

Skills for a global future

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Innovation: in simple terms, it's about new ideas being put into practice, and it underpins human progress, while in economic terms it can drive long-term productivity growth (Australian Department of Industry, Innovation and Science 2017). It can also provide the opportunity for the nation to claim a bigger share of global wealth estimated to be worth \$1.6 trillion, '...better jobs, and the best access to the products of innovation, such as new health treatments', according to *Australia 2030: prosperity through innovation* (Innovation and Science Australia 2017, p.1).

The opportunities underpinning the largest growth 'will come from knowledge-intensive companies that innovate and export, as they are the most profitable, competitive and productive' (Innovation and Science Australia 2017, p.1). To be able to do so, these companies will require a workforce whose skills can match, or are better than, our global competitors.

This year's theme *Skills for a global future* reflects the international nature of the 27th National Vocational Education and Training Research Conference 'No Frills' and the New Zealand Vocational Education and Training Research Forum. This theme also signals the pivotal role that vocational education and training (VET) plays in preparing people for an increasingly globalised workforce.

Last year we looked at *Skilling for tomorrow* (Payton 2017), which took a broad view of the trends changing the world of work, the skills employers seek and the ways in which VET providers can respond. A year on, we return to the topic of future skills, but this time we explore skills within the increasingly interconnected world in which Australia and New Zealand not only operate, but in which they seek to succeed. This paper explores findings from recent research into the future of work and skills to prompt questions and discussion at this year's conference, co-hosted by NCVER and its New Zealand partners, Industry Training Federation and Ako Aotearoa.

What do we mean by 'skills for a global future'?

Skills for a global future are the skills people will require for work in the increasingly globalised, interconnected world of work. But, what is a skill? It's a concept that can be hard to pin down and define (Lowry, Molloy & McGlennon 2008). The Organisation for Economic Co-operation and Development also refers to the challenge of defining a skill and states it refers (2016, p.17):

to the ability or capacity of an agent to act appropriately in a given situation. Both [skills and competencies] involve the application of knowledge (explicit and/or tacit), the use of tools, cognitive and practical strategies and routines, and both imply beliefs, dispositions and values (e.g. attitudes).

In simple terms, a skill is both the knowledge used and the tasks undertaken to achieve something.

In the workplace, skills are one of the three factors that many employers seek in potential employees, with values and behaviours in the 'work readiness' mix (Business Council of Australia 2016).

The skills we require for work are changing. A cursory scan reveals numerous research reports, papers and media stories detailing the skills workers now require or will likely require in the future. See the

[Workforce development](#) and [Employment](#) pods on NCVET's [VOCEDplus website](#) for a regularly updated, curated list of recent national and international research.

What is driving 'skills for a global future'?

As *Skilling for tomorrow* (Payton 2017) explored, the world of work is changing, driven by significant technological, economic, demographic and social changes. The combination of these simultaneously occurring trends are amplifying one another, resulting in faster, larger and more exponential shifts, vastly different from those previously experienced (Hajkowicz et al. 2016). To make the most of the opportunities prompted by these significant changes, both Australia and New Zealand have developed national action plans; see *Australia 2030: prosperity through innovation* (Innovation and Science Australia 2017) and New Zealand's recently announced Future of Work Forum (Ardern 2018).

