



The Future of Work

Literature review



**Jobs
Queensland**



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To make an enquiry, contact Jobs Queensland:

Email: info@jobsqueensland.qld.gov.au

Telephone: (07) 3436 6190

Mailing address: PO Box 80, Ipswich, Queensland 4305

Head office: Level 6, Icon Building, 117 Brisbane Street, Ipswich, Queensland 4305

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EXECUTIVE SUMMARY

Many sectors of Queensland's economy are currently experiencing significant change with implications for the future of work. Through our work with stakeholders, Jobs Queensland has seen how Queensland's industries and regions are changing. The impact of digital technologies and involvement in global value chains are driving changes in workforce composition and skills. Queensland faces many of the same issues that are impacting global economies, for example, accelerating uptake of digital technologies, changing demographic and social profiles, low wage and productivity growth, and perceived growing inequality.

This literature review looks at the impacts of three drivers of change of the future of work:

- technology impacts
- demographic and social changes
- legal, institutional and policy influences.

Much of the literature and commentary on the future of work takes an international focus or is focused on Australia at the national level. This project places a particular emphasis on the impacts and implications of the future of work on individuals, businesses and communities in Queensland. Globalisation is another important element – as both an influence towards and the outcome of changes from the three drivers. It has been and remains a driver of change in work and the demand for skills (Australian Industry Group [AiG], 2016a; Becker, Bradley, and Smidt, 2015; Dolphin, 2015). Globalisation creates structural change not only in industries but also in regions as the industrial composition of a region changes in response to changing global consumer demand. This impacts the social structure of the region as well as its demographic composition as people move into or out of a region in response (Jones and Tee, 2017; Aither, 2014).

The impact of globalisation is expected to increase as digital technologies increasingly enable the movement of labour virtually (Baldwin, 2018). We are seeing teleworking becoming mainstream, the rise of the 'digital nomad' where a person can work from anywhere in the world, and contingent employment models (Roos and Shroff, 2017). These changes will influence where we work, how we work and when we work, with some commentators predicting the 'rise of the individual' who will drive future employment models (Deloitte, 2018, April 5; KPMG, 2013). Precarious work is perceived to be on the rise in Australia as the nation transitions to a services and knowledge-based economy. The industries experiencing the most employment growth are service industries which traditionally offer lower skilled, lower paid, part-time and casualised employment. Even in the professional, scientific and technical services sector, a high-skilled and high-wage employment sector, the rise of the gig economy is impacting the quality of work available (Australian Council of Trade Unions, 2018a).

It is often thought that the major driver of this change is the uptake of digital technologies. Frey and Osborne (2013), with their focus on the impact of technology on jobs, forecast mass unemployment by 2030. Modelling was based on consideration of the impact of technology on whole jobs. More recent research recognises that a job is made up of a series of tasks requiring a range of skills. These studies highlight that the impact of technology is most likely to be at task level (Nedelkoska and Quintini, 2018; Bakhshi, Downing, Osborne and Schneider, 2017; Arntz, Zierhan and Gregory, 2016). Depending on the number of tasks that could potentially be automated, a small proportion of jobs may become obsolete. Importantly, however, all jobs will be impacted at some level and workers will need the skills gained through a lifelong learning mindset to meet changing job demands (AiG, 2016c).

It is important to remember that technology-driven change is not new. Predictions that technology will make humans redundant have been made since the start of the Industrial Revolution in the 1800s (Lawlor and Tovey, 2011; Boreham, Parker, Thompson and Hall, 2008). To date the predictions have not come true, and there is no evidence yet that this time will be any different. In the past, major technological advances have led to increased productivity and improved quality of life as difficult and dangerous tasks were no longer performed by humans.

More recent research acknowledges that technology is not the only driver to impact the future of work. Society and demographics will also influence the nature of work organisation and work arrangements in 2030 (Harris, Kimson and Schwedel, 2018).

In the last 100 years the global population has almost quadrupled (Goldin, 2016). Together with a proliferation of new technologies, these factors are driving changes in the economic and industrial composition of nations. Australia is not immune to these changes, as with many developed countries it is facing the impacts of:

- An ageing population (Balliester and Elsheikhi, 2018; Becker et al., 2015).
- Women entering the workforce in increasing numbers and who are better educated than at any other time in history (Australian Institute of Health and Welfare, 2018).
- Young people are staying in education longer and acquiring higher levels of education (Australian Bureau of Statistics [ABS], 2017, November 6).
- Young people, indigenous Australians and people with disabilities experience high levels of underemployment and/or unemployment (OECD, 2018a; Lowe, 2018).
- Many people from migrant and refugee backgrounds are not having their skills recognised or fully utilised within employment (Deloitte Access Economics, 2018b).

While increasing longevity is currently perceived at times as a 'problem', it need not be so. We are living longer, are healthier and are more engaged than previous generations, which opens up opportunities and challenges for everyone (Gratton and Scott, 2016). This changing demographic profile is seeing a growth in the proportion of people aged 65 and older remaining in the workforce and increased demand for services that cater to this older generation.

With the combination of an ageing existing workforce and the entrance of post-millennials from 2019, the world will - for the first time - see five generations in the workplace (Select Committee on the Future of Work and Workers, 2018). This will bring greater diversity of age and experience to enterprises, driving the need to develop and utilise skills to manage and engage such diversity.

Over the last 40 years, the Australian government has implemented many important structural reforms. The reforms have helped see the nation today enter its 28th year of uninterrupted annual economic growth (Tang, 2018). There are concerns that workplace laws have failed to keep pace with emerging trends, for example, the rise in non-standard work (Select Committee on the Future of Work and Workers, 2018). People are entering and exiting the workforce at multiple points (Buchanan, Verma and Yu, 2014) or seeking alternate work arrangements that meet their lifestyle requirements (Manyika et al., 2017; Roos and Shroff, 2017; AiG, 2016c). This is bringing into question the concept of a 'standard employment relationship' (Stanford, 2017).

What does this all mean for employment and skills?

New technologies will change the skills that a person requires, either to remain employed within the same organisation, or to transition to new employment which may be in another industry. Increasingly, workers will require the skills needed to work collaboratively with technology and/or to adjust to changing employment circumstances (AiG, 2016a).

These trends will drive the need for lifelong learning across the workforce regardless of age or time in the workforce. Continually evolving skill requirements and changing industry profiles within the economy will require institutions at all levels to consider ways to address potential economic and social inequality which may be exacerbated by geographical location, ethnicity and/or educational access.

Because people will be working longer (Gratton and Scott, 2016), educational institutions will need to meet the skills and training needs of a more age-diverse student cohort. Rapidly changing skills needs within enterprises will drive demand for access to modularised training that is delivered onsite to meet the needs of the enterprise.

Changing work environments and skills will pose a challenge to educational institutions. The demand for access to education and training throughout the life span will drive the need to consider alternate delivery models. This may be online by virtual classrooms, face-to-face outside of 'normal' delivery hours, onsite or a combination of methods. Already we are seeing the increasing uptake of massive open online courses (MOOCs) which offer the learner opportunities to undertake, often for free, short courses specific to their interest.

What can we do to address change and prepare for the future of work? Possibilities include utilising policy, regulation and our social institutions. This literature review presents a range of thinking on the future of work to sharpen our collective focus, identify opportunities for the future workplace and consider the implications on employment and skills policy in Queensland.

Key findings

Areas of consensus in the literature

- People, especially those most at risk of disruption to their employment, will need support to stay engaged or to re-engage with the labour force and/or education and training.
- Queenslanders will need to be prepared for the predicted departure from the 'traditional three-stage' working life.
- Employers will need support to respond to potential transitions within their industry, including their workforces.
- Change is not new – what is new is who will be impacted and the extent of the impact.
- There is growing consensus that the impact on jobs will be largely at task level.
- Key structural and economic reforms in Australia over the last 40 years have changed our labour market.
- Work is changing as a result of both technology and societal and demographic changes.
- We are not powerless in shaping our own futures.
- Participation in lifelong learning will be key as jobs and workplaces are transformed by the drivers shaping the Queensland economy.
- Collaboration across all institutions (education and training, government, employment and society) is needed to ensure a high-skilled and adaptive workforce.

Areas of contention in the literature

- The extent and speed of the impact of new technologies such as artificial intelligence (AI) and machine learning (ML) on work and workplaces.
- The impact and the extent of impact of new technologies on employment and productivity both in the short, medium and longer-term.
- The extent to which inequality is rising in Australia and how changes in technology and the broader economy will affect this projected trajectory.
- How technology and the move towards a more knowledge- and service-based economy will affect regional and rural areas.
- Definitions (e.g. worker/employee) are contested, resulting in anxiety and confusion.
- How and to what extent modes of employment are changing is contested, due to deficiencies in the availability of data, differences in measurement and varied motivations of those engaging in this mode of employment.
- The skills, knowledge and attributes needed for the future are contested.
- The role of vocational education and training is unclear.



Challenges and questions for consideration

While the challenges and considerations for government, industry and employment and training are significant, they are not insurmountable:

1. How do we identify and prepare for change associated with the impact of new technologies?

2. What will government, industries, employers and workers need to prepare for and adapt to this change?

3. What is the role of government in relation to the adoption/uptake of technology?

4. How do we promote equality through supporting people, especially those most at risk, to engage, stay engaged or re-engage with the labour force and/or education and training?

5. How do we prepare Queenslanders for the predicted departure from the 'traditional three-stage' working life?

6. How do we support employers in responding to potential transitions within their industry, including their workforces?

7. How prevalent are 'new' work arrangements (e.g. gig/platform-mediated work) in the Queensland economy?

8. What is the role of institutions (government, vocational education and training, etc.) in the process of transition?

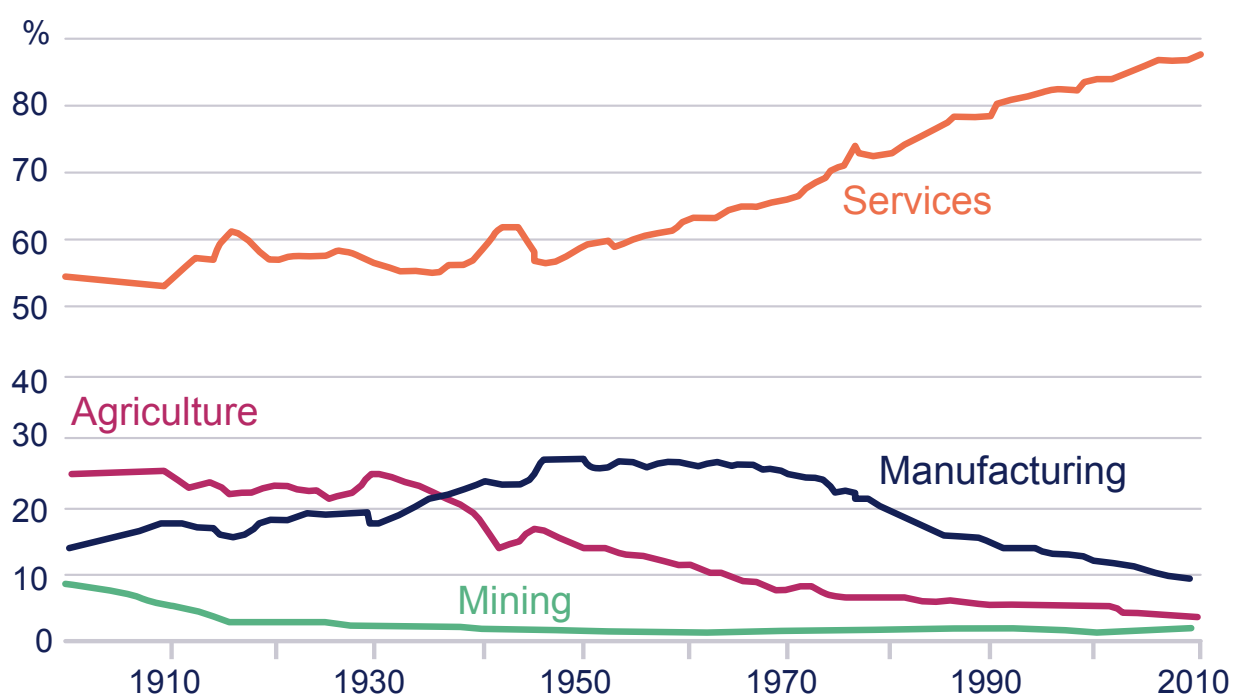
It is important to remember that, with the guidance provided by analysis and planning, there will be many opportunities for workforces and workers through greater choice in how, where and when they work and the tasks they perform. Jobs Queensland's work with industries across the state's regions provides us with valuable insights into how to maximise opportunities in the changing workplace.

We can take control – through policy, regulation and our social institutions. We all have a role to play in harnessing the future of work, be that government, industry, representative bodies, education or individuals, to ensure that all members of society benefit from the advantages that technology can bring.

INTRODUCTION

The changing nature of the economy is not new. Over the last 100 years, the Australian economy has undergone changes, including a significant shift from the manufacturing and agriculture industries as major employing industries, to employment now being heavily concentrated in the services sector (Figure 1). Much of this change has been driven by globalisation, with Australia transitioning towards an open, trade-exposed economy. This transition was underpinned by a vast array of structural reforms including tariff reduction and removal, floating of the Australian dollar, removal of barriers to foreign investment, adoption of a decentralised wage bargaining system, central bank independence, numerous free trade agreements (Berger-Thompson, Breusch, and Lilley, 2018) and more liberal immigration policies (Bowden, 2011). Globalisation creates structural change not only in industries but also in regions, as the industrial composition and economic prosperity of a region may change in response to global consumer demand (Jobs Queensland, 2018e).

Figure 1: Employment by Industry, Share of total, Australia, 1900-2010*



*Data are interpolated between 1900 and 1910.
Source: Connolly and Lewis, 2010.

There has been a clash of viewpoints on the future of work as Queensland moves further into the 21st century. The media has given the topic significant attention but many of their reports fall at either end of a continuum, either overly optimistic - 'technology will solve all our problems' (Rainie, 2018; Maney, 2016) or overly pessimistic - 'robots are going to take our jobs' (Elliott, 2018; BBC, 2017a; BBC, 2017b; Williams, 2017; Head, 2017; Sandhana, 2013) and focused solely on technological impacts. These alternate views echo much of the recent research literature (Nedelkoska and Quintini, 2018; alphaβeta, 2017; Brynjolfsson and McAfee, 2014; Frey and Osborne, 2013).

A closer look at the research and commentary suggesting that the future of work is likely to lead to significant job loss shows that this is not entirely correct. It is more correct to say that some aspects of jobs are at risk of being lost through automation – something not synonymous with job loss. The CSIRO (Hajkowicz et al., 2018) in its report for the Queensland Government reiterated this view, saying that ‘at risk’ was not synonymous with job loss, rather it referred to the ability of technology to change jobs.

The conversation is moving from a focus on jobs being replaced by technology to jobs being changed as technology takes on routine, repetitive and at times unsafe tasks that make up parts of today’s jobs. Other reports (Nedelkoska and Quintini, 2018; Bakhshi, Downing, Osborne and Schneider, 2017; Arntz, Zierhan and Gregory, 2016) present a view that reflects a further perspective. Their focus is on the impacts at task level rather than occupational level. As a result, their predictions of job losses are significantly less than Frey and Osborne (2013). Arntz, Gregory and Zierahn (2016), for example, put forward that only nine per cent of jobs within the United States (US) were at risk. In Australia, alphaBeta (2017) also provides a different perspective of the future, predicting that through automation Australian workers will be undertaking two hours less a week of repetitive manual job tasks.

Job change as a result of technology is not new (Williamson, Rahnaill, Douglas and Sanchez, 2015). It has been happening for millennia. The impact of the first stone tools for our hunter-gatherer ancestors contributed to the development of today’s civilisation, making it ‘the most successful technology in human history’ (Gorman, 2018). Innovation and Science Australia (ISA) (2017, pg. 1) predicts that by 2030 there could be a shortfall of six per cent in the number of workers required to maintain Australia’s projected gross domestic product (GDP). In Queensland, while there are approximately 868,000 jobs ‘at risk’ of automation, a million new jobs could be created by 2036 (Hajkowicz et al., 2018). Technological innovation will continue to be critical for employment well into the future. Innovation and Science Australia (ISA) (2017, pg. 1) states that by 2030, unless aided by innovation and digital technologies, there could be a shortfall of six per cent in the number of workers required to maintain Australia’s current gross domestic product (GDP) growth.

