A scan of approaches taken by Australia to build the digital skills of the existing workforce in response to digital transformation of industry

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Contents

Authors' Note

The Australian labour market, how we work and how our systems are responding are all changing rapidly as the COVID-19 situation continues to develop.

Some data included in this scan covers reference periods before the introduction of significant emergency control measures for COVID-19 and should therefore be used and interpreted with caution.

Acknowledgements

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Executive Summary and Key Policy Considerations

Accelerated change in the nature and context of work over the past few decades, particularly that caused by the ongoing implementation of new technologies, has engendered great debate at both industry and policy levels. Part of that debate centres around the kinds of skills required to maintain competitive economic productivity. The work profile of nearly every job has been affected, with some jobs being fully automated, and others partly or considerably altered in their texture. There are projections that some 375 million jobs (14% of the global workforce) will be automated by 2030.

This report presents a scan of approaches taken by Australia to build the digital skills of its existing workforce in response to digital transformation of industry by assessing:

1. the key policy settings and interventions in place to build the digital skills capability of Australia's existing workforce;
2. how the upskilling and reskilling of existing workers is funded at both national and state levels;
3. Australia's approach to credentialing digital skills;
4. lifelong learning and how Vocational Education and Training (VET) Interfaces with schools, and Higher Education (HE), and
5. processes used to identify digital skills, knowledge requirements, and gaps.

The review identified several important observations, which include key features and perceived weaknesses and strengths of Australia's policies and strategies regarding the environment, processes and approaches to workforce digital transformation.

Considerations for policy

- Lack of coherence - Although efforts are being made to establish a common policy agenda for digital transformation, the jurisdictions continue to pursue their own separate, and not always comparable, policies, leading to a lack of policy coherence for the nation.
- Implied only - The policies mostly focus on digital transformation from the perspective of the uptake of technologies and processes. Few explicitly articulate digital skills and provide direction on how they should be developed. Rather, this aspect seems to be implied, in that policies reference the need for, and importance of, digital capabilities and skills in the workforce. Even where this is articulated, it is not always clear who needs digital skills development and at what level of competence.
- Clear and deliberate focus - Although the importance of workforce digital skills is well acknowledged across all jurisdictions, there is no policy specifically developed in this space. Instead, workforce digital transformation is only

incorporated as a priority or area of interest in general digital transformation policies. A separate, specifically focused policy for digital workforce transformation is required for successful transition of the workforce in the emerging economy.

Considerations for funding workforce digital skilling

- Growing the investment pool - Many skills development programs initiated by government will rely on co-funding from employers. Traditionally, most funding for education and training comes from government. However, this funding, particularly for VET, continues to decline[1] so that it is now at its lowest level since 2008.[2] Given the importance of VET in addressing current and future digital skills challenges, consideration of how to grow the pool of VET funding is a priority.
- Contemporary funding model - Training programs resulting in full qualifications have tended to be the only ones attracting government subsidies. Skill sets and micro-credentials, however, are considered increasingly important to upskill the existing workforce. Increased funding support for skill sets and micro-credentials may therefore need consideration.

Considerations for assessment and credentialing of digital skills

- *Australian Qualifications Framework* (AQF) treatment - The location of digital skills within the AQF has received increased attention in recent years. There is a general view that the AQF should do more to emphasise the importance of digital skills within the framework. However, there are different views about the best approach to achieve these outcomes given the differences in digital skills requirements across training packages, programs and types of occupation. These contextual issues must be considered when reviewing how best to locate and treat digital skills within the AQF.
- Australia's national system of training design occurs through a tripartite process involving employer, union and government representatives with inherent intention to develop widely transferable skills for the digital economy and society. It is through this process that Units of Competency and Training Packages are developed and reviewed. For the broader workforce, Units of Competency typically embed digital skills in a relevant activity. For information and communications technology (ICT) professionals, digital skills are typically explicit. Given the critical nature of digital skills and their portability across

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[1] Burke, G. (2018), *Changes in Funding in Australian Vocational Education and Their Effects*, The University of Melbourne, Melbourne, https://melbourne-cshe.unimelb.edu.au/__data/assets/pdf_file/0010/2845774/Burke-Changes-in-funding-in-Australian-vocational-education-and-their-effects_.pdf

[2] Hurley, P. and Dyke, N.V. (2019) *Australian investment in Education: Vocational Education and Training*, Mitchell Institute, Melbourne, http://www.mitchellinstitute.org.au/wp-content/uploads/2019/12/Australian-Investment-in-Education-VET.pdf

industries, consideration should be given to how these skills can best be codified within education and training programs.

Considerations for lifelong learning and training interfacing

- Overt policy - Unlike some other countries (e.g. Germany and Singapore) Australia does not have a national lifelong learning policy. Given the rapid pace of technological change and changing nature of work, a lifelong learning policy may need to be given greater consideration. Such a policy would need to articulate the important role of digital skills in lifelong learning.

Considerations for digital skills identification and gap analysis

- Systematic approach - Industry Reference Committees (IRCs) in their work, developing and reviewing Training Packages, perform an important role in identifying emerging skills gaps via annual Industry Skills Forecasts. Beyond the ICT IRC, there appears to be some variation in how digital skills are understood and measured and how often they are captured in the forecasts. The Council of Australian Governments Industry and Skills Council and the Department of Education, Skills and Employment might consider how a more systematic, standardised and regular approach to capturing digital skills supply and demand could be achieved across all sectors and digital skill levels.
- Improved data sets - Many of the data sources required for conducting skills gap analysis were not designed to explicitly capture digital skills. The prospects for including digital skills variables within established survey instruments could be one approach to address data shortfalls.
- Source validity - Online job advertisements analysis is an increasingly popular source of digital skills identification and gap analysis. Caution is needed in the weight placed on the results and to what degree they inform decision making given that online job advertisements are not reflective of all available jobs; they typically address potential applicants; and they are selective in emphasis, inclusion and articulation of digital skills information.

List of Abbreviations

ABS	Australian Bureau of Statistics
ACARA	Australian Curriculum, Assessment and Reporting Authority
ACE	Adult and Community Education
ACT	Australian Capital Territory
ADDC	Australian Data and Digital Council
AISC	Australian Industry and Skills Committee
ANZSCO	*Australian and New Zealand Standard Classification of Occupations*
AQF	*Australian Qualifications Framework*
AR	Augmented Reality
CDU	Charles Darwin University
COAG	Council of Australian Governments
DESE	Department of Education, Skills and Employment
DESSFB	Department of Employment, Skills, Small and Family Business
DIST	Department of Industry, Science and Technology
DMC	Digital Management Capability
HE	Higher Education
ICT	Information and communications technology
IoT	Internet of Things
IRC	Industry Reference Committee
IT	Information Technology
LLN	Language, Literacy and Numeracy
National Partnership	*National Partnership on the Skilling of Australians Fund*
NSNL	*National Skills Needs List*
NT	Northern Territory
NSW	New South Wales
PMI	Project Management Institute
Qld	Queensland
RBA	Reserve Bank of Australia
RMIT	Royal Melbourne Institute of Technology
RPL	Recognition of Prior Learning

RTO	Registered Training Organisation
SA	South Australia
SSCE	Senior Secondary Certificate of Education
STEAM	Science, Technology, Engineering, Arts and Mathematics
STEM	Science, Technology, Engineering and Mathematics
TAFE	Technical and Further Education
Tas	Tasmania
UNSW	University of New South Wales
VET	Vocational Education and Training
Vic	Victoria
WA	Western Australia

Glossary

Artificial Intelligence (AI) The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, routine decision making and translation between languages.

Augmented Reality (AR) A technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.

Australian Apprenticeships National Skills Needs List (NSNL) Identifies trades that are assessed as experiencing a national skills shortage, based on detailed projections about labour demand and supply.

Automation Risk The risk that jobs that involve routine tasks are made obsolete by developments in AI and other ICTs more generally.

Big Data A data analytics technology that facilitates the fast and efficient processing of vast amounts of information. Big data has been used to identify common skills and competencies in demand by applying text search algorithms to millions of online job ads.

Blockchain A distributed ledger technology that offers the ability to obviate the role of an intermediary or a centralised authority to authenticate data, transactions and processes.

Chat Bot A computer program designed to simulate conversation with human users, especially over the Internet.

Cloud Computing The on-demand availability of computer system resources, especially data storage and computing power, not requiring direct active management by the user.

Credentialing A process used to verify that an individual (or organisation) has met certain defined standards established by a group charged with creating and implementing these standards.

Digital Readiness The ability for workers to reskill and upskill to adapt their skill sets to evolving employer demand for digital skills.

Digital Management Capability (DMC) The adoption of digital technologies such as mobile devices, social media, data analytics, cloud computing and IoT. Digital management capabilities also include the integration of these technologies into the operations of an organisation towards increased competitive advantage, business transformation and strategy.

Internet of Things (IoT)	Refers to an ecosystem of connected devices that can communicate with other connected devices, such as in the 'smart home'.
Lifelong Learning	An approach to education and training that extends beyond a person's formal education and encourages workers to reskill and upskill over the course of their careers through formal and informal education and training opportunities.
Digital Literacy	Includes foundational skills such as the ability to source, interpret and use information online, and set up and maintain passwords in a secure online environment. Emerging as a right to which citizens across some of the countries in this international scan are entitled, alongside language literacy and numeracy. The United Kingdom, for instance, has legislated the right to digital literacy, which includes access to accredited courses at no cost.
Digital Skills Framework	Offers a way to categorise the types of digital skills that are relevant for the workforce. Different countries have developed different frameworks that highlight different aspects of digital skills. The *Skills Framework for the Information Age* uses three categories of digital skills relevant to the world of work: digital literacy or foundational digital skills; generic ICT skills (including, e.g., competency around office productivity software) that are applied in a vast range of occupations; and advanced digital skills that are necessary among ICT specialists.
Digital Skills Shortage	A situation where employer demand for digital skills exceeds the supply of those skills. Assertions of such shortages are typically based on projected strong growth of demand for ICT specialists, or employer surveys where respondents communicate difficulty in hiring workers with relevant digital skills.
Hackathon	A forum that facilitates collaboration and problem solving within participant teams by setting a common challenge in a time-constrained format.
ICT Professionals	Individuals who typically have graduated with a bachelor degree or higher in the information systems and/or computer science fields, and are working in the ICT industry sector or applying their skills and knowledge in other sectors including banking and finance.
Job Polarisation	An effect that can arise from skill-biased technological change where job opportunities and income earning

	capacity continue to grow for skilled workers relative to unskilled workers.
Reskilling	The process of a worker acquiring new skills and developing new competencies for a different occupation, typically through formal education and training.
Skill-biased Technological Change	Technological change that favours workers with more skills, education and relevant experience.
Soft Skills	A broad set of skills in the workplace that extend beyond technical knowledge and are considered complementary to digital skills, such as communication, ability to negotiate with and persuade people, and commercial acumen.
Upskilling	The process of a worker building on their base of skills and competencies for more advanced roles in the same or related fields to their current occupation. This can be done by either formal education and training, or informal avenues such as learning on the job.
Work-integrated Learning	An educational or training qualification that incorporates work placements with employers.

1 1 Background

Skills demands in the future will be strongly influenced by the level and extent of technology used in work. There has been rapid and accelerating growth in digital and automated technology since 1990. The work profile of nearly every job has been affected, with some jobs being fully automated, and others partly or considerably altered in their texture. According to the McKinsey 'Jobs lost, jobs gained' report (McKinsey Global Institute, 2017),[3] this trend is likely to continue, with projections that some 375 million jobs (14% of the global workforce) will be automated by 2030.

In this context, Australian industry, in common with that of many other economies around the world, is under great competitive pressure to adopt new technologies in the workplace, including automation and robotics, the Internet of Things (IoT) and a wide variety of advanced Information and Communications Technology (ICT) programs, applications and systems. In this context, it is imperative to also create a sufficiently enabling environment for their implementation, an important aspect of which is digital skills development.

It is for this purpose that the Australian Industry and Skills Committee (AISC, 2019) has established the Digital Transformation Expert Panel to 'provide advice on how Australia's Vocational Education and Training (VET) system can most effectively respond to digital change underway across industry and its impact on the nation's workforce'.[4]

As part of the panel's methodology, the Skills, Training and Industry Research Network at RMIT University has undertaken a scan of the major existing policies and initiatives currently in place, both at national and jurisdictional levels, to support the existing workforce via digital transformation of industry. Where appropriate, the scan also recognises approaches or initiatives by organisations outside of governments.

In developing an analysis of digital workforce transformation, it is essential to first establish what is meant by digital skills. Gekara et al. (2019) undertook an

[3] McKinsey Global Institute (2017), *Jobs Lost, Jobs Gained; What the Future of Work Will Mean For Jobs, Skills and Wages*, https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages

[4] Digital Transformation Expert Panel terms of reference 2019.

extensive review of how digital skills are defined internationally.[5] In developing their definition, they particularly drew on the analysis developed by Ecorys,[6] which defines three broad categories of digital skills:

- **Category 1**: Foundational digital literacy skills that are pitched at a basic level and should be easily accessible to all citizens at no cost. These would include a basic understanding of productivity software such as work processing and spreadsheeting skills, as well as use of the internet and being familiar with social media. Category 1 digital skills should be considered foundational because they are necessary to build Category 2 and Category 3 skills.
- **Category 2**: These digital skills are more advanced than Category 1, but not specific or unique to ICT industries. They would be relevant in the application of, and adaptation to, new and emerging ICT innovations. These would include an understanding around the application of software such as SAP (for human resources and payroll, among other functions), Photoshop and Illustrator (for fashion design) or Stata and Eviews (for statistical applications).
- **Category 3**: These digital skills are necessary for ICT professionals. The *Skills Framework for the Information Age*[7] develops a taxonomy of six broad digital skills categories: strategy and architecture; change and transformation; development and implementation; delivery and operation; skills and quality; and relationships and engagement.

As this scan focuses on the workforce in general, the scope of the definition of digital skills cuts across all sections in the Ecorys typology but with more emphasis on categories 1 and 2. In this report, we adopt Gekara et al.'s (2019) working definition of digital skills as a combination of:

- digital knowledge (theoretical comprehension and understanding);
- cognitive knowhow (involving the use of logical, intuitive, innovative and creative thinking in the digital space);
- practical knowhow (including the use of digital tools such as hardware, software, information and security systems);
- competence (ability to learn, adapt and apply digital knowledge in a new setting); and

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[5] Gekara, V., Snell, D., Molla, A., Karanasios, S. and Thomas, A. (2019), *Skilling the Australian Workforce for the Digital Economy*, National Centre for Vocational Education Research, Adelaide, https://www.ncver.edu.au/research-and-statistics/publications/all-publications/skilling-the-australian-workforce-for-the-digital-economy

[6] Ecorys (2016), *Digital Skills for the UK Economy*, Department of Innovation & Skills and Department for Culture, Media & Sport, Government of the United Kingdom, London, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492889/DCMSDigitalSkillsReportJan2016.pdf

[7] Skills Framework for the Digital Age (n.d.) *Skills at a Glance,* https://www.sfia-online.org/en/framework/sfia-7/skills-home

- 'digital' attitude (value and beliefs), which workers need to master and demonstrate in the digital age.

1.1 Scope and Method

The report examines how, and the extent to which, the strategies in place articulate and provide direction on the development of skills to support the Australian workforce through digital transformation. While the review refers to some specific initiatives as illustrations, the primary focus is the digital transformation policies and strategies developed and published by the Commonwealth and state/territory governments.

The review was guided by four broad groups of research question:

1. What are the key policies and initiatives in place to enable digital transformation of the country's workforce? How successful are these and what are the blockages/sensitivities? Are there any major policies under development?
2. How is the upskilling of existing workers funded in critical areas such as digital transformation?
3. What is the country's approach to credentialing digital skills and the need for lifelong learning?
4. How does the vocational sector interface with the school and higher education sectors to enable lifelong learning in the digital space?
5. What process is used to identify the digital skills and knowledge requirements of the various industries and translate that information into a training response? How are digital skills gaps within the existing and future workforce identified and quantified?

The following key words were applied to a general web search in the first instance: Australian government; digital transformation; policies; and strategies. This produced, among other documents, a comprehensive summary overview of policies and strategies, published by the Australian Data and Digital Council (ADDC) in a 2019 report entitled *State of the Data and Digital Nation*.[8] The report details a total of 93 policy instruments, including strategies and initiatives across all jurisdictions (Cth, 16; NT, 9; WA, 8; SA, 11; Qld, 10; NSW, 13; ACT, 10; Viv, 12 and Tas, 4). The main ones are listed in Appendix 1.

This review encapsulates a cross-section of the major policies identified in the report as well as other relevant ones not included. Those identified as

[8] ADDC (2019), *State of the Data and Digital Nation,* https://www.pmc.gov.au/sites/default/files/publications/australian-digital-council-state-data-digital-nation_1.pdf

representing major overarching policies were subjected to a further search using a different set of key words—workforce development, digital skills, training and workforce capability—to examine how those policies addressed the digital workforce skills topic. The review focuses on only those policies published post-2016 as representing the current situation.

Finally, to address the expert panel's questions regarding funding for digital skills development; lifelong learning; assessment and credentialing; and interfacing between schools, HE and VET, representative key words were applied to search the general web as well as the specific strategies identified.

1.2 Outline of the Report

This report presents the findings of this analysis and is organised into five broad sections:

- Section One examines the policies and strategies adopted by federal and state/territory governments to guide Australia's overall digital transformation. These are examined in detail, specifically, to assess the nature and extent of treatment and coverage of digital workforce preparedness.
- Section Two discusses the different ways in which workforce digital upskilling is funded across different jurisdictions.
- Section Three offers a scan of how digital skills are currently assessed and credentialed.
- Section Four describes the various ways that training for digital skills interfaces between schools, VET and HE.
- Section Five examines how digital skills needs and training gaps are assessed and determined.

2 Policy Settings and Interventions to Build the Digital Capability of Australia's Workforce

As a result of the federal structure of Australian government, there are two main policy making levels; the state/territory level and the Commonwealth level. While Commonwealth-level policies target the entire Australian economy, those developed by states and territories are more local to the specific jurisdictions. This section of the report presents a scan of how the need for workforce digital training and/or upskilling is treated in the major policies for digital transformation at the two levels.

2.1 Key Considerations

- **Connecting the dots.** Although efforts are being made to establish a common policy agenda for digital transformation, the jurisdictions continue to pursue their own separate, and not always comparable, policies, leading to numerous separate policies nationally. There is therefore little policy coherence for the nation.
- **Articulating digital skills.** The policies mostly focus on digital transformation from the perspective of technologies and processes. Few explicitly articulate digital skills and provide direction on how to develop them. Rather, this aspect seems to be implied nominally, in that policies reference the need for, and importance of digital capabilities and skills in the workforce. Even when articulated, it is not always clear which groups they target; that is, *who* needs digital skills development and at what level of competence. The best approach is to have specific and clear policy targets regarding digital skills for (i) basic literacy for individuals; (ii) the general workforce; and (iii) ICT professionals.[9]
- **A specific workforce strategy.** Although the importance of workforce digital skills is well acknowledged across all jurisdictions, there is no policy specifically developed in this space. Instead, workforce digital transformation is only incorporated as a priority or area of interest in general digital transformation policies.
- **Definition of digital skills.** The language of articulation is important. The way in which digital skills are named and referred to differs across jurisdictions. The most common term used is 'digital skills' (e.g. as seen in the NT, ACT and WA). However, some policy documents use the terms 'digital literacy', 'digital capability' and 'digital competency'. Often more than one term is used. For

[9] Ecorys, op. cit.

instance, SA's *Digital Transformation Strategy*[10] uses the terms 'skills', 'capability', 'literacy' and 'competency'. The ACT Government *Digital Strategy* report[11] uses the term 'capabilities', while the *Canberra: A Statement of Ambition* report[12] uses the term 'digital skills'. The challenge in this is that, while the concepts of 'skills', 'capabilities', 'literacy' and 'competencies' are broadly related, they have distinct meanings and their use is likely to influence policy interpretation at the implementation stage.[13] [14] [15] [16] It also poses an unnecessary barrier to effective conversations with industry to identify skills needs and future policy and program settings.

2.2 Federal Government Policies and Strategies

Considering the challenge of national policy alignment, there have been a few notable federal level interventions that recognise the need for a consolidated national approach to digital transformation in Australia:

1. The federal government, through the Department of the Prime Minister and Cabinet, established the ADDC in 2018 with the objective to 'facilitate and drive better cross-government collaboration on data and digital transformation, and to create better services and policy outcomes for all Australians'.
2. The establishment of the Australian Government Digital Transformation Agency, is another important intervention at the federal level.[17] The agency works with the ADDC and various federal ministries to:

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[10] Government of South Australia (n.d.), *A Digital Transformation Strategy for the South Australian Government,* https://www.dpc.sa.gov.au/__data/assets/pdf_file/0010/45991/digital-transformation-strategy.pdf

[11] ACT Government (2016a), *ACT Government Digital Strategy 2016–2019*, http://www.cmd.act.gov.au/__data/assets/pdf_file/0010/988957/160927_DL_web.pdf

[12] ACT Government (2016b), *Canberra: A Statement of Ambition*, http://www.cmd.act.gov.au/__data/assets/pdf_file/0006/865482/Canberra-A-Statement-of-Ambition.pdf

[13] Jisc (2017), *Developing Digital Literacies*, https://www.jisc.ac.uk/guides/developing-digital-literacies

[14] Martin, A. and Grudziecki, J. (2006), DigEuLit: Concepts and tools for digital literacy development, *Innovation in Teaching & Learning in Information & Computer Science* 5 (4): 249-267. https://www.tandfonline.com/doi/full/10.11120/ital.2006.05040249

[15] Gekara et al. op. cit.

