

Skilling for tomorrow

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Could we be the last generation of people to have traditional workplace arrangements, in permanent, ongoing full-time roles with one employer at a time? It's a reasonable question, considering the changes we see flowing through the labour market. In the year between April 2016 and April 2017, two-thirds of jobs created in Australia were part-time¹ and the data show that part-time employment has increased three-fold since the 1970s.²

This steady and ongoing shift in the labour market is occurring at the same time as the economy adjusts and diversifies following the mining-boom between 2003 and 2013³ and is being reshaped by significant technological, economic, demographic and social shifts, shifts that are 'disrupting' business models and substantially changing the way we work and live. Think of the emergence of the 'gig' economy (working independently on a task-by-task basis for various employers)⁴ and portfolio workers. Combined, these fundamental transformations are known as the Fourth Industrial Revolution.⁵

Given that the vocational education and training (VET) sector provides students with the skills they need to get a job or change jobs, the Fourth Industrial Revolution will change VET too. This will require new thinking by governments, training providers, employers and students.

This paper provides a summary of research and discussion on the future world of work, drawing out points relevant to the theme of the 26th National VET Research Conference 'No Frills' – *Skilling for tomorrow*. It explores the drivers changing the world of work, the skills we're predicted to need in the future and what this means for training. The paper aims to encourage conversations and discussions on the question of your role in skilling for tomorrow.

What is changing the world of work?

Much has been written about the significant technological, economic, demographic and social changes, defined as 'megatrends' by the CSIRO,³ substantially changing the way we work. But, changes in the labour market are not new.

A little over 100 years ago, agriculture was Australia's largest employer, before the mechanisation of manufacturing and mass production took over. More recently, the advent of computers and the internet has changed the way work is done.² The declining costs of computers, coupled with their increasing capabilities and power, meant that information processing tasks became cheaper and employers turned to educated office workers in search of greater productivity.² Indeed, this phenomenon has resulted in a large shift in the skill composition of the Australian labour market, with the share of high-skill jobs increasing significantly, middle-skill jobs decreasing by almost as much, and the share of low-skilled jobs decreasing slightly.² This is perhaps best highlighted by secretaries, who experienced the greatest decline of any other mid-level occupation (skill level 3) between 2006 and 2011, losing 30 234 positions, or nearly a third of the entire workforce as a result of computerisation and the redistribution of duties to other staff.⁶

The difference now however is that the combination of the megatrends occurring simultaneously are amplifying one another, resulting in faster, bigger and exponential shifts, vastly different from those previously experienced. Innovations will support and drive other innovations.³ These impending changes offer great promise for both future prosperity and job creation, as well as a major challenge for people, corporations, societies and governments as they plan for and negotiate fundamental changes in the way we work and live.⁴

Technological advances

The 'Internet of Things', which in basic terms is the concept of connecting any device with an on and off switch to the internet and/or to each other,⁷ is one of the most significant current trends.³ Combined with the increasing