As the literature on the impacts of technology becomes more nuanced, the literature around the future of work too has evolved to consider other drivers of change. Demographic and social factors such as an ageing population and increasing longevity as well as rising urbanisation and a longer time spent in education can increase demand for particular types of services (e.g. health care and social assistance, and education and training) and have implications for future labour supply. There are also a range of legal, policy and institutional factors that impact how work is organised and performed.

There is no doubt that the structure of the labour market in Queensland is changing and will continue to do so. In recent decades, the Queensland economy has seen employment in service industries increase while employment in traditional sectors such as agriculture and manufacturing has declined. Economic modelling of several plausible future scenarios undertaken by Jobs Queensland (2018b) paints a picture of potential changes in the Queensland labour market between 2017 and 2022.

1. ‘At risk’ doesn’t mean the job will disappear. It means the person doing the job will need to transition their skills, either to continue in their position or to find a new one.

This work found that:

- Employment in Queensland is projected to increase by 2022 for each of the scenarios modelled, with the rate of growth ranging from 7.6 and 9.3 per cent.
- Over 50 per cent of all new workers are projected to be employed in just three industries – Health Care and Social Assistance; Professional, Scientific and Technical services; and Education and Training.
- It is projected that regions with the highest proportion of service industries will see the greatest growth in employment, with the majority of growth in the south-east corner of the State.
- Professionals will remain the largest occupational grouping and are projected to grow strongly, as is the Community and Personal Service Workers group.
- Under every scenario, the workforce becomes more educated, with the number of workers without post-school qualifications falling by between one and 2.6 per cent from 2017.

Examination of literature reviews in several reports (The Melbourne Institute of Applied Economic and Social Research, 2018; Seet, Jones, Spoehr and Hordacre, 2018; Williamson et al., 2015) and also the literature review undertaken by the International Labour Office (Balliester and Elsheikhi, 2018) demonstrates that much of the commentary on the future of work is not new. Indeed, Lawlor and Tovey (2011) and Boreham et al. (2008) describe global and Australian contexts very similar to today.

Outline of the project

The impetus for this project came from learnings gained by Jobs Queensland through its work across Queensland and the recognition that industries and regions within the state are changing. This raises questions for skills and employment policy both now and as we move forward. This project has been identified by The Honourable Shannon Fentiman MP, Minister for Employment and Small Business and Minister for Training and Skills Development as a priority project for Jobs Queensland.

This literature review is part of the first phase of a three-phase project to investigate what work in 2030 could look like for Queenslanders and our economy. The intent of the project is to provide evidence-based advice on the implications of technological change, demographic and social trends and institutional frameworks for skills and employment policy. A discussion paper outlining the issues and assumptions underpinning the future of work in Queensland will also be developed.

In phase two, consultations will be held with stakeholders across Queensland to further investigate the issues and assumptions identified in the discussion paper. The aim is also to obtain views on actions required to ensure Queenslanders have access to the skills and knowledge needed to participate successfully and productively in an increasingly digitised, automated and global economy.

A social research project will also be undertaken and the results of that research will be considered in future policy advice. Phase two is expected to be completed June 2019. Outcomes from phase two will inform work in phase three. This phase will be focused on deeper research into specific issues as identified through phase two activities.

Three potential research questions have been identified for the project:

- To what extent have and will the 'future of work drivers' impact the Queensland economy?
- What are the skills needed by employers and workers (new entrants and existing workers) to achieve quality work² in the future Queensland economy?
- What current and new skills and employment policy levers will be most appropriate to help build the capability of workers (particularly those most vulnerable) and employers to adapt and take full advantage of the 'future of work'?

Outline of the literature review

This literature review focuses on three drivers of change which can be considered as having major impacts on how work will look in the future for Queenslanders and the Queensland economy. The three drivers are:

- technology impacts
- demographic and social changes
- legal, institutional and policy influences.

These drivers are by no means the only changes impacting on the future of work to 2030, nor should they be considered as separate entities. Rather, they reflect common themes in the literature and also the chronology of the debate around the future of work. The structure of the literature review follows the evolution of the research. Early research has focused on technology and its impact on employment and jobs. Subsequent research has been exploring the impact of demographic and social changes such as women entering the workforce, rising education levels and an ageing population. Most recently, research has turned its attention to the legal, institutional and policy environment and implications.

The literature around each driver is examined in some detail. Section 1 focuses on technology and some of the research in the last five years on the potential impacts. The focus of Section 2 is on the demographic and social changes that have, and are currently occurring in society globally and in Australia specifically. The legal, institutional and policy influences in areas such as the labour market and regulation of technology are examined in Section 3.

The implications identified in the literature of each driver for training and skills is examined in Section 4 while Section 5 outlines the key themes emerging from the literature and identifies some questions for further consideration.

Evolution of the literature

The field of literature and commentary on the future of work is immense. New contributions to the debate are published on an almost daily basis by academics, governments, think tanks, not-for-profits and the corporate sector. The viewpoints expressed by researchers reflect the competing theoretical perspectives, be that economic, political or sociological, or are presented by commentators who enjoy engaging in controversial debate. As a consequence, there are a number of very different conclusions being presented in the literature.

In reviewing the literature around the future of work, we have chosen the 2013 report by Frey and Osborne as a starting point. This report had a significant impact on subsequent research. Frey and Osborne were not the first to research the future of work, and the literature reviews in many of the reports that we reviewed clearly indicate this, however the work of Frey and

2. Quality work is defined as 'the extent to which a set of job attributes contributes to, or detracts from, workers' wellbeing in their work and non-work domains' (Burgess, Connell and Dockery, 2013, *Quality of Work Research Project Report*, Curtin University).

Osborne has underpinned a number of influential reports, both internationally and within Australia since its release.

Frey and Osborne's work was influential because they were the first researchers to attempt to quantify the impact of technology across a wide range of industries and occupations within a specific country (United States of America) using predictive modelling. Their modelling showed that as many as 47 per cent of jobs within the US were at risk of disappearing due to the impact of automation.

Their methodology produced what is now considered to be a significant overestimate of the impact by assuming that all specific occupations were the same. As is now being shown, occupations actually consist of tasks. The grouping of tasks within an occupation can be very different. As a result, occupations are quite differentially susceptible to computerisation (alphaBeta, 2017; Arntz et al., 2016). Arntz et al. (2016) used different data sets which examined work at a task level to model the impact of automation. Their modelling showed that for the US, only about nine per cent of jobs would be at risk.

In Australia, regression modelling of occupational change has been undertaken by Data61 (Khan, Rudd, and Reeson, 2016) to explore the impact of computers on employment growth. This modelling found that only in the most highest skilled occupations was employment growth associated with computer use. Stanley, Doucouliagos, and Steel (2018) used regression analysis to examine the impact of information and communication technology (ICT) on economic growth. They found that while some forms of ICT have contributed to economic growth (landlines and mobile phones, and computer technology), internet access has had little impact on economic growth and therefore job creation. This finding supports earlier modelling by Khan, Rudd, and Reeson (2016).

The Foundation for Young Australians (FYA) has undertaken a significant body of research into the implications of the changing world of work for young Australians. Their analysis predicts that for young people in Australia, automation is expected to 'radically affect 70% of entry level jobs' (FYA, 2017b). Using analysis of the Longitudinal Survey of Australian Youth (LSAY) data, FYA (2018) highlighted that unemployment and underemployment are significant issues for people aged between 15 and 25 years despite rising education levels, with almost a third of this cohort being either unemployed or underemployed.

The Bankwest Curtin Economics Centre (Cassells et al., 2018) uses a range of data sources including the Australian Bureau of Statistics (ABS) to identify changing patterns of employment within Australia. They found a significant increase in part-time work since the 1970s, doubling from 15 per cent to 31 per cent in 2018. There has also been slight recent growth in the independent or contract workforce (from 11 per cent in 2014 to 11.6 per cent in 2016), especially for people in the middle of their working lives (aged 35 to 44 years). Job precariousness is another area which was investigated using data from the Household Income and Labour Dynamics in Australia (HILDA) survey. While precarious employment had increased for both men and women, they found it was men who had been the most affected. The findings from the Bankwest Curtin Economics Centre study are contested by other research (The Melbourne Institute of Applied Economic and Social Research, 2018).

Another framework used to identify drivers impacting on employment and work both internationally and in Australia has been scenario modelling based on identification of megatrends³.

3. Megatrends are significant shifts in environmental, economic and social conditions both within a country and globally that will play out over time. The indicative time period is usually 20 years (Hajkowicz, Cook and Littleboy, 2012).

Management consultancy firm McKinsey & Company used scenario modelling to attempt to predict the impact of technology on jobs (Manyika et al., 2017). Unlike both Frey and Osborne and the Organisation for Economic Co-operation and Development (OECD), McKinsey not only look at the jobs that could potentially be lost, they also consider the potential for job creation. They postulate that under their midpoint scenario, globally 400 million workers could be displaced. At the same time, they identify seven catalysts which they consider will create between 555 million and 890 million full-time equivalent (FTE) jobs. These catalysts are:

- rising incomes
- health care for ageing populations
- investment in infrastructure
- investment in buildings
- investment in energy
- technology development
- market for previously unpaid work (pg. vii).

The World Economic Forum (WEF) (World Economic Forum and The Boston Consulting Group, 2018) has also used scenarios to model the future of work. In developing the scenarios, they chose three core variables – the rate of technological change and its impact on business models; the evolution of learning among the current and future workforce; and the magnitude of talent mobility across geographies. These three variables are somewhat reflective of the drivers we have identified.

With regard to other variables, the WEF considers that:

No single actor – a government, business, individual, educational institution or union, among others – can decisively impact all of the variables, or indeed any single one of them ... through collaboration they can seek to manage the changes underway already and influence the future, taking action in the direction they desire (pg. 1).

In each of the scenarios, a view of the impact that the rate of uptake of education and skill development can have on economies is provided, and the challenges and opportunities for policy makers is presented.

In Australia, the CSIRO (Hajkowicz, Cook and Littleboy, 2012; Hajkowicz et al., 2016; Reeson, Mason and Sanderson, 2017) has used scenario modelling to identify megatrends impacting on the Australian workforce over the coming decades. The Queensland Department of Innovation, Tourism, Industry Development and the Commonwealth Games has worked with the CSIRO to examine the forces that are changing Queensland's economy over the next 20 years (Hajkowicz et al., 2018). They found that while there is potential for significant job change by 2036, Queensland also has the opportunity to create more jobs than it may lose. To do this we need to be proactive in identifying and taking advantage of future opportunities. This is a sentiment that is echoed at national level (ISA, 2017; Australian Centre for Robotic Vision, 2018).



section one

TECHNOLOGY IMPACTS

One area in which there is consensus across the literature is that advances in technology will impact the workforce of the future. The application of new technologies to the production and distribution of goods and service has the potential to fundamentally change the way work is organised and the quantity, quality and skill requirements of jobs. The impact of new technologies on work depends on the interplay between market forces, cultural and societal expectations and norms, and regulatory frameworks and policy.

New technology such as artificial intelligence (AI), big data, augmented and virtual reality, the internet of things (IoT), robotics, computer assisted design (CAD), drones and new materials technologies is already impacting how and where people work.

Some of the most visible changes to work precipitated by new technologies include:

- teleworkers/digital nomads/remote work teams
- call centre workers
- expansion of the gig and tasked-based employment model
- the rise of computer mediated work
- web-based employment platforms such as Airtasker.

These are in addition to the economic transition, already evident as evolving industry composition, occurring as a result of globalisation, changing consumer demands and falling labour productivity (AiG, 2016a; Becker, Bradley, and Smidt, 2015; CSIRO Futures, 2016; Chartered Accountants Australia & New Zealand, 2016; Allen and Berg, 2014). Industry 4.0, a term that initially described the changes driven by automation in the manufacturing supply chain, is increasingly being used more broadly to describe similar changes in other industries (Cassells et al., 2018).

What the literature says

Change as a result of technology is not new.

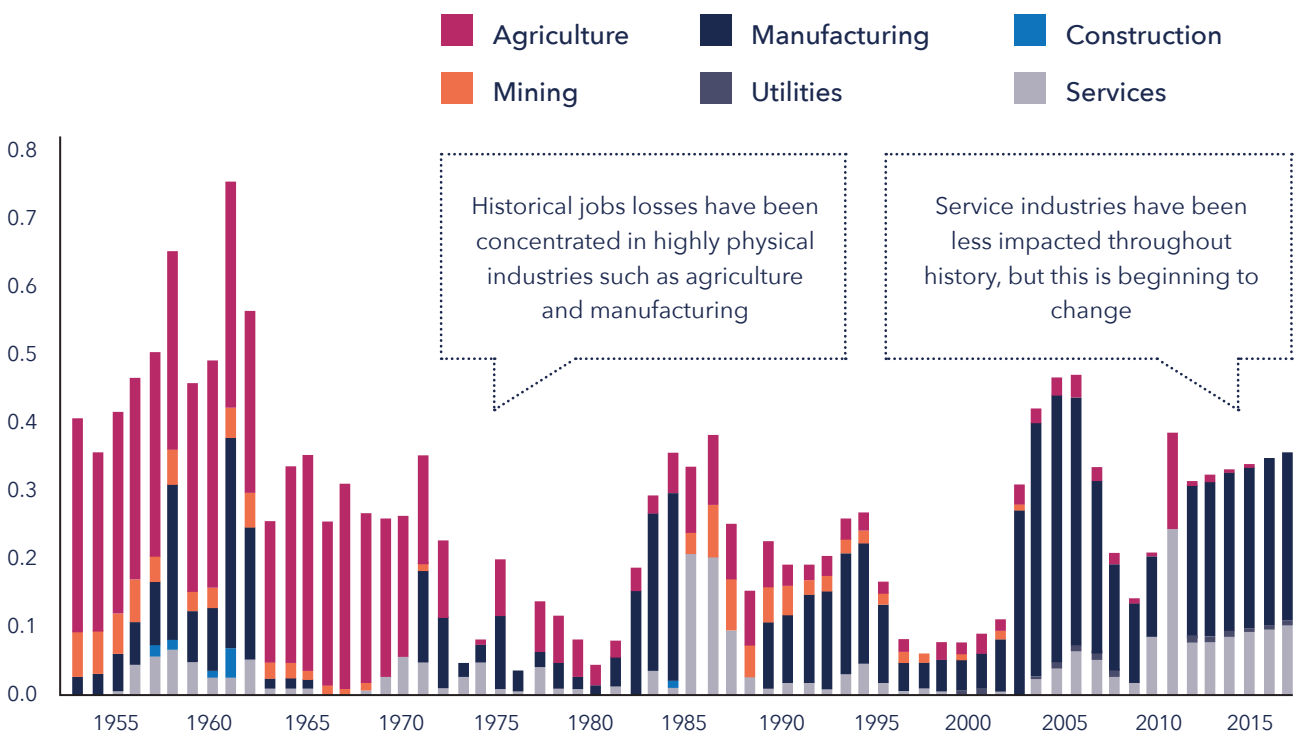
Is this time different? The answer is 'yes' ... and 'no'. The literature is polarised - either overly pessimistic or optimistic. Opinions range from a dystopian world with massive technological unemployment to a utopia where there is unlimited leisure time as technology will have fulfilled all the roles previously undertaken by humans (Furman, 2016).

Forecasts of mass unemployment due to technology have made since the early 1900s (Eslake, 2017; Atkinson, 2016). Eslake argues that just because a job or task can be automated doesn't mean that it will be. He cites a number of factors that impact on such a decision:

- large upfront costs
- legal and regulatory risks
- customer sentiment.

Wichmann (2018) says yes, the world is changing but no more rapidly than it has in the past. This view is shared by several authors including Roos and Shroff, 2017; alphaβeta, 2017; Furman, 2016; and Williamson et al., 2015. Figure 2 maps over time the impact of automation on industries within the US (alphaβeta, 2017, pg. 14). What is evident in this chart is that while the magnitude of the impact is no greater than previous waves of automation, the industries that are being impacted are changing.

