complete documentation of recommendations (Draft One). • Seek Project Working Group feedback. • Session with ICT IRC to confirm consensus and obtain detailed change requests.	• Project Working Group feedback obtained and incorporated.

Table 10: Project 3 - Stakeholders to be engaged (examples)

Employers	Industry associations/ Peak bodies	RTOs	Public/ Government bodies
IBM Cisco Netier Dialog Microsoft Ento Westpac Telstra HSBC Macquarie AWS	Australian Information Industry Association AIIA ACS Engineers Australia	Enterprise RTOs Private and Community RTOs Technical and Further Education institutions (TAFEs)	STAs Licensing bodies where applicable

Scope of Project	The project is estimated to take 12 months to complete with the Case for Endorsement and proposed training products to be submitted to the Australian Industry and Skills Committee for approval in mid-2019.
	A Snapshot (See Appendix C for detail) • 14 qualifications to be updated • 1 qualification to be created • 12 skill sets to be updated • 1 skill set to be created • 151 existing UoCs to be amended • 39 new units to be developed • 3 units to be deleted
	UoC unit sectors in scope and proposed number of existing units of competency to amend:

Unit sector (UoC code)	Nature of proposed changes	Number of UoCs
Database (DBS)	• Embed teamwork and communication, version control techniques.	6

Project 3 - Getting a better/more specialised job in IT		
	• Remove technology and methodology specific terminology to improve technology agnosticity of UoCs including removing references to 'object oriented' programming in ICTDBS504.	
Game development (GAM)	• Remove specific requirements for the development of 3D-specific games and assets to allow for the development of virtual, augmented, mixed reality and 2D games, assets and other components. • Modify UoCs to incorporate scripting requirements • Modify UoCs to incorporate game design techniques including storyboarding, conceptualisation, client requirement gathering. • Modify UoCs to incorporate teamwork and communication requirements. • Modify UoCs to incorporate design considerations for augmented, virtual, and mixed reality interfaces. • Incorporate concepts and usage of game engines.	28
General ICT (ICT)	• Introduce cybersecurity and risk management • Modify existing units to allow for the unit to address new and emerging technologies. This will require ensuring that specific technologies are not embedded into UoCs. • Introduce research skills into units addressing new and emerging technologies.	20
Networking (NWK)	• Introduce scripting requirements into UoCs to align with industry demands. • Modify UoCs to allow for new and emerging technologies and methodologies to be addressed by UoCs including software defined networks, the Internet of Things and cybersecurity. • Introduce cloud computing technologies to align with current and evolving industry practice.	30
Project management (PMG)	• Embed critical thinking skills into project management UoCs to align with industry requirements. • Modify terminology and structure of UoCs to allow for emerging and maturing methodologies to be taught to learners. • Embed teamwork and communication methods into UoCs to ensure learners are equipped with skills as required by industry. • Embed change management skills into UoCs.	12
Programming and software development (PRG)	• Embed concepts of problem solving, critical thinking, and design thinking into the UoCs. • Modify terminology to allow for UoCs to incorporate emerging and maturing software development methodologies and paradigms such as Agile, DevOps, test driven development.	26

Project 3 - Getting a better/more specialised job in IT		
	• Embed requirements for use of version control systems and approaches. • Embed teamwork and communication requirements in UoCs. • Modify terminology to decrease the prevalence of object oriented programming requirements to allow for other paradigms such as declarative, imperative, functional, and procedural. • Embed client requirements gathering and negotiation into UoCs. • Require the use of modern programming languages in UoCs.	
Systems analysis and design (SAD)	• Embed teamwork and communication skills into UoCs. • Embed critical thinking and design thinking skills into UoCs.	7
Systems administration and support (SAS)	• Modify UoCs to increase usability of vendor certifications in conjunction with UoCs. • Modify UoCs to embed teamwork and communication practices in UoCs. • Modify UoCs to allow for emerging and modern testing methodologies in the scope of agile software development methodologies.	8
Web (WEB)	• Remove technology and methodology specific terminology to improve technology agnosticity of UoCs including removing references to 'object oriented' programming in ICTWEB501 and ICTWEB503.	14
Total		**151**