[16] Iordache, C., Mariën, I. and Baelden, D. (2017), Developing digital skills and competences: A quick-scan analysis of 13 digital literacy models, *Italian Journal of Sociology of Education*, 9: 6–30. http://ijse.padovauniversitypress.it/system/files/papers/2017_1_2.pdf

[17] Australian Government Digital Transformation Agency (n.d.), *Listed Degrees for Cadetships and Graduates*, https://www.dta.gov.au/help-and-advice/learning-and-

- provide strategic leadership on whole-of-government and shared ICT and digital services;
- deliver policies, standards and platforms for whole-of-government and shared ICT and digital service delivery;
- provide advice to agencies and the government on ICT and digital investment proposals; and
- oversee significant ICT and digital investments, assurance policies and frameworks and the whole-of-government digital portfolio.

3. The *National Partnership on the Skilling Australians Fund,* (the National Partnership), was established to enable the Commonwealth and state/territory governments to commit to pooling resources for:

> improved employment outcomes by supporting Australians to obtain the skills and training they need for jobs in demand through increasing the uptake of apprenticeships and traineeships and other relevant employment-related training.

4. The Council of Australian Governments (COAG) *Vocational Education and Training Reform Roadmap*[18] aims to enhance capacity to respond flexibly to changing industry skills needs, through high-quality training and assessment.
5. The cross-sector Training Package projects commissioned by the AISC enable Industry Reference Committees (IRCs) to formally recognise the skills that are common across industries and codify those skills into cross-sector Units of Competency.[19]

These interventions are developed within a broader policy setting, which is made up of several key strategies. According to the ADDC's 2019 *State of the Data and Digital Nation* report (p. 4), 16 policies and strategies for digital transformation are identified at the Commonwealth level.

This section of the report examines the nature of and extent to which federal policy addresses the changing nature of Australian industry and provides direction for equipping the workforce with the necessary skills. The analysis focuses on three key strategies, which are summarised in Table 1.

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development/start-your-digital-career-government/listed-degrees-cadetships-and-graduates

[18] COAG (2019), *Vocational Education and Training Reform Roadmap*, https://docs.employment.gov.au/system/files/doc/other/vet_reform_roadmap_consultation_draft_0.pdf

[19] Innovation and Business Skills Australia (2017), *Digital Skills Cross Sector Project*, https://ibsa.org.au/wp-content/uploads/2018/01/IBSA-Digital-Skills-Final-Case-for-Change-Nov-2017.pdf

2.2.1 The Digital Transformation Strategy 2018–2025

The *Digital Transformation Strategy* was developed by the Digital Transformation Agency in 2018.[20] It articulates Australia's vision and roadmap to becoming 'one of the top three digital governments in the world for the benefit of all Australians by 2025'. Its primary objective is to provide an environment in which government services and processes are consolidated and simplified, flexible and responsive, as well as efficient. The roadmap to 2025 is guided by three key priorities:

- **Government that is easy to deal with**: to ensure easy, efficient and accessible government services.
- **Government informed by you**: to create transparent, adaptable and inclusive public service.
- **Government that is fit for the digital age**: to boost the capacity of the infrastructure to support a modern, digital-age government.

In recognition of the importance of equipping the government workforce to deliver envisaged digital age services, the issue of digital skills is addressed as part of 'expanding digital capability, under priority three—Government that is fit for the digital-age'. The expressed aim in this respect is to:

> identify and describe the digital skills we need so that training, recruitment and career development is easier for the Australian Public Service. This includes programs to recruit emerging talent through internships, cadetships and graduate placements (40).

This will be achieved via the Australian Government's modernisation fund, which is developed in collaboration with the Australian Public Service Commission. To further strengthen the focus on digital skills development among the public service workforce, the Digital Transformation Agency has adopted the *Building Digital Skills Across Government* initiative, under which more specific programs are developed to enhance the digital skills of government, including digital service standard training programs, mentoring programs, professional development workshops and meet-up events. It is as a part of this skills specific initiative that the *Building Digital Capability* program was introduced in partnership with the Australian Public Service Commission.

2.2.2 Digital Economy Strategy—Australia's Tech Future

This major digital transformation strategy was launched in 2018 by the Ministry of Industry, Science and Technology. It is perhaps the most comprehensive

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[20] Australian Government Digital Transformation Agency (2018), *Digital Transformation Strategy*, https://www.dta.gov.au/digital-transformation-strategy

strategy in the sense that, unlike the *Digital Transformation Strategy*, its focus is economy wide as opposed to just government and public service.

It appears to be more empirically driven and informed by the conclusion that the Australian economy is undergoing significant changes, following influential emerging technology trends such as artificial intelligence (AI), blockchain, IoT and quantum computing. Its overall aim is to deliver a strong, safe and inclusive digital economy. It focuses on four broad priority areas: *people* (skills inclusion), *services* (digital government), *assets* (digital infrastructure and data) and *environment* (cyber security regulation).

In this strategy, the issue of skills is treated as the top priority. There is clear recognition that the demand for digital skills is increasing across all sectors, with up to 90% of Australians requiring some level of digital skills at work within the subsequent five years. With this recognition, *Australia's Tech Future* addresses the important questions of why skills are important; what skills opportunities there are; where national focus and attention should be with regard to skills; and what the government is doing and should do about workforce skills.

The strategy identifies several specific actions that should be implemented to equip the workforce for the 21st century economy:

- maintaining a strong national curriculum that focuses on what students should learn to effectively participate in 21st century work;
- anticipating industry needs through improved labour market analysis to ensure that the skills developed remain relevant and up to date;
- building on Australia's highly educated population by providing people with the specific technical skills needed in the economy;
- increasing flexibility in the education and training system to be able to adapt and respond to changing industry skills needs with agility;
- supporting workers impacted by automation through targeted retraining and upskilling and assisting them in the transition to emerging and growing occupations within the economy;
- using skilled migration programs to attract highly skilled people who can supplement existing skill sets and address short-term gaps; and
- paying attention to shortages in key digital skills including data management and analysis; cyber security; cloud computing; AI and machine learning: robotics; digital design; software design; and advanced mathematics and statistics.

2.2.3 Australia 2030: Prosperity Through Innovation Strategy

This strategy was developed by the Innovation and Science Australia Board in 2017. Its core objective is to ensure Australia's:

> Competitive[ness] in a global innovation race by scaling up more high-growth industries and companies; commercialising more high-value products and services; fostering great talent; and daring to tackle global challenges (p. iii).[21]

To achieve this broad objective, *Australia 2030* focuses on five 'imperatives for action':

- **Education**: responding to changing industry skills needs.
- **Industry**: to stimulate business growth and improve productivity.
- **Government**: government as catalyst for innovation through quality service delivery.
- **Research and development**: enhancing research and the translation and commercialisation of outputs.
- **Culture and ambition**: enhancing a culture of innovation.

As in *Australia's Tech Future*, the importance of skills for government is clear from the emphasis given to the *education* area. The government understands that, 'Education determines the capability of workers and entrepreneurs, and therefore the economy's productivity and innovation capacity. Education also shapes Australians' life opportunities' (26).

Australia 2030 also clearly expresses the government's role in designing, funding and regulating many aspects of the Australian education and training system to enhance its role in preparing Australian workers to contribute to the growth of the digital economy. Two strategic opportunities are articulated under the *education* priority: (1) strategic emphasis on science, technology, engineering and mathematics (STEM) in schools to ensure that students are introduced early to the appropriate knowledge and skills of the future, and (2) a responsive VET system.

As part of the first strategic priority, STEM in schools, the strategy identifies specific interventions necessary for workforce capability development, including:

- investing in professional development and support for school leaders;
- keeping the *Australian Curriculum* current;
- ensuring students are motivated and pursuing the skills they need to succeed in the future workforce; and
- further improving transparency and accountability across school systems.

With regard to VET, it is envisaged that Australian workers should be enabled to adapt to changing industry skills needs, including the transiting of techno-

[21] International Council for Online Educational Standards (n.d.), *Learn More About Us,* https://icoes.org/about-us/

displaced workers into new jobs via upskilling. The strategy recommends direct government intervention in:

(i) reviewing VET to enhance its capacity to respond to emerging skills needs under changing technologies; and

(ii) enhancing the international competitiveness of Australian VET in developing initial skills training, supporting lifelong learning, helping businesses remain competitive and ensuring effective interfacing with other parts of the HE system.

Clearly, there are strong commonalities among these three major strategies regarding the core objectives as well as the areas of priority and focus. Particularly, they all recognise the importance of workforce digital skills capacity building.

In addition to these broad-based digital transformation policies, there is evidence for emerging specific digital transformation initiatives, some of which address specific aspects of digital skills needs and development. The *National Blockchain Roadmap*, for example, outlines what is needed to further advance blockchain across the Australian economy and highlights the importance of developing 'blockchain literacy' as a priority. Although the specifics of blockchain literacy are not stipulated, the roadmap suggests that such literacy involves not just understanding blockchain technology but also legal and regulatory knowledge regarding the use of blockchain in the Australian context (Australian Government, 2020). Other sector-specific interventions like the *National Digital Health Strategy*, by the Australian Digital Health Agency, the *Digital Continuity Policy 2020*, by the National Archives of Australia, and the *Data Strategy 2018–2020*, by the Ministry of Industry, Innovation and Science, all recognise the importance of having an appropriately skilled workforce to drive the emerging digital economy and society.

An additional recent intervention from the Department of the Prime Minister and Cabinet, which supports the work of the ADDC, is the Digital Technology Taskforce. The taskforce, established in November 2019, is tasked with the responsibility to work with industry to determine:

> ways to ensure all Australians can benefit from digital technology and be protected against harms [including' how Government can promote productivity gains through the take up of digital technology across the Australian economy].

Among the priorities of the taskforce is how to enhance *digital skills and inclusion* in society as an important element, alongside digital infrastructure, of harnessing the full benefits of a digital economy.

Table 1: The Articulation of Digital Skills Development in Federal-level Policies

Strategy	Articulation of strategy for digital skills	Key features	Target sector
Digital Transformation Strategy	Focused on the digital transformation of government services. One of its objectives that will take the government into a digital age is to equip its people and businesses who work for the government with digital skills.	• Developed in 2018 by the Digital Transformation Agency • Focused on digital transformation of government services • Contains a detailed roadmap of objectives to 2025 • A key objective of the roadmap is to 'Equip people and businesses with the skills necessary to deliver world-leading digital services' • Proposes continuous professional development activities including seminars, workshops and professional mentoring as part of the workforce digital capability development	Public
Australia's Tech Future	Utilises research into industry and occupation trends and extensively articulates the need for digital skills, suggesting which skills are in short supply and explaining what the government aims to do to develop skills in the workforce. Proposes close collaboration between government, industry and the education sector to deliver broad reforms to the education and training systems so that	• Developed in 2018 by the Ministry of Industry, Science, Energy and Resources • Targets all of economy and society across the key aspects of people, services, infrastructure and environment • Workforce and citizen digital skills transformation is top priority, with key emphasis on inclusion • Aims to equip Australians with the skills required to thrive in an evolving job market, and grow their businesses into the future • Proposes clear determination of emerging skills opportunities, areas of emphasis and the specific role of government	All of economy and society

Strategy	Articulation of strategy for digital skills	Key features	Target sector
	Australians can build skills and adapt quickly as opportunities change.	• Articulates several skills development areas for attention, including strengthening the national curriculum and enhancing flexibility within education and training; but does not provide any specific direction on VET in regard to workforce digital skills development	
Australia 2030—Prosperity Through Innovation Strategy	Clearly articulates the need for improved workforce skills and capabilities and what needs to be done to improve education and training; also gives recommendations for government action based on a skills needs analysis.	• Developed in 2017 by the Innovation and Science Australia Board • Its target is all of economy and society • The skills question is high priority as part of the *Education* key imperative • Specifically proposes strengthening VET and STEM education to equip people with the relevant skills for the 21st century • Proposes making VET more flexible and responsive to changing skills needs; but no specific actions are proposed • Emphasises training and professional support for teachers in schools to strengthen STEM education	Mainly targets economy and industry

2.3 State/Territory Policies and Strategies

Our scan reveals a wide range of policies and strategies on various aspects of digital transformation across the different jurisdictions. However, only a few stand out as representing key policy directions for state/territory digital transformation. Just like at the federal government level, there is significant focus on transforming government service provision, although some jurisdictions have produced wider-reaching strategies covering business transformation; data protection and cyber security; digital inclusion considering remote and regional communities; digital health; and so on.

In this section, we examine how digital workforce transformation is built into the transformation of these various aspects. While reference is made to associated strategies and initiatives, the review here focuses on key policies in each of the jurisdictions.

2.3.1 Australian Capital Territory

In the Australian Capital Territory (ACT), digital transformation policy is articulated in the *ACT Government Digital Strategy*, which was published in 2016 by the Chief Digital Officer. It follows the ACT Chief Minister's *Statement of Ambition* whose vision is for Canberra to become one of the world's most liveable and competitive cities. One of the top priorities in this vision is *talent* under which the government aims to enhance the capacity of the education and training system to develop, attract and retain talented people.

The ACT's digital strategy, thus, builds on this broad vision and is premised on the recognition that 'technology has become an integral part of [people's] lives and [our] culture' and therefore aims to boost the ACT Government's ability to, 'clearly express the ACT Government's intentions and create the impetus and architecture for fully digitised services and technology platform renovation'.

The primary focus of this strategy is government service delivery in three dimensions: *growing the digital economy*; *delivering digital services;* and *building digital foundations*.

As per the *Statement of Ambition*, a well-trained and appropriately skilled workforce is central to building the digital foundations envisaged in digital transformation. Consequently, one of the key priority initiatives under the strategy is *Building the Workforce of the Future* in which the government works, 'with industry and education providers to understand the skills required in the future and establish courses and initiatives that provide industry-ready graduates'.

The *Future Skills for Future Jobs Grants Program*[22] has been developed as a specific intervention under this initiative. It is an apprenticeship program co-developed with industry to provide 'people with the opportunity to be employed while they train, and to develop their competence in the workplace'. For the program, the government committed:

> $1 million in 2019–20 … to support the ACT's target of an additional 4,165 commencements (including Australian Apprenticeships, pre-apprenticeships, pre-traineeships, and higher apprenticeships) in the Territory by 30 June 2022.

This funding is co-provided with the National Partnership, which is an important federal-level intervention to provide funding for workforce development.

2.3.2 New South Wales

In New South Wales (NSW), the main strategy is contained in two documents—*Digital NSW: Designing our Digital Future* and *NSW Government ICT Strategy*—that form part of the consolidated digital.nsw policy platform.[23] Like the ACT's digital strategy, the focus in these two strategies is government service delivery. The *Digital NSW* strategy, for example, defines several priorities:

- **Customer experience**: to improve the experience of government services.
- **Data**: to create better policies, services and decisions enabled by data insights.
- **Digital on the inside**: to establish streamlined and simplified government processes.
- **Technology:** to optimise technology spend to realise value for money.
- **Cyber security**: to strengthen risk management and response by building a whole-of-government cyber security capability.
- **Legislation**: to ensure that future legislation supports digital transformation.
- **Delivery capability**: to increase collaboration and agility across government.

The *NSW Government ICT strategy*, developed by the Department of Finance, Services and Innovation, complements *Digital NSW* with specific focus on the government's ICT capabilities.

Interestingly, there is little direct articulation of workforce digital skills in the *Digital NSW* strategy. Four digital enablers—technology, cyber security, legislation and delivery capability—are identified; yet, whereas one would expect digital skills to be a major digital enabler, only vague mention is made,

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[22] ACT Government (2019), *Future Skills for Future Jobs Grant Program Guidelines,* https://www.skills.act.gov.au/Future%20Skills%20for%20Future%20Jobs%20Grants%20Program%20-%20Guidelines

[23] NSW Government (n.d.), *Digital NSW: Designing our Digital Future,* https://www.digital.nsw.gov.au/sites/default/files/DigitalStrategy.pdf

under *delivery capability*, to 'continuous personal development of employees and support new ways of working to maximise potential' (11). There is no mention in the entire document of workforce, skills or training.

However, the *strategic directions* page on the digital.nsw web policy platform describes a digital capability framework, developed to provide 'practical training to strengthen our digital capabilities and, ultimately, our customer service' in recognition of the fact that creating a customer-first service requires investment 'in the people who will innovate, design and deliver it'. However, there is no evidence of the framework and no clear roadmap to developing this workforce capability.

2.3.3 Northern Territory

The *Digital Territory Strategy* is the key policy instrument in the Northern Territory (NT), which, 'establishes, for the first time, a framework for maximising the opportunities of the digital age across our business, industry, education, community and government sectors'.

Its implementation is through annual action plans that follow five key directions: growing jobs and businesses; connecting territory communities; building digital skills; enabling smarter communities; and improving government services.

Unlike the above strategies for the ACT and NSW, the NT strategy seems to be more holistic rather than solely focusing on the digital transformation of government services. It is also one of the most comprehensive and clearly mapped-out policies of all the jurisdictions.

Like the ACT policies, workforce digital transformation is top priority in the NT's *Digital Territory Strategy*. Not only is workforce digital transformation expressed as one of the five key priorities, it is backed by several concrete initiatives and programs. Such statements as 'Plan approaches with Registered Training Organisations (RTOs) to deliver cyber security VET courses in the NT', 'Identify and scope new or modified courses in STEM, cyber security and digital technology to increase Charles Darwin University (CDU) programs across higher education' and specific mention of professional development programs such as 'work experience programs', 'traineeships' and 'digital women' suggest a clear and deliberate consideration of the *whys* and *hows* of workforce digital development.

In the *Digital Territory Action Plan 2019–2020,* articulation of digital skills development is even stronger and clearer:

> Upskill and re-skill existing workers in occupations affected by significant change through the Industry Build Skills Program. Up to 50 ICT professionals from the NT are participating in the program, gaining

> Advanced Diplomas in either ICT Project Management or ICT Business Systems Analysis … and… Promote new pathways for the Master of Information Technology degrees, allowing graduates to enter with any bachelor's degree.[24]

This plan details four areas of emphasis under the *building digital skills* priority, which include:

- growing the STEM skills required for future careers;
- developing Territorians' digital knowledge and skills to take up new opportunities in digital industries in the NT;
- ensuring inclusion for all age groups, and socio-economic backgrounds and regions, by providing the skills and knowledge necessary to benefit from new technologies; and
- establishing cyber security and data science education opportunities to grow these specialised and in-demand skill sets.

Some of the initial concrete initiatives proposed in the 2019/20 implementation phase to achieve the goals of building digital skills include:

- implementing digital technologies learning areas across NT schools;
- implementing the ICT capabilities of the *Australian Curriculum* across NT schools to establish foundational digital capability; and
- construction of a state-of-the-art Science, technology, engineering, arts and mathematics (STEAM) centre at Darwin High School.

Further, a $1 million *Digital Partnerships Grants Program* is established with NT businesses to support industry in developing digital skills, including by provision of funding support.

Although the NT places great importance on the need to develop digital skills among its people and workers, the interventions proposed in the blueprint (some of which are already actioned) mostly focus on early education—for example, STEM and STEAM—and little on the upskilling of the workforce. Programs such as Alice Springs' *Geek in Residence*, *Showcasing Territory Talent*, STEM and STEAM Centres of Excellence and *Territory Seniors Gaining Knowledge* (see https://digitalterritory.nt.gov.au/digital-stories) are all aimed at basic school-level skills. There seems to be no action relating to VET where skills for the existing workforce are developed and updated.

[24] NT Government (2018), *Digital Territory Strategy: Action Plans*, https://digitalterritory.nt.gov.au/digital-territory-strategy/action-plans

2.3.4 Queensland

The main strategy for digital transformation is embedded within the broader *Queensland Plan*, which articulates an overarching 30-year vision for the state. Launched in 2014, the plan identifies nine key foundations:

- Education: building life skills and inspiring bright minds
- Community: making connections
- Regions: building thriving communities
- Economy: forging diversity and prosperity
- Health and wellbeing: being healthy and active
- Environment: achieving balance
- People: creating opportunities for everyone
- Infrastructure: being connected
- Governance: balancing all our interests

Each of these foundations spells out specific goals. Under the *Education* foundation, there are four goals: a flexible and future-focused curriculum; practical-based learning; enhancing the value and working conditions of teachers; and education as a lifelong experience. Although the *People* foundation is more about community health, liveability and inclusion, there is mention of the need to attract people with the right minds and trained professionals (Goal 27), as well as the need for further skills training and learning for Queenslanders 55–64 years of age to ensure their continued participation in the community.