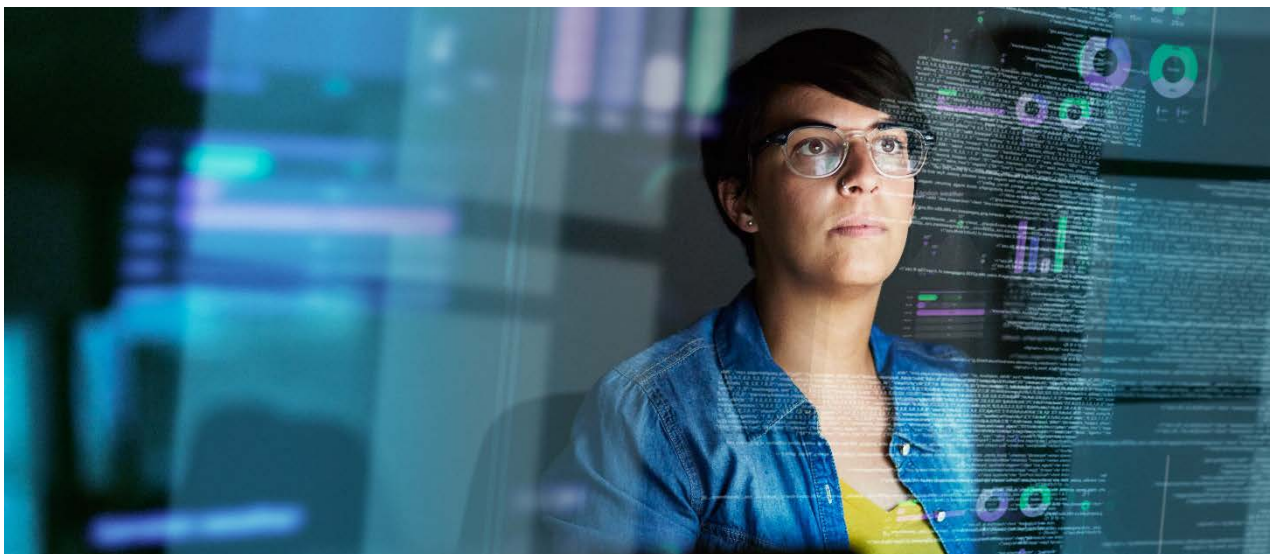
Technological change

The pervasiveness of technology and its increasing capabilities and computational power are resulting in an explosion of data volumes, as well as rapid advances in automation and artificial intelligence, meaning that technological progress is profoundly impacting every aspect of our lives.

Looking specifically at jobs, the introduction of new technologies in the past affected manual jobs rather than knowledge-based jobs (Australian Industry Group 2018; Allen, Teodoro & Manley 2017). Today, the level of routine in tasks performed determines a job's vulnerability (Australian Industry Group 2018). Jobs that include routine tasks which can be coded are susceptible to automation, covering jobs on the high skilled end of the skill distribution, as well as manual jobs at the low skilled end (Australian Industry Group 2018).

Inevitably, the question arises of how many jobs will be affected by new technologies and automation.

Efforts to answer this question rely on predictions. One study suggests that it is highly probable that 40% of the Australian labour market, or five million jobs, could be replaced by machines in the next couple of decades (Committee for Economic Development of Australia 2015). As noted above, jobs can be seen as 'bundles of tasks' (Healy, Nicholson & Gahan 2017, p.21), and critics have argued the modelling that supports this prediction does not consider the differences at task level within occupations.



When task variations within occupations are taken into account, a smaller proportion of jobs in Australia are considered at high risk of being replaced by machines: around 9% according to recent estimates (Cassells et al. 2018).

It is also important to note that predictions assess the feasibility of automation on existing jobs, but do not predict how many jobs will be created. As with previous industrial revolutions, some jobs disappeared and new ones were created. In fact, by 2030 we may experience a shortage of workers rather than a shortage of jobs (Innovation and Science Australia 2017).

While there is uncertainty about the quantum of jobs affected by automation, there is certainty that most jobs will change (Manyika 2017). Indeed, analysis by the OECD, cited in Healy, Nicholson and Gahan (2017), shows that the potential of job transformation exceeds the threat of job destruction in the wake of automation, in both Australia and New Zealand. Enabling one or more tasks to be automated within a job does not necessarily mean the entire job is under threat or likely to disappear (Healy, Nicholson & Gahan 2017). Seet et al. (2018, p.26) point out that often disruptive technologies expand the scope of tasks in existing jobs.