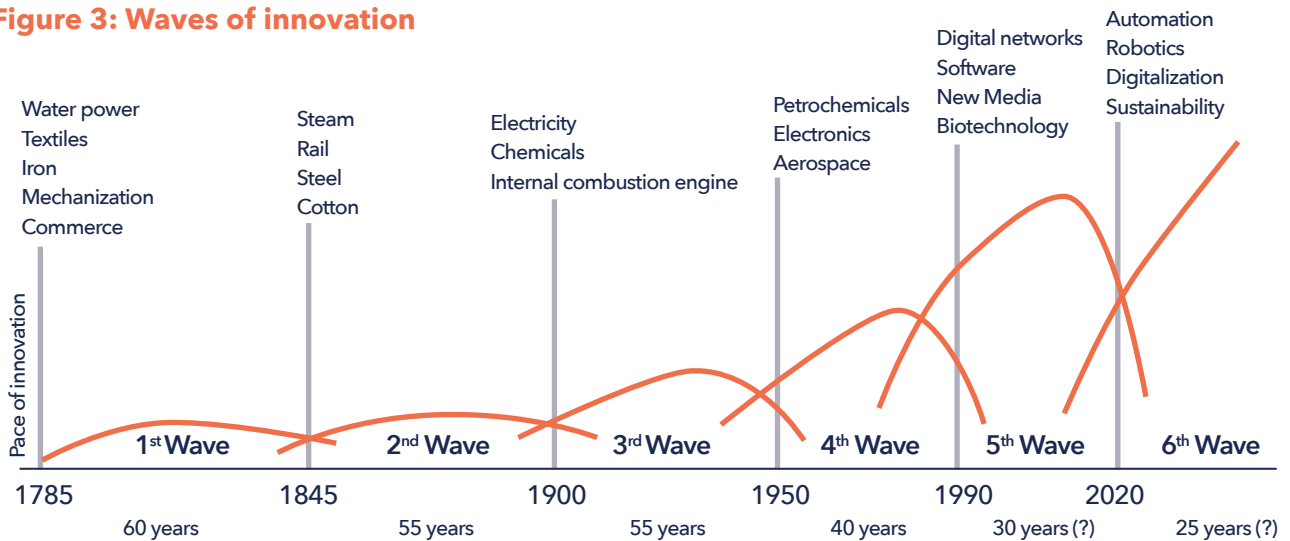
Figure 2: US Job losses due to productivity improvement by sector



Note: 2011 onwards based on the linear trend for each industry since 1990
 Source: alphaβeta, 2017, pg. 16.

Others don't agree. According to Rodrigue (2017), the length of time taken for each successive wave of innovation has been decreasing and the impact has been increasing (Figure 3).

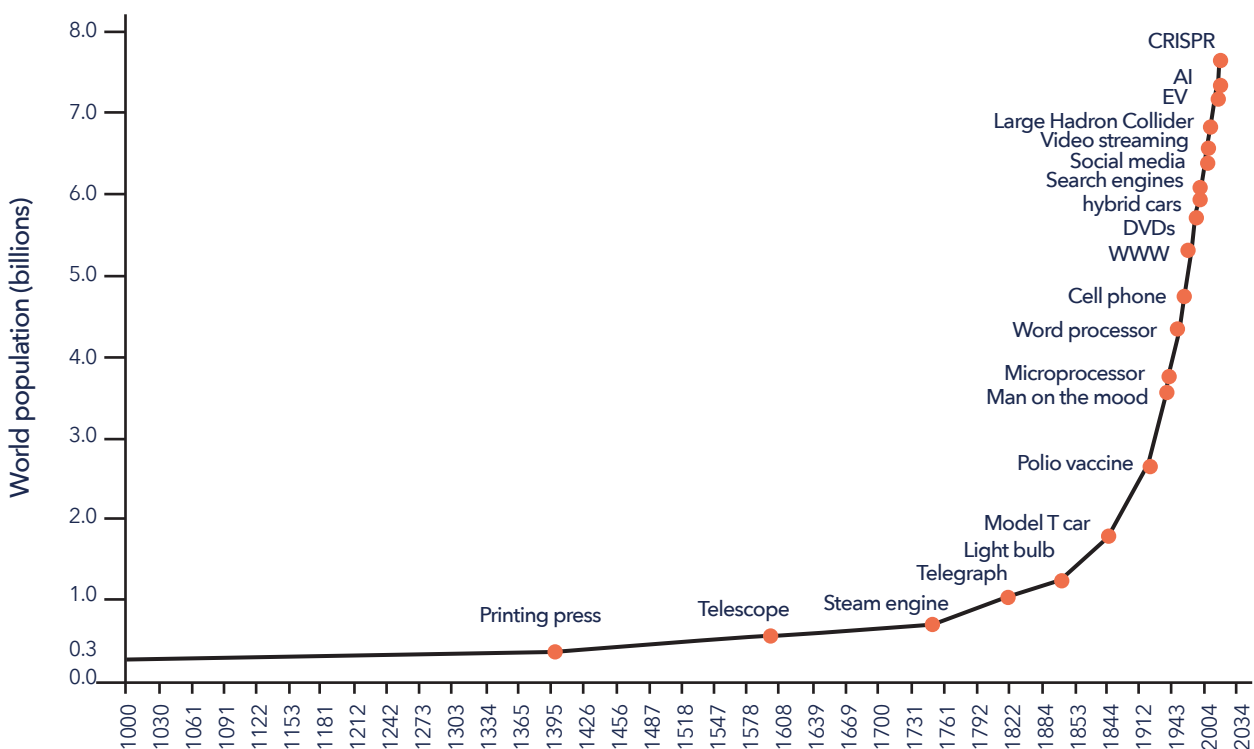
Figure 3: Waves of innovation



Source: Rodrigue, 2017.

One other notable change is the proliferation of new technologies that are entering use. Since the beginning of the 20th century, there has been a rapid increase in the introduction of new technologies (Figure 4). Many of these technologies are yet to become commonplace (e.g. hybrid cars) and others have already been superseded (DVDs). Some are still in evolution (electric vehicles; AI; and clustered regularly interspaced short palindromic repeats [CRISPR] technology). Others like the Large Hadron Collider are specialist technologies which are unlikely to be replicated.

Figure 4: Technology change and world population since 1000AD



Source: BoA Merrill Lynch Global Investment Strategy, Global Financial Data, Haver, based on Fogel (1999, pg. 2.).

At the same time, the global population has almost quadrupled (Figure 4; Goldin, 2016). The scope of change is different. In the past, technological change has seen the replacement of physical tasks rather than intellectual tasks. That is, machines replaced tasks that people did with their hands rather than their heads (Carney, 2018; Lawlor and Tovey, 2011). The development of AI and machine learning (ML) has the potential to change that (Carney, 2018; Petropoulos, 2018) as these technologies encroach into domains that have traditionally been considered uniquely 'human' (Arntz et al., 2016). Arntz et al. (2016) argue that there are a number of factors that impact the rate of change, such as legal and ethical obstacles, economic considerations as well as societal views and responses to the technology and its use.

If we look at the history of technological adoption, it is possible to see a pattern of uptake and impact on jobs and industries. Initial uptake of technology is slow. This is for a number of reasons, some of which are related to the technology itself, others to society and demography, and the legal and policy institutions that underpin it (Williamson et al., 2015; Pratt, 2015).

For example, the technology may be either too expensive or too experimental and outputs are not predictable. As the costs decrease and the quality of outputs improve, productivity rises and uptake increases. This increases the impact of the technology on society. The impacts are felt initially locally as the technology is adopted by one or two enterprises and any job losses are easily absorbed locally. As the adoption of the new technology spreads across an industry and/or across regions, impacts are felt more widely and, in the short term, more deeply. Often regions are not able to absorb the resulting job losses and reskilling demands that are needed to transition displaced workers to new jobs and different industries. (Jobs Queensland, 2018c, 2018d; Edmonds and Bradley, 2015; Williamson et al., 2015).

While technology has the power to shape society and its institutions, similarly society also shapes technology often in ways that are not immediately obvious. Uptake and impacts across industries, occupations and regions is rarely even, influenced by a number of factors such as:

- geography
- demography
- people's willingness to engage with the technology
- the skills base of the available labour force
- economic and financial considerations at both an enterprise level and more broadly
- government policies (Williamson et al, 2015).

Roos and Shroff (2017) identified three views around the impact of technology on work in the future:

1. Jobs will be eliminated.

Historically we have seen jobs eliminated within sections of the agriculture and manufacturing industries of developed countries⁴, including Australia (Figure 1). This is referred to in the literature as 'creative destruction' (Schumpeter, 1942). What is new is the potential for digital technologies to impact all industries. The impact is expected to be felt most in the services sectors (Roos and Shroff, 2017; alphaBeta, 2017).

Roos (2017) argues that the degree of complexity across a nation's economy will influence the impact technology has. Countries with high-cost labour will be the first to be affected due

4. It is important to note that technology has not been the only driver here - in some cases the shifting of labour costs from high-wage economies to low-wage economies and offshoring has also been a significant driver.

to the cost benefit of replacing labour with technology. However there are factors which will slow down or impede the adoption of technology. Some sectors may traditionally be slow or poor users of technology, or the rate of development of a given technology may outpace the full utilisation of the technology and, as a result, business may be reluctant to invest (Roos and Shroff, 2017).

2. Jobs will be transformed.

The second view supports recent research that technology is most likely to replace tasks within jobs rather than whole jobs themselves (alphaβeta, 2017; Bakhshi et al., 2017; OECD, 2017).

Downey (2016) argues that automation reduces task complexity enabling a less skilled worker to do the job. He hypothesises that jobs can only be partially automated as the technology requires some level of human oversight. Because routine tasks are concentrated within jobs in the middle skilled range, this has led to job polarisation.

The extent to which jobs will be transformed can be influenced by the extent to which society values the job (Pratt, 2015). The value of human-to-human services will be one area of influence.

3. Jobs will be displaced.

The displacement of jobs argument focuses on 'contingent work arrangements' where parts of jobs are outsourced by organisations. In this view, the tasks that can most effectively be done by humans will be undertaken by employees while contingent labour or digital platforms are used for all other tasks within a job.

Organisations may use such work arrangements for three reasons – short-run fluctuations in work volume; managing labour costs when needing to acquire specialised skills; and managing pressures associated with short-term performance and efficiencies (Roos and Shroff, 2017).

No agreement on impact on number of jobs

Table 1 (Winick, 2018) illustrates the complexity and lack of agreement in quantifying the impact of technology on jobs. Most predictions are about the number of jobs that could potentially be lost. Figures vary greatly from 1.8 million jobs lost worldwide by 2020 to two billion by 2030. There has been less focus on predicting potential jobs growth. On the jobs creation side, predictions are more modest with McKinsey being the most optimistic (up to 890 million new jobs by 2030) amongst commentators.

Table 1: Predicted number of jobs that automation will destroy/create

When	Where	Jobs destroyed	Jobs created	Predictor
2016	Worldwide		900,000-1,500,000	MetraMartech
2018	US	13,852,530*	30,078,340*	Forrester
2020	Worldwide		1,000,000-2,000,000	MetraMartech
2020	Worldwide	1,800,000	2,300,000	Gartner
2020	Sampling of 15 countries	7,100,000	2,000,000	World Economic Forum (WEF)
2021	Worldwide		1,900,000-3,500,00	International Federation of Robotics
2021	US	9,108,900*		Forrester
2022	Worldwide	1,000,000,000		Thomas Frey
2025	US	24,186,240*	13,604,760*	Forrester
2025	US	3,000,000		ScienceAlert
2027	US	24,700,000	14,900,000	Forrester
2030	Worldwide	2,000,000,000		Thomas Frey
2030	Worldwide	400,000,000-800,000,000	555,000,000-890,000,000	McKinsey
2030	US	58,164,320*		PwC
2035	US	80,000,000		Bank of England
2035	UK	15,000,000		Bank of England
No date	US	13,594,320*		OECD
No date	UK	13,700,000		IPPR

*extrapolation based on percentage of jobs lost or gained in the report
Source: Winick, 2018.

Other than Frey and Osborne (2013), there are only a few other reports that have modelled the impact of technology on jobs. The OECD has taken a task-based approach to modelling the impact of technology, arguing that 'occupations usually consist of performing a bundle of tasks not all of which may be easily automatable' (Arntz et al., 2016). Their modelling predicts that overall the share of jobs at risk of automation in the US is nine per cent. The risk varies, however, from country to country and may be influenced by differing policies, institutions and workplace organisation (Arntz et al., 2016; Nedelkoska and Quintini, 2018).

NESTA (Bakhshi et al., 2017) has used a mixed method approach to analyse the impact of technology. They look at job features such as cognitive skills and systems skills, knowledge and capabilities to explore what this means for the future of work. Their findings suggest that for approximately 70 per cent of occupations, job redesign together with workforce retraining has the potential to promote growth. Because Osborne is a contributing author, the report has additional significance as it represents revised outcomes based on a variation of the original modelling.

Using trend analysis, Accenture (2016) predicts that 25 per cent of the global economy will be digital by 2020. This will require a 'cultural rethink' for organisations and the way they work. Unlike other modellers, Accenture focuses on a positive future for workers, 'where technology

empowers people to evolve, adapt and drive change' (pg. 12). McKinsey (Blackburn, Freeland and Gartner, 2017) expects that by 2020 there will be 30 billion connected 'things' (people or assets) worldwide (pg. 6).

There is limited Australian data available on the predicted impact of technology on jobs. The 2015 report from the Australian Council of Learned Academies (ACOLA) (Williamson et al., 2015) examined evidence from across a wide range of fields with the aim of understanding the role of technology in Australia and to provide guidance to government and industry for the future. Among the findings in the report, three in particular highlight the complexity of predicting the impact of technology on the future of work:

- it is difficult to determine the impacts of technologies
- technologies mean different things to different people
- technologies can be understood in multiple ways (pg. 16).

The Office of the Chief Economist (Edmonds and Bradley, 2015) predicted that around 44 per cent of Australian jobs were at risk of automation by 2030. Their work drew on the work of Frey and Osborne and uses Australian data to consider which occupations and industries are susceptible to automation.

The CSIRO (CSIRO Futures, 2016) through its 'digital DNA' scenario predicted that 'almost half of all Australian jobs' would be displaced by 2030. This estimate is in line with the work of ACOLA (Williamson et al., 2015) which is based on Frey and Osborne's 2013 modelling. While some workers would be able to upskill/reskill or be 'repurposed', others would leave the labour force altogether (pg. 18). Recent work by the CSIRO has predicted that as many as 868,000 jobs could be at risk of substantial change in Queensland by 2036. Their modelling also predicts that 1,000,000 new jobs could also be created in the same timeframe (Hajkowicz et al., 2018).

alphaBeta, an Australian consultancy firm, partnered with Google to analyse changes in the composition of jobs in Australia over 15 years. Their 2017 report concluded that technology has the potential to increase the amount of time workers can spend on tasks that are 'uniquely human' and boost the Australian economy by up to \$2.2 trillion by 2030 (alphaBeta, 2017).

Australians and the uptake of technology

Technology is a key enabler of globalisation and productivity improvements (Australian Centre for Robotic Vision, 2018). To compete in global supply chains, businesses need to adopt the latest technological processes and production methods. Australians like to think that they are early adopters of technology and this may be true for personal devices such as smartphones. According to the OECD, in 2016 Australia was ranked third globally for its rate of mobile penetration. As well, over 80 per cent of Australians had access to a computer at home (OECD, 2018c).

At the industry level, Australia leads the world in the use of autonomous vehicles with the largest fleet of autonomous vehicles in action in the Pilbara in Western Australia (Australian Centre for Robotic Vision, 2018). The adoption of drone technology for recreational use is driving changes to knowledge and skill requirements as well as regulation. The Civil Aviation Safety Authority (CASA) introduced legislation in late 2017 to regulate the flying of 'unmanned aircraft' (Australian Government, 2017, October 17).

However overall take-up is not so positive. Australia lags well behind other developed nations in automation with less than 10 per cent of Australian listed companies engaging in automation to 2015 (alphaBeta, 2017). The Australian Computer Society (ACS) (Deloitte Access Economics, 2018a), in its annual report, described Australia's digital performance over the five years to 2018 as 'almost no relative improvement' (pg. 3). There have been some gains - a more than 60 per

cent increase in the export of ICT services and a growth in the workforce of 6.3 per cent from the previous year. If Australia (and therefore Queensland) is to participate in global supply chains, businesses are going to need to improve their rate of adoption of technology (Deloitte Access Economics, 2018a).