While this is a broad-based plan, a separate strategy, *DIGITAL1ST: Advancing Our Digital Future*, has been developed to specifically target digital transformation. The strategy is dual pronged and aims to bring the state into the digital age both 'for citizens' and 'for business and industry'. For its citizens, the strategy plans to digitally enhance the efficiency and accessibility of public services; for business and industry, it will enhance efficient access to data and information that will encourage and catalyse economic innovation, especially for small businesses.

The strategy is developed around four key priorities:

- **People**: empower Queenslanders to grow, change, contribute to and participate in the state's shared digital future, including the capability of people delivering government services.
- **Collaboration**: work in partnership across the community, industry, small businesses and start-ups, and research organisations—as well as within and between government departments and agencies to create a new playing field in which everyone can better contribute.

- **Connectivity**: take a planned approach to build better connections and digital infrastructure for all communities, considering the dispersed and decentralised nature of the state.
- **Trust**: have reliable, secure and trustworthy information to enable the delivery of leading digital government services.

Under the people priority, the strategy outlines 'a three-year roadmap, and 10-year strategic plan for the way that the public service will build skills for the future as part of the *Building a Digital Government Workforce* initiative (17). However, no further details are provided and there does not seem to be any articulation of actions on VET for general workforce digital transformation.

However, a separate initiative called *Skills for Queensland: Great Training for Quality Jobs*, developed by the Department of Employment, Small Business and Training, appears to be complementary to the two broader strategies and emphasises the need to 'assist workers and job seekers to be highly capable, adaptable and productive throughout their working lives' (ii).

To achieve this, several actions are proposed, some of which involve:

- a $5.5 million, 3-year micro-credentialing pilot to provide focused training for new or transitioning employees who need to improve specific skills;
- a higher-level apprenticeships program to support students and industry to connect workplace learning with higher-level qualifications and offer on-the-job training experience at a higher level of skill and expertise;
- a $5 million investment under the *Regional Skills Adjustment Strategy* to enable TAFE Queensland to continue to support regional workforces to navigate change, including workers that are at risk of being displaced from traditional industries;
- a schools, industry and employer partnership initiative to give school students access and exposure to practical work experience and placements and ensure students completing VET courses are appropriately job ready;
- an expanded *Gateway to Industry Schools Program* implemented in collaboration with the Department of Education to better support school students to participate in VET programs that industry has identified as current and emerging priority qualifications; and
- the *Skills Assure* network established in which quality, vetted training providers are listed to enable students, employers, business and industry to identify quality providers.

Among these three strategies, there seems to be a comprehensive coverage of digital transformation generally, as well a clear plan for workforce digital transformation.

2.3.5 South Australia

In South Australia (SA), the overarching policy for digital transformation is contained in the *Digital Transformation Strategy*. Its main target, however, is the public sector and it specifically aims to modernise and transform the provision of public services. It articulates 'across government initiatives to build the digital capabilities of the South Australian Government'.

It is built around six key priorities:

- co-creating customer services for enhanced experience;
- maintaining digital records and protecting data and information;
- empowering staff with digital literacy and capabilities;
- fostering stronger public private collaborations and adopting a common approach to creating user experience, design and experience;
- creating new service models through digital technology; and
- ensuring open data access in the design of digital systems.

Beyond listing the priorities there is little more information provided on how they will be achieved. In particular, there seems to be no plan for how workforce digital literacy and capabilities are to be developed.

A separate *ICT Strategy 2018–2021* attached to the main policy similarly focuses on improving government service, with its stated vision being 'to harness opportunities created by new technologies and new ways of working to best serve South Australia'.[25] It spells out four key areas of emphasis, including better access, seamless service delivery, a connected government and contemporary architecture, but does not mention the role and necessity of an appropriately skilled public sector workforce to deliver all these.

While the *Delivering Digital 2016–2020* digital technology strategy[26] developed by the South Australian Department for Education is more specific to education, it seems to be more about school education rather than skilling and upskilling the workforce. It articulates four key priorities that aim 'to meet the current and future needs of schools, preschools, care and protection services and the department as a whole':

- improving the educational diagnostic and evaluation tools and resources currently used;

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[25] Government of South Australia (2018), *South Australian Government ICT STRATEGY 2018–2021*, https://www.dpc.sa.gov.au/__data/assets/pdf_file/0004/45922/sagov-ICT-strategy-2018-2021.pdf

[26] Government of South Australia (2016), *Delivering Digital 2016–2020*, https://www.education.sa.gov.au/sites/default/files/delivering-digital-2016-2020-strategy.pdf?acsf_files_redirect

- identifying ways of providing educational sites with secure, reliable access to technology anytime, anywhere;
- improving data and analytics to support early intervention for children at risk by providing education staff with real-time information; and
- making the state's education systems more efficient by, for example, transitioning existing paper-based service to digital services, including an Electronic Document Management System.

Similarly, there is no provision for workforce digital transformation in any form as the strategy makes no mention of VET or HE.

Further, a general scan of the *Skills* page of the South Australia Department for Innovation and Skills website reveals a rather generic approach to skills development. It makes no specific reference to workforce digital skills.

2.3.6 Western Australia

Western Australia's digital policy is contained in the *Digital WA: State ICT Strategy 2016–2020* document and the *Western Australian Innovation Strategy*, published by the Department for the Premier and the Department for State Development, Transport and Innovation, respectively, in 2016.[27] [28]

The main emphasis in the two, like in the NSW, ACT and SA strategies, is improving government service delivery through advanced technologies. There is, however, significant attention given to supporting programs for innovative capacity; that is, supporting organisations, especially small and medium-sized enterprises (SMEs), in building their innovative capacity through funding and promotion.

Digital WA aims to 'create a scalable and reliable digital foundation to meet the needs of the Western Australian government' by:

- ensuring quality access to government services for the community;
- supporting public sector employees in the delivery of high-quality services;
- ensuring access to relevant data from all government agencies;
- ensuring productive collaboration; and
- mutual support between local technology businesses to develop innovative ways to deliver services.

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[27] Government of Western Australia (2016b), *Western Australian Innovation Strategy*, https://www.parliament.wa.gov.au/publications/tabledpapers.nsf/displaypaper/3914841a31223b11af0b93b4482580650045371a/$file/4841.pdf

[28] Government of Western Australia (2016a), *Digital WA: State ICT Strategy 2016–2020*, https://www.wa.gov.au/sites/default/files/2018-06/Digital%20WA%20State%20ICT%20Strategy.pdf

One of the key strategy roadmap initiatives is *people capability*, with specific reference to a digital workforce. Under its core capabilities area, *Digital WA* recognises the need to 'Identify gaps and address gaps in workforce digital skills' and states that:

> Public sector staff should have the right skills and training to understand and effectively use current and emerging digital technologies. Agencies should be supported by highly skilled, professional ICT staff capable of providing trusted advice and effectively managing the sourcing and delivery of ICT services… and….Business structures and staff training will be suitable and flexible to enable well-controlled change management (40).

The strategy roadmap contains a plan for progressive enhancement of public sector workforce skills starting with a detailed assessment of digital skills gaps in 2016 and implementing professionalisation through certification of ICT skills. An ICT leadership program would then be developed to train top executives in ICT skills by the end of 2017. The ICT training would then be rolled out to the general government workforce within 2017/18 to achieve a digitally skilled workforce. By the end of 2019, there would be a comprehensive digital workforce plan developed.

The *Western Australian Innovation Strategy*, on the other hand, is more about enabling innovative capabilities of individuals and businesses in the broader workforce through targeted government programs, education opportunities and direct support of innovative ventures. A key aim of the strategy is *talent and skills*, 'to retain, attract and develop innovative and entrepreneurial talent and skills through activities and programs developed to engage the brightest minds'.

In this regard, the strategy makes broad statements about the importance of a skilled workforce for innovation and presents past illustrations of the same, but does not present any action plan for achieving the stated goal. Further, the illustrations presented have no connection to any government intervention; rather they show how skilled people drive innovation.

2.3.7 Victoria

The primary focus of the Victorian *Information Technology Strategy 2016–2020*[29] is government service delivery; it aims to 'support the technology changes

[29] Victorian Government (2016), *Information Technology Strategy 2016–2020*, https://www.vic.gov.au/information-technology-strategy

required to enable public sector reform and aligns with a focus on value and effectiveness' (5). It is developed around four key priorities:

- information and data reform;
- digital opportunity;
- technology reform; and
- capability uplift.

Under the *capability uplift* priority, the strategy states that ICT must be viewed as a core skill set of public servants and explains that, 'The government will identify roles, responsibilities and training needs in order to uplift ICT capability within the government' (30).

Two actions relating to capability uplift were planned to be completed by 2017:

- review and update the *ICT Governance Education Program* for executives sitting on ICT project boards; and
- develop an upskilling plan for ICT capability within the government.

In the *Information Technology Strategy Action Plan 2019–20*, a brief review of outcomes from previous actions shows that these actions have been successfully completed leading to, for example:

- successful building of a community of practice for information technology (IT) project practitioners;
- successful administration of a range of grants from the *Public Sector Innovation Fund*, including undertaking a partnership with Code for Victoria to realise the value of embedding external capability and adopting new ways of working to solve public sector challenges; and
- successful delivery of five tools for use by government departments and agencies, including a Victorian Legal Aid client matching tool for eligibility triaging and Parks Victoria biodiversity atlas.

A separate strategy linked to the main IT strategy, *Digital Workplace Strategy*, instead of further amplifying the digital *capability uplift* priority and providing more specific direction, simply emphasises the priority by stating the need to:

> Leverage the ICT Capability Uplift Plan to define key capabilities and implement an uplift plan to develop these capabilities on an organisational level and critical competencies on an individual level.

Its main focus seems to be on enhancing the technological infrastructure and processes in the workplace. There also seems to be more focus in the Victorian strategy on ICT skills as opposed to digital skills for the general workforce.

2.3.8 Tasmania

The digital transformation strategy in Tasmania was developed in 2019 via a lengthy consultative process. It is contained in the policy document *Our Digital Future: Tasmanian Government Strategy for Digital Transformation 2019–2022*.[30] Unlike most of the other strategies reviewed, with the exception of that of the NT, Tasmania seems to have a highly comprehensive and holistic approach to digital transformation as it covers the broad spectrum of society, industry and government.

The stated overarching objective is 'to ensure that our communities, businesses, industries and public services are equipped to optimise the use and benefits of new technologies'. The strategy focuses on three broad areas:

- Digital community: inclusion, skills and engagement
- Digital economy: business, industry and workforce
- Digital government: services, capability and infrastructure

Skills development is clearly a major area of interest for the Tasmanian Government considering that two of the three priority areas touch on it.[31] First, the strategy aims to enhance the skills of the general society to ensure productive and inclusive engagement; second, it aims to provide the workforce with the necessary skills for productive and gainful work. Even in the third priority, *digital government*, there is emphasis on developing the capabilities of public service workers to enhance the quality and efficiency of government services.

Specifically, the strategy aims to:

- develop more opportunities for lifelong digital skills learning;
- work with industry, business and education partners to develop and promote centres of excellence in digital education, career pathways and workforce capability; and
- develop digital culture and capability across government agencies.

The ultimate objective, in the area of digital skills, is to develop 'a talented, diverse and inclusive local workforce that values, attracts, trains and retains people with specialised technology skills' (3).

Actual implementation of the strategy is through annual action plans. The first of these is the *Tasmanian ICT Workforce 2020–2023 Action Plan*, which

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[30] Tasmanian Government (2019), *Our Digital Future: Tasmanian Government strategy for digital transformation 2019–2022,* http://www.dpac.tas.gov.au/__data/assets/pdf_file/0010/485704/DRAFT_Our_Digital_Future.pdf

[31] Ibid.

specifically articulates the strategic aim, 'to build the capacity, capability, diversity and profile of the ICT workforce to drive the ongoing digital transformation of industry and enable future economic growth and prosperity'.

Interestingly, however, the skills-related actions 14–20 in the plan (8), are specific to the ICT workforce. The initiatives announced around capability building primarily target ICT workers (Action 14), ICT graduates (Action 15), ICT professionals (Action 16 and the ICT workforce (Action 18). Only one action (20) seeks to go outside the ICT workforce through the development of short courses to help business leaders develop a strategic understanding of Industry 4.0 technology and its impact on the workforce.

This is potentially a weakness as it might mean that the digital skills of the general workforce are ignored, yet it is the general workforce's skills that will determine the success of the digital economy. Further, this emphasis on specialist ICT skills potentially undermines the inclusive community objective.

The proposal in Action 19 to adopt the *Skills Framework for the Information Age* also implies particular emphasis on professional ICT skills as opposed to digital skills for the general workforce.

Table 2: State/Territory-level Policies and Strategies

State	Strategy	Overall digital skills policy emphasis	Key features	Target sector
ACT	*ACT Digital Strategy*	The ACT Government's digital strategy is developed with the specific aim of building digital capability of government. Its focus regarding workforce digital transformation is, therefore, specific to workers in the public sector.	• Published in 2016 by the chief digital officer • Main focus is the public sector • Contains within it the *Building the Workforce of the Future* initiative to enhance the digital skills of government workers • Another initiative, *The Future Skills for Future Jobs Grants Program*, has a broader focus to promote apprenticeships for the general workforce in the Territory • This initiative is co-funded by the National Partnership	Economy wide
NSW	*Digital NSW: Designing Our Digital Future; NSW Government ICT Strategy*	Digital transformation policy in NSW also focuses more on the digitalisation of the public sector. While the *Digital NSW* strategy articulates overall vision, the *NSW Government ICT Strategy* focuses more specifically on cultivating government ICT capabilities.	• Developed by the Ministry of Finance, Services and Property • Available on a consolidated digital.nsw web platform • Pays little direct attention to workforce digital skills • There is passing reference to a digital capability framework for developing practical training to strengthen digital capabilities but little else is said	Primarily government and public sector
NT	*Digital Territory Strategy*	This is a comprehensive policy that covers all aspects of community, economy and government. It aims to transform the skills of the overall NT workforce via several specific initiatives.	• Digital skill development is one of the key priorities of the strategy with concrete initiatives identified • Strong emphasis on training and education, including upskilling of workers, generally, and minorities for digital jobs	Economy wide

State	Strategy	Overall digital skills policy emphasis	Key features	Target sector
			• Detailed direction for improving digital skills in the associated *Digital Territory Action Plan 2019–20* • A $1 million *Digital Partnerships Grants Program* is established to support industry to develop digital skills, including funding support • The key weakness is that all actions relating to workforce skills are specific to ICT, with specific reference to ICT skills, professionals, workforce	
Qld	*Queensland Plan; DIGITAL1ST: Advancing our Digital Future*[32]	While the *Queensland Plan* articulates an overarching 30-year vision for the state, the accompanying *DIGITAL1st* strategy is more specific to digital transformation. Generally, education and workforce digital skills development are key priorities.	• The *Queensland Plan* was developed in 2014 while *DIGITAL1ST* came in 2017 • Education and workforce development are key priorities in both strategies • *DIGITAL1ST* in particular gives clear examples of past successful initiatives, along with plans for new ones • A *Building a Digital Government Workforce* initiative within *DIGITAL1ST* provides a clear 3-year and 10-year strategic plan for building skills for the future • A separate but complementary initiative, *Skills for Queensland: Great Training for Quality Jobs*, specifically describes several actions designed to help job seekers and workers acquire required skills	Economy wide

[32] Queensland Government (2017), *Digital1ST: Advancing our Digital Future*, https://digital1st.initiatives.qld.gov.au/documents/digital-strategy.pdf

State	Strategy	Overall digital skills policy emphasis	Key features	Target sector
SA	*Digital Transformation Strategy; ICT Strategy 2018–2021; Delivering Digital 2016–2020*	The *Digital Transformation Strategy* contains the overarching policy for digital transformation in SA. The *ICT Strategy*, on the other hand, focuses more on ICT capabilities. Nonetheless, both are aimed primarily at the public sector, so digital workforce transformation is similarly addressed, with the aim of enhancing the digital government workers.	• Developed in 2018 • Refers to the aim to enhance capabilities, generally, with little specific emphasis on workforce skills • A complementary *Delivering Digital 2016-2020 Digital Technology Strategy* developed by the Department for Education addresses the skills issue but focuses more on preschool and school education rather than workforce skills • Even the *Skills page of the Department for Innovation and Skills website* is rather vague in its articulation of skills development and makes no specific reference to workforce digital skills	Primarily government and public sector
WA	*Digital WA: State ICT Strategy 2016–2020; Western Australian Innovation Strategy*	WA digital policy is contained in the *Digital WA: State ICT Strategy 2016–2020* and the *Western Australian Innovation Strategy*. The primary focus is government service delivery through digitalisation. Digital skills are, therefore, discussed in relation to the government workforce.	• Both developed in 2016 • Primary focus is public sector • Strong emphasis on public sector digital skills, especially ICT skills • Provides a clear 3-year roadmap for transforming the government workforce	Primarily government and public sector
Vic	*Information Technology Strategy 2016–2020*	The Victorian *Information Technology Strategy 2016–2020* presents a comprehensive overarching policy focus. The primary focus is, however, government service delivery with a	• Published in 2016 • Primarily focuses on the public service • Workforce skills development is addressed under the *capability uplift* priority, which spells out specific action for enhancing workers' ICT capabilities	Primarily government and public sector

State	Strategy	Overall digital skills policy emphasis	Key features	Target sector
		clear objective to enhance the ICT capability of the workforce.	• A separate *Digital Workplace Strategy* within the main policy emphasises actions for enhancing overall digital capability • There is general reference to ICT capability with little specific emphasis on workers' digital skills	
Tas	*Our Digital Future: Tasmanian Government Strategy for Digital Transformation 2019–2022*	The digital transformation strategy in Tasmania is contained in the policy document, *Our Digital Future: Tasmanian Government Strategy For Digital Transformation 2019–2022*. Skills is clearly a major focus of the Tasmanian Government considering that two of the three priority areas touch on this.	• Developed in 2019 • Targets whole of society and economy • Workforce skills is a major emphasis to enhance productive engagement and inclusivity • Encourages and supports lifelong learning • Implemented through annual action plans, the first being the *Tasmanian ICT Workforce 2020–2023 Action Plan* • Interestingly, there is overemphasis on skills for the ICT workforce as opposed to digital skills for the workforce	Economy wide

3 Funding for Upskilling and Reskilling of Existing Workers

This section considers how digital skills development is currently funded in Australia. As part of this inquiry, consideration is given to the upskilling and reskilling of existing workers and target groups in areas related to digital skills. It provides a mostly aerial view of the current situation but highlights specific examples of funding initiatives and programs that support workforce skills development more generally, as well as some that target digital skills specifically.

3.1 Key Considerations

- **The source and amount of VET funding**. Many skills development programs initiated by government rely on co-funding from employers. Traditionally, funding for education and training comes from government. However, funding for VET has declined[33] and it is currently at its lowest level since 2008.[34] According to recent National Centre for Vocational Education and Training statistics, overall government funding provided through VET appropriations and VET intergovernmental funding arrangements totalled $6.1 billion in 2018, a decrease in nominal terms of $134.6 million (2.1%) compared with 2017.[35] Given the importance of VET in addressing current and future digital skills challenges of the existing workforce and how widespread that need will be, consideration of how to grow the pool of VET funding is a priority.
- **Subsidies for digital skills qualifications.** Given the emerging importance of digital skills it may be important to consider if government support for particular qualifications should be strengthened. The Digital Skills Cross Sector *Case for Change*,[36] for example, suggests making the Diploma of Applied Technologies available as a subsidised program/eligible for *VET Student Loans*. Identifying which programs should be given such priority, however, is not without challenges given funding constraints and skill shortages in other non-manufacturing occupations (e.g. care sector) where training subsidy needs may be greater.
- **Skill sets and full credentials.** Training programs resulting in full qualifications have tended to be the only ones attracting government subsidies. Skill sets and micro-credentials, however, are considered increasingly important to upskill the existing workforce (see following credentialing section). Further, the COAG Industry and Skills Council reforms identified the need to foster greater recognition of skill sets. Increased funding support for skill sets and micro-credentials may therefore need consideration.

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[33] Burke, G. (2018), op. cit.
[34] Hurley, P. and Dyke, N.V. (2019), op. cit.
[35] https://www.voced.edu.au/content/ngv%3A85210
[36] Innovation and Business Skills Australia (2017), op. cit.