Indeed, an analysis of the 20 billion hours Australians worked in one year shows that the time spent on physical and routine tasks has reduced by two hours a week over the last 15 years (AlphaBeta 2017). Most of this change has not come from the loss of physical or routine jobs but from workers switching to different tasks within the same jobs, as machines take on an increasing amount of the repetitive routine work (AlphaBeta 2017). This study also forecasts that by 2030 Australians will spend on average two hours per week less on routine and manual tasks and more time on interpersonal, creative and synthesis tasks.

The extent and pace of technological advancements in our workplaces are affected by technical feasibility, the cost of developing and deploying solutions, employer size, labour market dynamics and economic benefits (Manyika 2017; Gekara et al. forthcoming). Geographical location is also a factor, and access to fast, reliable and affordable digital infrastructure is an ongoing problem in the regions that could restrict economic opportunities (Healy, Nicholson & Gahan 2017).

Automation and the advancement of other technologies are forces we cannot stop, but they can significantly boost productivity and national income (AlphaBeta 2017; Australian Department of Industry, Innovation and Science 2017). AlphaBeta (2017) argues that, to make the most of technological advancements, a strong policy framework is required to ensure that workers at risk of being displaced are redeployed, also noting that more firms must be encouraged to intensify their automation efforts.

Economic and labour market transformations

Economies change, as does the composition of the labour market. These shifts influence and drive changes in the demand for skills.

Over the last 30 years or so, more of us acquired jobs as a share of our respective populations (Cassells et al. 2018; Stats NZ 2018). The increases have been driven mostly by more women entering the respective workforces (Cassells et al. 2018; Culling & Skilling 2018). More recently in New Zealand (since 2000s), the participation rate of people aged 55 years and above has increased (Culling & Skilling 2018). There have also been other shifts. In Australia, male labour force participation has fallen from 80% to 70% (Cassells et al. 2018) and has decreased slightly in New Zealand from 79% to 75% between 1986 and 2016 (Stats NZ 2018).

At an industry level, Australia mostly no longer makes things, instead it services people (Cassells et al.

2018), with almost 80% of the labour force employed in the services industries (Lowe 2017). This shift to a service economy is a key reason for the contrasting trends in male and female employment. Employment in female-dominated sectors, such as Health care and social assistance, is growing faster, followed by Professional, scientific, and technical services and Education and training (Cassells et al. 2018; Healy, Nicholson & Gahan 2017). The increasing predominance of service industry roles means that more people – male and female – will be needed in occupations historically dominated by females (Allen, Teodoro & Manley 2017).

It is a similar story in New Zealand, as its economy also transitions to one that is service-based: its growth industries are expected to be Business services, followed by Retail trade and accommodation and Construction and utilities (New Zealand Ministry of Business, Innovation and Employment 2018a).



Change is further evident at the occupation level in both Australia and New Zealand, with both countries experiencing a significant shift in the skill composition of their respective labour markets (Cassells et al. 2018; New Zealand Ministry of Business, Innovation and Employment 2018a). Highly skilled workers now dominate both economies. Using Australian Bureau of Statistics Labour force data, Cassells et al (2018) find that, by occupation, Professionals account for nearly a quarter of all workers, followed by Technicians and Trade and Clerical and administrative workers. On the other hand, the share of Machinery operators and drivers and Labourers has declined (Cassells et al. 2018). For New Zealand, census data shows that Professionals in 2013 accounted for slightly more than one fifth of workers, followed by Managers, then Clerical and Administrative, and then Technicians and Trades workers (New Zealand Ministry of Business, Innovation and Employment 2018b). In New Zealand, the shares of Clerical and Administrative, and then Technicians and Trades workers declined between 2006 and 2013, as did those of Machinery operators and drivers and Labourers (New Zealand Ministry of Business, Innovation and Employment 2018b). If these trends continue, there will be ongoing demand for higher-level skills. Jobs requiring medium skill levels are also increasingly automated, together with routine activities such as monitoring (Seet et al. 2018, p.18).