Uptake of technology in Australia is not evenly distributed (ISA, 2017; Australian Centre for Robotic Vision, 2018) with some industries having embraced digital technology and automation for over 50 years (manufacturing) and other leading the world in the use of autonomous vehicles (mining). Other industries, especially those in the services sector, are still 'exploring' or 'experimenting' (Australian Centre for Robotic Vision, 2018, pg. 31). At the individual firm level, it has been contended that the impacts will vary depending on a range of factors such as the size of the firm; its stage of development; capability and capacity to innovate; and the purpose for which the technology was introduced (Seet et al., 2018).

The productivity paradox

Previously new technologies (steam power, electricity, etc.) have been shown to improve productivity (Brynjolfsson and McAfee, 2014; Edmonds and Bradley, 2015). Yet the global economy to date has not shown significant productivity growth with the uptake of new technologies such as robotics, AI, big data, etc. (OECD, 2018d). Two reasons have been postulated for this:

1. there is a lag between when a technology is introduced and when the impact on productivity is felt; or
2. the inability of current productivity measures to account for machine productivity as opposed to human productivity (Sanjeev, Kamat, Prakash and Weldon, 2017).

Weir (2018), in looking at the impacts at enterprise level, put forward that the uneven take-up of new technologies across economies is a contributing factor to the lack of productivity improvement. While early adopters have experienced productivity growth, those enterprises that have been slow to take advantage of new technologies are facing increasing productivity slowing. Weir's work drew upon an OECD study (2015b) on the diffusion of technology between firms and the rising gap in productivity growth between 'globally advanced', 'nationally advanced' and 'laggard' firms. The OECD also identified important differences between firms within countries, with SMEs lagging, and that consequently there is a large gap between what can be automated from a technical point of view (and by leading innovative firms) and what is actually being automated by the average firm (OECD, 2018d).

According to McKinsey (Blackburn et al., 2017) Australia's multifactor productivity has fallen by almost ten per cent since 2005. Currently Australia's productivity growth has been below what is needed to sustain economic growth (alphaBeta, 2018). CAANZ (Chartered Accountants Australian & New Zealand, 2016) estimate that Australia will need an annual labour productivity growth of almost three per cent to maintain the GDP growth experienced between 2001 and 2013.

Roos and Shroff (2017) described the different impacts of technology on jobs (displacement, transformation and/or creation). Carney (2018) focuses on the impact of technology on productivity and described the impact as three major effects which have differing speeds:

1. The destruction effect sees the replacement of labour by technology (this aligns to Roos and Shroff, 2017). This usually occurs at the commencement of the change cycle.
2. The productivity effect is the result of increased demand driven by increased supply. This effect takes time to filter through the economy. In the medium term there is a reduction in the number of jobs and in labour's share of income.

3. The creation effect aligns to the third view presented by Roos and Shroff (2017). Technological change leads to the creation of new jobs which, when combined with the productivity effect, counterbalances the destruction effect, resulting in increased productivity and boosting wages (Figure 5).

Figure 5: Three effects of technology and productivity



Source: Carney, 2018.

Likely all jobs will be impacted, some highly, others minimally

All occupations are susceptible to some form of digital disruption. Modelling by various organisations (alphaBeta, 2017; Bakhshi et al., 2017; Arntz et al., 2016; CSIRO Futures, 2016) which looks at the tasks involved in a range of occupations has shown that the impact of technology can be greater for some occupations than others. The degree to which a job may be changed will depend on a number of factors, of which the impact of digital technologies is one.

The impact of digital technologies will be driven or constrained by the degree to which tasks within a particular job can be automated. If the job contains a high number of tasks that can be automated, it is more likely the job is to be impacted by automation. However automation currently tends to only replace those tasks within a job that are routine, easily codifiable and predictable (Bakhshi et al., 2017; Roos and Shroff, 2017).

Chalmers and Quigley (2017) describe the impact of technology as being either labour-saving or labour-linking. Labour-saving technology is technology which replaces slower, less efficient labour with faster and more efficient technology. This can happen at the occupational level, e.g. the horse-drawn plough being replaced by the mechanical plough, or at a task level, e.g. handwritten letters by the typewriter (this technology has now been replaced by laptops and tablets and electronic communications).

Labour-linking technology has seen the rise of digitally enabled employment platforms such as Airtasker, Sidekicker, Uber and Airbnb. For some analysts, these platforms enable the utilisation of dormant economic assets, adding value to the Australian economy (Allen and Berg, 2014). These platforms are providing alternate faster means of connecting labour supply and demand. The impact of the rise of digitally enabled employment models is examined in greater depth in Section 3.

Recent research in Australia (Seet et al., 2018) examined the relationship between disruptive technologies and the demand for skills within organisations and identified two different patterns of disruption:

- elimination of the number, and in some instances, the need for particular jobs; and
- expansion of the scope of tasks in existing jobs (pg. 26).

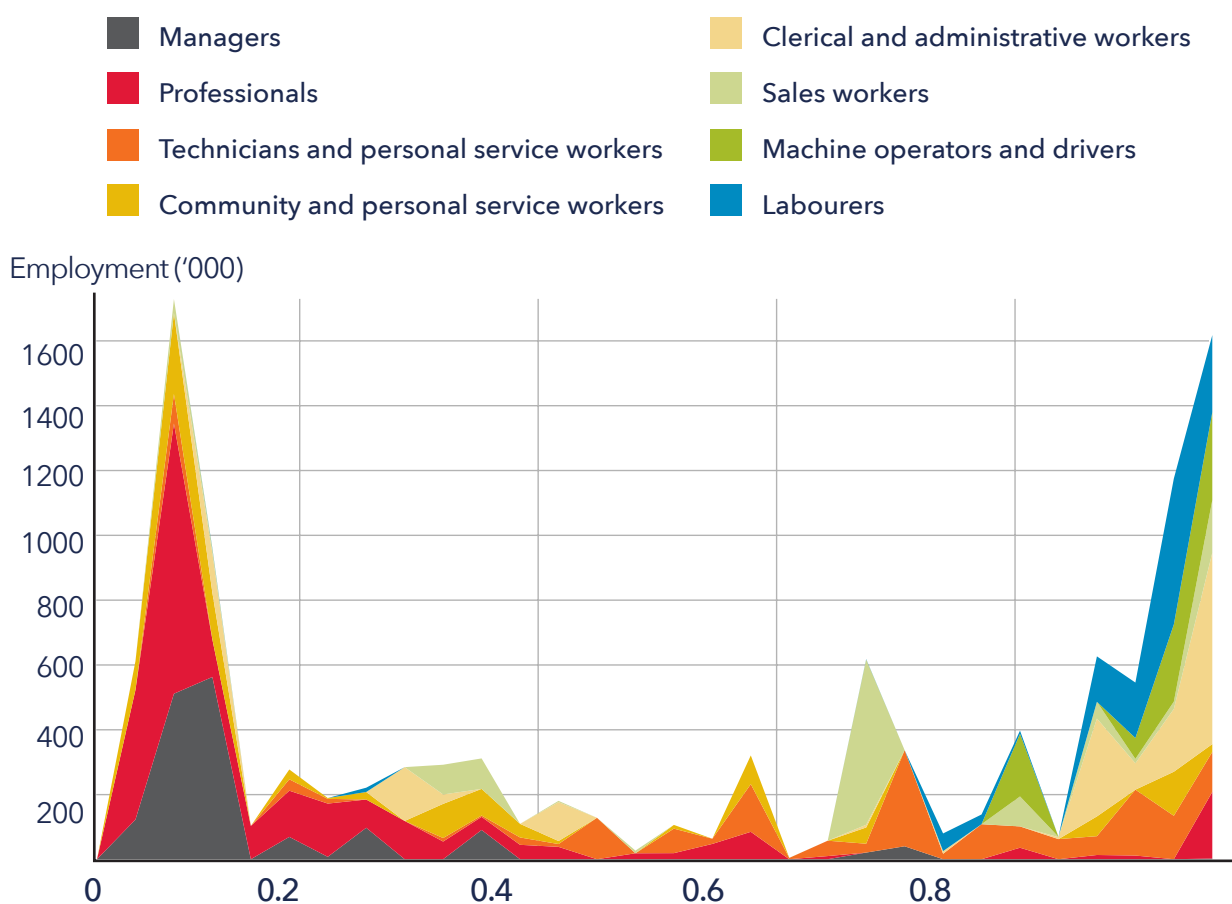
Seet et al. (2018) found that while there was acknowledgement that disruptive technologies could have a significant impact on jobs, there appeared to be few concerns around large-scale

job losses. Instead, technology was being used to eliminate risky and dangerous job roles and/or to fill identified workforce gaps.

Impacts for employment

'Job polarisation' is a term that is used to describe the impact of computerisation on employment where many routine and easily codifiable tasks have been able to be undertaken by computers. This has led to a decrease in the number of jobs in occupations such as sales, retail, production and administration (Autor 2015; Williamson, et al., 2015; Frey and Osborne 2013). These jobs are considered to be 'middle income, middle skilled' roles (hence the reference to 'hollowing out of the middle') (Figure 6). At the same time, there has been growth in jobs at either end of the jobs/income spectrum. This creates a u-shaped employment profile (Autor, 2015).

Figure 6: Distribution of job categories against probability of computerisation



Note: This is the Australian equivalent of Figure 3 on page 37 in Frey and Osborne.
Source: Durrant-Whyte et al., 2015.

Both the work by Frey and Osborne (2013) – who used O*NET⁵ data – and subsequent modelling (Nedelkoska and Quintini, 2018; Durrant-Whyte, McCalman, O’Callaghan, Reid, and Steinberg, 2015) suggest that middle income, middle skilled jobs – the job roles traditionally held by white males – are most likely to be impacted by automation.

5. O*NET is the Occupational Information Network - a database that contains hundreds of standardised and occupation-specific descriptors on almost 1,000 occupations within the U.S. economy. It was developed under the sponsorship of the US Department of Labor/Employment and Training Administration.

Within Australia, this pattern of job polarisation is contested (Department of Jobs and Small Business, 2018b). Research undertaken by Coelli and Borland (2015) examined Australian employment data for the five years to 2011 and found a similar pattern of polarisation emerging in Australia.

This is in contrast to findings by the Bankwest Curtin Economic Centre (Cassells et al., 2018). Using data from 2006 to 2016, Cassells et al. (2018) show that the impact of technology has been mostly on low- and middle-skilled occupations and that women have been most impacted, with growth of almost 3.5 percentage points in high-skilled employment, and a decline of 2.6 percentage points in low-skilled employment. Australia's higher levels of education (OECD, 2018a) may contribute to the differing profile.

Modelling by Durrant-Whyte, et al. (2015) predicts a pattern of job polarisation for Australia (Figure 6). This is in line with work undertaken by Edmonds and Bradley (2015) who used the same modelling methodology as Frey and Osborne. They found however that at the lower end of susceptibility to computerisation, Australia has a lower proportion of jobs (32.7 per cent in Australia versus 37.7 per cent in the U.S.).

Technological change and the uncertainty about its implications for the future of workers adds further complexity to the concerns around inequality and wage growth. Technology impacts not just the types of jobs demanded by the labour market, but also the relative incomes of these jobs. This change in labour market demand has the potential to accelerate existing inequalities through job and/or wage polarisation (Hajkowicz et al., 2016).

Autor (2015) believes that the main issue is not so much about determining the extent of job polarisation, but rather understanding its influence or implications for wage polarisation or wage inequality more broadly. Recent research has shown evidence of a squeeze on the middle class, as the distribution of income has shifted towards the higher and lower ends of the scale (Bakhshi et al., 2017; Autor, 2015). It is important to note that Australia (along with Canada and Sweden) has been identified as an exception to this global trend (Dabla-Norris, Kochhar, Suphaphiphat, Ricka, and Tsounta, 2015).

The link between skills and job polarisation is difficult to define. Certainly in Australia, the transition to a services-based economy is driving the demand for highly skilled workers (Department of Jobs and Small Business, 2018b). The occupations predicted to show the most growth are high skilled roles such as Professionals (doctors, nurses, allied health, engineers, etc.) and managers as well as low skilled roles such as Personal carers (Jobs Queensland, 2018b; Shah and Dixon, 2018; Department of Jobs and Small Business, 2018a).

Have the skills required for these roles changed and become increasingly complex? We don't know as there has been limited credible research undertaken in this area. We do know that increasingly employers are demanding workers (new and existing) hold qualifications for these roles (SkillsIQ, 2017). This had led to concern around over-qualification and skills underutilisation with Australia having one of the highest levels of skills mismatch in the OECD (OECD, 2018a). Jennifer Westacott (BCA, 2016) has expressed concern about the impact of "creeping credentialisation" on Australian jobs and the labour force more broadly.

Tradition entry-level roles disappearing

It has been reported that traditional entry-level roles are disappearing (Jobs Queensland, 2017b, 2018a). Certainly youth unemployment has risen and is proving to be a 'wicked' problem for governments to resolve (Carvalho, 2016). There is increased competition for lower skilled/entry-level jobs⁶ with as many as 20 applicants for each job (Anglicare Australia, 2017; Department of Employment, n.d.). At the same time the number of entry-level jobs available has declined

6. Lower skilled/entry-level jobs are classified by the ABS as those at skill level 5 or 6 in the Australian and New Zealand System of Classification of Occupations (ANZSCO).

by as much as 50 per cent since 2006 (Bowman and Azpitarte, 2017) and these jobs only make up just 15 per cent of the jobs market (Anglicare Australia, 2017). Competitors for these jobs often include vocational education and training (VET) and higher education graduates as well as young people straight from school (Bowman and van Kooy, 2016). Increasingly, entry-level jobs are appearing in the 'caring industries', that is in health and community services. These industries are predicted to grow by over three per cent by 2022 (McKinsey & Company, alphaBeta and Macquarie Group Foundation, 2018).

Technology is also impacting entry-level roles for higher education graduates. The deputy president of the Queensland Law Society said that as firms embraced computerisation the proportion of graduates in the industry had dropped from 50 per cent to 20 per cent. Furthermore this is leading to a shortage of experienced lawyers to supervise new graduates (Professor Margaret Thornton cited in Kane, 2018).

New entry-level roles requiring higher level skills appearing

It is predicted that between 2016 and 2020, of the almost one million new jobs that will be created, almost half of them will require a bachelor degree or higher. VET qualifications will be needed for a further 44 per cent (Australian Government Department of Employment, 2016, cited in Torii and O'Connell, 2017). It is perhaps worth noting that not all these new jobs will be entry-level jobs. At an occupational level, both professionals (skill level 1) and managers (skill level 1 or 2) are predicted to see the most growth to 2022 (Shah and Dixon, 2018). The majority of growth will be at skill level 1 which requires a bachelor or higher qualification (Department of Jobs and Small Business, n.d.). Jobs Queensland (2018b) finds a similar pattern in Queensland to 2022, and predicts that the number of workers without post-school qualifications will fall by between one and 2.6 per cent between 2017 and 2022.

Analysis of 2016-17 employment data has shown that, for the majority of people who found employment, over 50 per cent of positions were either part-time and/or casual (ACOSS and Jobs Australia, 2018).

According to the Business Council of Australia (BCA) (2017), a qualification based solely on technical knowledge and skills will not be enough to gain entry to the workforce. The WEF, 2016, (cited in BCA, 2017) found that the skills required for most occupations in 2020 will not be the skills currently required. There has been little empirical research into what are the 'new' entry-level roles or how entry-level roles are changing and the skills that are required for them. Research by the National Centre for Vocational Education Research (NCVER) (Seet et al., 2018) found that, in relation to digital skills, employers may have difficulty articulating what it is they require in a job. This may lead to a mismatch between employer expectations and the applicant's skills and knowledge (Select Committee on the Future of Work and Workers, 2018; OECD, 2018c; SkillsIQ, 2017).

Impacts on health and safety issues

An alphaBeta (2017) report looked at the impact of technology on health and safety and concludes that the impacts have been largely positive, with many high-risk repetitive tasks being able to be taken on by technology enabling workers up to undertake more creative 'human' tasks. Furthermore, the introduction of labour-saving technology will potentially improve job satisfaction and work-life balance for workers by freeing up an additional two hours per week to undertake tasks that are intellectually more satisfying. This is supported by the findings of a qualitative report by NCVER (Seet et al., 2018) which explored through industry interviews, the relationship between technology and skills demand. It found that where there had been a reduced need for certain job roles, these roles had largely been risky or difficult.