3.2 Overview of the Training Funding Environment

As highlighted in Sections 3 and 4, digital skills development occurs at a range of education levels and involves both formal accredited and non-accredited formal and informal training. The training associated with this skills development may be paid for in several ways:

1. First, trainees may be expected to pay for training via wage reductions or tuition fees.
2. Alternatively, employers may finance training as part of their workforce development strategy or training levy imposed by the industry, collective bargaining obligations or government policy (e.g. payroll tax system).
3. The public financing of training is the third approach typically drawn upon to advance skills development. Public financing of training occurs in a number of ways, ranging from direct payments and subsidies for trainers and/or trainees, to tax rebates for those undertaking training and public provision of training institutions.

In Australia, government funding for training initiatives may originate from the Commonwealth or state and territory governments, or be jointly funded by federal and state and territory governments. Historically, government support for training institutions in Australia primarily included public training institutions, but currently a range of private and community-based training organisations are also eligible to receive government support. The distinction between employer- and public-financed training is also becoming less clear as public–private financial arrangements and partnerships become more common in the area of training across many states and territories.

Trainee-financed training, employer-financed training and public financing of training all perform an integral role in advancing digital skills development in Australia. For the purposes of this report, we primarily concentrate on the public financing of digital skills development particularly that associated with formal VET, resulting in nationally recognised qualifications. Considering the importance of encouraging the development of digital skills for all Australians, we also present a few notable examples of government (state, territory or Commonwealth) funding for digital skills education in schools.

3.3 Funding of General Skills Development Including Digital

Specifying the public financing of digital skills development is not straightforward. As outlined in Section 3, digital skills typically sit at one of three levels: as part of a basic foundation for work or further study; as enabling skills within the broader workforce; or as high level skills for ICT professionals where they are at the heart of the job role.

Within Training Packages and accredited courses, this means that digital skills are typically codified into standalone Units of Competency at the basic level or for ICT professionals. However, for the bulk of the workforce and the majority of Training Package qualifications, digital skills are embedded within vocation-specific Units of Competency that focus on the skills of the job. This embedding makes it impossible to separately establish the amount of funding devoted to building digital skills for the bulk of Australia's workforce.

As its name implies, the *Foundation Skills Training Package* captures digital skills at the basic level. Three of its 94 units pertain specifically to digital skills; the others deal with numeracy, literacy and a range of soft skills. In each of the three qualifications that comprise the Training Package, the three digital skills units are packaged as electives. In 2018, there were over 124,200 enrolments across the three units.

At the other end of the spectrum, the ICT Training Package is comprised of 672 technology-focused Units of Competency, 54 skill sets and 39 qualifications. In 2019, there were over 64,900 qualification enrolments. Two skill sets in the Training Package are focused on foundational skills: ICT00047 Digital literacy skill set and ICT00046 Digital literacy e-citizen. In 2018, there were approximately 430 enrolments across the two skill sets (noting that skill set data can be under reported).

In Victoria, digital skills at the foundation level are supported by Adult, Community and Further Education programs that develop 'literacy, numeracy, English language, employability and digital skills education and training'.[37] While the state government provides the funding for this 'core skill' training for adult Victorians needing to build their educational capacity, community-based and registered Learn Local providers deliver much of this training.

There are currently some 270 registered Learn Local providers in Victoria involved in increasing educational attainment and employability of adults across the state, including their digital skills proficiency. Digital skills, for example, are embedded in the Certificates of General Education, which the Adult, Community and Further Education sector leads and finances, and Learn Local providers deliver.

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[37] Victorian Government (2020), *Adult, Community and Further Education Board Strategy 2020–25*, Victorian Government, Melbourne, https://www.education.vic.gov.au/Documents/about/research/acfepublications/ACFE_Board_Strategy_2020-25.pdf

Programs aimed at supporting the upskilling and retraining of workers can often include digital skills development, but these are typically not the sole skill specified. The *Skills Checkpoint for Older Workers Program* supported by the Department of Education and Training provides eligible Australians aged 45–70 with advice and guidance on transitioning into new roles within their current industry or pathways to a new career, including referral to relevant education and training options. Eligible participants are able to receive up to $2,200 to fund suitable accredited and non-accredited training. The government contribution, however, must be matched by either the participant or their employer. Digital skills are one of many training options supported under the program (Department of Education, Skills and Employment [DESE]).[38]

Other training programs that provide support for a range of skills development, including digital skills, are jointly funded by the Commonwealth and state governments. The *Skilling Australians Fund*, for example, is jointly funded by the Commonwealth and state and territory governments and provides financial support for apprenticeships and traineeships across a range of key priority areas, including future growth sectors. The fund is managed as a project-based National Partnership with the state and territory governments, and while digital skills development is not its only aim, it has assisted in the development of skills in this area.[39]

This funding for example, helps support the ACT Government's *Future Skills for Future Jobs Program*, which has a focus on digital and cyber skills. Group training organisations, RTOs, businesses, employers and industry are eligible to apply for funding, but the expectation is that the projects will be 'co-developed' between these organisations, industry and government (ACT Government, 2019). Under this program, and in line with the National Partnership, the scheme must:

- include industry partners, or be industry led;
- identify new pathway opportunities for Australian apprenticeships; and
- promote market diversification and productivity.

Thus, while trainees are likely to benefit from these programs, the funding does not support them directly. However, in response to rising tuition costs for training, governments have also sought to better support trainees with the financial costs of training. Since 2008, for example, many trainees have been able to make use of the Commonwealth government's income contingent

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[38] DESE (2020a). *Skills Checkpoint for Older Workers Program,* https://www.employment.gov.au/skillscheckpointprogram

[39] DESE (2020b). *Skilling Australians Fund,* https://www.employment.gov.au/skilling-australians-fund

loan scheme, which aims to assist eligible students to pay their tuition fees for higher-level (diploma and above) VET courses undertaken through approved providers. Under the loan scheme a trainee pays nothing up front for their course, as the government pays the tuition fees to the education provider. The trainee is required to repay the debt via the tax system when their income reaches a certain indexed threshold.

The initial scheme, *VET FEE-HELP*, had a troubled history. What started as a well-intentioned program to support access and equity for those seeking training became badly rorted by unscrupulous training providers, resulting in higher tuition fees and trainees taking on increased debt.[40] The Commonwealth government has sought to address these problems in recent years through greater regulation of the newer *VET Student Loans* scheme and the behaviour of training providers wanting to access the scheme. Trainees wanting to apply for a loan also now need to undergo literacy and numeracy screening. However, they are not required to undergo the same screening for digital skills.

The Victorian Government's *Free TAFE* is another example of government supporting trainees with tuition fees. Under this scheme the Victorian Government covers tuition fees for priority courses for students who are eligible for government-subsidised training. The priority courses align with identified skills shortage occupations such as accounting, aged care, dental assistance, nursing and hospitality.[41] While none of the courses eligible under the scheme are 'digital' skill specific, many, if not all of the courses available under the scheme include digital skills as part of the qualifications. Subsidised tuition, whether through loan provision or tuition waivers, must therefore be an important consideration in advancing digital skills.

In Tasmania, funding for VET training occurs through Skills Tasmania, the State Training Authority that manages a wide range of funding programs for the development of workforce skills. There are funding programs for RTOs, to develop and provide relevant Skills in specified areas; for employers, to help them in the training and upskilling of their employees; and for learners, to help them undertake training to upskill and improve their employability in the changing economy. What is interesting, however, is that the majority of the funding is provided to employers, for example, to subsidise SMEs who employ apprentices and all employers for the expenses of providing training to their

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[40] Saccaro, F. and Wright, R. (2018), *VET-FEE HELP: What Went Wrong*? The University of Melbourne, Melbourne, https://melbourne-cshe.unimelb.edu.au/__data/assets/pdf_file/0012/2845776/Final-VET-FEE-HELP-.pdf

[41] Victorian Government (2019), *Free TAFE for Lots of Jobs,* https://www.vic.gov.au/free-tafe

employees. Endorsed RTOs, on the other hand, receive subsidies to help them develop and deliver a wide range of training aimed at developing the skills required by industry. Learners are only able to directly obtain funding to support travel to and from training where necessary and, in some cases, for tuition relief for certain courses.

Although the funding provided through Skills Tasmania is for training in general, the overall objective is to ensure that workers have the skills needed for employment and that are required by industry. The Advanced Manufacturing and ICT industries, however, have been identified as priority industries towards which government investment in training and workforce development is being directed. Intermediate and specific ICT digital skills development are benefiting from these priority initiatives.

3.4 Funding for Specific Digital Upskilling of the Workforce

Funding for more specific 'digital skills' related programs typically involves full public provision or a mix of public and private funding. A growing trend appears to be co-funding arrangements between government and employer. These initiatives tend to be more common at the state/territory level and include the following notable examples.

The *Skilling South Australia* initiative is one example of a comprehensive state-based skills initiative that has funded a range of digital skills projects (see https://www.skilling.sa.gov.au/). One of those projects involves an innovative partnership with Microsoft to upskill adult workers. Launched in 2018, Microsoft partnered with SA's Department of State Development and the City of Salisbury to develop a pilot project teaching digital skills to displaced automotive supply chain workers following the closure of the Holden manufacturing plant in Elizabeth in late 2017. The pilot project was funded as part of the *Automotive Industry Structural Adjustment Programme*.[42] Participants in the pilot were provided access to digital skills training and certifications delivered by Prodigy Learning, a global training partner for Microsoft. Prodigy Learning also led the development of the digital foundations courses, which were designed to meet local worker requirements.

Displaced workers enrolled in the program were also expected to attend a 2-day workshop to help them develop a personal business plan, and identify a career path and any new skills they needed to help them find meaningful employment. The primary motivation for the pilot program was to help

[42] Microsoft (2018a), 'Microsoft launches program to help build Australia's future ready workforce', https://news.microsoft.com/en-au/2018/02/07/microsoft-launches-program-help-build-australias-future-ready-workforce/

displaced manufacturing workers and other disadvantaged groups to upskill in an economy becoming increasingly technology driven. The pilot was designed to understand how best to support at-risk workers and how assistance might be scaled up and involve additional stakeholders, including other training providers (Microsoft, 2018b).

Microsoft has further partnered with several other states and territories, including SA, NSW, Victoria and the ACT, under the *Microsoft Traineeship* program to develop more specialised IT skills. This program aims to create a pipeline of IT talent by increasing IT traineeships in the respective jurisdictions. In SA, where the latest phase of the program is being undertaken, some 40 people have been provided with 2-year traineeships that combine on-the-job paid work experience with a Certificate IV in Information Technology and a Microsoft Azure Certificate delivered through TAFE SA. Under the program, trainees would be employed by a group training company and placed with a range of Microsoft Partner Network members to ensure they receive a diverse range of workplace experiences. It is estimated that the South Australian Government has provided $200,000 in financial support for the program.[43] The *Microsoft Traineeship* program is in many ways an industry-specific digital skills program, given its focus on addressing future workforce needs of the IT industry. The IT industry, however, has not been the only beneficiary of specific digital skills funding.

In Queensland, the government has worked with the Queensland Resources Council and TAFE Queensland to implement the *Sustaining Digital Futures Project* to develop digital skills among employees in the state's resources sector. The project funding supports customised training to upskill existing employees and prepare the next generation of workers in the coal, metalliferous and gas sectors for emerging digital skills needed by the industry.[44]

In the NT, the 2019 state government budget allocated some $8.4 million over two years to fund *Territory Workforce 4.0*.[45] Its aim is to prepare Territorians for the jobs of the future. The funding is allocated annually across two years in the following way:

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[43] Barbaschow, A. (2019), 'Microsoft extends IT skills development program to South Australia', https://www.zdnet.com/article/microsoft-extends-it-skills-development-program-to-south-australia/

[44] TAFE Queensland (2019), *Sustaining Digital Futures Project Takes Resources Training to the Next Level,* https://tafeqld.edu.au/news-events/news-blogs/2019/taking-resources-training-to-next-level.html

[45] Manison, N (2019), *BUDGET 19: Putting Territorians First by Investing in Skills Training,* http://newsroom.nt.gov.au/mediaRelease/30001

- $2.2 million for Future Skills Vouchers of up to $3,000 for up to 700 Territorians to access future skills training.
- $1 million for the *Future Proofing Training Infrastructure Fund*.
- $1 million for flexible funding dedicated to regional areas for building future skills.

3.5 Funding for Digital Training in Schools

As digital skills become key enablers in the modern Australian workforce, and are expected to significantly underpin Australians' employability, it has become necessary to ensure that, like other traditional core skills such as numeracy and literacy, they are inculcated earlier in the education system. Therefore, in addition to changing Commonwealth policies for primary and secondary education in this regard, all states and territories have adopted various strategies, including funding initiatives, to support digital skills education.

At the Commonwealth level, support for STEM is an example of such an initiative. The DESE has established a $1.1 billion funding program through which funding support is available for several initiatives aimed at enhancing STEM skills in young Australians. These include the $51 million *Embracing the Digital Age* school initiative and the $14 million *Inspiring STEM Literacy* early learning initiative. Further, a $29.9 million *Supporting Artificial Intelligence in Schools* initiative has been developed as a school education component of the *Artificial Intelligence Capability Fund* measure. It aims to build the AI capability of both businesses and workers and provide new employment opportunities. In addition, the Australian Government is investing $1.5 million to commission the development of a range of curriculum resources to assist with the delivery of AI and emerging technologies content and the associated general capabilities in the *Australian Curriculum*.

Another notable Commonwealth government initiative in this space is the *Digital Literacy School Grants*, which were introduced by the then Department of Education and Training, following the endorsement of the *Australian Curriculum: Digital Technologies* by all education ministers in 2015.[46] Its initial objective was to support learning in basic-level digital literacy and device use skills, but it was later expanded to include more advanced-level skills such as algorithmic and computational thinking, coding, data synthesis and

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[46] Australian Government (n.d.), *Digital Literacy School Grants—Enhancing Digital Literacy Through a Whole of School Approach*, *Grant Guidelines*, Department of Education and Training, Canberra, https://docs.education.gov.au/system/files/doc/other/dlsg_-_guidelines_round_2_accessible_copy_0.pdf

manipulation, and the ability to design and use digital technologies. To facilitate this, the government allocated $4 million over a period of two years from 1 July 2016 to 30 June 2018, with the aim of:

- stimulating best practice models of implementation of, and student and teacher engagement in, the *Australian Curriculum: Digital Technologies;*
- encouraging sharing of ideas and experiences in relation to the *Australian Curriculum: Digital Technologies*, within and among schools;
- facilitating the development, implementation and sharing of demonstration projects that can be used by other schools to implement the *Australian Curriculum: Digital Technologies; and*
- facilitating effective ways that leaders can inspire their teachers and students to extend and apply their learning across other learning areas through the *Australian Curriculum: Digital Technologies*.

These grants were, however, competitive and outcome oriented. They included three categories:

- Category A—grants of $10,000–20,000 for single-year projects.
- Category B—grants of $20,001–50,000 for projects of larger scale lasting up to two years.
- Category C—grants of >$50,000 where a project has demonstrated capacity to reach regional, national or sectoral scalabilities, for example by involving clusters of schools and/or peak bodies/professional associations.

Our search identified numerous examples across all states and territories, of programs aimed at improving digital skills among particular categories of students and workers. One example is the Western Australian Government's *Digital and Technology Skills Program*, which is a government-led and financed digital skills initiative in which applicants must provide or secure a net cash co-investment of funds at a ratio of no less than 30:70 of applicant-to-state government funding. The program is a core part of the Western Australian Government's STEM skills strategy designed to assist Western Australians under-represented in STEM, and/or living in regional or remote communities, in digital and technology engagement and skill building. Principally, it focuses on students with Index of Community Socio-Educational Advantage scores of 1,000 or less and people in the community who are under-represented in STEM or living in regional or remote areas, and provides grants to well-established STEM education service providers to deliver proposed projects that:

- develop and deliver digital and/or technology skills training;
- create awareness of the importance of digital and/or technology skills for current and future jobs; or
- stimulate interest and participation in STEM via digital and/or technology education.

4 Australia's Approach to Credentialing Digital Skills

This section discusses how the credentialing of digital skills in Australia occurs through both the formal national qualification framework and informal industry/organisation-level mechanisms. Credentialing comes in a variety of forms. It may involve formal government regulation and training standards such as those associated with nationally recognised qualifications or it may occur through a self-regulatory process instituted by an industry association, individual business or other professional body to determine and acknowledge that an individual has demonstrated the prescribed competence for the relevant specialist role.

The section examines current and emerging approaches to credentialing workforce digital skills starting with formal qualifications developed in accordance with the *Australian Qualifications Framework* (AQF). It considers foundation, VET and HE qualifications, as part of mainstream credentialing. It also discusses emerging approaches outside the AQF designed to recognise continuous digital upskilling through alternative credentialing that provides individuals with opportunities to display their digital skills developed through learning, living and working in the digital society.

4.1 Key Considerations

- **Design—Explicit and implicit inclusion of digital skills**. Design of Australia's national system of training occurs via a tripartite process involving employer, union and government representatives with inherent intention to develop widely transferable skills for the digital economy and society. It is through this process that Units of Competency and Training Packages are developed and reviewed. For the broader workforce, Units of Competency typically embed digital skills in the relevant activity. At a foundational level and for ICT professionals, digital skills are typically explicit. Given the critical nature of digital skills and that they are often portable between industries, consideration should be given to how these skills are best codified within education and training programs.
- **Digital literacy skills and the AQF**. The location of digital skills within the AQF is receiving increased attention in recent years. While there is a general view that the AQF itself should do more to emphasise the importance of digital skills, there are different views about the best approach to achieve these outcomes given the differences in digital skills requirements across Training Packages, programs and different types of occupation. There is also the practical issue of technological evolution, its increasing permeation through skill levels and how a

framework that is typically enshrined for a period of years can adequately and meaningfully respond. These contextual issues must be considered when reviewing how best to locate and treat digital skills within the AQF.

- **Digital skills and foundational qualifications.** Digital literacy among school students is becoming essential. However, the digital skills associated with the Senior Secondary Certificate of Education (SSCE) may not be well understood in the broader community, including employers, which may be a barrier to employment and training and education pathways. How the SSCE can better serve as a basic digital skills credential and a pathway to further digital skills learning and employment should be a consideration.
- **Skill sets and micro-credentials**. Australia's VET system has traditionally supported the development and delivery of full credentials and qualifications. In recent years, however, there is growing interest—particularly from employers—in skill sets and micro-credentials. Digital skill sets and digital micro credentials, for example, are seen as an efficient way to upskill existing workers in relation to both time and resourcing. Accommodating these shorter courses into the AQF and training system is therefore becoming an important priority.
- **The evolving relationship between short courses and full AQF qualifications.** Enabling courses (also called foundation, access, widening participation, pathway, bridging or tertiary preparation programs) are not currently recognised in the AQF. This can mean students enrolled in an enabling course may not be able to transfer their learning to another institution or program because of lack of clear pathways or credit policy. This may adversely affect students from disadvantaged backgrounds, such as regional and remote students and Aboriginal and Torres Strait Islander students. It is important that these short training programs provide pathways into full programs to the extent possible. Government funding for short programs should also take this into consideration.
- **The proliferation of digital badges and credentials outside the AQF**. Digital badges are validations earned rather than a course as such. How to support staff, students and employers to understand the purpose of digital credentials and their value to lifelong learning must be given consideration. It is also important to consider how micro-credentials interface with formal qualifications. The International Telecommunications Union, for example, recommends that:

> this may involve increased recognition of credentials obtained in other countries or allowing credits earned in non-formal education (e.g. digital badges and online course completion certificates) to count toward credit in formal education institutions.[47]

Achieving these outcomes is not easy, particularly when the contents of non-accredited short programs and micro-credentials are often unknown and difficult to verify. The decentralised and distributed nature of micro-credentials presents a key challenge. The effect of this can be to move learning to a more informal environment and to disrupt the relevance of formal credentialing. This trend, however, is unlikely to go away. Strengthening the interface between formal and micro credentialing, therefore, must be a priority.

One approach worth considering is 'open badges'. These are increasingly popular among organisations and individuals as informal ways of recognising achievement, including the acquisition of certain skills. Many micro-credentials are, for example, presented in the form of open badges. The open badge approach uses:

> a top-down design to structure and understand the certification process as micro-certification units. These types of systems are adaptable and clearly communicate the evidence of knowledge, skill, and experience represented by the credential.[48]

Another possibility is to use an existing qualifications framework (such as AQF) as a national roadmap to credential micro-credentials, including digital micro credentials. However, this would require micro-credentials to meet higher teaching and learning standards than is currently required for many micro-credentials.

4.2 Overview

Credentialing is 'a process used to verify that an individual (or organization) has met certain defined standards established by a group charged with creating and implementing these standards' (Styles, 1999). It requires an authoritative third party to recognise skills, knowledge and experience at different levels of proficiency to a standard that is flexible and inter/nationally portable.