The possibility of the polarisation or hollowing-out of the labour market, with a decline in medium-skilled workers, is a real concern for the future composition in the Australian labour market (Cassells et al. 2018; Healy, Nicholson & Gahan 2017). In New Zealand, projections show employment growth by

occupation will be strongest for highly skilled and skilled occupations, and weakest for elementary and semi-skilled occupations (New Zealand Ministry of Business, Innovation and Employment 2018a). In Australia, the rate of growth in Community and personal service workers, however, is likely to go some way towards narrowing the division between high and low-to-medium skilled workers (Cassells et al. 2018, p.12).

This has implications for skilling and workforce development — jobs are available but they do not always match the skills of workers.

Our employment and organisational structures are changing too. While there are limited authoritative data on the size of the 'gig' economy in Australia, Cassells et al. (2018) estimates that around 12% of the Australian workforce are independent contractors, which is equivalent to 1 270 000 workers.

Further, their analysis shows that a rising share of people aged 35 to 44 years report that they are independent contractors, perhaps motivated by the new opportunities available in the shared or 'gig' economy (Cassells et al. 2018). Cassells et al. (2018, p.21) also estimate, based on data from the Oxford Internet Institute, that among these new opportunities, 'software development, incorporating tasks such as programming, web design and data science, is the largest category of online freelancing services originating in Australia', at 37% in 2018. Over a quarter of listings are for Creative and multimedia services (Cassells et al. 2018). Aided by digital technology, some labour is becoming more mobile and independent from 'standard employment' (Hajkowicz et al. 2016).



Demographic changes

We are living longer, which means that our population, as a whole, is getting older. In coming years, both Australia and New Zealand will experience a 'retirement boom', with increasing numbers of older workers leaving the workplace. In Australia, an estimated six per cent 'shortfall in the number of workers needed to maintain current gross domestic product (GDP) growth in 2030' will occur (Innovation and Science Australia 2017, p.1). In projections to 2032 in New Zealand, retirement age groups are expected to rise, and it is expected that 20–22% of New Zealanders will be aged 65+, compared with 15% in 2016 (Stats NZ 2016). If fertility, net overseas migration and life expectancy rates continue in line with recent trends, the proportion of the population aged 65 years and over in Australia could increase from 14% in 2013 to 19% in 2033 (Committee for Economic Development of Australia 2015). The working population of both

countries will support a greater number of retired people and we may be working longer as the retirement age increases.

'Gen Y' and 'Gen Z' (people born between 1980 and 2009) will increasingly account for a greater share of the workforce, reaching 60% in a decade's time (Allen, Teodoro & Manley 2017). Usually, people in these generations are generally described as adaptive, open to opportunities and responsive to innovation (Allen, Teodoro & Manley 2017). Within our workplaces this could mean we are working with people across diverse age groups and cultural backgrounds (Hajkowicz et al. 2016).

These demographic changes have implications for vocational education skills and training, as future demand is higher for occupations with relatively older workforces, a consequence of workers' proximity to retirement. As experienced workers leave, there are fewer available to supervise apprentices. Additionally, where training, such as apprenticeship training, takes time, and completion rates can be low, sufficient recruitment is needed to avoid future shortages. This demonstrates the need for monitoring and long-term planning in education and training and workforce development, along with different approaches to how people are trained and upskilled (Kiernan 2018). With this issue in mind, Shah and Dixon (2018) forecast that, in Australia, future job openings arising predominantly from retirement will be in skilled occupations of Technicians and trade workers (for example, for bricklayers, carpenters and joiners and automotive electricians and mechanics). Hence, as these examples demonstrate, VET skills that are often termed 'technical skills', and the training for them, will still be needed in the future.

Other trends, such as environmental, policy and regulatory issues, also influence the demand for skills. You can read more about each in [Future skills and training: a practical resource to help industry identify future skills and training](#) (Allen, Teodoro & Manley 2017) and the recently released Australian Industry and Skills Committee [National industry insights report: national overview](#), developed by NCVET (2018).

What are the skills for a global future?

As we have seen, our jobs and our workplaces are and will continue to transform and evolve in response to technological, economic, demographic, social and other trends.