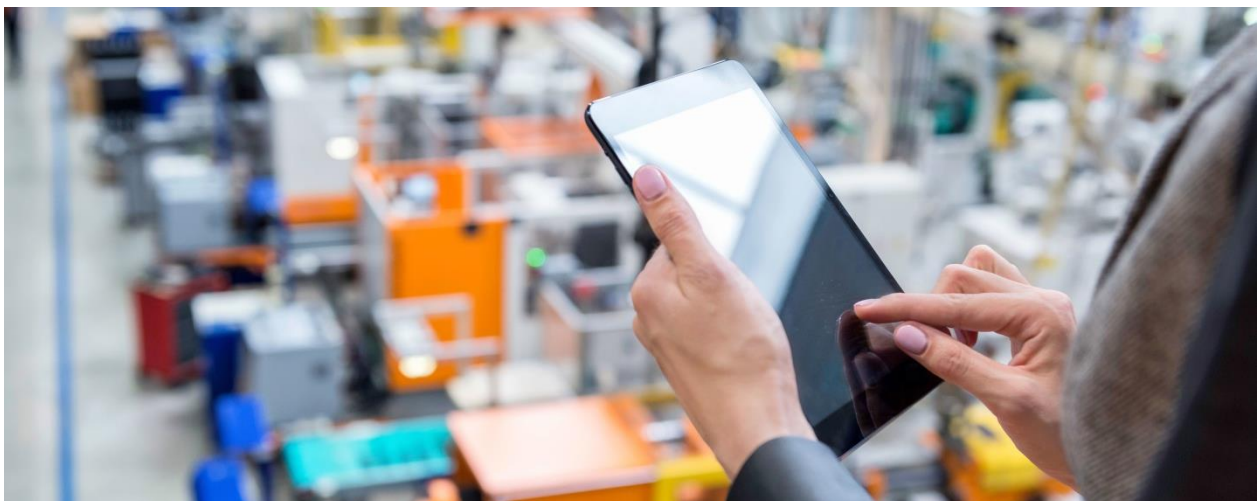
availability of broadband, rising number of data-storage services ('the cloud'), decreasing sharing costs, greater penetration of smart devices, and the number of devices with in-built Wi-Fi and sensors,⁷ the 'Internet of Things' offers exponential growth in interactions and ideas.² These developments, with the explosion in data volumes and rapid advances in automation and artificial intelligence, are producing robotic devices and other computational systems that can perform numerous tasks more quickly, more safely and more efficiently than humans.³ The growth in technological advances is reshaping the labour market, workforce and jobs.³ Once thought impossible, driverless cars are just around the corner, enabled by big data, which is allowing non-routine tasks to become programmable. Driverless trucks have been in operation in the Pilbara region of Western Australia since the first half of 2014.² It's no longer jobs that involve repetitive tasks and low levels of social interaction, creativity, mobility and dexterity that are at risk of automation. Some non-routine jobs are also under threat, but how many?

Modelling by the Committee for Economic Development of Australia for its report *Australia's future workforce?* found that it is highly probable that 40% of the Australian labour market, or five million jobs, could be replaced by computers in the next couple of decades.² Another study using similar modelling, published by the Foundation for Young Australians, found that around 70% of young Australians are getting their first jobs in roles that will, due to automation, either look very different or be completely lost in the next 10 to 15 years.⁸

Other studies, however, have focused on work activities rather than jobs, noting that most occupations consist of a number of activities with differing automation potential. The recent report by the McKinsey Global Institute *A future that works: automation, employment, and productivity* examined the current automation potential in 46 countries if technologies available today were adapted. Based on this study, 44.9% of work activities in Australia could be automated by adapting current technologies, which is comparable to the Netherlands (45.4%), the United States (45.8%) and Canada (47.0%).⁹ Closer to home, there are differences in automation potential in work activities: China (51.2%), Malaysia (51.4%), Indonesia and India (51.8% each), Thailand (54.6%) and Japan (55.7%).⁹ This highlights the sizable differences in automation potential between countries, based mainly on the structure of economies, the relative level of wages, and the size and dynamics of the workforce.¹⁰

While there is conjecture about the scale of change in jobs, there is a general consensus that automation will affect all jobs to varying degrees: not all jobs are at risk of being fully automated. Even when current technologies are adapted, very few occupations globally (fewer than 5%) would be fully automated.¹⁰ The extent and pace of automation will also be affected by technical feasibility, the cost of developing and deploying solutions, labour market dynamics, economic benefits, and regulatory and social issues, such as the degree to which we accept machines doing work, for example, driverless trucks hauling freight.¹⁰

It is also important to remember that jobs were created during and following previous industrial revolutions, while wages, living standards and life expectancy also rose. People got new jobs and better pay but they were not necessarily those whose jobs had disappeared.³ Today, as in the past, we're unable to predict the new jobs that will arise from technologies not yet available, but we will be able to use machines and 'big data' to predict the skills people will need.