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[47] International Telecommunications Union (2018), *Measuring the Information Society Report Volume 1*, International Telecommunications Union, Geneva, https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-1-E.pdf

[48] Davies, R., Randell, D. and West, R. (2015), Using open badges to certify practicing evaluators, *American Journal of Evaluation* 36 (2): 151-163. https://journals.sagepub.com/doi/full/10.1177/1098214014565505

The credentialing of digital skills occurs in several ways and depends on how they are perceived and related to particular qualifications and associated occupations. As outlined earlier:

- When viewed as foundation skills they are typically explicit, for example, as distinct Units of Competency in the *Foundation Skills Training Package*.
- When considered an 'enabling' skill, digital skills are typically implicit and embedded in certificates or qualifications.
- Where they are a focus of the job role, digital skills are explicitly identified, for example, in ICT-related qualifications.

This implies that some digital skills are discrete and remain hidden within a macro-credential, which makes their credentialing process extremely difficult and complex. The speed of technology change coupled with the move towards micro-credentialing has meant digitals skills are becoming increasingly 'credentialed' outside full qualifications and often outside the traditional AQF. These developments have stimulated considerable debate as to how digital skills should be formally recognised and treated from primary and secondary schooling to VET and HE.

4.3 The Treatment of Digital Skills Under the *Australian Qualification Framework*

The AQF was introduced in 1995 to underpin the national system of regulated qualifications in Australia's school, VET and HE sectors. It incorporates the qualifications from each of the three education and training sectors into a single comprehensive national qualifications framework. The DESE monitors and maintains the AQF in consultation with the states and territories.

The AQF consists of 10 levels, ranging from Certificate I to a doctoral degree, with HE awards including levels 5–10 as part of it (Figure 1). For each level of award (diploma, associate degree, degree), the AQF defines its (a) purpose; (b) knowledge; (c) skills application and knowledge of skills; and (d) volume of learning. In this regard, it ensures relativity between qualification levels and supports the interface between schools, the vocational sector and universities to facilitate lifelong learning.

Figure 1: The *Australian Qualifications Framework*. Source: Australian Qualifications Framework Council, 2013[49]

One of the key objectives of the AQF is to facilitate pathways to, and through, formal qualifications. It also complements national regulatory and quality assurance arrangements for education and training. Currently, any qualification type listed in the AQF must satisfy the following seven considerations:

1. be quality assured under government-approved standards;
2. be accredited by an authority authorised under legislation;
3. be described according to the AQF descriptions of learning outcomes (knowledge, skills, the application of knowledge and skills and generic learning outcomes);
4. be located at an existing AQF level;
5. have clear pathways within the AQF;
6. not duplicate an existing AQF qualification type; and
7. meet a defined industry, professional or community need.

[49] Australian Qualifications Framework Council (2013), *Australian Qualifications Framework, Second Edition January 2013*, Australian Qualifications Framework Council, South Australia, https://www.aqf.edu.au/sites/aqf/files/aqf-2nd-edition-january-2013.pdf

Of the enrolments in the HE sector reported through the *Higher Education Information Management System* in 2017, 97% were in AQF qualifications. In 2018, there were approximately four million students enrolled in VET. Of these, approximately half were enrolled in full AQF qualifications. In 2018, just under half a million students were enrolled in senior secondary school studying for the SSCE. This highlights the current predominance of AQF qualifications and suggests that they will continue to provide the foundation for education and training in vocations, professions and broad disciplines for some time. This view is supported by stakeholders.[50] [51]

The treatment of digital skills under the AQF varies depending on the AQF level and the specific qualification being undertaken. In recent years, however, concerns have emerged that the AQF does not adequately profile digital skills and capabilities. A recent Commonwealth review, for example, suggests that more explicit attention needs to be given to digital literacy within both the framework and individual qualifications. The review advocates that digital literacy be treated similarly to literacy and numeracy as 'general' capability skills.[52] However, it is also noted that the review panel did not propose the inclusion of digital skills in a revised AQF taxonomy. They claim this is:

> because it is difficult to identify a progression in complexity for digital literacy independently of the relevant field or discipline. For example, a Doctoral student in the humanities may require digital literacy skills for online research and for publication. However, these skills are not likely to be as broad and complex as the digital literacy skills required of a student undertaking a Diploma in cyber security or games and application development.[53]

In the following sections, ongoing discussions regarding the treatment of digital skills at the different education levels are further highlighted.

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[50] Wells, J. (2018), *Review of the Australian Qualifications Framework, Discussion paper.* University of Melbourne, Melbourne, https://submissions.education.gov.au/Forms/AQF2019/Documents/099-University-of-Melbourne.pdf

[51] NSW Government (2019), *NSW Government Submission to the Australian Qualifications Framework Review*, https://submissions.education.gov.au/Forms/AQF2019/Documents/006-NSW-Government.pdf

[52] Noonan, P. (chair) (2019), *Review of the Australian Qualifications Framework: Final Report 2019*, https://docs-edu.govcms.gov.au/system/files/doc/other/aqf_review_2019_0.pdf

[53] Ibid.

4.3.1 Foundational Qualification

Digital skills are increasingly being considered a necessary part of the *Australian Curriculum* and foundational qualifications of secondary education. The Committee for Economic Development of Australia, for example, has argued that digital skills are becoming 'a new basic skill set in the way reading and writing are today and should be a core component of ongoing workplace skills development'.[54]

Alongside literacy and numeracy skills, digital skills are recognised as essential for enabling students to present knowledge and ideas to others. They are recognised as important skills expected of SSCE graduates' qualifications outside of the 10 defined formal qualification levels (Australian Qualifications Framework Council, 2013). In this regard, the SSCE can implicitly serve as a basic digital skills credential and a pathway to further digital skills learning, work and effective participation in civic life (Australian Qualifications Framework Council, 2013).[55] This is in line with the recommendation of a recent expert review of Australia's VET system for:

> The Commonwealth to work with the States and Territories to develop a new national agreement for foundation skills to deliver consistent levels of access across Australia to language, literacy, numeracy and **digital literacy** courses for adult Australians who do not have language, literacy, numeracy and **digital literacy** levels up to Level 2 in the Australian Core Skills Framework (Joyce, 2019, p. 105).[56]

4.3.2 Digital Skills in Vocational Education and Training Qualifications

Debate about the treatment of digital skills is also prominent within the VET sector. Digital skills are developed as part of most formally accredited mainstream qualifications across three dimensions: foundational, broader industry and ICT specialists.

First, digital skills are developed as part of foundation skill development. For each VET qualification, trainees must successfully complete a specified number of units of competency, including a range of skills broadly known as

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[54] Committee for Economic Development of Australia (2015), *Australia's Future Workforce?*, Committee for Economic Development of Australia, Melbourne. https://www.ceda.com.au/Research-and-policy/All-CEDA-research/Research-catalogue/Australia-s-future-workforce

[55] Noonan (2019), op. cit.

[56] Joyce, S. (chair) (2019), *Strengthening skills: Expert review of Australia's Vocational Education and Training System,* Australian Government, Canberra, https://www.pmc.gov.au/sites/default/files/publications/strengthening-skills-independent-review-australia-vets_1.pdf

foundation skills. Foundation skills in the VET system consist of core language, literacy and numeracy (LLN) skills as detailed in the *Australian Core Skills Framework*, and those included in the *Core Skills for Work* (Australian Government, 2013).

The *Core Skills for Work* includes 10 non-technical skills areas grouped into three skills clusters:

Skills Cluster One: Navigate the World of Work
(1) Manage career and work life
(2) Work with roles, rights and protocols
Skills Cluster Two: Interact with Others
(3) Communicate for work
(4) Connect and work with others
(5) Recognise and utilise diverse perspectives
Skills Cluster Three: Get the Job Done
(6) Plan and organise
(7) Make decisions
(8) Identify and solve problems
(9) Create and innovate
(10) Work in a digital world.

The combination of LLN and the non-technical *Core Skills for Work* generally align with what the school sector refers to as 'general capabilities' and what is referred to as 'graduate attributes' in HE (Australian Government, 2013).

The second approach is typically used for the broader workforce, whereby digital skills are embedded in Units of Competency into the relevant activity; for example, the use of digital skills in communication, teamwork and problem solving. In this regard, the VET system's main approach has been to treat digital skills as part of a range of generic transferable skills.[57] Identification of the 'foundational' digital skills contained within a particular qualification or Training Package can be challenging as they are not always explicitly presented because of this treatment.

The third way VET addresses digital skills needs is via the development of more intermediate and specialist digital skills required for IT and more digital-oriented occupations (ICT professional skills). As highlighted in Table 3, the VET sector supports digital skills and knowledge-related credentials that are recognised throughout Australia under the AQF certificate and diploma levels.

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[57] Snell, D., Gekara, V. and Gatt, K. (2016). *Cross-Occupational Skill Transferability: Challenges and Opportunities in a Changing Economy*, National Centre for Vocational Education Research, Adelaide, https://www.ncver.edu.au/__data/assets/file/0023/55913/cross-occupationalskilltransferability-2862.pdf

Table 3: VET Digital Skills Credentials

Level	Description	Examples of Digital Skills Credentials
Certificate II	Certificate II courses are designed for people to undertake mainly routine work or as a pathway to further education	Information, Digital Media and Technology
Certificate III	These courses are designed to help enter a role with the skills and experience needed	Information, Digital Media and Technology with or without – Interactive Gaming and Programming Specialisation
Certificate IV	These courses are designed for people looking to move into supervisory and management positions. Graduates will develop a broad range of specialised skills and knowledge to be applied in varied contexts in the workplace or as a pathway to further education.	Programming, Digital and Interactive Games, Information Technology Networking, Website Development, Digital Media Technologies, IT support, Web Based Technologies, Computer Systems Technology
Diploma	Diploma courses are designed for people looking to move into supervisory and management positions. Graduates will develop a broad range of specialised skills and knowledge to be applied in varied contexts in the workplace or as a pathway to further education.	IT Networking, Software Development, Screen and Media, Website Development, Social Media Marketing, Information Technology, Applied IT, IT Systems Administration, Applied Cloud Technology, Database Design and Development, Digital and Interactive Games, Engineering

The specific digital skills developed as part of these types of qualification are much more explicit and identifiable.[58]

Despite the importance of VET in developing digital skills, the sector has not tended to promote these skills. With the growing importance of digital skills across most occupations, however, there has emerged a growing interest in better understanding and profiling the types of skills that can be developed through the VET sector.

[58] Gekara, V., Molla, A., Snell, D., Karanasios, S., and Thomas, A. (2017). Developing appropriate workforce skills for Australia's emerging digital economy, NCVER, Adelaide, Australia.
https://www.ncver.edu.au/research-and-statistics/publications/all-publications/developing-appropriate-workforce-skills-for-australias-emerging-digital-economy-working-paper

4.3.3 Innovations in Specialised Vocational and Educational Training Programs

Several specialised VET programs have emerged in recent years that are worth noting. The development of these program has involved close collaboration between training providers and private enterprise.

In WA, concerns about the skills required to operate automated equipment in the resources sector led to a collaboration between Rio Tinto, the Western Australian Government and WA TAFE in the development of new automation courses: Certificate II in Autonomous Workplace Operations and Certificate IV in Remote Centre Operations. These courses aim to assist workers in taking advantage of the opportunities that automation is expected to deliver to the resources industry.[59]

In SA, Flinders University and ASC Shipbuilding collaborated in developing a Diploma of Digital Technology aimed at upskilling the region's ship builders. The focus of the program centres around *Industry 4.0* technologies that are to be deployed at the Osborne Naval Shipyard in SA.[60]

In NSW, TAFE and private enterprise are collaborating in slightly different ways. TAFE NSW Digital Lab[61] and TAFE Enterprise are working with NSW businesses in developing digital capabilities of their workforce in areas related to machine learning and AI; robotic process automation; virtual, augmented and immersive reality; and learning analytics and mobile application development. TAFE Enterprise works directly with businesses on the potential use of emerging technologies, while the Digital Lab assists with the associated training and workforce development requirements.

4.3.4 Digital Skills in Higher Education Qualifications

Australia's HE system is the primary source of advanced digital skills credentials across all qualification levels under the AQF. It is designed to create a 'culture of enquiry and innovation that the new economy needs' with sophisticated technical and increasingly enterprise and work readiness skills in problem

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[59] Crozier, P. (2019), 'TAFEWA offers "autonomous workplace" courses', https://www.itnews.com.au/news/tafe-wa-offers-autonomous-workplace-courses-526567

[60] Manufacturers Monthly (2020), 'Australian launches first digital shipbuilding course', https://www.manmonthly.com.au/news/australia-launches-first-digital-ship-building-course/

[61] https://www.tafensw.edu.au/enterprise/for-industry/digital-lab-archive

solving, creativity, communication, cultural adaptability and global awareness.[62]

An essential consideration during the HE course development process is mapping and analysis against the AQF requirements. A list of degrees from the Australian Government Digital Transformation Agency[63] includes over 380 advanced digital skills-related qualifications ranging from mathematics to applied AI and cyber security across all qualification levels—PhD, master, bachelor and graduate certificate (Appendix 2). These credentials are nationally recognised under the AQF.

A closer examination of the fields of study covered by Australia's advanced digital skills and knowledge credentials, such as cloud computing, data analytics, applied AI, cyber security and digital transformation, indicates that the system is responding to the diffusion of emerging technologies and their implications for the future of work and jobs. Table 4 lists the types of IT skills in demand nationally.

Table 4: IT Skills in Demand Nationally

Area	**Top 5 skills in demand nationally**
Information technology	Cloud engineers, cloud architects, project managers, network engineers, security governance, risk and compliance specialists, end user support professionals
Digital technology	Full stack software engineers, cloud engineers, data engineers, data scientists, react native engineers
Project and business change	Project managers, business analysts, change managers, change analysts, project coordinators

Despite Australian Government data showing an increase in the proportion of university students in advanced digital skills and other STEM-related fields of study (Australian Industry Group, 2018), the *Hays Jobs Report* shows that Australia's digital talent gap and skills shortage continues to grow. This is most likely a result of a growing mismatch between the skills employers need and

[62] Australian Industry Group (2018), *Developing the Workforce for a Digital Future*, https://cdn.aigroup.com.au/Reports/2018/Developing_the_workforce_for_a_digital_future.pdf

[63] https://www.dta.gov.au/

those job seekers possess.[64] This indicates that special attention must be directed to the so-called advanced 'employability skills' required to work, learn and thrive in a technology-saturated world. These include creative thinking, problem sensitivity and adaptability.[65]

4.4 Digital Skills Credentials Outside the *Australian Qualifications Framework*

A wide variety of credentials developed by industry and training providers exist outside the formal AQF and nationally recognised qualifications system. While non-accredited training and industry-based credentialing are not new, there is an expectation that this form of credentialing will continue to expand. With increasing changes in the nature and context of work—where workers are having to more frequently change jobs and roles, and employers demand a flexible, responsive and agile mechanism that supports existing workers to upskill—a formal approach to training recognition, that is, through formal assessment and credentials, is under increasing scrutiny.

The recent review of the AQF highlighted its design limitations for the recognition of shorter-form credentials (a term that refers to micro-credentials, skill sets and other shorter credentials) that are not recognised as full AQF qualifications.[66] As the training agenda is increasingly driven by the evolution of the economy, other training programs—some of which are employer developed and delivered in house—have evolved. Consequently, there is increasing motivation to also adopt a more flexible and miniaturised process of credentialing so that smaller-scale lifelong and life-wide learning can be recognised.[67]

Therefore, credentialing in the emerging training context includes both the skills and competency outcomes of formally accredited training under the AQF as well as non-accredited industry training, including vendor and employer-provided programs that offer an award or certificate of participation. Several institutions offer short courses that are not accredited under the AQF. Short courses are designed to address particular skills needs or to upskill, and provide

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[64] Hays (2020), *Hays Jobs Report January To June 2020: Information Technology*, http://image.email.hays.com/lib/fe4715707564057c751475/m/1/c3d78c21-938d-4c58-97a5-fe1520d6aadc.pdf

[65] United Nations Educational, Scientific and Cultural Organisation (UNESCO) (2017), *Digital Skills for Life and Work*, UNESCO, Paris, https://unesdoc.unesco.org/ark:/48223/pf0000259013

[66] Noonan (2019), op. cit.

[67] https://journals.sagepub.com/doi/abs/10.1177/1098214014565505?journalCode=ajec

a pathway for formally recognised macro-credentials through technical and further education (TAFE) or university.

For example, as of March 2020, the national register on VET in Australia (Training.com.au) lists 229 short courses of which 81 are directly related to digital and technical skills. The digital short courses cover blockchain, developing AI strategy, cloud computing, cryptocurrency, as well as specific applications such as MYOB and Xerox. Some of these courses do not result in nationally accredited credentials but are recognised by other associations and organisations such as the EC-Council, and the Project Management Institute (PMI). Others do not have any accreditation. Some are delivered by well-known Australian institutions (e.g. RMIT Online, Swinburne Online) in partnership with globally recognised companies such as Accenture, as summarised in Table 5.

Table 5: Examples of Non-accredited Digital Skills Courses

Institution	Partners	Third-party accreditation	Digital skills short courses
Academy Xi	University of NSW (UNSW) (only for one course)	None	Digital Media, IT, Analytics, Social Media, Web Design
RMIT Online	awsEducate, Accenture, Adobe, STONE&CHALK	None (RMIT can issue self-accreditation through Tertiary Education Quality and Standards Agency)	Digital Leadership, Salesforce, User Experience, Cyber Security, Virtual Reality, Augmented Reality (AR), Digital Marketing and Blockchain Applications, Solution, Strategy
The CAREER Academy	MYOB, Xerox, AAT	International Council for Online Educational Standards	MYOB and Xerox Accounting Certificate
Learning People	Code Institute (only for one course)	CompTIA, EC-Council, PMI, Microsoft, Red Hat, Oracle	PRINCE, Big Data Collection, SQL Database, Systems Admin, Ethical Hacker, Cyber Security, Web Developer
Swinburne Online			Cybersecurity Strategy. Strategy with Big Data, Intelligent Automation and Chatbots
SpotED		CompTIA	Xerox Accounting, Salesforce, IT Security, Social Media
Monarch Institute			DMI Certified Digital Marketing Professional certification

Source: Compiled from https://www.training.com.au

4.5 Micro- and Digital Credentials

Traditional approaches to credentialing (i.e. full credentials or macro-credentials) focus on recognising learning on a larger scale based on the award of formal credentials in the form of certificates, diplomas and degrees. One key characteristic of this form of training and credentialing is the long lead times and a sense of finality in one's education and training.

A learning and development model known as the 70:20:10 model[68] estimates that only 10% of professional learning occurs during formal training whereas the remaining 90% occurs informally through working experience (70%) and informal social interactions (20%). Further, as workplaces and systems are increasingly automated and digitalised, there is a constant need to upgrade workforce skills to stay current with rapidly changing technologies.

There is an increasingly popular view that to prepare workers for the emerging context of work and create an appropriately trained and skilled workforce, the system(s) needs to embrace and better recognise the relationship between macro credentials and 'just-in-time' micro-credentials.

Skill sets comprising a small number of Units of Competency have been part of Australia's VET system for several years and there are now 1,389 on the national register (training.gov.au), of which over 80 relate to digital skills.

4.5.1 The Digital Transformation of Credentials

The digital transformation of industries is changing both the content and process of credentialing. Alternative (or at least complementary) credentialing models that support and recognise knowledge and skills acquisition, tracking and certification as a lifelong enterprise are increasing. Micro-credentials (also known as digital badges, nano-degrees, micro-certifications, web badges, mini-degrees and open badges) are one such alternative and represent a competency or achievement earned through participation, progression, completion and demonstration of learning.

4.5.2 Micro-credentialing Use Cases for Digital Skills in Australia

A micro-credential is a certification of achievement in a specific area of study or professional development in a form that is shareable with peers, employers and educational providers. Unlike a macro-credential (such as a those set out in the AQF), micro-credentials focus on smaller-scale elements of learning and can cover both soft and hard skills, such as using enterprise information systems, online safety or working with big data attained at work or training. Micro-credentialing allows individuals, students and workers to quickly piece together the training and skills they need across both VET and HE systems and obtain new qualifications as needed throughout their working lives.

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[68] Kajewski, K. and Madsen, V. (2012), *Demystifying 70:20:10*. DeakinPrime, Deakin University, Melbourne, http://deakinprime.com/media/47821/002978 _dpw_70:20:10wp_v01_fa.pdf

An increasingly common form of representation of a micro-credential is a digital badge. A digital badge is an electronic representation of an accomplishment, affiliation or interest that is visual, available online and embedded with metadata that provides the context, meaning, process and result of an activity.[69] Both the recent review of the AQF and several Australian institutions have embraced digital badges (micro-credentials) as a meaningful way to recognise lifelong learning, and have established procedures and principles for their use, design and application as an integral form of award.

Several digital skills-specific use cases are highlighted in Table 6 and attention is drawn to both the challenges and opportunities that micro-credentialing presents.