Key findings

Areas of consensus in the literature

- Change is not new – what is new is who will be impacted and the extent of the impact.
 - The demographic that is being impacted is different, with the impact most likely to be felt by ‘white collar’ workers with post-secondary school education qualifications such as diplomas and undergraduate degrees.
- There is growing consensus that the impact on jobs will be largely at task level.
 - While there is potential for some jobs to disappear, it is more likely that jobs will change; some so substantially that they will no longer be recognisable, others minimally.
 - At the same time, new jobs will be created which may require new skills that have not yet been identified.
- Participation in lifelong learning will be key as technology changes jobs and workplaces.
 - Workers will need to redevelop skills and attributes throughout their lifespan to remain in the labour force.

Areas of contention in the literature

- The extent and speed of the impact of new technologies such as artificial intelligence (AI) and machine learning (ML) on work and workplaces.
 - The extent of impact is contested with some authors arguing that all industries and all jobs and all sectors of the workforce will be impacted. Others argue that the impacts will vary due to a number of factors relevant to the country being impacted.
 - Some authors contend that the speed of change is faster than ever before while others disagree.
- The impact and the extent of impact of new technologies on employment and productivity both in the short-, medium- and longer-term.



Challenges and questions for consideration

- How do we identify and prepare for change associated with the impact of new technologies?
- What will government, industries, employers and workers need to prepare for and adapt to this change?
- What is the role of government in relation to the adoption/uptake of technology?
 - Accelerate, regulate or non-intervention?



section two

DEMOGRAPHIC AND SOCIAL CHANGES

In addition to technological advancement, demographic and social changes are also cause and consequence of changes to the substantive content of work and work arrangements. The interplay between these changes has the potential to create a 'perfect storm', presenting new and potentially amplifying existing opportunities and challenges for Queenslanders.

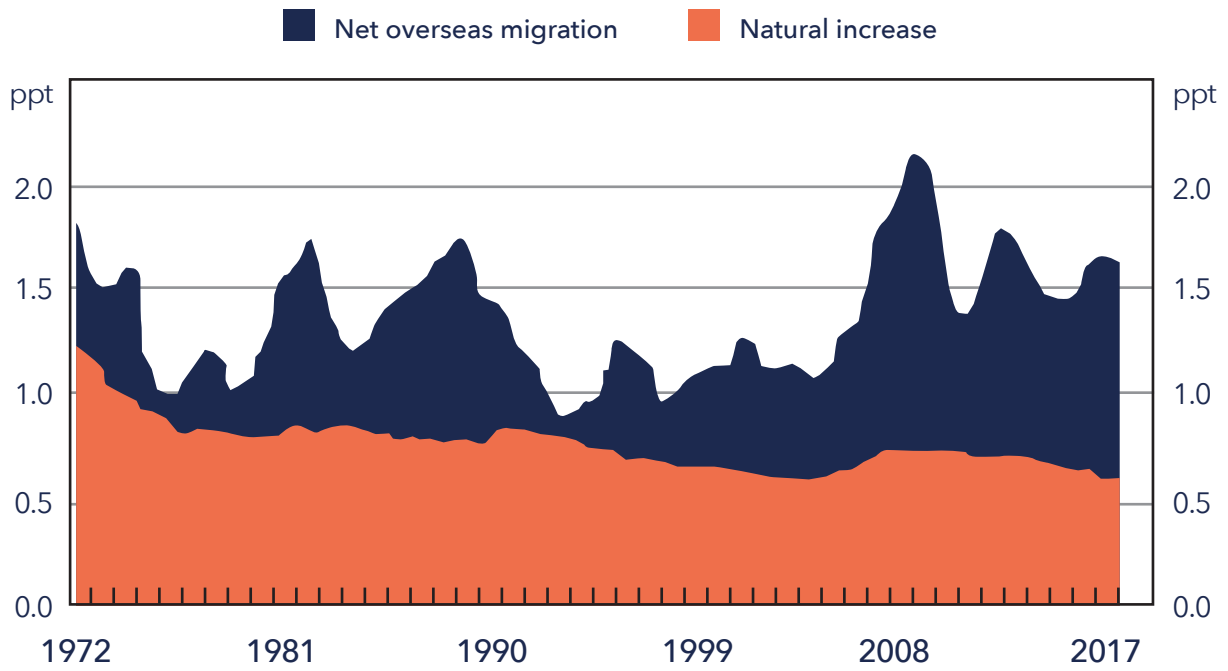
What the literature says

Demographic change

Over the last ten years, Australia's population has grown at an annual rate of more than 1.5 per cent, while Queensland's population has grown at an even faster rate of 1.8 per cent (Lowe, 2018; Queensland Government Statistician's Office (QGSO), 2018b). The effect of increased population growth on our demography, and subsequently our labour markets, has been important to our economic prosperity. While population growth has historically been a key factor underpinning economic growth in Queensland, it will also continue to be an important contributor to growth in the future (Queensland Government, 2018).

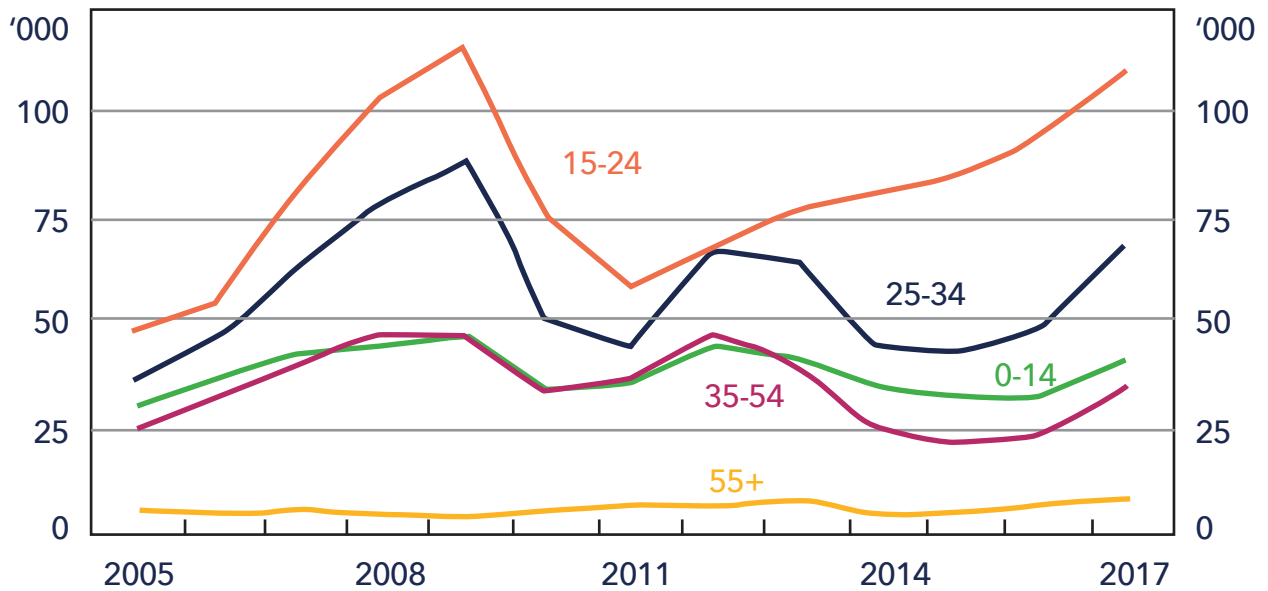
These rates of population growth have been largely attributable to increased levels of net overseas migration (Figure 7). Australia's migration system is designed to attract migrants with desirable skills and qualifications (Select Committee on the Future of Work and Workers, 2018). Increased migration has helped our economies adjust to large swings in the overall demand for labour and address specific skills shortages. Migration growth is also characterised by a significant increase in the number of overseas students studying in Australia. On average, new migrants to Australia are younger than the resident population, which has also assisted in reducing the rate of population ageing in Australia (Lowe, 2018) (Figure 8).

Figure 7: Population growth*, year-ended contribution, Australia



* Total population is the sum of natural increase and net overseas migration.
 Source: Lowe, 2018, based on ABS data.

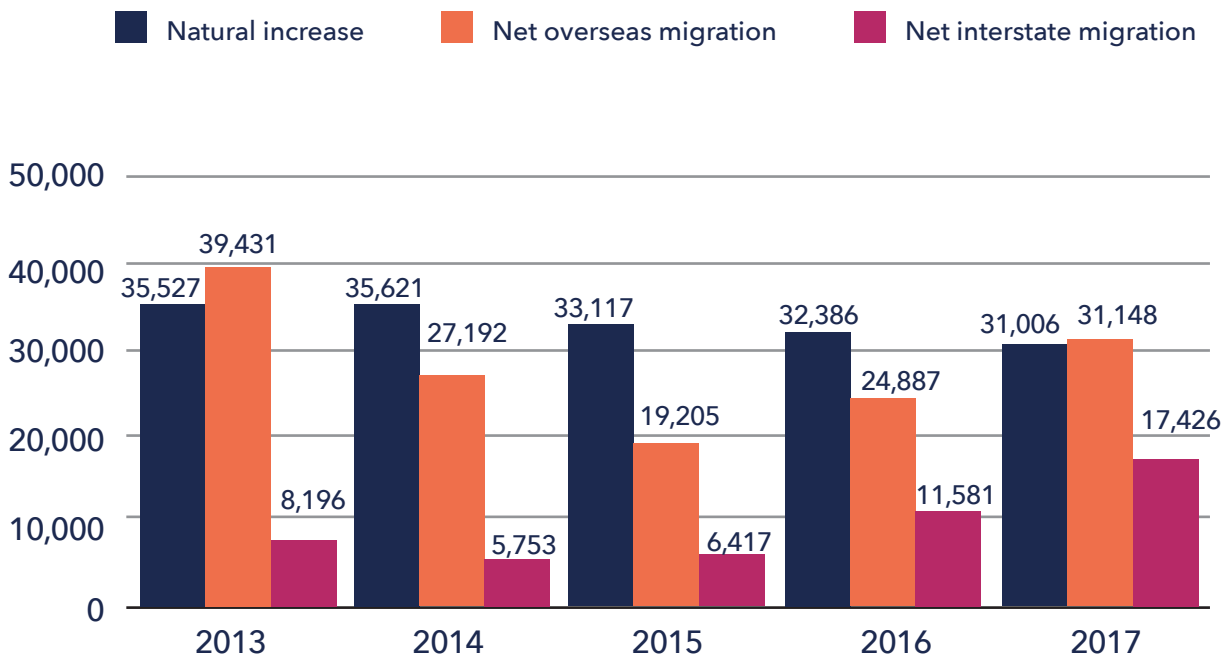
Figure 8: Net overseas migration to Australia by age



Source: Lowe, 2018, based on ABS data.

An important part of this growth in the Queensland population has and will continue to be migration from both interstate and overseas, which currently accounts for around half of Queensland's population growth (Figure 9). Migration has particularly been important for Queensland's regional areas, in addressing both skills shortages and increasingly ageing demographic profiles (Regional Institute Australia, 2018, November).

Figure 9: Components of population change, Queensland 2013-2017



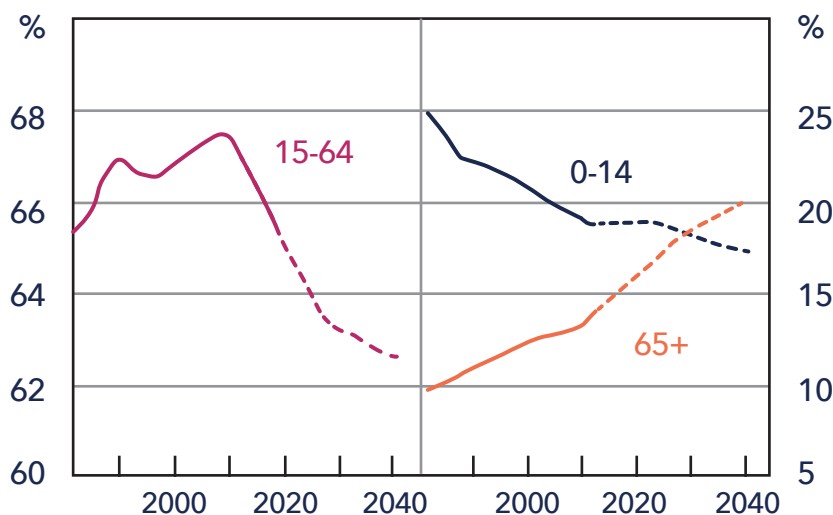
Source: Queensland Government Statistician’s Office, 2018a - licensed and adapted under CC BY 4.0.

Ageing population

Despite this increase in relatively young migrants, the share of the Australian working age population (aged 15–64) has been falling and is projected to continue for at least a generation (Figure 10). This reflects a combination of the ongoing transition of baby boomers into the retirement age bracket, lower fertility rates and increased life expectancy. By 2040, it is estimated that 20 per cent of the population is expected to be aged over 65, compared with 15 per cent today (Lowe, 2018). Queensland’s population is similarly ageing, with the proportion of people aged 65 years and over set to rise from 13 per cent in 2011 to between 19 and 21 per cent in 2036 (Hajkowitz et al., 2018).

Life expectancy at birth is expected rise to 96.6 for women and 95.1 for men by 2054–55, up from the current figures of 93.6 and 91.5 respectively. The number of Australians aged over 65 is projected to nearly double by 2035. Furthermore, Australians will be able to work in a productive capacity for longer. The Intergenerational Report (Australian Treasury, 2015) noted that recent improvements in life expectancy have been met or exceeded by improvements in healthy life expectancies. That is, not only are Australian lives getting longer, Australian are enjoying good health for an increasing number of those extra years (Australian Chamber of Commerce and Industry, 2018).

Figure 10: Population shares by age, Australia



Source: Lowe, 2018, based on ABS data.

As the overall population begins to age, it might be expected that the proportion of people who are participating in the labour force would decline. In Australia, we are seeing shifts in behaviour that have, along with the increasing number of migrants who are of working age (Hajkowicz et al., 2016), offset the effects of ageing on labour supply.

Australians are increasingly working to older ages. In January 2018, Australians aged 65 and over had a workforce participation rate of 13 per cent, compared with eight per cent in 2006. Workforce participation had increased for both men and women, with men more likely to be in the workforce than women at this age (17 per cent to ten per cent in January 2018) (Australian Institute of Health and Welfare, 2018).

This is reflective of a number of factors: improved health outcomes; changes in the nature of work; retirement income policies; and the financial considerations of a longer life (Lowe, 2018).

Participation rate data provides some insight into labour market issues. Underutilisation⁷ is persistent within the labour force data, suggesting excess capacity in the labour market, despite the increasing amount of hours worked in by the labour force overall. Around one-quarter of part-time workers in Australia are actively looking to work more hours than they currently do and on average they are seeking to work an extra two days a week (Debelle, 2018). Some groups within the labour force are more impacted by underutilisation than others. Over the past decade, there has been a rise in the share of underemployed younger workers who are willing and able to work extra hours (Dhillon and Cassidy, 2018).