Economic and labour market changes

Australia has experienced 25 consecutive years of economic growth, an enviable record. However, we now face new challenges as the nation's economic conditions are influenced by a number of forces, including trade with other countries, technology, globalisation and innovation.

Changes in the economy are reflected in the composition of the Australian labour market, which has altered over recent decades, with declining employment in manufacturing and agriculture and increases in the service sector.³ More recently, employment has fallen in small business, following the Global Financial Crisis.³ Like other Organisation for Economic Co-operation and Development (OECD) economies, Australia is moving towards a knowledge-based economy, and has experienced a 'hollowing out' of its labour market, also in line with other countries, although not to the same degree. The share of high-skilled jobs has increased by a large amount, driven by more people gaining higher-level qualifications. The share of middle-skill jobs has fallen by almost a corresponding amount, and there has been a small decrease in the share of low-skilled jobs.²

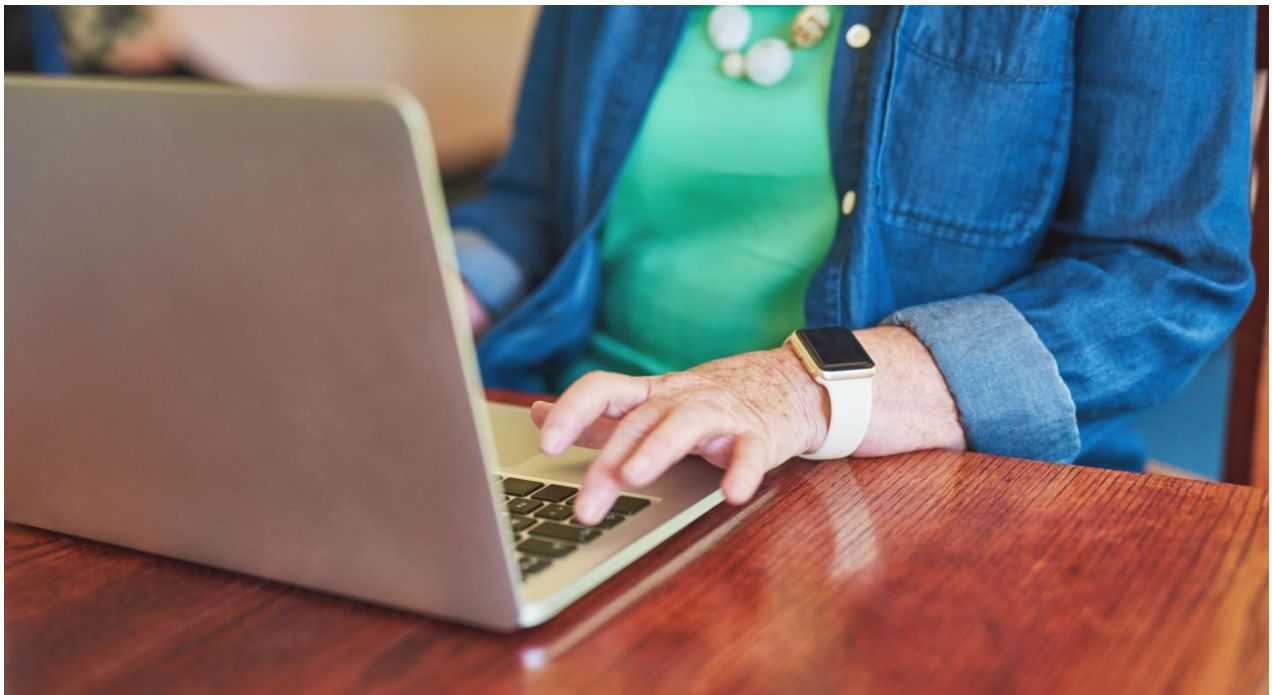
Looking at the labour market, men in particular have been affected by these changes. Since the 1970s, the number of men in full-time work has declined by nearly 20%, in part a result of the decline in traditional manufacturing.² Conversely, the number of employed women has increased, with most finding part-time work. Overall, part-time employment now accounts for nearly a third of all jobs.¹ Over the past decade, there has been a decline in the workforce participation rate. The reasons behind this might include discouraged job seekers, the casualisation of work, and the increasing potential for technological employment.³ It is also worth considering adding the rate of underemployment (the proportion of people who want and can work more than they currently do) to the list of possible reasons: currently underemployment is at 18% of the youth labour force, the highest in the 40 years since it has been counted.¹¹ Yet, Australia, as noted above, has experienced a record period of economic growth: we're still making, extracting, building and selling goods and services, and skill shortages in various industries are regularly reported. This has implications for skilling and workforce development – jobs are available but they don't always match the skills or location of workers.²