[69] West, D. and Lockley, A. (2016), Implementing digital badges in Australia: The importance of institutional context. In D. Ifenthaler, N. Bellin-Mularski & D-K. Mah (Eds.), *Foundation of Digital Badges and Micro-credentials: Demonstrating and Recognizing Knowledge and Competencies* (pp. 467–482), Springer, Switzerland, https://link.springer.com/chapter/10.1007/978-3-319-15425-1_26

Table 6: Examples of Micro-credentialing Use Cases in Australia

Initiative	Description
Curtin	A MicroMasters Program offered through the EdX platform
Deakin	A digital credentialing system and digital badging system implemented through DeakinDigital and Deakin Hallmarks.
Griffith	A policy on micro-credentialing that provides the framework for approval of university micro-credentials as well as micro-credentials undertaken in partnership with third parties.
IBM	An open badge infrastructure with five badge levels for explorer, advocate, inventor, certified and excellence focusing on knowledge, skills, capabilities, authority and eminence, respectively An Internet-based search shows other IBM badges. This is a typical example of the proliferation of digital badges and an indication that institutions and employers are still exploring the potential of digital badges for credentialing skills.
RMIT	A pilot to create an innovative suite of micro-credentials developed with industry partners that is open to all students. The Lifelong Digital Learning credential sits within a Digital Literacy stack designed as a tool to support lifelong learning and prepare students for living, learning and working in a digital society. RMIT is currently embedding many of these micro-credentials into formal degree programs.
TAFE NSW	Micro-credentials designed to help develop specific industry-recognised skills to address workplace and career progression needs.
UNSW Canberra	Micro-credential postgraduate courses with credit granted into them from specified professional education courses.
TAFE Queensland	Free micro-credentials and formal skill sets offered in conjunction with the Queensland Government as part of its response to supporting businesses and individuals through COVID-19 in areas such as digital literacy essentials, cyber security essentials, digital data essentials, data analysis essentials.
Workplace Credentials (DeakinCo)	Provision of university-recognised and skill-specific Workplace Credentials that validate and accredit skills such as innovation, critical thinking, digital literacy, teamwork and problem solving to organisations and individuals. Other education and training providers are also supported to offer the Workplace Credentials using their own brand. Case studies https://www.deakinco.com/case-studies.

5 Lifelong Learning and Interfacing of Vocational Education and Training with Schools and Higher Education

This section discusses how Australia's school and university sectors interface with the VET sector to facilitate the acquisition of digital skills. The section also discusses how interfacing has been achieved in relation to digital skills development in Australia and how the interface between the various sectors enhances individuals' abilities to demonstrate their accumulated knowledge and skills over their working life. To understand the interfaces and interfacing, we examine formal learning pathways or credit arrangements existing between organisations, starting with the *Australian Curriculum*.

5.1 Key Consideration

- **Lack of national lifelong learning policy**. Unlike some other countries (e.g. Germany and Singapore) Australia does not have a national lifelong learning policy. Given the rapid pace of technological change and changing nature of work, and the multi-directional pathways learners now take, a lifelong learning policy may need to be given greater consideration. Such a policy would need to articulate the important role of digital skills in lifelong learning.

5.2 Overview

There is considerable international debate on the question of how to shape education and training systems, and programs to promote lifelong and life-wide learning, as well as how to facilitate the transferability of that learning across all education and training pathways, in ways that can meet the needs of learners, the economy and society.

Lifelong learning has been a recurrent theme in education policy for over 40 years, resulting in an evolving discourse.[70] While there are multiple definitions of lifelong learning, most stress the idea of a 'cradle to grave' approach to learning that involves:

> all general education, VET, non-formal education and informal learning undertaken throughout life. The ultimate objective is an

[70] Volles, N. (2016). Lifelong learning in the EU—Changing conceptualisations, actors, and policies, *Studies in Higher Education* 41 (2): 343–363, https://www.tandfonline.com/doi/abs/10.1080/03075079.2014.927852

> improvement in knowledge, skills and competencies within a personal, civic, social and/or employment-related perspective.[71]

While Australia does not have an explicit lifelong learning policy to influence the broader policy environment or positioning of lifelong learning, much of the education and training architecture facilitates lifelong learning and one's accumulated knowledge and skills acquisition over their career. In particular, the Australian education and training system has attempted to advance lifelong learning via improved pathways and interface between primary and secondary schooling, the VET sector and HE; and better alignment with changing industry skills needs and expectations.

5.3 The *Australian Curriculum*

In Australia, the national curriculum serves as a platform for interfacing the development of skills generally; digital skills are a part of that. The *Australian Curriculum* addresses general capabilities through the content of its learning areas:

- Literacy
- Numeracy
- ICT Capability
- Critical and Creative Thinking
- Personal and Social Capability
- Ethical Understanding
- Intercultural Understanding

Like the AQF, the *Australian Curriculum* treats digital literacy skills as a subset of literacy skills needed to live, learn and work in a time in which digital technologies (e.g. social media, internet platforms, electronic devices) are used to communicate, and to store and access information. Developing capabilities to identify and use digital technologies confidently, creatively, critically and responsibly are part of the *Australian Curriculum*.

As part of the ICT learning area, digital capabilities are developed as students learn to effectively use different digital technologies:

> To access, create and communicate information and ideas, solve problems and work collaboratively in all learning areas at school and

[71] European Parliament and the Council of Europe (2006), Recommendation of the European Parliament and of the Council on key on key competences for lifelong learning, *Official Journal of the European Union* 394 (11), https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:394:0010:0018:en:PDF

> in their lives beyond school and … adapt to new ways of doing things as technologies evolve limiting the risks to themselves and others in a digital environment (Australian Curriculum, Assessment and Reporting Authority [ACARA] n.d.).[72]

Students develop capability in using ICT for tasks associated with:

> information access and management, information creation and presentation, problem-solving, decision-making, communication, creative expression and empirical reasoning. This includes conducting research, creating multimedia information products, analysing data, designing solutions to problems, controlling processes and devices, and supporting computation while working independently and in collaboration with others (ACARA n.d.).

Graduates who successfully complete Years 11 and 12 receive an Australian SSCE (commonly known as the High School Certificate [HSC]), which enables them to proceed to tertiary education, including vocational education and university. In some states, students who have not completed Years 11 and 12 are able to complete the SSCE through a TAFE college or other RTO. The training curricula for both of these qualifications have a reasonable amount of technology training embedded within them.

5.4 Vocational Education and Training in Schools

The *VET in Schools* program is an important initiative designed to better integrate secondary and vocational education via the delivery of VET qualifications in secondary schools. The program provides an important learning pathway for school students into VET, and a nationally recognised qualification, as part of their school studies. Students can undertake VET at school in one of three ways: (a) as part of their school studies, delivered and resourced by a school RTO; (b) by enrolling in a qualification with an external RTO, funded or through fee-for-service arrangements (i.e. where the student or parent pays for the qualification); or (c) as a school-based apprenticeship or traineeship.

The program is supported by states and territories who define priority qualifications and skill sets that attract a subsidy. Digital skills are among the priority skill sets that attract a state government subsidy and are developed through a number of programs, including:

- Certificates I, II and III in Information, Digital Media and Technology;

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[72] ACARA (n.d.), *Information and Communication Technology (ICT) Capability,* https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/information-and-communication-technology-ict-capability/

- Certificates II and III in (a) Telecommunications Technology (b) Telecommunications Technology Network Build, Operate and (c) Telecommunications Technology Operation;
- Certificate IV in Cyber Security; and
- Diploma of (a) Information Technology Systems Administration (b) Software Development (c) Website Development (e) Database Design and Development (f) Digital and Interactive Games and (g) Information Technology Networking.

Both the AQF and VET reviews proposed that VET in schools be in its own category because the system is currently struggling to measure exactly what is being delivered across the country (Joyce, 2019; Noonan, 2019). In addition, the expert review of Australia's VET system reported that some school VET certificates are not valued by employers:

> Some of the certificates school students are completing are not meeting industry's needs and do not provide a pathway to a job. In particular, employers are not confident that graduates of certificate IIIs and some certificate IIs delivered in schools have the skills and competencies the qualifications denote and are therefore not ready for the workplace (Joyce, 2019, p. 95).

5.5 Recognition of Prior Learning and Credit Transfers

Recognition of Prior Learning (RPL) is a process that assesses the skills and knowledge of individuals acquired through formal, non-formal and informal learning and counts towards a nationally recognised qualification or statement of attainment. It is a formal process used to determine the credit outcomes for students or existing workers wanting to undertake or achieve a formal qualification through VET or HE. In some instances, workers who can demonstrate that their prior learning aligns with specific skills, knowledge and learning outcomes are able to receive a full qualification with minimal additional formal training.

This process of skills recognition is particularly important in retrenchment situations where older workers may struggle to find alternative employment without a formal qualification. In most instances, prior learning assessment only results in some credit (e.g. Units of Competency or university course) towards a qualification but this provides those individuals an important pathway into formal learning.

RPL is considered an important component of lifelong learning policy agendas in that it provides a mechanism to recognise both formal and informal learning, as well as greater social inclusion and equity of access to educational opportunities. RPL has tended to be more widely understood and embraced in the VET sector because it is a requirement of the *Standards for Registered*

Training Organisations 2015. In HE, RPL has been subject to considerable debate and some resistance. While the benefits of RPL for equity and access are generally recognised, concerns about its potential to compromise the quality of academic standards remain. Evidence suggests, for example, some Australian universities have been 'cautious in their approach to RPL'.[73]

5.6 Vocational Education and Training and Higher Education Synergies

Increasingly the traditional boundaries between VET and HE are becoming more porous as VET and HE institutions work together to create education pathways. These pathways have been more common in dual sector institutions but most HE institutions work closely with VET institutions on developing programs that improve access for vocational students into HE. Diploma courses in digital media, IT support and IT networking, for example, are being developed to articulate into diploma bachelor degrees in IT systems of media communication. Deakin College, for example, offers a Diploma of IT that allows students direct entry to a second year bachelor degree in IT, computer science or cyber security.

5.7 Single-Unit Study

Single-unit study modes are now available throughout the HE sector. They allow individuals to tap into digital skills training opportunities for personal and professional development throughout their working lives. Queensland University of Technology, for example, allows individuals to take up to four single units of study without having to apply for a course. These units cover a wide area including business, IT, engineering, science and mathematics, and health and community services. While the completion of a single unit does not lead to a formal qualification, it supports lifelong learning of existing workers, enables workers to decide if further study in a particular field is desirable and may ultimately lead to advanced standing towards a degree.

5.8 Adult and Community Education

Ensuring adults are not left behind by rapid technological change and the increased emphasis on formal qualifications is an important component of effective lifelong learning policies. Adult and Community Education (ACE) supports adult learners who may not have completed schooling, have no formal qualifications and find it difficult to access employment. It provides

[73] Pitman, T. and Vidovich, O.L. (2012), Recognition of prior learning (RPL) policy in Australian higher education: The dynamics of position-taking, *Journal of Education Policy* 27 (6): 761–774, https://www.tandfonline.com/doi/full/10.1080/02680939.2011.652192

pathways for adult learners to undertake pre-vocational, bridging, entry-level and foundation skill programs. Basic computing and digital skills programs are often included as part of these programs. Through the acquisition of these foundational skills, disadvantaged adult learners are able to gain generic skills needed to apply for and secure employment and enter pathways to further education.

ACE programs are offered in all states and territories by a diverse range of organisations embedded in local communities:

- Aboriginal Community Controlled Education Providers
- AMES Australia
- Centre for Adult Education (Vic)
- LINC Network (Tas)
- Workers Education Association (SA, NSW)
- Community colleges and community learning centres
- Neighbourhood and community houses
- Telecentres
- U3As
- Adult and further education programs in many TAFEs

These organisations often run digital skills training programs for adults. In some cases, they have joined with other organisations in the delivery of these courses. Several neighbourhood houses, U3As, local shires and libraries, for example, deliver programs associated with *Digital Springboard*. *Digital Springboard* programs were developed by Infoxchange and Google to help people learn digital skills. Employing a community-based learning model, these programs aim to develop basic digital skills needed in relation to searching for and obtaining work; starting a business; and advancing one's career and business via social media (https://www.digitalspringboard.org.au/digital-springboard-reaches-10000-people-across-australia). Another example is Southern Grampians Adult Education Inc., which develops and delivers a range of education and training programs for adult learners. Basic digital skills development (e.g. social media awareness, practical computer skills, internet use, cyber safety) is one of the areas in which they have worked with ACE providers to support adult learners and those with disabilities (https://sgae.vic.edu.au/course/introduction-to-digital-skills/).

6 Digital Skills Identification and Gap Analysis

This section considers two key questions:

- What process is used to identify the digital skills and knowledge requirements of the various industries and translate that into a training response?
- How are digital skills gaps within Australia's existing workforce currently identified and quantified?

The first question draws attention to how the VET sector specifically develops a training response to meet the digital skills gap. There is overlap between the two questions with the latter asking how digital skills gaps—where employer demand for digital skills is not being met—are identified and measured. This section, therefore, addresses the two questions simultaneously.

The section begins by outlining key considerations emerging from the scanning exercise and continues with describing the general approach for skills identification (including examples and case study of outputs under that process) before moving to digital skills-specific identification and gap analysis processes.

6.1 Key Considerations

- **Basic and intermediate digital skills.** Workforce upskilling is occurring in Australia, but it is often a challenge to track whether skills are developing at the rate of workplace technological change. The trend in strong growth in high-skilled occupations (where digital skills are most required) is contributing to higher digital skills demand. Currently, however, there is only limited evidence from academic and industry research to support a shortage of digital skills among the overall workforce. However, this does not necessarily imply no shortage and might just be that no accurate and appropriate ways of recognising, measuring and articulating digital skills have been adopted. From an Australian perspective, an evaluation towards identifying and quantifying a deficit in the workforce's digital skills should focus on basic and intermediate digital skills.
- **Specialist ICT skills.** Australia's ICT specialist workforce, both in the ICT and other sectors, remains relatively small but is growing significantly. Industry and government reports highlight that meeting the increasing demand for advanced ICT skills from Australia's public, private and community sectors will be a challenge. However, the combination of skilled migration, VET and HE programs appears to be improving the supply of these specialised skills, in the short and long term respectively.
- **Industry forecasts.** IRCs in their work developing and reviewing Training Packages, perform an important role in identifying emerging skills gaps through annual Industry Skills Forecasts. Beyond the ICT IRC, there appears to be some variation in how digital skills are understood and measured and how often they

are captured in forecasts. The COAG Industry and Skills Council and the DESE might consider how a more systematic, standardised and regular approach to capturing digital skills supply and demand could be achieved across all sectors and digital skill levels.

- **Inclusion of digital skills in established surveys.** Many of the current data sources for conducting skills gap analysis were not designed to explicitly capture digital skills. For example, the Survey of Employers who have Recently Advertised (SERA) informs the DESE's assessment of workforce shortages across different occupations. However, the survey does not specifically seek to evaluate or measure the digital skills gap in Australia's workforce. Including digital skills variables within these established survey instruments might be one approach to address data shortfalls.
- **Online job advertisements:** Online job advertisements analysis is another common method of digital skills identification and gap analysis. It serves as a proxy for understanding emerging skills needs and the extent to which they are in demand. Caution is needed in the weight placed on the results and to what degree they inform decision making given job advertisements are typically addressing potential applicants and are selective in emphasis, inclusion and articulation of digital skills information.

6.2 Generic Approaches to Skills Identification

In recent decades, work across different functions, occupations and industries has become increasingly ICT intensive. Rapid innovation in the ICT industries is expected to exacerbate this trend, notably the prospects for widespread application of robotics and automation, AI, big data, distributed ledger technologies such as blockchain, and the IoT.[74] The rapid innovation, dissemination and application of ICTs is characterised as skill-biased technological change (i.e. a shift in technology that favours skilled over unskilled labour), which has increased the wage premium associated with workers who have the relevant and necessary skills to produce, adopt and/or adapt to the relevant technologies. Australia has participated in this general trend of workforce upskilling, job polarisation and growth in overall earnings inequality.[75]

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[74] World Bank (2019), *World Development Report 2019: The Changing Nature of Work*, World Bank, Washington DC, https://www.worldbank.org/en/publication/wdr2019

[75] Borland, J. and Coelli, M. (2016), Job polarisation and earnings inequality in Australia, *Economic Record*, 92 (296): 1–27. https://fbe.unimelb.edu.au/__data/assets/pdf_file/0009/1427409/1192CoelliBorland.pdf

6.2.1 The Australian Bureau of Statistics Classifications of Skills

The *Australian and New Zealand Standard Classification of Occupation* (ANZSCO) provides a national framework for identifying the skill level of jobs, qualifications and/or experience needed to work in various occupations.[76] Using this framework, the Australian Bureau of Statistics (ABS) has developed a measure of the skill content of occupations, based on skill level and skill specialisation.

The ABS classifies the skill level of each occupation into one of five groups based on a judgement about the required level of formal education and training, previous experience in a related occupation, and on-the-job training (ABS, 2009). To make this judgement, the ABS relies on advice from employers, industry training bodies, professional organisations and others. The highest-skill occupations that require cognitive skills are allocated to Skill Level 1, while the lowest are allocated to Skill Level 5:

- SKILL LEVEL 1: Occupations at Skill Level 1 have a level of skill commensurate with a bachelor degree or higher qualification. At least 5 years of relevant experience may substitute for the formal qualification. In some instances, relevant experience and/or on-the-job training may be required in addition to the formal qualification.
- SKILL LEVEL 2: Occupations at Skill Level 2 have a level of skill commensurate with either NZ Register Diploma or AQF Associate Degree, Advanced Diploma or Diploma. At least three years of relevant experience may substitute for the formal qualifications listed above. In some instances, relevant experience and/or on-the-job training may be required in addition to the formal qualification.
- SKILL LEVEL 3: Occupations at Skill Level 3 have a level of skill commensurate with one of the following: NZ Register Level 4 qualification, AQF Certificate IV or AQF Certificate III including at least two years of on-the-job training. At least three years of relevant experience may substitute for the formal qualifications listed above. In some instances, relevant experience and/or on-the-job training may be required in addition to the formal qualification.
- SKILL LEVEL 4: Occupations at Skill Level 4 have a level of skill commensurate with one of the following: NZ Register Level 2 or 3 qualification or AQF Certificate II or III. At least one year of relevant experience may substitute for the formal qualifications listed above. In some instances, relevant experience may be required in addition to the formal qualification.

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[76] ABS (2009), *Australian and New Zealand Standard Classification of Occupations, First Edition, Revision 1,* https://www.abs.gov.au/ausstats/abs@.nsf/0/598C2E23628BB8FDCA2575DF002DA6B8?opendocument

- SKILL LEVEL 5: Occupations at Skill Level 5 have a level of skill commensurate with one of the following: NZ Register Level 1 qualification AQF Certificate I or compulsory secondary education (ABS, 2009).

Skill specialisation is evaluated and measured across four dimensions: field of knowledge required; tools and equipment used; materials worked on; and goods or services produced or provided. For example, one analysis of ABS data based on the four skill specialisation dimensions shows that the strongest employment growth in the past 50 years has been in occupations that require the highest-level skills.[77] High-skill jobs have increased their share of total employment from 15% in 1966 to over 30% in 2016 (see Figure 2). Conversely, the weakest growth has been in Category 3 occupations, lower and middle-skilled jobs that tend to be routine and manual task intensive. According to Heath (2020):

> The strength in high-skilled employment has mainly come from an increase in the skills required within each industry over time, rather than a shift in employment from industries that are dominated by lower-skilled occupations to industries that are dominated by higher-skilled occupations.

Further, while white collar jobs have experienced the strongest employment growth in the past two decades, blue collar jobs have posted the weakest growth, with their employment share declining by over 300 basis points to under 9%. Against this backdrop, the employment share of routine task-intensive jobs has shrunk considerably over the past three decades, while non-routine tasks—particularly roles that require cognitive skills—have expanded (see Figure 3).

These trends have informed predictive models used to identify changing skills needs into the future. Assumptions that routine manual and routine cognitive tasks and occupations will be automated have been built into various labour market models aimed at predicting the occupational and skills needs of Australia's future workforce (see Skills Impact, 2017).[78] [79] [80]

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[77] Heath, A (2020), *Speech: Skills, Technology and the Future of Work,* https://www.rba.gov.au/speeches/2020/sp-so-2020-03-16.html#r1

[78] Skills Impact (2017), *Automation Skills Cross-Industry Project*, https://www.skillsimpact.com.au/site/skilliampactmedia/uploads/2018/07/CFC.AutomationSkills171130.pdf

[79] Foundation for Young Australians (2017), *The New Work Smarts: Thriving in the New Work Order*, Foundation for Young Australians, Melbourne, https://www.fya.org.au/report/the-new-work-smarts/

[80] Committee for Economic Development of Australia (2015), op. cit.