Female participation

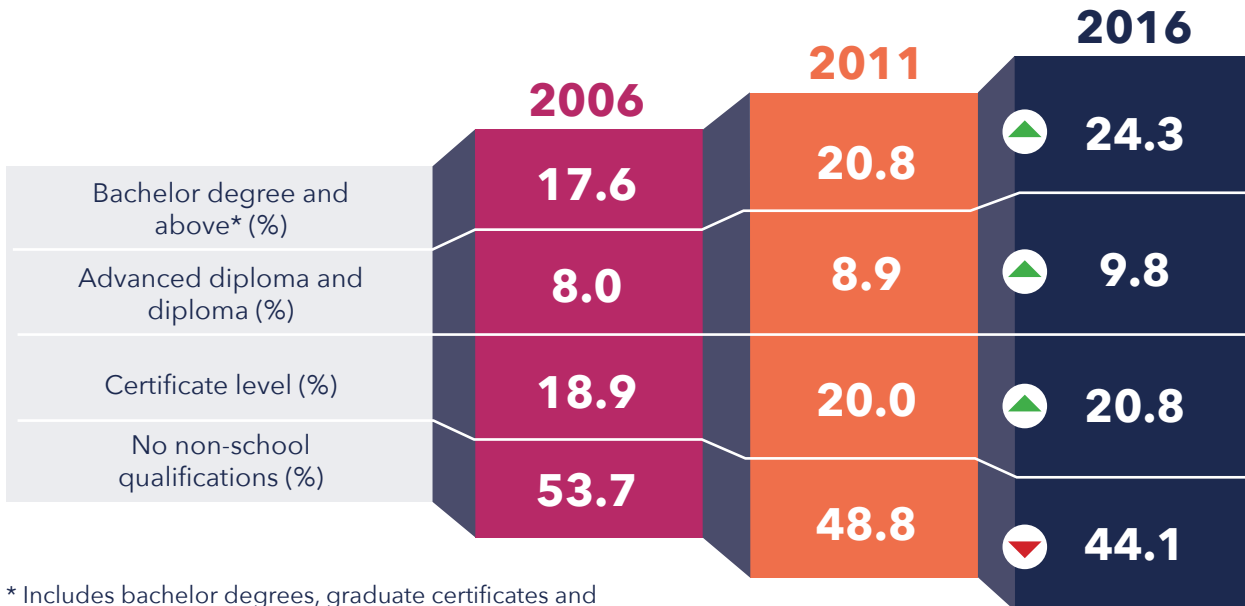
Another significant change is the increasing labour force participation of women over the past number of decades. Labour supply in Australia across virtually all age groups has been boosted, rising from 43 per cent in 1978 to nearly 60 per cent in 2015 (Hajkowicz et al., 2016). This shift has been assisted by policy changes related to parental leave and child care, and the increased prevalence of flexible and part-time work opportunities. Changing societal attitudes and educational attainment, reflected by increased time spent in study and changing fields of study, have also played a significant role (Lowe, 2018; Australian Treasury, 2015). While the gender pay gap has narrowed, the difference in pay between men and women in Australia is still of concern (Cassells and Duncan, 2018).

7. Underutilisation encapsulates the extent to which people's desire for work is not being met, including persons who are not working but want to work, and those who are working but want to work more.

Educational attainment

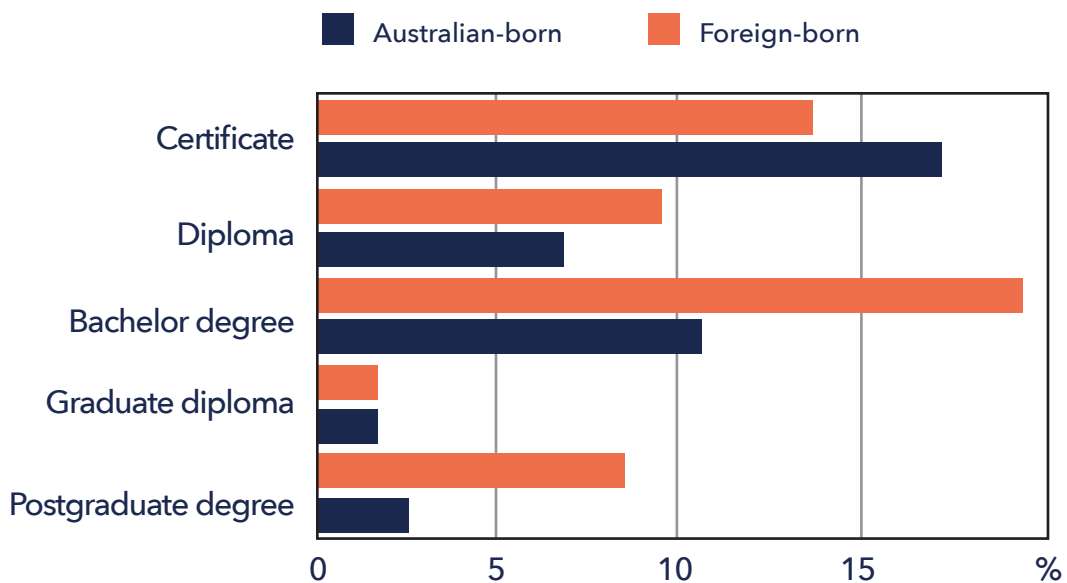
Increasing educational attainment by both men and women is another indicator of our changing demography. Over the past decade, the percentage of Australians with no post-school qualifications has declined by almost ten per cent, with a notable shift in educational attainment towards higher level qualifications (ABS, 2017) (Figure 11).

Figure 11: Non-school educational attainment over time, Australia



* Includes bachelor degrees, graduate certificates and graduate diplomas and post graduate degrees.
Source: ABS, 2017, Census of Population and Housing

Figure 12: Non-school educational attainment, share of population by country of birth, Australia, 2016



Source: Lowe, 2018, based on ABS data.

Some of this change in educational attainment levels of the labour market is attributable to:

- older workers, who are less likely to hold post-school qualifications. As they retire, the proportion of the workforce with no post-school qualifications declines (OECD, 2017; Dixon, 2017).
- the education qualifications of our migrant intake, who on average possess a higher level of education than their Australian-born counterparts (Figure 12; Lowe, 2018).
- the longer time spent studying by younger Australians, reflective of education policy promoting such behaviour (ABS, 2017, November 6).

Urbanisation

Over half of the world's population currently lives in cities, and this number is expected to increase to 68 per cent by 2050 (United Nations, 2018). Cities are magnets for high value, knowledge-intensive industries, where physical proximity and the diversity of people enables collaboration and sparks innovation (Bakhshi et al., 2017; Charles, 2017). Firms and workers benefit from enhanced labour pooling and matching, and employment and consumption opportunities are more plentiful. Advantages from such concentration of people highlights a basic unevenness of economic development - the tendency for places close to large markets to grow more rapidly than places more distant (Bakhshi et al., 2017).

In 2017, population growth in Queensland has been largely concentrated within the south east corner. This area accounted for 88.3 per cent of Queensland's growth for the year, reflecting the increasing urbanisation of the region (QGSO, 2018a). Over the last few decades, Queensland has seen a steady trend of people moving away from inland communities and towards coastal centres that offer more when it comes to employment, education, health and lifestyle opportunities (Deloitte, 2017). According to projections, this concentration of Queensland's population is expected to continue, with eight of the state's top ten local government areas (LGAs) by population size in 2036 located in South East Queensland (QGSO, 2017).

As technology shifts the economy towards higher value, knowledge-intensive work, vibrant and creative metropolitan areas (Yigicanlar, 2010) offer significant advantages. Within Queensland this transition presents a challenge for rural and remote areas affected by persistent workforce attraction and retention issues (Becker, Hyland and Soosay, 2013). These areas typically have an older population that is ageing at a faster rate than capital cities (National Seniors Australia, 2014). Furthermore, the long-term trend of productivity improvements in sectors such as agriculture have contributed to consolidation and growth of regional towns and centres (Productivity Commission, 2017b) and urbanisation.

On the other hand, the combination of the changing nature of work, advancements in telecommunications, and the push for greater workplace flexibility, have reduced the need for work to be performed in a central location (Cassells et al., 2018). Further opportunities may grow for alternative working arrangements and/or a geographically dispersed workforce⁸ (for example, remote work) that may reduce physical and geographical barriers⁹ (Financial Planning Association of Australia, 2018).

It has long been argued that digital transformations, such as the internet and cloud computing, would break down the barriers of distance. This vision is not playing out as first imagined. Even as telecommunications and travel have steadily grown cheaper, people are choosing to live closer together rather than further apart (Deloitte, 2017). While the technological readiness of a region's workforce and economy are fundamental to its competitiveness (Regional Australia Institute, 2015), there remains persistent issues within regional areas of access to high quality

8. For a comprehensive list describing various forms of displaced work see Victorian State Government (2013).

9. Other changes to employment arrangements arising from digital technologies, such as the 'gig economy', are discussed in Section 3.

internet services (Australian Information Industry Association, 2018; Jobs Queensland, 2017b). Furthermore, the success of implementing displaced and/or dispersed work arrangements relies on the effective management of employees and workloads (Victorian State Government, 2013).

As Australia transitions to a services and knowledge-based economy, concerns around increasing urbanisation and existing regional disparities might be ameliorated by new forms of technology and work arrangements. Given workforce decentralisation has been an area of increasing interest for Australian governments (Parliament of Australia, 2018), a conversation about this potential may be needed sooner rather than later.

Across the state, opportunities to find a good job that pays reasonably well vary significantly. This impacts people's spending power and their ability to cope when times are tough. Lower income families have less economic reserves to draw on during periods of employment disruption, such as unemployment or ill health. It affects the ability of families to relocate in search of better opportunities. Given the size of Queensland, it is not always easy to move to where the jobs are, further entrenching regional disadvantage (Jobs Queensland, 2018c; Deloitte, 2017).

Inequality

Inequality has been identified as a defining challenge of our times (United Nations, 2016). It constitutes several dimensions and is not just a matter of income and wealth – it is also about access to skills, resources, knowledge (Buchanan et al., 2018) and the consumption of vital goods and services, such as health care and home ownership (Bakhshi et al., 2017; Deloitte, 2017).

The Productivity Commission (2018a) recently looked at trends in inequality, economic mobility and disadvantage across Australian society. Using an array of indicators that examine the distribution of household incomes, consumption and wealth, and their composition and movement over time, they found that over nearly three decades inequality has only risen slightly in Australia. Nevertheless the Productivity Commission (2018a) identified roughly 700,000 Australians were experiencing entrenched economic disadvantage in 2015-2016. People living in single-parent families, unemployed people, people with disabilities and Indigenous Australians are particularly likely to experience income poverty, deprivation and social exclusion. To support their specific needs, The Productivity Commission (2018a) identifies the need for targeted policy interventions for these cohorts.

While this result at first might seem somewhat acceptable amid current sentiment, detailed results in the report highlight numerous areas for concern, such as the recent low income growth of young persons. Indeed, for the first time in history the wealth accumulation trajectory of the generation of workers entering employment is well below that of their predecessors at comparable ages (Business Council of Co-Operatives and Mutuals, 2018).

Queensland's Gini Coefficient¹⁰ has increased over the past two decades indicating an increase in wealth inequality (Hajkowicz et al., 2018). Rising inequality in labour market outcomes and income has occurred amid rising prosperity, with one third of Queensland's income in 2014-15 earned by just one tenth of the population. Furthermore, inequalities between Queenslanders are masked by economic statistics which are aggregated to the state level.

There are regional aspects to inequality. Levels of household wealth in Queensland are generally higher in the Brisbane region than elsewhere. Furthermore, the majority of the most disadvantaged statistical local areas in Queensland are considered 'very remote', with poor access to services and infrastructure like the internet. As you move away from urban centres, almost all measures of socioeconomic welfare fall (Deloitte, 2017).

10. The Gini Coefficient is a widely accepted measure of wealth distribution where a higher score translates to higher inequality.

Persistent low wage growth over the years following the resources boom in Australia, despite a tightening labour market is another area of concern. Arsov and Evans (2018) found that, in most economies, recent low wage growth did not reflect a weaker relationship with unemployment. Lower productivity growth, the difficulty in cutting wages following the global financial crisis (GFC) and a decline in labour's bargaining power help explain some of the wage sluggishness. However others have questioned the stability of the Phillips Curve framework (concerning unemployment and inflation/wages) in Australia, suggesting a rethink of this relationship is required given current levels of labour underutilisation and low wage growth (Weir, 2018; Chua and Robinson, 2018).

Another recent economic development is that the labour share of Australia's national income has been declining (Hajkowicz et al., 2016). This has not always been the case. Drawing on the work of economist Thomas Piketty on the disproportionate relationship between the rate of the return on capital and economic growth, Leigh (2014) found that the period from 1980-2010 marked the first notable increase in Australia's wealth to income ratio, with the income of the top one per cent almost doubling.

Technological advancements risk further shifting the composition of national income from labour to capital by increasing returns to capital owners and thus concentrating wealth to fewer people (Balliester and Elsheikhi, 2018; Hajkowicz et al., 2018). If machines were in fact to make human labour superfluous, we would have vast aggregate wealth but a serious challenge in determining who owns it and how to share it. Furthermore, a burst of robotic productivity can enrich one generation of capital owners at the expense of future generations. As the fruits of this productivity surge are consumed by the old, the young face diminished demand for their labour, and in some cases also experience credit constraints that inhibit their human capital investments (Autor, 2015).

Potential downward pressure is placed on wages when displaced labour adds to the supply of skilled labour already seeking employment (Autor, 2015). The global talent pool is currently growing rapidly as more people in less developed countries, such as India and China, enter tertiary education. Increasing international competition in the skilled labour market means it is unclear whether the growing number of educated people will continue to enjoy earning premiums and better career perspectives (Hajkowicz et al., 2016). Competition in the global labour market is increasingly seen as a source of widening wage inequality in both developed and developing countries (Balliester and Elsheikhi, 2018).

The relationship between inequality and economic growth has been discussed in various contexts. Recent studies have tended to highlight the long-run economic costs of persistent and/or rising inequality. There may also exist specific sectoral effects, such greater health and social problems raising demand for health care and social services. It can also translate into disparities in consumption demand between individuals, particularly for non-durable goods and services (such as education) that may further affect levels of inequality and/or economic growth.

For the most part, workers will be able to easily adjust their work routine and remain in their current jobs. However in some instances automation can lead to higher unemployment or reduced work hours, which will cause hardships. This is especially true for older and vulnerable workers who lose their jobs and lack the flexibility to find a new one quickly (alphaBeta, 2017). Adults with a tertiary education fare better on the labour market than less-educated adults (OECD, 2018a). The distributional aspects of labour market transitions will require consideration alongside the productivity and efficiency aspects (Autor, 2015; alphaBeta, 2017).

Technological advancement has the potential to combat inequality. If effective in increasing the productivity of workers, it could result in significant improvement to both wages and incomes (Autor, 2015). It also has the potential to increase labour market participation by eliminating age-old barriers arising from the physical and geographical requirements of existing work and may allow many Australians to access exciting new job opportunities (Hajkowicz et al., 2018).

Other social and cultural changes

There are many other social and cultural changes occurring alongside those pertaining to demography, urbanisation and inequality.

Aside from the substantive content of work, technological change is affecting many other aspects of our lives. The adoption and deployment of advanced information technologies have driven rapid changes across the economy and transformed the way we live, consume and interact with others.

The move towards a services and knowledge-based economy, along with rising incomes, has also spurred demand for differentiated products that have nothing to do with the technological vanguard, such as restaurant meals, cleaning services, haircare, personal fitness, barbering and brewing (Autor, 2015; Bakhshi et al., 2017). Furthermore, increasing concern about the sustainability of economic growth patterns is driving demand for greener models of growth (Hajkowicz et al., 2018) and as consumption patterns change, job growth in eco-friendly retail and other 'green' occupations is expected to grow (Balliester and Elsheikhi, 2018).

The way we interact has also changed. The global growth of internet-connected devices is transforming the way in which people live and work. Social media offers new ways to connect and has rapidly become a popular and efficient platform for sharing, communicating, networking and collaborating for individuals, organisations and businesses globally. Most importantly, it provides opportunities for employers and potential employees to access entirely new employment environments previously considered beyond reach (Hajkowicz et al., 2016).

Technological change can also have negative social implications – advances have already generated significant health issues including the effects of our digital lifestyles, limited exercise and changing interpersonal relationships. Other impacts of digitisation include stress and anxiety associated with social media usage, cybersecurity concerns and privacy breaches (Hajkowicz et al., 2018). Furthermore, for those living on the other side of the 'digital divide', the inability to interact with technology in a meaningful way inhibits their ability to participate in society and the workforce. There may be hidden costs and uneven impacts on individuals, particularly where change is rapid or unexpected, including financial and emotional wellbeing.

Finally, amidst all the other technological, demographic and social changes, our personal relationship with work is also changing. Aside from injury time/risk of injury decreasing and job satisfaction increasing, it is also leading to increased facilitation of flexible work arrangements, such as working from home, and providing increased work/life balance opportunities. No longer is the labour market the sole domain of the traditional, male breadwinner working nine-to-five to support a stay-at-home wife and children (Select Committee on the Future of Work and Workers, 2018). This changing division of labour in the workplace is likely to also translate to the household. A lack of boundaries around when and where we work can also encroach upon our personal lives, potentially extending into our nights and weekends, taking up time normally spent on rest, leisure and personal relationships (Cassells et al., 2018).

Impacts for employment

Demographic and social changes, along with technological advancement, will interact to influence the future employment and wellbeing of Queenslanders. As such changes progress, and potentially accelerate or deviate from their current trajectory, numerous opportunities and challenges will likely emerge for employment.