5   IRC signoff

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

James Wyatt
Chair
Information and Communications Technology IRC
10/5/2018

Appendix 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 2018 Industry Skills Forecast and Proposed Schedule of Work has been reviewed and approved by this IRC as of April 2018. The AISC has endorsed a new IRC membership, which commenced 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
Jim Wyatt	Optimi Digital	Principal	IRC Chair
Alison Wall	nbn	Curriculum Lead, Industry Workforce Development	IRC Deputy Chair
Ros Eason	Communications Workers Union (CWU)	Senior National Industrial Research Officer	IRC Member
Louise Smith	Australian Computer Society	Director Workforce Planning and Development	IRC Member
Charles Hoang	Australian Industry Group	Digital Policy, Capability & Industry Professional	IRC Member
Kevin Harris	Australian Information Industry Association	Chair	IRC Member
David Masters	Microsoft Australia	Corporate Affairs Director	IRC Member
David Sweeney	Telstra	Labour Strategy Consultant - Global Talent - Human Resources	IRC Member

Name	Organisation	Title	IRC role
Emma Broadbent	CISCO Networking Academy and Social Innovation Group - ANZ and Pacific Islands	Regional Manager	IRC Member
Melanie Brenton	Industry Skills Advisory Council	Industry Engagement Officer	IRC Member
Patrick Emery	Australian Communications Media Authority (ACMA)	Manager - Technical Regulation	IRC Member
Lucy Poole	Digital Transformation Agency (DTA)	Head of APS Digital Capability	IRC Member
Owen Pierce	Australian Cyber Security Growth Network	Program Manager	IRC Member

Appendix B Training Package Profile

Qualifications	Qualification code	Enrolments (2016)
Information Technology		
Certificate I in Information, Digital Media and Technology	**ICT10115**	**14,231**
Certificate II in Information, Digital Media and Technology	**ICT20115**	**11,534**
Certificate III in Information, Digital Media and Technology	**ICT30115**	**14,692**
Certificate IV in Information Technology	**ICT40115**	**2424**
Certificate IV in Information Technology Support	**ICT40215**	**474**
Certificate IV in Web-Based Technologies	**ICT40315**	**1078**
Certificate IV in Information Technology Networking	**ICT40415**	**2506**
Certificate IV in Programming	**ICT40515**	**1315**
Certificate IV in Information Technology Testing	**ICT40615**	**34**
Certificate IV in Systems Analysis and Design	**ICT40715**	**20**
Certificate IV in Computer Systems Technology	**ICT41015**	**417**
Diploma of Information Technology	**ICT50115**	**3421**
Diploma of Information Technology Systems Administration	**ICT50315**	**497**
Diploma of Information Technology Networking	**ICT50415**	**3639**
Diploma of Database Design and Development	**ICT50515**	**201**
Diploma of Website Development	**ICT50615**	**2262**
Diploma of Software Development	**ICT50715**	**1218**
Diploma of Systems Analysis and Design	**ICT50815**	**238**
Advanced Diploma of Information Technology	**ICT60115**	**395**
Advanced Diploma of Network Security	**ICT60215**	**329**
Advanced Diploma of Information Technology Business Analysis	**ICT60315**	**336**
Advanced Diploma of Information Technology Project Management	**ICT60415**	**199**
Advanced Diploma of Computer Systems Technology	**ICT60515**	**172**
Graduate Certificate in Information Technology and Strategic Management	**ICT80115**	**14**
Graduate Certificate in Information Technology Sustainability	**ICT80215**	**N/A**
Telecommunication Technology		
Certificate II in Telecommunications Network Build and Operate	**ICT20215**	**1238**
Certificate II in Telecommunications Technology	**ICT20315**	**67**