Globally, there is a growing supply of labour, with people from emerging markets such as India looking for work. If current trends continue, global unemployment is set to get worse, albeit gradually, reaching more than 215 million job seekers by 2018. It is estimated that during this time 42.6 million people will enter the labour market each year looking for work, but only around 40 million net new jobs will be created every year.² Meanwhile, the global youth unemployment rate is almost three times higher than the adult unemployment rate.² This is in spite of growing numbers of young people with tertiary-level education both in Australia and overseas. In 2012, every third adult in the OECD had attained a tertiary degree.³ Over the last decade the gap between the number of people with tertiary education from OECD and non-OECD countries has closed, and by 2030, 70% of people with tertiary education are expected to come from non-OECD countries.³ In this same timeframe, China and India are expected to provide nearly half of all people with tertiary education aged 25–34 years and over 60% of the STEM-qualified workforce for the G20 nations.³ In Australia, more young people are studying at universities, and for longer, and doing double degrees or graduate qualifications in response to rising demand for qualifications. However, this also means that many are entering the labour market later.

As we have seen over the last decade, technological advancements have transformed the scope, scale and potential of business, disrupted business models, and fundamentally changed the behaviour of customers.³ Advances in digital technology allow even the smallest of businesses to build reputations and access large markets and PricewaterhouseCoopers (PwC) estimates that businesses can unlock an additional \$49.2 billion in the private sector over the next decade if technologies are used to their full potential.³ The path to prosperity brought about by the Fourth Industrial Revolution will be through innovation. The commodity in scarce supply will be ideas, and the creators and holders of those ideas will reap enormous rewards.² Australia, being an early adopter, will experience diminished returns as the world increasingly moves towards 'winner takes all' outcomes, in which those who create something unique or special command increased returns, while the remainder get lower and lower returns. Australia has a well-regarded entrepreneurial environment, attitude and potential, but it lacks venture capital funding, which has declined since the GFC, although there are promising signs of investment growth.³ One suggestion is to legislate a small proportion of super funds to support entrepreneurial ventures such as the California Public Employees Retirement System, which entered entrepreneurial investing largely because of its proximity to Silicon Valley.²

Demographic and social changes

We, as a population, are getting older and living longer. This has implications for the labour market. 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 could increase from 14% in 2013 to 19% in 2033.² The working population will support a greater number of retired people and we may be working longer as the retirement age pushes back to 70 years by 2035. The workforce participation rate for older people is projected to increase from 12.9% in 2015 to 16.9% by 2034–35, offsetting an expected fall in workforce participation for people aged 15 years and over.³ In our workplaces this will mean we are working with people across diverse age groups and cultural backgrounds.³ With the rapid pace of technological change, education and training providers could expect these demographic changes to be replicated in their classrooms. Our ageing population is also expected to create new economic opportunities and consumer markets across the world.² In an increasingly connected world, the potential for geographically diverse groups of workers to collaborate and share files, data and information, and the ability for businesses and workers to establish flexible working arrangements and use co-working environments, is extraordinary and already underway.³