Based on past trends, the impacts on employment will not be uniform in either their speed or scope. However they will be widespread and affect industries, communities, employers, workers and individuals. The exact impacts will vary depending on the location, industry of employment, current working arrangements and individual characteristics. For some, continuity or intensification of existing structures or processes may be just as likely to change.

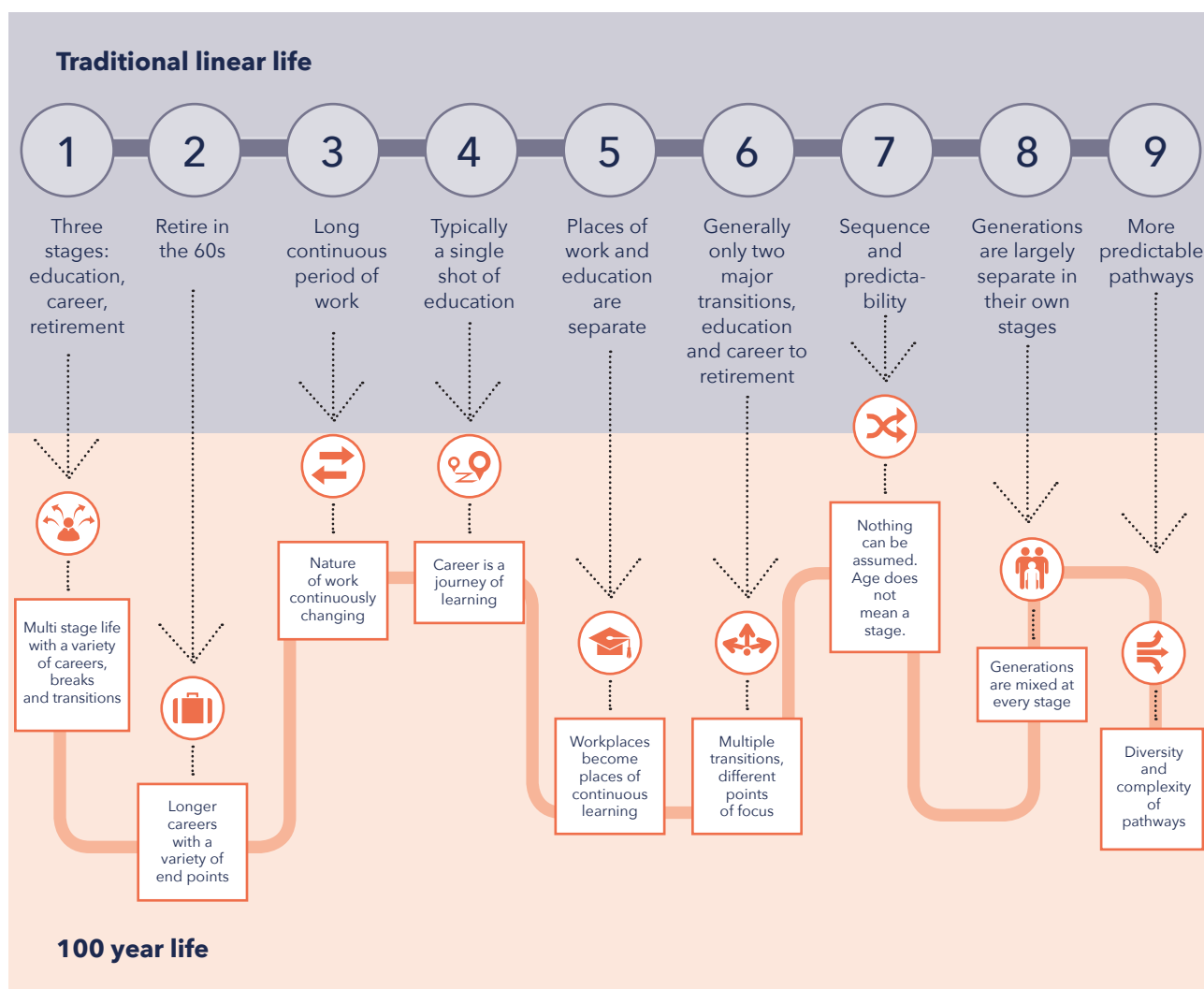
Despite the numerous future possibilities already discussed, increased life expectancy means people will ultimately need to work for longer (Gratton and Scott, 2016; Reeson, Mason, Sanderson, Bratanova and Hajkowicz, 2016, Australian Human Rights Commission, 2016; Australian Treasury, 2015). Initial indications suggest that not everyone is prepared for such a change. In a recent survey, nearly one in four working Australians stated that they did not know how they could stay relevant in the workforce to ensure that they have a career in the next 10 years (SEEK, 2018).

Queenslanders need to consider their current and future working and non-working lives. But where does one begin? While many have discussed the topic, few offer guidance for individuals towards taking the first steps in preparing for the prospect of a longer working life.

Gratton and Scott (2016) offers some hope and direction for such a fundamentally significant transition. Central to their research is the notion that the traditional three-stage working life¹¹ that most people follow will no longer be relevant heading into the future. Given various factors, many of which have already been discussed in this literature review, they forecast a multi-staged working life, with multiple transitions between work and education, will become the norm (Figure 13).

11. The first stage being education, followed by a career and then retirement.

Figure 13: Traditional linear life versus 100-year life



Source: Deloitte, 2018, October (based on Gratton and Scott, 2016).

The insights and optimism of Gratton and Scott provides a useful framework for identifying and discussing the opportunities and challenges for various groups of the Queensland labour market who have different needs and expectations of the future, and will make different contributions to the economy and society overall.

Mature-age/late-career workers

It is useful to start by first looking at mature-age workers, who have a relatively short timeframe to adjust to the realities of a potentially longer working life. This section of the workforce is currently best characterised as representing the Baby Boomer generation - those born between 1946 and 1964 (McCrinkle Research, 2018a).

An increasing pension age, levels of and access to retirement savings/superannuation and the increased costs associated with living longer will drive the need for a longer working life (Gratton and Scott, 2016; Swoboda, n.d.). The decision to remain in the workforce for longer than previous may arise out of opportunity rather than necessity, particularly as technology has the great potential to reduce the physical demands in many forms of work.

Many older workers are willing and able to work past traditional retirement ages, though this is more applicable to knowledge workers than those remaining in manual occupations (Hajkowicz et al., 2016).

Attitudinal changes are required to keep older workers in jobs for longer (Deloitte, 2017). Negative perceptions/ageism still persists in many Australian workplaces (Centre for Workplace Leadership, 2018; Australian Human Rights Commission, 2016). This may cause many older people to hesitate to explore new employment options (Select Committee on the Future of Work and Workers, 2018).

Therefore a shift in perception is necessary towards focusing on the various opportunities that mature-age workers can bring to a workplace, for example, increased productivity, performance and innovation (Australian Human Rights Commission, 2016), knowledge, experience and mentoring capabilities (Agarwal, Bersin, Lahiri, Schwartz and Volini, 2018). Economic benefits from ongoing tax contributions and a lower dependency on social assistance are additional reasons to champion the benefits of retaining mature-age workers in the workforce (Australian Human Rights Commission, 2016).

New working arrangements such as tapered retirement models are emerging. These will assist in smoothing the transition for mature-age workers into a tail end of a revised working life, as will freeing up positions for a younger generation of workers eager to find a foothold on the lower rungs of the career ladder (Hajkowicz et al., 2016).

Mid-career workers

Currently positioned a little earlier in the traditional working life model are workers in the middle stages of their career. These workers are best characterised as those currently belonging to Generation X, born between 1965 and 1979 (McCrindle Research, 2018a). Similar to their mature-aged colleagues, mid-career workers need to grapple with a departure from an expected three-stage working life model. Many in this demographic may already be making the transition.

A large part of this transition will be the increased likelihood of the requirement to upskill/reskill over the remainder of their working life. Costs are typically borne by the individual through the purchase of additional education and forgone income. There are also potential costs to employers (Productivity Commission, 2017a; Griffin, 2018) including increased workloads for other staff.

Young/early-career workers

Still relatively new entrants to the workforce, today's young workers born between 1980 and 1994 are more commonly known as Millennials or belonging to Generation Y. In addition to the invention of leisure-related technologies such as DVDs, video game consoles and iPods, this generation also witnessed the creation and widespread adoption of the transformative communication-based innovations of the internet, email and SMS (McCrindle Research, 2018a).

As a cohort they are perhaps more diverse than any preceding generation, with one in five born overseas and one in four with at least one parent born overseas (Centre for Multicultural Youth, 2018). This generation is entering adulthood and starting its working life in an era of lower economic growth than that experienced by previous generations, and at a time when the digital economy is eroding traditional employment relationships (Centre for Future Work, 2018). The future of work is more uncertain for this generation of workers than ever before (Select Committee on the Future of Work and Workers, 2018).

Like mature-age and mid-career workers, young workers also need to reassess the longstanding expectations of a traditional working life. They have the luxury of observing and learning from the transitions of their older counterparts, and more time to re-evaluate their career.

Young workers appear to already see the merits of increased education, having spent longer periods in study than previous generations whilst pursuing part-time work. This group also show preferences towards features of a non-traditional working life, such as flexibility and improved work/life balance (Hays, 2013).

That being said, early-career workers still face challenges. Even with higher educational attainment, early-career workers often find gaining employment difficult, with experience remaining a highly prized prerequisite by employers. Rates of both casual employment, unemployment and underemployment have increased notably for young people, and ever more qualifications and experience are needed to secure good jobs (Hajkowicz et al., 2016; Dhillon and Cassidy, 2018). Furthermore, the share of young adults (age 20 to 24) not in employment, education or training (NEET) is still high in Australia and above the OECD average (16.2 per cent vs. 12.0 per cent in 2016) (OECD, 2018a). The difficulties of finding employment opportunities are also further amplified by the challenge of technology-driven job polarisation and the increasing number of older workers remaining in the labour market.

Future/'soon-to-be' workers

It would be remiss not to discuss the next generation of workers, comprised by those currently known as 'Post-Millennials' or Generation Z who are born from 1995 onwards (McCrinkle Research, 2018a). These 'digital natives' are growing up with the technologies and social networking systems that previous generations have needed to learn and adapt to, and also innovations such as tablets, Google, Facebook and Twitter.

They are likely to enter the workforce without the expectations of a traditional three-stage working life or working conditions. Instead, based upon the current expected trends, their career paths will be shaped and informed by the experiences of those generations before them, such as ongoing career transitions and expectations of a longer working life (Hajkowicz et al., 2016).

It is probable they may not even work in the same jobs as their older counterparts - children starting preschool in 2017 may go on to be employed in jobs we haven't imagined/don't exist yet (ManpowerGroup, 2018; Torii and O'Connell, 2017).

Multigenerational workplaces

As will be explored in the next two sections, people are not only living longer, they are also remaining in the workforce longer. This, combined with young people staying in education longer, is creating a very different 'workplace of the future'. 2019 could potentially see the beginning of a workforce comprising five generations as the 'digital generation' enter employment (Select Committee on the Future of Work and Workers, 2018). This has significant implications for employment, employers (in attracting, recruiting, training and retaining new entrant workers), and for the integration of multiple generations within the one workplace.

Gender

There will be potential opportunities and challenges for women and men, both in the workplace and at home.

While female participation and opportunities in the labour market are improving (overall participation, full-time employment and occupational representation), there is still more progress to be made. Despite gains in workforce participation, women remain the most under-utilised factor for fair and prosperous economic growth (The Women, Work and Leadership Research Group, 2018). Educational attainment of women now outpaces that of men in Australia, there would be potentially large gains to the economy if women participated more in the labour market (OECD, 2018a).

Women are also still facing limited career progression, a gender pay gap and lower retirement savings by almost half, on average. As female participation becomes increasingly important for economic growth, ensuring the economic independence of women, their health and wellbeing is likely to be on the agenda for government, industry and employers (Hajkowicz et al., 2016).

A fundamental tension exists between achieving career growth while meeting expectations of reproduction and care (The Women, Work and Leadership Research Group, 2018). As women make up an increasing proportion of the labour market, the need to balance work and family responsibilities will increase demand for flexible working arrangements.

The knowledge economy should offer more opportunities for career flexibility, which can be beneficial for women who have children and also offer men the opportunity to play a more active role in childcare (Hajkowicz et al., 2016).

Despite this opportunity, men face their own unique challenges. Current trends in Australia show men are increasingly vulnerable to insecure work arrangements, with the proportion of men in part-time work significantly increasing over the past 10 years (Cassells et al., 2018). Of greater concern is that male workforce participation is in decline, but not because men are taking on more family responsibilities. There is a notable and concerning upward trend in the number of low-skilled (and often single) males who are dropping out the workforce entirely (Hajkowicz et al., 2016).

The transition to a new working life may not be as smooth for men compared to women, due to the typical stability/certainty of male-dominated employment (Gratton and Scott, 2016). According to Acemoglu and Restrepo (2017, cited in Balliester and Elsheikhi, 2018), men are facing greater job losses compared to women in industries exposed to automation. Lower-skilled men are particularly vulnerable to the changing market landscape (Cassells et al., 2018). If equivalent jobs are not available, these workers are likely to drop out of the labour force, which could further affect male participation rates (Hajkowicz et al., 2016). Ensuring the continued engagement of this cohort will be necessary for future economic growth.

Disadvantaged cohorts

The OECD has identified people with disabilities as having untapped labour market potential (OECD, 2018a). Australia has one of the lowest rates of job participation for people with a disability in the OECD. Automation and AI have the potential to increase job participation for people with some types of physical disabilities by reducing manual tasks.

Extending the availability of flexible working arrangements specifically for people with disabilities, who currently face systemic barriers to workforce participation, is currently being promoted. The ability to work from home is described as game changing for this cohort. A more casualised workforce potentially offers young people with disabilities possible advantages, where they may not be able to undertake full-time work or where they may have to explore the kind of work that they want to do and that fits in with their particular needs (Victorian Youth Disability Advocacy Service, cited in Select Committee on the Future of Work and Workers, 2018).

Indigenous persons in Australia face significantly lower employment rates than the non-Indigenous population (OECD, 2018a). Indigenous workers are also more likely than their non-Indigenous counterparts to be employed in occupations which are vulnerable to automation and also disproportionately affected by evolving changes in the workplace, such as increased casualisation in remote areas (Markham, 2018).

In addition, research has revealed a strong association between ethnic background and higher rates of detachment from the labour market in Australia (Centre for Multicultural Youth, 2018). Given the current poor employment outcomes for many culturally and linguistically diverse (CALD) communities, it is expected that future changes in the job market, such as automation,

will also adversely affect them.

As a result, culturally diverse people will face significantly reduced job opportunities or none at all. The employment challenges and barriers they currently face will be exacerbated (Victorian Multicultural Commission, 2018).

As well as being vulnerable to exploitation in the informal economy, CALD Australians are likely to be overrepresented in insecure employment arrangements. This is especially the case for women, resettled refugees, very young and older migrants (Federation of Ethnic Communities' Council of Australia, 2018).

In partnership with Multicultural Affairs Queensland, Deloitte (2018b) undertook research into the economic and social opportunities arising from better utilisation of the skills and experience of migrants and refugees in Queensland. Forty nine per cent of migrants who have arrived in Queensland in the last ten years are working in jobs that do use their highest level of skills or qualifications. This means that the majority of migrants and refugees with overseas-obtained post-school qualifications are working in lower skilled jobs, with the inability to gain recognition of their overseas obtained qualifications and/or skills and overseas industry experience being identified as contributing to this outcome. Obtaining recognition of such qualifications, skills and experience could help combat potential challenges faced by migrants in Queensland. Effective engagement of skilled migrants and refugees in the labour market has the potential to add \$250 million to the Queensland economy over the next ten years (Deloitte, 2018b).

Regions

Changes in regional labour markets are often incremental and can be planned for, but in some cases may be rapid, dynamic and unforeseen. Depending on their speed, magnitude and severity, transitions can have significant economic and social impacts on workforces in regions and communities, requiring the development and implementation of appropriate adjustment responses (Jobs Queensland, 2018b).

The combination of forces driving the transition of the Australian economy will unavoidably create friction points in specific regional areas and localities across the country, while being the source of considerable growth and prosperity in others. Some regions may also have limited capacity to respond to changes in economic conditions (Productivity Commission, 2017b). Depending on the economic climate, and the skills and mobility of individual workers, many might struggle to find new work in their region (alphaBeta, 2017).