Qualifications	Qualification code	Enrolments (2016)
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	1471
Certificate III in Telecommunications Technology	ICT30515	468
Certificate IV in Telecommunications Network Design	ICT41115	N/A
Certificate IV in Telecommunications Engineering Technology	ICT41215	48
Diploma of Telecommunications Engineering	ICT51015	6
Diploma of Telecommunications Planning and Design	ICT51115	N/A
Advanced Diploma of Telecommunications Network Engineering	ICT60615	1
Graduate Certificate in Telecommunications	ICT80315	0
Graduate Certificate in Telecommunications Network Engineering	ICT80615	15
Graduate Diploma of Telecommunications and Strategic Management	ICT80515	15
Graduate Diploma of Telecommunications Network Engineering	ICT80415	5
Digital Media		
Certificate IV in Digital Media Technologies	ICT40815	360
Certificate IV in Digital and Interactive Games	ICT40915	475
Diploma of Digital and Interactive Games	ICT50215	4631
Diploma of Digital Media Technologies	ICT50915	1045

Source: National Centre for Vocational Education Research (2017) *Total VET activity 2015-16, 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.

Licensing, 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.

Table 11: ACMA registration types

Registration Type	Description
Open	• 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	• 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	• 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 12 lists the UoCs in the ICT Training Package that are required for ACMA registrations.

Table 12: Licence and regulatory requirements

ACMA Registration	Required UoCs for registration
Restricted Registration	**1.** • ICTCBL236 Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule. **OR** **2.** • 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	**1.** • 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.** • 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

ACMA Registration	Required UoCs for registration
	• ICTCMP201 Organise and monitor cabling to ensure compliance with regulatory and industry standards.
Lift Registration	• ICTCBL238 Install, maintain and modify customer premises communications cabling: ACMA Lift Rule.
The following UoCs align with regulatory requirements for specialised cabling work:[77]	
Structured Cabling	• ICTCBL301 Install, terminate and certify structured cabling installation.
Optical Fibre	• ICTCBL302 Install and terminate optical fibre cable on customer premises.
Coaxial Cable	• ICTCBL303 Install and terminate coaxial cable.
Aerial	• ICTCBL205 Joint metallic conductor cable on customer premises, and • ICTCBL309 Construct aerial cable supports, and • ICTCBL310 Install aerial cable.
Underground	• 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 13 lists the UoCs (includes imported UoCs from other Training Packages) that fall into the definition of high risk work and therefore must be delivered and assessed accordance with the national standard.

Table 13: 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**	• 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

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[77] 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.

	Training Package	UoCs
		• 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	• RIIWHS204D Work safely at heights • RIIHAN301D Operate elevating work platform
	Transport and Logistics Training Package	• TLID2010 Operate a forklift • TLID3035 Operate a boom type elevating work platform
Native UoCs	**Information and Communications Technology Training Package**	• 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 14, in addition to the mandatory VET assessor requirements.

Table 14: Assessor requirements

ACMA Registration	License/Registration	Recommendation
Restricted Registration	• 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[78] registered assessor**
Open Registration	• ICTCBL236 Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule	**Open Registered Cabler**

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[78] 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>.

ACMA Registration	License/Registration	Recommendation
	• 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	**TITAB registered assessor**
Lift Registration	• ICTCBL238 Install, maintain and modify customer premises communications cabling: ACMA Lift Rule	**Lift Registered Cabler** **TITAB registered assessor**
The following UoCs align with regulatory requirements for specialised cabling work:[79]		
Structured Cabling	• ICTCBL301 Install, terminate and certify structured cabling installation	**Open Registered Cabler** **TITAB registered assessor**
Optical Fibre	ICTCBL302 Install and terminate optical fibre cable on customer premises	**Open Registered Cabler** **TITAB registered assessor**
Coaxial Cable	• ICTCBL303 Install and terminate coaxial cable	**Open Registered Cabler** **TITAB registered assessor**
Aerial	• ICTCBL205 Joint metallic conductor cable on customer premises • ICTCBL309 Construct aerial cable supports • ICTCBL310 Install aerial cable	**Open Registered Cabler** **TITAB registered assessor**
Underground	• ICTCBL205 Joint metallic conductor cable on customer premises • ICTCBL307 Install underground enclosures and conduit • ICTCBL308 Install underground cable	**Open Registered Cabler** **TITAB registered assessor**

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[79] 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.