Technological advances are not only changing our jobs but also our employment and organisational structures. The rapid rise of the peer-to-peer employment market is testament to these shifts. On websites such as Freelancer, InnoCentive and Upwork, employers and employees advertise employment opportunities, promote themselves and access job markets that were once much less accessible.³ The number of people using the Australian company Freelancer grew from one million to 10 million between 2009 and 2014, connecting over 17 million employers across 247 countries.³ Other sites enable the efficient outsourcing of all manner of tasks (such as Airtasker), while yet others enable people to transform their free time into paid work, albeit as additional or sole income.³ These changes are giving rise to the portfolio worker, who freelances with multiple employers. Aided by digital technology, labour is becoming mobile and independent.³

Such sites offer advantages and challenges: employees can gain exposure to new and different technologies and skills, but may find they are working irregular hours (outside normal working times) and some report they are dissatisfied with the income variability and the lack of benefits typically associated with traditional work.¹⁰ While employers can access expanded pools of resources and talent and reduce capital expenditure on physical resources and energy, they have to manage a diverse, global team and a huge number of inputs.²

What are the future skills?

Data modelling by the CSIRO for TAFE Queensland determined which skills and abilities are becoming more or less important in the workplace.¹² The modelling indicated that, of the STEM skill set, which included science, technology design, engineering, mathematics, programming, systems analysis, critical thinking and computer use, it was technology design skills that were represented in the jobs with the greatest employment growth, followed by mathematics, computer use and critical thinking skills. In the communication skills set, made up of active listening, speaking, writing, coordination, service orientation, instructing, and negotiation, the top three skills were service orientation, negotiation and active listening. In the technical skills set, comprising operations analysis, operation and control, equipment maintenance, troubleshooting, management of financial resources, management of personnel resources, and installation, the findings were less clear-cut, with installation and management of financial resources skills showing greater demand than equipment maintenance, operation and control, and operations analysis skills.¹²

Entrepreneurship and lifelong learning should also be added to the core skills (even if the latter is more of an attribute). In view of the combination of technological change and longer working lives – during which time we may change careers a number of times and work for numerous employers – lifelong learning will be fundamental to future work environments. Perhaps a striking example of this commitment to lifelong learning is Ben Tripodi, who in 2015 at 24 years of age, graduated with a bachelor of health sciences from Flinders University; Ben has already completed four further courses online and developed new professional skills from conferences, networking and a ‘digital mountain of books queued up on his Kindle’.¹³ While it’s not clear from the article whether the four online courses Ben completed were VET courses, it does speak to the trend of students who undertake vocational education and training after gaining a bachelor’s degree or higher.¹²

Attaining whole qualifications for each job change may not, however, be required. A recent study shows that jobs are more related than we may previously have considered.¹⁴ Using big data, the Foundation for Young Australians study analysed more than 2.7 million job advertisements to reveal seven new job clusters in the Australian economy where the required skills are more closely related and more portable than we previously understood¹⁴. The job clusters are the ‘Generators’, the ‘Artisans’, the ‘Carers’, the ‘Informers’, the ‘Technologists’, the ‘Designers’ and the ‘Coordinators’. When a person trains or works in one job, they gain skills for around 13 other jobs because employers demand very similar skills in many jobs. In some cases, if someone has trained for or worked in one job, only one additional skill is required for a further 44 different jobs.¹⁴ The study has the potential to change how we think about jobs and career advice: rather than asking young people to name their dream job, we could ask them about their areas of interest or to identify their skills.



What does this mean for training?

Education and training have never been more important. *The VET era: equipping Australia's workforce for the future digital economy* undertaken through CSIRO for TAFE Queensland, offers a number of recommendations framed by the pace of technological change. The report, whose findings are synthesised here, notes the troubling gap between the skills profile of the current workforce and the growing demand for more highly skilled workers.¹² Given that VET providers train the largest segment of our workforce, the report argues that Australia's competitiveness in the future global marketplace depends on VET providers training larger and more diverse student populations at higher skill levels.