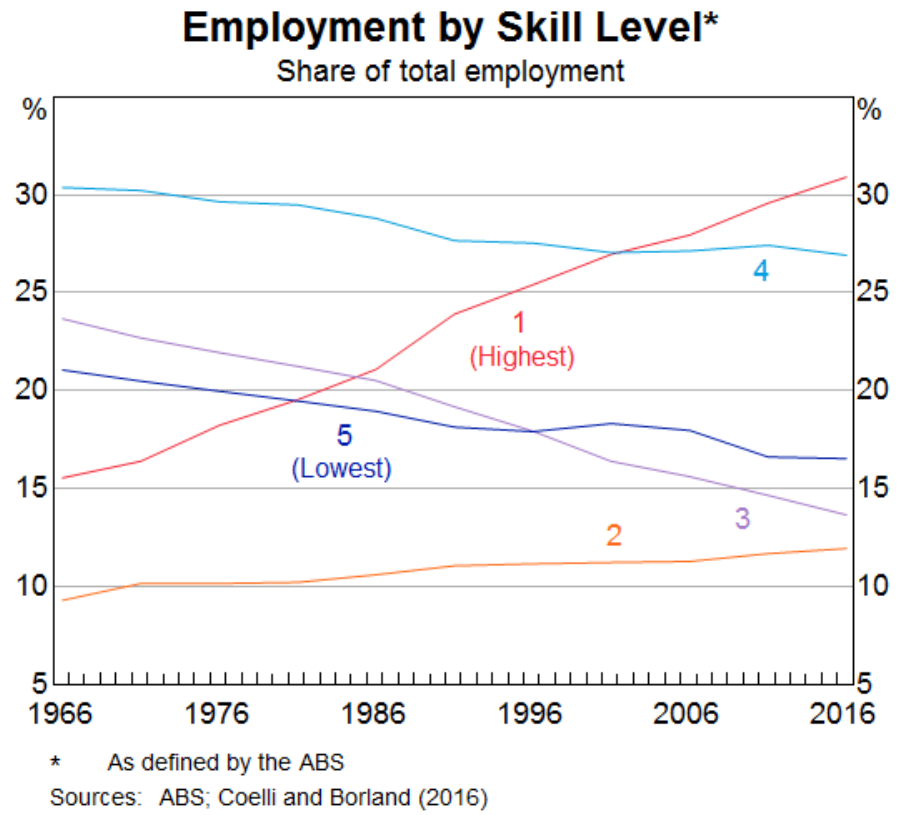

Figure 2: Historical Changes in the Share of Total Employment by Skill Level. Source: Heath (2020)

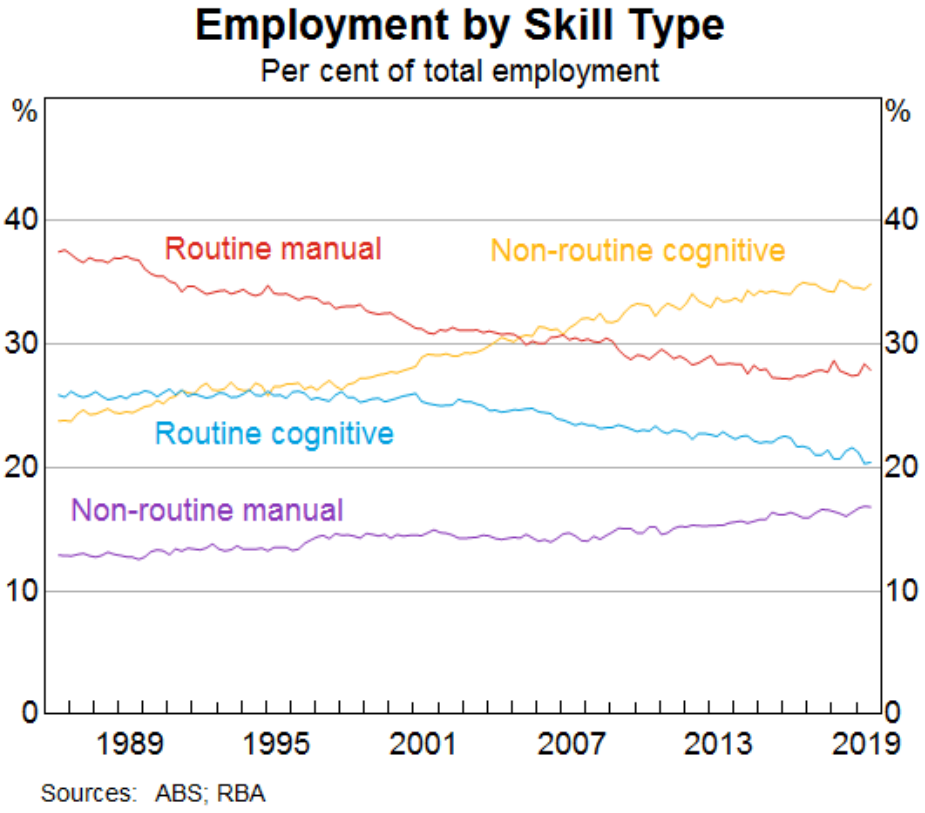

Figure 3: Historical Changes in Share of Employment by Skill Type. Source: Heath (2020)

6.2.2 The Reserve Bank of Australia Approach

It is noteworthy that generic employability skills such as problem solving and communication skills are not included in ANZSCO, unlike the Bureau of Labor Statistics *O*NET* program—the primary source of occupational information in the United States—which evaluates the social skills and problem-solving skills content of occupations. Further, the ABS classification of skills does not provide information about the specific skills that are generally associated with high-skilled occupations. To address this, the Reserve Bank of Australia (RBA) have adopted a method that involves comparing:

> the skills used in occupations that are highly skilled (defined as ABS skill level 1), middle-skilled (defined as ABS skill level 2 and 3), and relatively low-skilled (defined as ABS skill level 4 and 5) (Heath, 2020).

Analysis from the RBA shows that there are five key skill requirements for highly skilled occupations: analytical, cognitive, social, management and mathematical skills (Figure 4). The analysis does not have a separate category for digital skills, possibly because of the diversity of what constitutes digital skills requirements across different occupations.

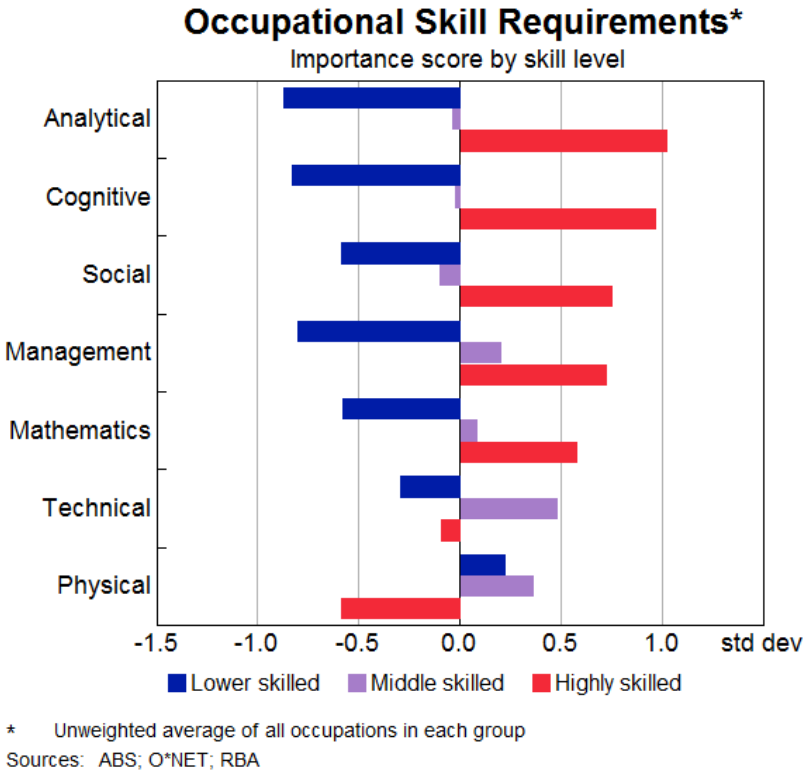

Figure 4: Occupational Skill Requirements: Importance Score by Skill Level. Source: Heath (2020)

Nonetheless, two markers provide an indication of the growing importance of digital skills. First, most occupations that involve the development or

application of ICTs would probably require a combination of some, or all, of the five core skills characteristic of the highest-skilled occupations. Second, some of the professions in Australia that have experienced the strongest employment growth in the past two decades are digital intensive and have new job titles, including computer software programmers, ICT security specialists and computer network professionals (Heath, 2020).

6.2.3 The Department of Education, Skills, Employment

Forecasting the demand for skills requires a granular understanding of projections for total employment, employment by industry and employment by occupation, and an understanding of the skills content of those occupations.

At present, the DESE produces annual projections for employment growth by industry, occupation and skill level for the following five years.[81] The latest annual report, released in January 2020, contains forecasts out to May 2024 (DESE, 2020). The report is designed to guide and inform employers, job seekers and policy makers about medium-term trends and help to improve decision making by these stakeholders. The projections are developed using time series analysis models combined with exponential smoothing and dampened trend models, with an adjustment made to reflect known future industry developments.

This process of skills forecasting can reveal several interesting insights. For example, consistent with industry reports, it shows that new jobs for software and applications programmers, which require advanced digital skills, are forecasted to experience a higher percentage growth rate (around 23.4%). It can also reveal the impact of the automation risk on employment (Figure 5). For instance, between 1989 and 2019, jobs that are highly susceptible to automation risk—that is, those that involve routine tasks—have declined as a percentage of employment (Heath, 2020). Such analyses provide useful information for early digital upskilling interventions of the workforce facing risk of automation.

[81] https://www.employment.gov.au/newsroom/australian-employment-thriving-through-change

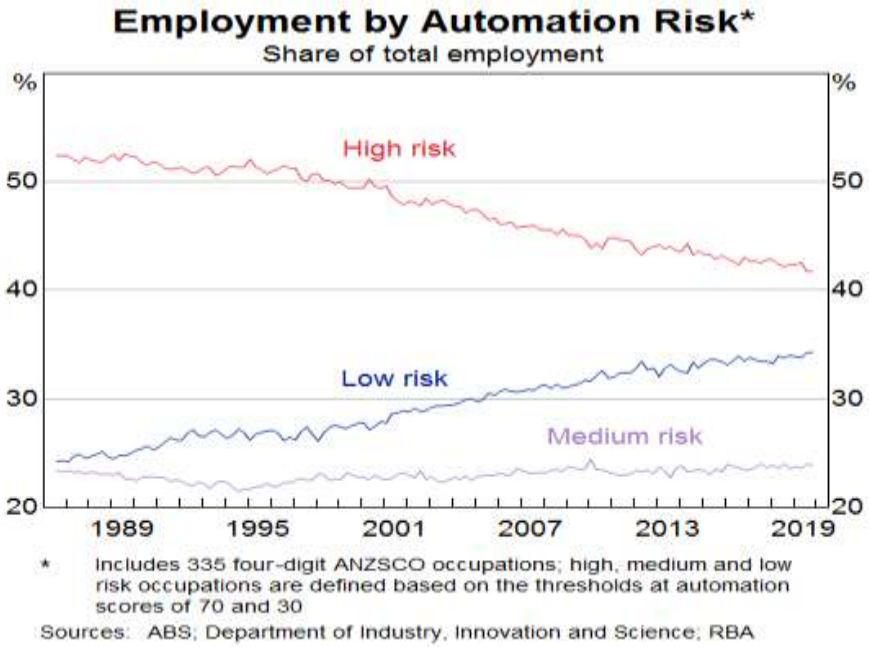

Figure 5: Employment by Automation Risk. Source: Heath (2020)

The DESE also undertakes analysis of skill shortages in the Australian labour market and publishes the results at national, territory and state levels.[82] The methodology uses the SERA.[83] States and territories are also undertaking their own future skills needs analyses using surveys. For example, Victoria's Local Government Workforce Development Group's 2018 analysis of future skills needs revealed that digital skills were one of the key areas in which councils were least well-positioned.[84]

The evolving nature of work, and anecdotal evidence from the DESE and states and territories, suggests that employers increasingly value higher-skilled employees, including those with digital skills. At the same time, however, there is widespread anxiety around technological unemployment; that the existing workforce will struggle to adopt and adapt to the rapid pace of innovation in ICTs; and that automation will continue to render jobs involving routine tasks obsolete.[85]

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[82] Municipal Association of Victoria (2018), *Local Government Workforce and Future Skills Report, Victoria*, https://www.employment.gov.au/national-state-and-territory-skill-shortage-information

[83] Australian Government (2017), *Skills Shortage Research Methodology*, DESE, https://docs.employment.gov.au/documents/skill-shortage-research-methodology-0

[84] Municipal Association of Victoria (2018), op. cit.

[85] Hajkowicz, S., Reeson, A., Rudd, L., Bratanova, A., Hodgers, L., Mason, C. and Boughen, N. (2016), *Tomorrow's Digitally Enabled Workforce: Megatrends and Scenarios for Jobs and Employment in Australia Over the Coming Twenty Years*, CSIRO, Brisbane,

6.2.4 Industry Reference Committees and Skills Forecasts

The AISC represents the main forum used to identify digital skills and knowledge requirements of industries and translate this into a training response. The AISC was established in 2015 to facilitate formal industry engagement in approving VET Training Packages for implementation. It does so primarily through IRCs, which comprise industry and union representatives and represent the channel by which skill requirements of the workforce are identified, codified into Training Packages and subsequently evolved as skills change.[86]

Training Packages focus on what is expected from a competent individual in the workplace. They specify the skills and knowledge required within discrete Units of Competency. RTOs use Training Packages to develop their learning programs and assessment activities. Skills Service Organisations (formerly known as Industry Skills Councils) work under the direction of IRCs to develop and review training packages.

There are currently 60+ IRCs, for which the monitoring of skills demand and supply among Australian industries is a key component of their role. This information is captured through their submission of Skills Forecast reports produced once every three years and the annual update, which together report on industry outlook, new and emerging skills and associated training needs for each industry. These forecasts rely on ABS census and *Labour Force Survey* data, training data (e.g. VOCSTATS) and data collected from their own stakeholder surveys and workshops. An IRC *Skills Forecast Survey* is one of the primary instruments used to acquire information from employers on priority skills needs, skill shortages and issues relating to workforce training. In recent years, IRCs have used these surveys to collect information about digital skills. A review of IRC Skills Forecasts and industry outlook reports, however, identified significant variation among IRCs in the information collected about digital skills and how regularly it is collected. How digital skills are defined and measured also appears to be highly variable between industries. This presents some challenges, but also an opportunity to better understand demand for digitals skills and emerging skills gaps within and across industries.

Unsurprisingly, the ICT IRC has been the most consistent in collecting digital skills data. The ICT IRC is responsible for ICT specialist occupations, including workers involved in IT, communications technology and digital media. The peak bodies in the ICT IRC are the Australian Computer Society, Australian Industry Group

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https://data61.csiro.au/en/Our-Research/Our-Work/Future-Cities/Planning-sustainable-infrastructure/Tomorrows-Digitally-Enabled-Workforce

[86] AISC (2019), *Industry Reference Committees*, https://www.aisc.net.au/content/industry-reference-committees

and Australian Information Industry Association. The employer representatives are Cisco, Microsoft Australia, National Broadband Network (NBN), Optimi Digital, Telstra and the Industry Skills Advisory Council NT. The union representative is the Communications Workers Union and the government representatives are the Australian Communications and Media Authority and the Digital Transformation Agency. At present, there are around 50 Training Packages[87] with varying levels of qualification across digital media, IT and telecommunication technology.

According to its 5-year employment outlook, the ICT IRC identified around 504,000 workers in Australia's ICT sector in 2018, with this number projected to grow to over 570,000 jobs (or 13%) by 2023. Around 80,000 students, or 2% of all VET learners, were enrolled in ICT qualification courses in 2017.

The IRC has identified two key challenges and opportunities. First, graduates with vendor certifications—offered through Amazon Web Services, Microsoft and Cisco—are highly sought after, which presents opportunities for such certifications to complement VET qualifications, but with a risk that they might act as substitutes. Second, many graduates of ICT Training Packages undertake further training for higher qualifications, which points to the need for more specialised ICT training at a higher AQF level of accreditation. The IRC has identified two high-level skill requirements: technical knowledge and enterprise skills, including communication; teamwork and problem-solving skills. It proposes modifying training packages in various telecommunications qualifications in response to changing technology, cyber security, evolving telecoms business models and the impact of the NBN.[88]

6.2.5 The Australian Digital Inclusion Index

An important consideration in the skills question, which is highlighted across several policies examined here including *Australia's Tech Future*, is social and economic inclusion. As the economy and society digitally transforms, there is a strong need to ensure that all citizens can access the emerging benefits and that no one is disadvantaged. The Digital Inclusion Index was launched in 2029 to, as per its forward, ensure that, 'Australians enjoy the many benefits [brought by digital technologies], whether it is running a business, accessing education and services, or connecting with family, friends and the world beyond'.

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[87] PwC (2019), *Industry Skills Forecast and Proposed Schedule of Work*, https://s3-ap-southeast-2.amazonaws.com/pwcau.prod.s4aprod.assets/wp-content/uploads/20190621114920/ICT-ISF-3-May-FINAL-SIGNED.pdf
[88] Ibid.

It does this by measuring and monitoring achievement via a number of key indices, including:

- The Access sub-index:
  - Internet Access
  - Internet Technology
  - Internet Data Allowance
- The Affordability sub-index:
  - Relative Expenditure
  - Value of Expenditure
- The Digital Ability sub-index:
  - Attitudes
  - Basic Skills
  - Activities

Under the Digital Ability sub-index there is recognition of the importance of skills in the process of building an inclusive digital society. It thus measures societal improvements across the areas of digital attitudes, basic digital skills and digital activities; for example, use of digital tools. Application of the Digital Inclusion Index in 2019 showed significant improvement in the Digital Ability sub-index since 2014, by 8.6 points; from 42.2 in 2014 to 50.8 in 2019 (Attitudes from 45.9 to 51.2; Basic Skills from 46.6 to 58.1; and Activities from 34.2 to 43.1).

6.3 Digital Skills Assessment

A key challenge in defining digital skills identification and assessment is the diversity in the range of ICT-related occupations and the heterogeneity in available computer hardware and software. Moreover, the various ICT innovations, including distributed ledger technology, the IoT, AI, big data, and robotics and automation, are each distinct and it may be misrepresentative to bundle them into a single category of digital knowledge and skills.

6.3.1 Digital Management Capability

Agarwal et al. (2019) used data from the ABS Management and Organisational Capabilities Module to calculate six scores for management capabilities, one of which is digital management capability (DMC).[89] They define DMC as involving:

[89] Agarwal, R., Bajada, C., Brown, P., Moran, I. and Balaguer, A. (2019), *Development of Management Capability Scores*, Research Paper 10/2019, Department of Industry, Innovation and Science, Australian Government, Canberra, https://www.industry.gov.au/sites/default/files/2019-09/development-of-management-capability-scores.pdf

> The effective adoption of digital technologies such as mobile devices, social media, data analytics, cloud computing and Internet of Things. Digital management capabilities also include the integration of these technologies into the operations of an organisation towards increased competitive advantage, business transformation and strategy.

Their findings indicate that management skills in Professional, Scientific and Technical Service industries—where digital skills are likely to be important—are well below the overall management score of 0.28. More specifically, DMC is particularly weak, posting a standardised score of 0.11.[90] This suggests that governments and the education system have a role to play in improving digital managerial capability to better harness the skills of workers with Category 3 digital skills, notably those in ICT industry sectors.

6.4 Digital Skills Gap Analysis in Australia

The Department of Industry, Science and Technology (DIST) contends that Australia faces the imminent prospect of shortages in key digital skills, including data management and analysis, cyber security, cloud computing, AI and machine learning, robotics, digital design, software design and advanced mathematics and statistics.[91] Various methodologies are used to evaluate whether there is a shortage of digital skills in the economy, and to quantify that shortage.

6.4.1 Employer Survey

One commonly used approach to identify digital skills gaps is to ask employers and recruiters whether the demand for digital skills is being met by suitable applicants. The DESE undertakes research on skilled occupations and provides information about workforce shortages. The stated aim here is to 'identify shortages in the Australian labour market in skilled occupations where long lead times for training mean that shortages cannot be quickly addressed'.[92]

The SERA informs assessments of workforce shortages by the DESE. The survey collects qualitative information based on discussions with employers and recruitment specialists, and data on the percentage of vacancies filled and the number of applications, qualified applicants and suitable applicants. The

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[90] Ibid.
[91] Australian Government (2018), *Australia's Tech Future: Delivering a Strong, Safe and Inclusive Digital Economy*, Department of Industry, Science and Technology, Canberra, https://www.industry.gov.au/sites/default/files/2018-12/australias-tech-future.pdf
[92] Australian Government (2017), op. cit.

research focuses on a core of around 80 skilled occupations that generally require at least three years of post-school education and training.

The SERA is a phone-based survey of employers who have recently advertised for skilled workers. The job advertisements or vacancies are collected from newspapers and job search sites. The information collected from employers is discussion based rather than in a survey format. Data on skills demand are collected via industry activity statistics, changes in employment levels, vacancy trends and graduate employment outcomes. Data on the supply of skills are collected from training completions and commencements, people leaving the occupation, net migration and informal supply.