Appendix C 2018/19 units for review

Summary:

Table 15: Summary of 2018/19 units for review

Type of review	Scope of Project 3
Qualification/s to be updated	14
New Qualification to be created	1
Skill sets to be amended	12
Skill sets to be created	1
New units to be created	39
Existing units to be updated / amended	151
Existing units to be deleted	3

Type of review	Scope of Project 3
Qualification/s to be updated (14)	• ICT50115 Diploma of Information Technology • ICT50215 Diploma of Digital and Interactive Games • ICT50315 Diploma of Information Technology Systems Administration • ICT50415 Diploma of Information Technology Networking • ICT50615 Diploma of Website Development • ICT50715 Diploma of Software Development • ICT60115 Advanced Diploma of Information Technology • ICT60215 Advanced Diploma of Network Security • ICT60315 Advanced Diploma of Information Technology Business Analysis • ICT60415 Advanced Diploma of Information Technology Project Management • ICT60515 Advanced Diploma of Computer Systems Technology • ICT50515 Diploma of Database Design and Development • ICT50815 Diploma of Systems Analysis and Design • ICT50915 Diploma of Digital Media Technologies
New Qualification to be created (1)	• Diploma of Information Technology *(Vendor Certification Specialisation)*
Skill sets to be amended (12)	• ICTSS00031 Application Development Specialist Skill Set • ICTSS00032 Basic Application Development Programmer Skill Set • ICTSS00036 Certified Network Associate Technology Specialist Skill Set • ICTSS00037 Certified Network Professional Specialist - Voice and Wireless Skill Set • ICTSS00038 Certified Network Professional Specialist Skill Set • ICTSS00040 Certified Security and Architect Specialist Skill Set

Type of review	Scope of Project 3
	• ICTSS00041 Certified Technician or Technology Specialist - Infrastructure Configuration Skill Set • ICTSS00049 Internetworking Systems Coordinator - Administrator Skill Set • ICTSS00053 Virtualisation Specialist Skill Set • ICTSS00056 Enterprise Desktop Virtualisation Specialist Skill Set • ICTSS00057 Enterprise Server Virtualisation Specialist Skill Set • ICTSS00059 Advanced ICT Sustainability Skill Set
Skill Sets to be created (1)	• ICTSS000xx Specialist cyber security Skill Set
New UoCs to be created (39)	Cyber security 1. Create cyber security standards for an organisation 2. Communicate cyber security incidents within an organisation 3. Implement best practices for identity management 4. Plan and implement a cyber security project 5. Evaluate an organisation's compliance with relevant cyber security standards and law 6. Acquire digital forensic data (from workstations and mobile devices) 7. Perform a cyber security risk assessment 8. Respond to cyber security incidents 9. Gather, analyse and interpret threat data 10. Implement cyber security operations 11. Undertake penetration testing for an organisation 12. Undertake advanced penetration testing for web site vulnerabilities 13. Evaluate threats and vulnerabilities of IoT devices 14. Protect critical infrastructure for an organisation 15. Configure security devices for an organisation 16. Design and implement a virtualised cyber security infrastructure for an organisation 17. Utilise design methodologies for security architecture Cloud computing and data analytics 18. Use basic methods in data science/analytics 19. Use advanced methods in data science/analytics 20. Design cloud storage system architecture 21. Establish cloud security mechanisms and protocols 22. Administer cloud services 23. Identify risk mitigation techniques for cloud services 24. Develop cloud disaster recovery plans 25. Analyse and manage big data in cloud based systems 26. Review and assess service level agreements Internet of Things 27. Install IoT devices and networks 28. Program IoT devices/microcontrollers 29. Connect IoT devices and networks 30. Design and test IoT devices and networks 31. Gather, configure and verify data from different source inputs 32. Analyse data from different source inputs