This could prove challenging for VET providers, particularly as they seek to secure funding and resources to meet demand in an environment in which it is easier for consumers to differentiate providers based on cost rather than on quality. Building partnerships with other VET providers, employers and other key stakeholders will be critical. Harnessing these communication channels will build shared understanding of the competitive advantage that will attach to a more highly skilled workforce, and focusing on those sectors where digital disruption is already being experienced and where the need for reskilling and upskilling is being felt will help to prioritise effort. With public funding unlikely to keep up with the growing need and value of education, innovative funding models could help students and their employers meet shortfalls.

In terms of the courses offered, the report recommends reorienting course offerings to reflect the growing importance of communication skills, also arguing that incorporating technological and numeracy skills into a broader range of courses will be of great benefit to students and employers. To deepen understanding, it is recommended that the digital literacy skills incorporated into courses reflect the technology used in the workplace; in this context it is about using technology to solve problems and achieve practical ends.

The packaging and timing of VET offerings also need to be re-evaluated. Rapid changes in the work environment, combined with longer working lives, will drive the formal education sector towards a lifelong learning model. Courses and their associated qualifications will need to become more modular to allow them to be completed progressively and flexibly alongside work. Further, modular course offerings should serve as the building blocks for more long-term and continuous engagement between students, employers and VET providers. Ongoing virtual engagement with students and employers may represent a means of supporting this longer-term relationship. Maintaining currency with industry requirements is central to VET but is becoming increasingly challenging with the pace of change. A more strategic approach is required, one that would include sharing of information among educators and digitally streamlined consultation with employers. Agility can also be supported by better understanding the external environment. It is also now possible to obtain real-time data relating to job vacancies, skill requirements and changing employment patterns to inform decision-making.

Digital technology will significantly change the way education is delivered. It is expected that most students will continue to benefit from small group (or one-on-one) tutoring, particularly as the relative importance of solving complex problems in teams, versus carrying out routine tasks, increases in workplaces. Teachers will spend less time preparing, lecturing and marking and more time with students, helping them to understand the more difficult concepts of their courses. Well-designed online course material, developed to a high standard in line with student expectations, will greatly enhance learning experiences for students. The fixed costs of this will be high, especially for technical courses, but once developed it can be delivered widely at minimal marginal cost. Training providers have three options: they can choose to develop content themselves and seek to license it to recoup costs; they can partner with other providers to develop and provide content; or, they can pay others for online content, which is likely to require some customisation, and focus on supplementing it with excellent teaching. Each option carries a degree of risk: the first is a high-risk strategy, whereas the other two options are less so.¹²

To return to VET qualifications, perhaps it is time to re-imagine them in view of the emergence of the Fourth Industrial Revolution and the growing demand for 'soft' or 'enterprise' skills. One suggestion is to move away from narrowly defined qualifications built around specific roles or tasks towards broader qualifications, those structured around the concept of vocational streams.¹⁵ Vocational streams are clusters of occupations that share similar

requirements for knowledge, skills and attributes.¹⁵ By focusing on the broader capabilities underpinning vocational streams, it is expected that job mobility, adaptive capacity and career development will be promoted.¹⁵ This idea, developed by Leesa Wheelahan and John Buchanan and their colleagues (and published by NCVET), has greater merit in light of the Foundation for Young Australians' research finding that seven job clusters span the 1000 or so occupations in Australia. Further, a study by Patrick Korbel and Josie Misko revealed that enrolments in VET qualifications are heavily concentrated in relatively few qualifications, with 85% of enrolments spread across 200 qualifications and the remaining 15% spread across 1444 qualifications.¹⁶

The Fourth Industrial Revolution brings far-reaching and accelerating disruptive change to business models and traditional education practices. For governments, it will entail innovating within education and labour-related policy-making.⁵ For the education and training sector, it will mean vast new business opportunities as it provides new services to individuals, entrepreneurs, organisations and the public sector.⁵ Is the system ready to face what the future brings?

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