Beyond specific 'technical skills', what other skills need to be present to ensure that applicants are competitive for the jobs of the future? People can no longer rely only on technical skills (carpentry, mechanics, bricklaying); they *also* need a set of transferable skills (Foundation for Young Australians 2017). The three transferable skills with the largest increase in demand over the past three years in Australian internet job postings were digital literacy (up by 212%), critical thinking (up by 158%) and creativity (up by 65%) (Foundation for Young Australians 2017, p.10). Employers asked for these skills along with the relevant technical skills (Foundation for Young Australians 2017, p.11).

While these emerging skills are not necessarily new skills, they are being increasingly requested. New research (White 2018) explores 'employability skills' in internet job postings for the last four years. This research shows employers request communication skills above all other skills. Across all occupations, employers place a great deal of importance on effective communication. White (2018) found that the top ten employability skills, in order of employers emphasising these in internet job postings, were communication skills, organisational skills, writing, planning, detail orientation, team work/collaboration, problem-solving, time management, research and computer/digital skills. For Technicians and trade workers, employers still place emphasis on the specific technical skill (White 2018).

In view of technological advancements, digital skills are clearly a fundamental skill, and their demand is expected to rise (Seet et al. 2018). However, evidence indicates that a large proportion of people do not use digital technologies effectively at work or do not possess adequate information and communications technology (ICT) skills (Australian Industry Group 2018). In Australia, some employers are reluctant to adopt the newer digital technologies because of their workforce's lack of basic digital skills and the perceived costs of digital upskilling (Gekara et al. forthcoming). The degree to which digitalisation is occurring in Australian workplaces also varies, with some industries reporting that digital disruption has increased over the past five years, while others reported that the adoption of digital technology was gradual and restricted (Gekara et al. forthcoming). In terms of current skilling approaches, larger firms indicate that they implement in-house training to help fill gaps, while smaller firms tend to hire workers with the requisite skill set (Seet et al. 2018). This demonstrates the importance of VET adequately skilling workers for digitalisation (Seet et al. 2018).

More broadly, the forthcoming Gekara et al. study finds that Australian employers expect their workforce to be equipped with digital skills that range from a mindset/way of thinking (including being entrepreneurial, demonstrating creativity and willing to experiment) and functioning within an increasingly digitalised workplace, to confidently using advanced features in digital technologies and enterprise systems (Gekara et al. forthcoming). It is of concern that the employers interviewed in this study say they are dissatisfied with the digital skills of VET graduates. Recent analyses of internet job postings in Australia indicated that more than 90% of Australia's current workforce will need to be at least a digital citizen (use technology to communicate, find information and transact) to function in a digitally enabled workforce within the next two to five years (Foundation for Young Australians 2017).

It is important to note that, from a training perspective, industry training packages include digital skill competencies, although mainly at a basic level of device operation (Gekara et al. forthcoming). Furthermore, in the majority of the training packages analysed, most of the units of competency focusing on digital skills tend to be elective rather than core skills (Gekara et al. forthcoming). This suggests swift changes are required to redress VET digital skills for the future.



The release of a national digital economy strategy in Australia is expected imminently (Department of Industry, Innovation and Science 2017) and New Zealand has a program of work underway in the digital sector (Ministry of Business, Innovation and Employment 2018c). In view of the focus on digital economies, Gekara et al. (forthcoming) propose a comprehensive digital skills framework, based on an evaluation of a number of frameworks internationally.

Global skills however are not limited to those required for digital workplaces. The following skills are identified in *Future skills and training: a practical resource to help identify future skills and training* as the future skills required across the workforce (Allen, Teodoro & Manley 2017):