Type of review	Scope of Project 3
	Blockchain
	33. Identify the business applications of blockchain
	34. Develop and maintain blockchain solutions
	35. Develop and monitor smart contracts
	Other
	36. Assess outsourcing ICT projects
	37. Utilise IT project management methodologies (e.g. Agile)
	38. Lead a co-located or virtual team
	39. Conduct impact analysis of digital disruption

Existing units to be updated / amended (151)

Field	Units to be amended
Database (6)	• ICTDBS501 Monitor and improve knowledge management system
	• ICTDBS502 Design a database
	• ICTDBS504 Integrate database with a website
	• ICTDBS601 Build a data warehouse
	• ICTDBS602 Develop a knowledge management strategy
	• ICTDBS603 Determine suitability of database functionality and scalability
Gaming (28)	• 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

Field	Units to be amended
	• 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
ICT (20)	• ICTICT501 Research and review hardware technology options for organisations • ICTICT502 Develop detailed component specifications from project specifications • ICTICT504 Confirm transition strategy for a new system • 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 • ICTICT515 Verify client business requirements • ICTICT601 Develop ICT strategic and action plans • ICTICT602 Develop contracts and manage contracted performance • 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 • ICTICT813 Manage ICT services
Networking (30)	• ICTNWK502 Implement secure encryption technologies • ICTNWK503 Install and maintain valid authentication processes • 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 • 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 • ICTNWK514 Model preferred system solutions • ICTNWK519 Design an ICT security framework • ICTNWK520 Design ICT system security controls • 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

Field	Units to be amended
	• ICTNWK527 Manage an enterprise virtual computing environment • 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 • ICTNWK601 Design and implement a security system • ICTNWK602 Plan, configure and test advanced server-based security • 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 • ICTNWK614 Manage ICT security • ICTNWK616 Manage security, privacy and compliance of cloud service deployment
Project Management (12)	• ICTPMG501 Manage ICT projects • 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 • ICTPMG802 Manage a telecommunications project • ICTPMG804 Evaluate and use telecommunications management networks
Programming and software development (26)	• 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 • 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 • 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 • 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

Field	Units to be amended
	• 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
Systems analysis and design (7)	• ICTSAD504 Implement quality assurance processes for business solutions • ICTSAD505 Develop technical requirements for business solutions • ICTSAD506 Produce a feasibility report • ICTSAD601 Perform ICT-focused enterprise analysis • ICTSAD603 Plan and monitor business analysis activities in an ICT environment • ICTSAD606 Analyse stakeholder requirements • ICTSAD607 Manage assessment and validation of ICT solutions
Systems administration and support (8)	• ICTSAS501 Develop, implement and evaluate an incident response plan • ICTSAS504 Develop and conduct client acceptance test • ICTSAS505 Review and update disaster recovery and contingency plans • ICTSAS507 Implement and evaluate systems for regulatory and standards compliance • ICTSAS509 Provide client ICT support services • ICTSAS510 Review and develop ICT maintenance strategy • ICTSAS511 Prioritise ICT change requests • ICTSAS601 Implement change management processes
Web Development (14)	• 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

Units to be deleted from the ICT Training Package (3):

Units to be updated with the intention to delete
• ICTSUS602 Establish a business case for sustainability and competitive advantage in ICT projects
• ICTSUS802 Conduct a business case study for integrating sustainability in ICT planning and design projects
• ICTSUS804 Use ICT to improve sustainability outcomes

Please note: it is likely that more units than those listed in the table above will be deleted from the ICT Training Package as part of training package development work, however, significant additional stakeholder consultation is required to identify those units and to fully understand the implications of deleting those units. This consultation will occur as part of our Case for Endorsement work.

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