Each occupation is assigned one of three ratings: 'shortage'; 'recruitment difficulty'; or 'no shortage'. In the latest report, undertaken for 2018/19, occupations in the Design, Engineering, Science and Transport Professionals sector were assigned a shortage rating across Australia. Some jobs in the sector, including construction project managers, quantity surveyors, electrical engineers and mining engineers, require Category 2 digital skills.[93] This provides limited evidence of shortages in Category 2 digital skills in some pockets of the workforce.

6.4.2 Analysis of Job Vacancies

Undertaking a text search analysis of the digital content and description of job vacancies can identify digital skills gap.[94] [95] [96] The Foundation for Young Australians relied on a jobs vacancy analysis of some 2.7 million online job advertisements using an occupation clustering algorithm based on whether employers demanded particular skills from applicants.

Job vacancy methodologies are increasingly popular for identifying skills needs, but there are some weaknesses with the approach. For example, there is an over-reliance on online job advertisements, which do not cover all jobs on offer in the workforce. Gekara et al. (2019) also found that the digital skills content and description of job vacancies is often vague and poorly defined; hence the need for a national taxonomy for digital skills. This might reflect

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[93] Department of Employment, Skills, Small and Family Business (2020), *Employment Outlook to May 2024,* https://cica.org.au/wp-content/uploads/Employment-Outlook-to-May-2024.pdf
https://cica.org.au/wp-content/uploads/Employment-Outlook-to-May-2024.pdf
[94] Burning Glass Technologies (2017), *The Digital Edge: Middle-Skill Workers And Careers*, https://www.burning-glass.com/wp-content/uploads/Digital_Edge_report_2017_final.pdf
[95] Gekara et al. (2019), op. cit.
[96] Foundation for Young Australians (2017), op. cit.

Australia's poor digital managerial capability as identified by Agarwal et al. (2019).

6.4.3 National Skills Needs List and Foundational Digital Literacy

The Australian Apprenticeships National Skills Needs List (NSNL) identifies trades that are assessed as experiencing a national skills shortage, and is based on detailed projections about labour demand and supply. An Australian apprentice undertaking a Certificate III or IV qualification that leads to employment in an occupation on the NSNL might be eligible for various government- and employer-provided incentives and benefits, including trade support loans.

The trades on the list at present do not require either Category 2 or 3 digital skills. However, some would require foundational digital literacy such as an understanding of customer relationship management software for those who deal with customers. The NSNL is currently subject to a review following a proposal to use a broad skills shortage methodology that can be applied across all occupations.[97] The proposed methodology is quantitatively based although it would be complemented by industry engagement. Some of the inputs into the process of forecasting skill shortages by trade include future labour demand, the current level of employment, replacement demand and temporary skilled migration. A traffic light indicator then would flag as green those occupations and skills that are forecast to be in shortage.

6.4.4 Wage Growth Trend Analysis

Economists have also used wage growth trends to identify emerging skills gaps. According to this approach, excessive wage growth is assumed to be strongly suggestive of skill shortages. Growth in total hourly rates of pay excluding bonuses in occupations likely to require Category 3 digital skills (e.g. Professional, Scientific and Technical Services) has outpaced the All Industries category over the past two decades, but only marginally (see Figure 6).

[97] Department of Employment, Skills, Small and Family Business (2019), *Review of the Australian Apprenticeships National Skills Needs List—Methodology Discussion Paper*, https://docs.employment.gov.au/system/files/doc/other/191211_review_of_nsnl_-_methodology_discussion_paper_final_0.pdf

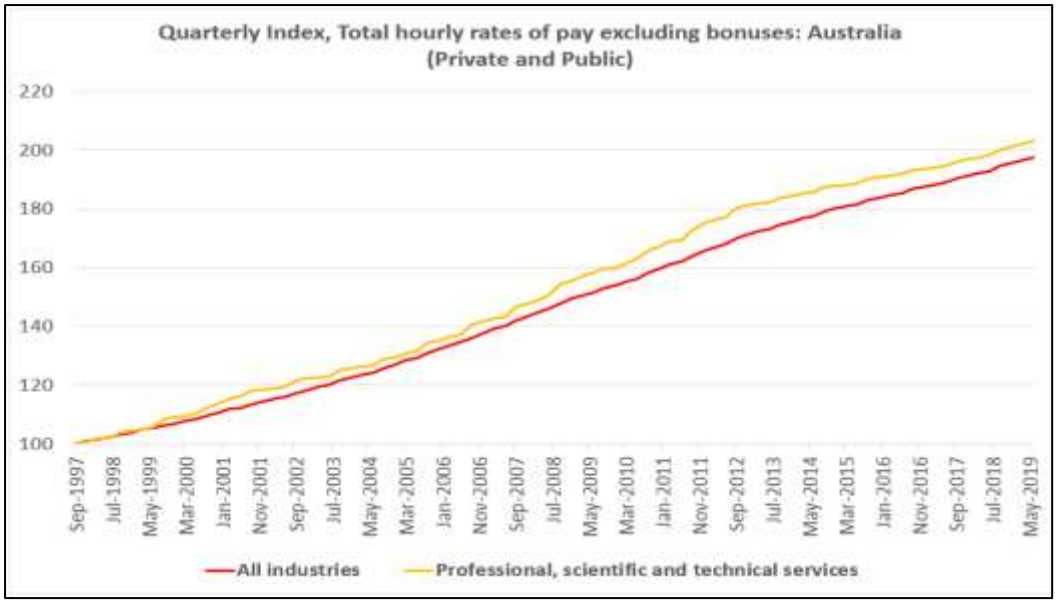

Figure 6: Growth in Total Hourly Rates of Pay in Professional, Scientific and Technical Services Compared With All Industries. Source: ABS

A more granular breakdown of wages growth in Australia shows that seven other industry sectors have experienced stronger wage growth than Professional, Scientific and Technical Services in the past two decades, with many of them not intensive in the use or application of ICTs; they include Utilities, Mining, Construction, and Health Care and Social Assistance (see Figure 7).

Wage trends do not point to any compelling evidence for the DIST's (Australian Government, 2018) contention of a digital deficit in Australia's workforce for highly skilled occupations, including for ICT workers. Further, the occupations suffering a 'shortage' as identified by the DIST make up a very small percentage of Australia's total workforce. Further, wage trends indicate that the industry sectors that have experienced the strongest wage growth in the past two decades are those that are generally not ICT intensive, including Mining, Construction and Utilities (see Figure 7).

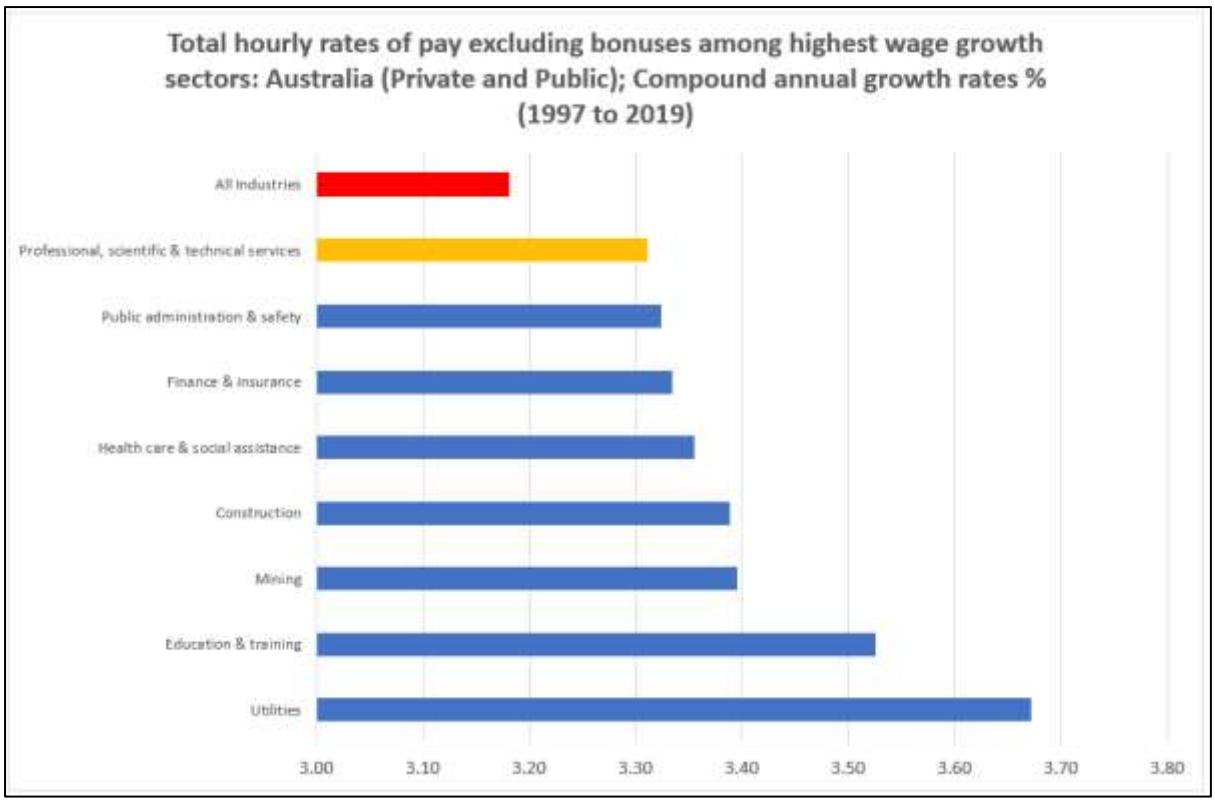

Figure 7: Growth in Total Hourly Rates of Pay in Key Industry Sectors. Source: ABS.

Appendices

Appendix1: List of Significant Policies and Strategies across Australian Jurisdictions

Jurisdiction	Policy	Key focus
Federal	*Digital Transformation Strategy*	This strategy was designed for the purpose of making federal government services more digitally efficient and accessible. It therefore focuses mainly on improving the digital skills of the public service. 'Expanding digital capability' of government employees is mentioned among other actions to achieve this.
	Building Digital Skills Across Government Initiative	This initiative lists programs to develop specific skills within the public service. These include *Entry Level Digital Programs*; *Coaching and Mentoring for Women* and the *Building Digital Capabilities Program*.
	Building Digital Capability Program	This specialist program focuses on enabling the public service to be better skilled to support digital transformation. It aims to do this by enhancing digital leadership, and attracting and retaining digital talent.
	Innovation and Science Australia Board: *Australia 2030*	The main focus of this strategy is to boost Australia's economy in the current competitive climate of digital transformation. It aims to increase innovation in industry by prioritising education and upskilling programs to respond to changing industry needs.
	The National Blockchain Roadmap[98]	This strategy focuses on how industry and the economy can benefit from the development of blockchain technology. It aims to enact this via effective regulation, skills and capabilities to drive innovation and international collaboration.

[98] Australian Government (2020), *The National Blockchain Roadmap: Progressing Towards a Blockchain Empowered Future*, Department of Industry, Science, Energy and Resources, Canberra, https://www.industry.gov.au/data-and-publications/national-blockchain-roadmap

Jurisdiction	Policy	Key focus
	Digital Economy Strategy—Australia's Tech Future	This strategy has the all-encompassing focus of boosting the economy by developing digital capability in multiple sectors. It takes a multifaceted approach including boosting the curriculum, anticipating industry needs and using upskilling and training programs to respond to these.
	Digital Economy Strategy—Australia's Tech Future	This strategy aims to improve national digital health via initiatives and innovation. It focuses on improving health technologies and processes to better support the public.
	Digital Capability Strategy	This is one of the strategic priorities of the *Digital Transformation Strategy*. The aim is to identify the skills needed for the digitised workforce and to improve training across the government based on this.
	Hosting Strategy	The site provides information in the key areas of starting a career; upskilling; changing careers; career advising and being an employer. A viewer can also browse for skills training by specific industry needs. This strategy is intended to provide direction to the public service-hosting ecosystem. It aims for a whole-of-government approach.
	MySkills Initiative	This is a full directory for the public to search for and compare courses offered in VET.
	ACT Chief Minister's *Statement of Ambition*	This is a broad statement focusing on modernising the city of Canberra in a number of ways, including attracting talented innovators; improving infrastructure; diversifying the economy; and embracing digital transformation.
ACT	*ACT Digital Strategy*	This strategy focuses on the digital improvement of the public service via building relationships with industry; developing community-centred services; and digitally intelligent city planning. It lists a digitally skilled workforce as a priority and outlines a number of initiatives, such as the *Future Skills for Future Jobs Program*.
	Future Skills for Future Jobs Program	This is an apprenticeship program co-developed with industry to teach the skills needed for the technologically advanced workforce of the future.

Jurisdiction	Policy	Key focus
	NSW Government ICT Strategy	This strategy focuses mainly on developing the government's ICT capability. It aims to do this via the key areas of improving technology; cyber security; legislation; and delivery capabilities.
NSW	*NSW Government ICT Strategy*	This is a broad strategy outlining the ways in which the NSW Government plans to improve its public service via digital transformation. Its key focuses are to make services more accessible and to design platforms that make it easier to do business in NSW. It is complimented by the *NSW Government ICT Strategy* and both are found under the consolidated platform of digital.nsw.
	Digital Territory Strategy	This is a comprehensive strategy focusing on the key directions of growing jobs and businesses; connecting territory communities; building digital skills; enabling smarter communities and improving government services. Digital transformation is a top priority in all of these areas.
NT	*Digital Territory Action Plan 2019–2020*	This plan builds on the *Digital Territory Strategy* by providing clear initiatives and case studies enacted to achieve NT's key directions.
	Alice Springs' *Geek in Residence*	This program provides access to computers, iPads and digital training for youth. Trainers deliver fun activities that equip teenagers with the skills needed for a future workforce.
	Showcasing Territory Talent	This program showcases a new industrial research hub based at CDU, which will benefit digital innovators and local businesses.
	STEM and STEAM Centres of Excellence	Centres such as Megafauna Central in Alice Springs have excellent facilities, including an AR experience, which help to build the digital capabilities of youth.
	Territory Seniors Gaining Knowledge	This program entails free workshops for the elderly in which they learn how to use mobile devices and build their computer skills to close the IT knowledge gap and connect the community.

Jurisdiction	Policy	Key focus
	Queensland Plan	This is a broad, 30-year plan that aims to develop the state in every sector, including infrastructure, community and the economy.
Qld	*DIGITAL1ST: Advancing our Digital Future*	This strategy builds on the *Queensland Plan* by going into more detail on the state's digital aims. These are to bring Queensland into the digital age, both 'for citizens' and 'for business and industry'.
	Skills for Queensland: Great Training for Quality Jobs	This initiative, developed by the Department of Employment, Small Business and Training, complements the two strategies by going into greater detail about digital training initiatives for the future workforce.
	GoDigitalQld[99]	This is an older and less relevant strategy that aims to boost Queensland's digital economy via the main areas of government, communities, business and the digital industry.
	Digital Health Strategy	This strategy aims to improve digital health by conducting research, educating the health workforce and improving health technologies.
	IT Strategy 2016–2020	This is a comprehensive strategy, again focusing on improving the public service. It aims to do this through information and data reform; digital opportunity; technology reform; and a capability uplift.
Vic	Information Technology Strategic Action Plan 2019–2020	The annual Actions Plans complement the overall strategy by going into more detail on how the main aims are being progressed each year and providing case studies.
	Digital Workplace Strategy	This strategy is very broad, focusing mainly on improving digital processes and platforms in the workplace.

[99] Queensland Government (2014), *GoDigitalQld: Queensland Digital Economy Strategy and Action Plan,* https://cabinet.qld.gov.au/documents/2014/May/DigitalEconomy/Attachments/Strategy.PDF

Jurisdiction	Policy	Key focus
	Statement of Direction (Department of Premier and Cabinet)	This statement consists of multiple strategies, each with the aim of making government IT systems more efficient. These include finance systems, procurement systems and the workplace environment.
	DataVic Access Policy	The purpose of this policy is to provide public access to government data. It aims to use open data to stimulate economic activity and innovation.
	Data Reform Strategy	This strategy focuses on using data reform to improve government policy and service. It aims to do this mainly by improving technologies and digital processes.
	Victorian Protective Data (PDP) Framework	The main purpose of this framework is to educate public services on the new protective data security provisions introduced by the *Privacy and Data Protection Act 2014* and the new framework for data security.
	Data Exchange Framework	This is an initiative under the *IT Strategy 2016–2020*. The aim of this action is to create a whole-of-government approach to data sharing.
	Cyber Security Strategy	The aim of this strategy is to develop and implement a cyber security framework to protect the public and strengthen government services and systems.
	Digital Accessibility	This is a step-by-step guide for the public and businesses to make content accessible, especially to the disabled.
	Digital Transformation Strategy	This is the overarching strategy for digital transformation in SA, with the key focus being on improving public services. It aims to achieve this by creating new digitally efficient platforms; improving digital literacy; and maintaining digital records.
SA	*ICT Strategy 2018–2021*	This is another broad strategy focusing on improving government services, specifically through better access and service delivery.
	ICT Strategy 2018–2021	This strategy was developed by the Department of Education and therefore provides more detail on digital transformation, specifically in the education sector. It focuses mainly on developing technological resources in schools.

Jurisdiction	Policy	Key focus
	Digital WA ICT Strategy	This is the overarching strategy for digital transformation in WA. Its main focus is to improve government services, mainly through development of digital infrastructure but with a secondary aim to improve employee capability.
WA	*Western Australian Innovation Strategy*	This strategy aims to boost the economy and modernise the workforce by encouraging innovation and entrepreneurship.
	Understanding Digital Inclusion in Tasmania	This report provides comprehensive research findings on the state of digital inclusion in Tasmania, along with suggestions for improvement. It therefore provides the context for the digital strategies below.
Tas	*Our Digital Future* Tasmanian Government strategy for digital transformation 2019–2022	This strategy provides a holistic approach to tackling digital transformation, with its three-pronged approach being to improve the digital community, economy and government. It outlines a number of initiatives to achieve each of these aims.
	ICT Workforce Action Plan	Annual Action Plans compliment this overall strategy by going into detail about the actual implementation of initiatives. This is accompanied by facts and statistics about the current ICT workforce.

Appendix 2: Summary of Advanced Digital Skills Macro-credentials in Australia

Level	Field of study	Total
PhD	Information Technology, Engineering and Computer Science, Engineering and IT, ICT, Business Information Systems	5
Master	Business and Data Analytics, Games and Interactivity, Artificial Intelligence, Applied Artificial Intelligence, Cybernetics, Information Technology, Enterprise Resource Planning Systems, Computing, Computer Science, Machine Learning and Big Data, Cloud Computing and Virtualisation, Software Engineering, Network and Information Security, Cyber Security, Strategy and Risk Management, Data Science, Computer Engineering, Mechatronics, Software, Enterprise Architecture, Informatics, Information Management, Information Studies, Learning and Computer Vision, Business Informatics, Technology Management	107
Bachelor	Computing, Mathematics, Information Technology, Science, Data Science, Decision Science, Software Engineering, Engineering, Software Technology, Cloud Technology, Data Analytics, Artificial Intelligence, Business Information Systems, Cyber Security, Digital Design, Business Intelligence, Information Strategy and Management, Information Systems Management, Information Systems, Business Analytics, Information Technology Management, Business Information Systems, Business Information Technology, Design, Big Data, Digital Security, Digital Media, Digital Transformation, Information Systems Economics, Game Design, Health Information Management, Technology and Innovation, Web Design and Production	169
Graduate diploma	Analytics, Business Analytics, Enterprise Resource Planning Systems, Computer Science, Computing, Cyber Security, Data Science, Digital Communication and Culture, Digital Media, Information Technology, Interaction Design, Internet Communications, Machine Learning, Predictive Analytics, Applied Data Analytics, Business Information Systems, Computing, Networking, Software Engineering, Virtual and Augmented Reality	35

Level	Field of study	Total
Graduate certificate	Analytics, Applied Data Science, Applied Statistics, Business Administration Computing, Business Analytics, Business Cyber Security, Business Informatics, Business and Technology, Business Information Technology, Cloud Computing and Virtualisation, Computer Science, Cyber Crime, Cyber Security, Cyber Studies and Investigations, Data and Cyber Management, Data Management, Data Science, Digital Communication and Culture, Digital Media, Digital Health, Engineering Science (Software Engineering) Enterprise and Resource Planning Systems; Enterprise Architecture, Geographic Information Systems, Government Informatics, Industry Computing, Information and Communications Technology, Information Management, Information Studies, Information Systems, Information Systems and Technology, Information Systems Security, Information Technology, Information Technology Management, Information Technology Project Management, Information Technology Studies, Interaction Design, Internet Communications, Internetworking, Machine Learning, Mathematics, Mobile Applications Development, Networking and Systems Administration	63

Source: Compiled from https://www.dta.gov.au/help-and-advice/learning-and-development/start-your-digital-career-government/listed-degrees-cadetships-and-graduates

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