Foundational skills	Strong foundational skills, such as literacy and numeracy skills, including digital and financial literacy, are important for most jobs in the knowledge economy. Strong foundation skills are essential to develop or train within any new, more specialised, skill areas.
Skills for collaborating	Employers are striving to develop a culture in which the most valuable employees are those who can collaborate and share information, the aim being to improve efficiency and achieve organisational goals. Specific skills include communication, teamwork, relationship management, organisational awareness, social/cultural awareness, sociability and teaching others.
Skills for learning and adapting	Changes within jobs will be ongoing and may accelerate. This will require workers to constantly adapt to new processes and technologies and to take greater responsibility for their skills development. Specific skills include adaptability, perseverance, resilience, curiosity, responsiveness, experimentation, and initiative.
Entrepreneurship skills	These skills are widely considered indispensable for the 21st century and are associated with identifying problems, creating solutions, taking action and being self-reliant and resourceful. Specific skills include problem-solving, negotiation, communication, customer engagement, persuasion, creativity, self-management, experimentation, financial literacy, initiative, and critical thinking.
Analytical skills	The focus on STEM (scientific, technological, engineering and mathematics) skills arises from the expectation that workers will increasingly require analytical skills, in particular to use available data and derive value from it (note the explosion in data volumes and the rise of 'big data'). For some, this will require being able to analyse and present data; for others, it will require the ability to interpret data analysis and apply findings.
Skills for adding value	With the ongoing shift to knowledge-based economies in Australia and New Zealand, as well as challenges from increasing global competition, resource-related pressures, and empowered and demanding consumers, employers will seek workers who can create valuable products using fewer resources (who can do more with less). Specific skills include creativity, problem-solving, resourcefulness, reasoning, data analysis/interpretation, customer engagement, experimentation and critical thinking.

Non-automatable skills	With automation expected to continue to take on more of the routine, codifiable tasks in jobs, employees will be expected to focus more on interrelationships and the personalisation of customer service, and negotiating with and persuading potential clients. Specific skills include empathy, sociability, teamwork, social cultural awareness, communication, persuasion and adaptability.
Social platform skills	Future communication tools will require employees to be literate in new media. Social technologies drive new forms of production and value creation. Specific skills include new media literacy, design mindset, cross-cultural competency, computational thinking, virtual collaboration.

What is VET's role in developing 'skills for a global future'?

Education and training determine the capability of workers and entrepreneurs and, therefore, the economy's productivity and innovation capacity (Innovation and Science Australia 2017). In particular, VET 'is an important source of skilled workers for Australian businesses and for start-ups, especially in the trades and hospitality' (Innovation and Science Australia 2017, p.34) and supplies a large number of young people with the skills for their transition to the workforce.

Yet, the importance of VET-trained workers will increase as industries need to swiftly adapt to new demands and technologies and thus require higher skills and more frequent skill updates (Innovation and Science Australia 2017). Vocational education and training is a key supplier of industry upskilling and reskilling.

Australian skills and labour demand forecasting is undertaken at a state and territory level and the following two examples show that VET skills, including upskilling, are central to a successful future of work in Australia. It is predicted that demand for VET-level qualifications in New South Wales will increase from around 30% of workers in 2015 to 45% in 2036 (Innovation and Science Australia 2017). In South Australia, industry demand for VET qualifications accounts for two-thirds of the total qualification demand forecast to 2025 (Training and Skills Commission 2017). The majority of the demand for VET qualifications in South Australia will be for new entrants and existing workers – and these are to gain a qualification at the same level or lower than their existing qualification (Training and Skills Commission 2017, p.11). This highlights the need for upskilling and reskilling of workers already in jobs who will have to adapt to changing requirements. Vocational education and training will be critical to workers moving from jobs affected by automation, by providing reskilling and helping people to take up the new business and work opportunities presented by new technologies (Innovation and Science Australia 2017).

Similarly, New Zealand forecasts for tertiary education show a rise in demand for VET qualifications from 2018 to 2022 with level 3–4 certificates rising 3.7% and level 5–7 certificates/diplomas rising by 6.9% (New Zealand Ministry of Education 2018). Further, significant retraining and upskilling of people will be needed in New Zealand as more jobs are automated, with particular attention given to lower-skilled workers whose jobs are most at risk (Kiernan 2018).

The focus of VET must be beyond skilling for a job (and its technical competencies) to one that encompasses 'soft skills' and imparts continuous learning and adapting mind sets across a lifetime career that will involve change (Bowles 2017).

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