Regional and rural Australians face greater potential impacts as a result of automation, technological development and changing work patterns than their urbanised counterparts. This is for a variety of reasons, such as the prevalence of jobs with a high likelihood of automation in rural areas and existing weaknesses in regional labour markets (Shop Distributive and Allied Employees' Association, 2018).

The likelihood and degree of technological impact will differ between regions due to the nature of jobs/tasks and capacity across regions¹². Remote areas outside of South East Queensland have smaller populations and economies, and therefore have lower capacity to absorb displaced workers. This will amplify the potential knock-on effects and require a specific focus on dedicated and differentiated responses for each region (Hajkowicz et al., 2018).

Work undertaken by Jobs Queensland in the Fraser Coast region and with regional tourism stakeholders identifies the diversity of Queensland's regions and the need for place-based

12. This refers to the capacity for workers to get another job in the same region when they leave their existing job.

responses to regional challenges (Jobs Queensland, 2018c, 2018e).

Employers

The importance of employers in the context of these implications for employment must be acknowledged. In addition to managing their own futures, employers will also need to consider the opportunities and challenges confronting their current and future workforce.

Aside from the ongoing discourse around career longevity, significant cultural shifts in Australian workplaces will occur (Australian Chamber of Commerce and Industry, 2018). Employers will need to manage an increasingly diverse labour force of different age groups, health and social status (Hajkowitz et al., 2016).

Differing interests of employers and workers in times of profound change is nothing new. Managing the needs of each party, such as flexible working arrangements of workers versus the preference of employers for conformity and predictability, will pose challenges. Some companies (for whom attracting smart and skilled workers is crucial) are already realising the commercial advantages of changing their policies and practices. Not all will, and many may not offer the 'flexible' opportunities that some individuals desire (Gratton and Scott, 2016).

Other employers may offer preferences for flexibility, in terms of employee working contracts as opposed to their working arrangements. This 'battle', currently being waged in Australia around new forms of business/employment models, is discussed in further detail in Section 3.

Key findings

Areas of consensus in the literature

- Like many developed nations, Australia's population is ageing and this has implications for both employers and the labour force more broadly.
 - People are living longer and many are expected to remain in the workforce longer.
 - Workplaces are changing as they endeavour to adjust to a multigenerational workforce.
- Australia is becoming more urbanised.
 - This trend is also evident in Queensland.
 - Regional restructuring often occurs as people migrate to where the jobs and opportunities are.
 - Rural and remote communities are becoming more marginalised and isolated.

Areas of contention in the literature

- The extent to which inequality is rising in Australia and how changes in technology and the broader economy will affect this projected trajectory.
- How technology and the move towards a more knowledge- and service-based economy will affect regional and rural areas.



Challenges and questions for consideration

- How do we promote equality through supporting people, especially those most at risk, to engage, stay engaged or re-engage with the labour force and/or education and training?
- How do we prepare Queenslanders for the predicted departure from the 'traditional three-stage' working life?
- How do we support employers in responding to potential transitions within their industry, including their workforces?



section three

LEGAL, INSTITUTIONAL AND POLICY INFLUENCES

The third and final driver of the future of work considered is legal, institutional and policy influences. These influences, guided by various institutions, have also helped shape the employment and social landscapes of Australia over the last century – arguably more so than technological and social/demographic change.

While the term ‘institution’ itself comprises many aspects, in this section the primary focus is on the formal institution of government and the influence it exerts through public policy intervention. Other formal institutions such as economic and legal systems, and the factors within these systems, are also considered. The environment in which these institutions and the other drivers interact is often referred to as the ‘political economy’.

What the literature says

Australian institutions and the labour market

The Australian government has implemented many important structural reforms over the last 40 years that have helped see the nation today enter its 28th year of uninterrupted annual economic growth (Tang, 2018).

The reduction and removal of the tariff system, floating of the Australian dollar and central bank independence helped Australian businesses and economy compete on a global stage (Berger-Thomson, Breusch, and Lilley, 2018; The Economist, 2017a; Daly, 2012). To cushion workers from the effects of the reforms to Australia’s tariff system, the government of the time negotiated a ‘social wage’ with the Australian Council of Trade Unions (ACTU) under The Prices and Incomes Accord while moderating actual wage demands. Wage determinations were decentralised and the system of enterprise bargaining entrenched under subsequent governments, weakening the role of trade unions (Wright and Lansbury, 2015).

Subject to greater international competition, employment in manufacturing contracted and a decline of blue-collar jobs, often precipitated by technological change, contributed to the drop in union density (Bowden, 2011). At the same time, the rise of the services sector has resulted in less-capital intensive, smaller scale production reducing the imperative for a stable workforce (Stanford, 2017). Female participation in the workforce, which had been restricted by the primacy of the standard employment relationship (SER)¹³ and the institutions around it, increased (Stanford, 2017; Cassidy and Parsons, 2017). The expansion of Australia’s migration system (including trade in international education) has seen the arrival of a segment of overseas workers who often work in industries such as hospitality, agriculture and the transportation industry where award protection is difficult to enforce (Bowden, 2011). Technology also enabled the vertical disintegration of production and the subsequent outsourcing of various tasks to specialised businesses (including offshoring of some processes) (Coase cited in Deloitte, 2013).

13. The standard employment relationship (SER) is defined as one in which workers “work for just one employer, year-round, usually on a full-time basis, on the employer’s premises, and utilising capital equipment supplied by the employer” (Stanford, 2017, pg. 9).

There has been a trend towards flexible production processes mirrored by flexible labour market practices. This has led to the commodification of labour as 'human capital' (Oliver, Yu and Buchanan, 2018). Public regulation and institutions are viewed by some commentators as hampering the efficient operation of the market and accordingly, labour market regulatory structures have been weakened and compliance mechanisms under-resourced (Quinlan and Sheldon, 2011).

Job quality in Australia is viewed as favourable by international standards, underpinned by a strong aggregate labour market with legal safeguards to minimum terms, conditions and non-discrimination (Burgess, Connell, and Dockery, 2013). There are some views that suggest that our workplace laws, designed to provide a balanced framework for cooperative and productive workplace relations, have failed to keep pace with emerging trends, such as the rise in non-standard work (Select Committee on the Future of Work and Workers, 2018).

Non-standard employment

Outsourcing, contracting and sub-contracting have a long tradition in employment history and these were the predominant forms of work until the late 19th century, when the first factories began to appear (Stanford, 2017). The more recent quest for increased labour market flexibility has led to claims about the prevalence of non-standard work arrangements and precarious work. Determining the proportion of workers employed in these different arrangements is challenging. The OECD (2015a) notes that definitions of non-standard work arrangements are often defined by what they are not rather than what they are.

These alternative forms of employment are cited as beneficial to the economy overall, contributing to increased labour force participation, promoting linkages between work and the unemployed and increasing services and choice for consumers while reducing costs (AiG, 2016c; Manyika, Lund, Bughin, Robinson, Mischke, and Mahajan, 2016). For businesses (particularly small businesses and start-ups) it has been identified that a contingent workforce assists in meeting temporary fluctuations in demand, reducing costs of sourcing, engaging and monitoring labour, meeting capital market pressures and even overcoming the complacency of permanent employees that constrains innovation and productivity (Cassidy and Parsons, 2017; Roos and Shroff, 2017; AiG, 2016c; Manyika et al., 2016). Workers are also considered to benefit from the emergence of these employment modes, with increased flexibility and the potential for increased job satisfaction and the opportunity to supplement incomes (Roos and Shroff, 2017; AiG, 2016c; Manyika et al., 2016).

This has led to concerns that the SER is declining while alternative forms of employment are on the rise (Stanford, 2017). Stanford (2017) notes that, as the factors which led to its emergence have diminished, so too has the supremacy of the SER as the dominant mode of employment in Australia. Indeed Carney and Stanford (2018) assert that less than half of employed Australians now work in a permanent full-time paid job with leave entitlements.

Non-standard forms of employment and the conditions on offer are far from homogenous. Fixed-term contract workers generally have similar work schedules and wages to that of standard workers and tend to be highly-skilled. The tenure of permanent part-time workers is similar to that of standard employment while almost one-fifth of casual workers have worked for their current employer for five years or more (Lass and Wooden, 2017). Many people working part-time do so through choice (Cassells et al., 2018; Cassidy and Parsons, 2017).

The bulk of commentary around non-standard employment locates it as a key factor in inequality in Australia. Part of the Productivity Commission's (2018a) discussion around inequality centres on persistent disadvantage in Australia, noting it can take the form of poverty, material deprivation and social exclusion - all potential by-products of precarious employment.

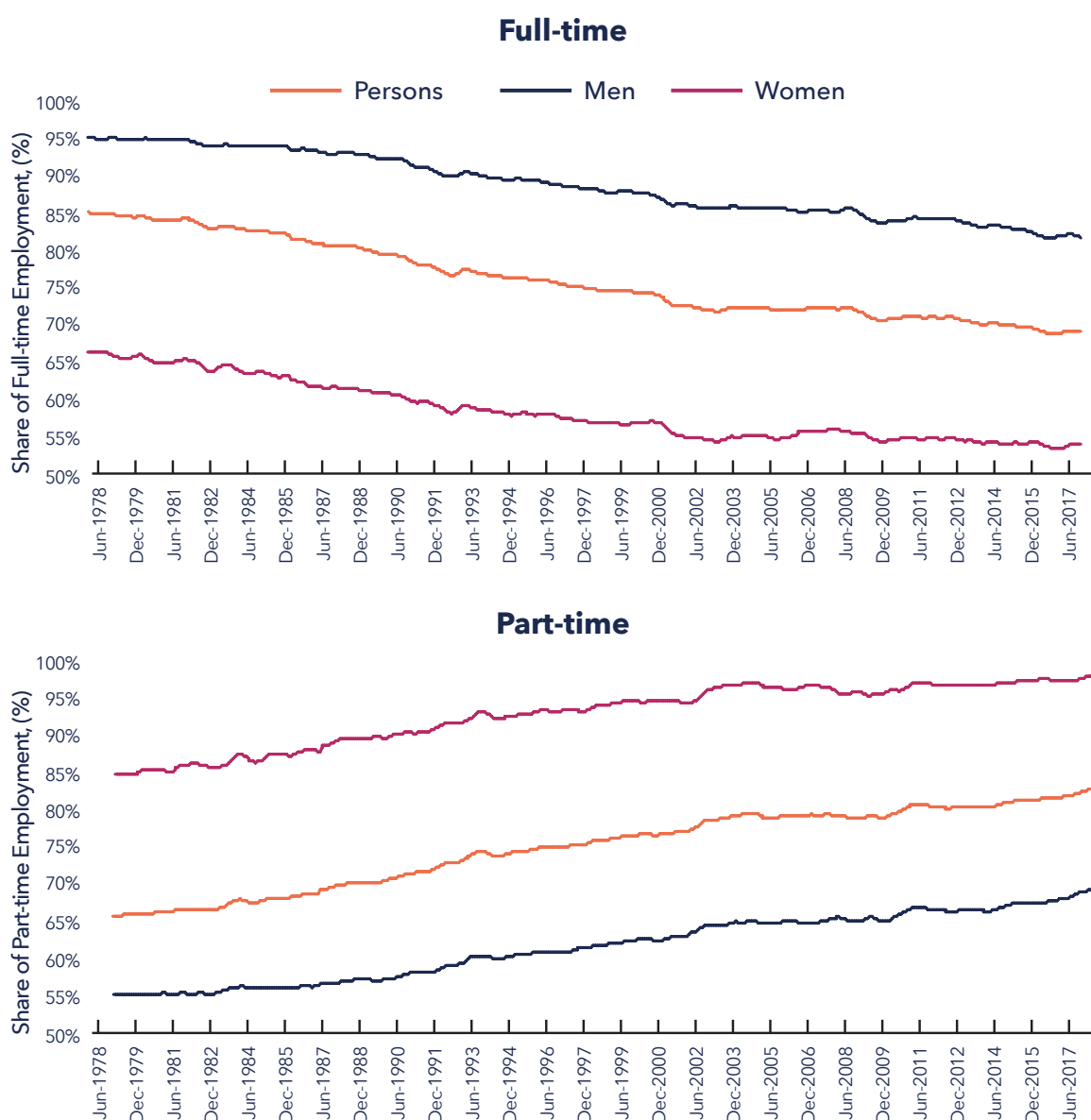
The ACTU (2018a) and the Centre for Future Work (Carney and Stanford, 2018) contend that the evolution of non-standard employment is commensurate with an increase of precarious or

insecure work. Others reject this assertion and contest that insecure work has not significantly increased over the past two decades. According to AiG (2018a), the proportion of workers who were casual employees barely increased between 1998 and 2018, while the proportion of permanent employees is higher. These findings are mirrored in work undertaken by Borland (cited in Marin-Guzman, 2017), Eslake (2017) and Lass and Wooden (2017).

Part-time employment

Historical analysis of labour force data¹⁴ shows a gradual but notable change in the structure of employment in Australia. Part-time employment has become more commonplace amongst both men and women across all ages, with a corresponding increase in part-time hours worked (Cassells et al., 2018; Cassidy and Parsons, 2017) (Figure 14). Such analysis, while showing a move from full-time to part-time employment, fails to differentiate between employment (full-time or part-time) that can be considered secure. That is, ongoing with the one employer, regular income and access to entitlements such as paid leave and superannuation.

Figure 14: Share of full- and part-time employment, Australia, 1978 to 2018



Source: Cassells et al., 2018, based on ABS data.

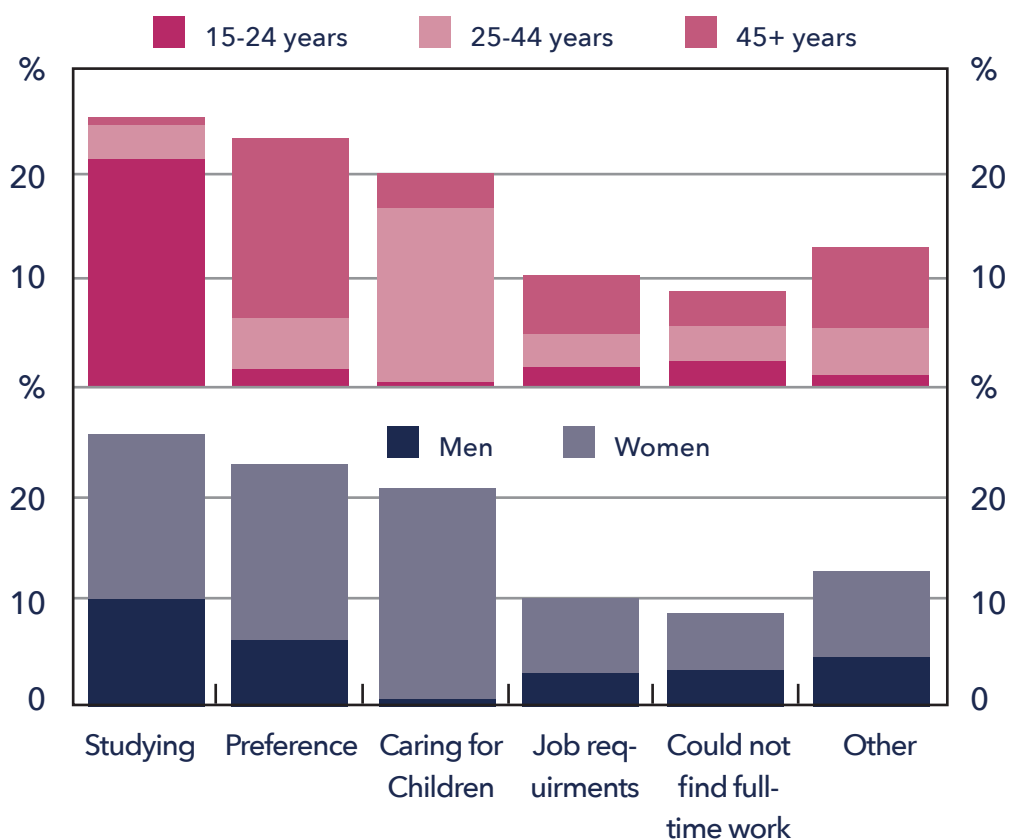
14. The ABS Labour Force Survey measures the number of people aged 15 and over in the Australian labour force at a particular time. The ABS defines people as 'employed' if they work one hour or more in the reference week. People who work 35 hours or more per week are classified as employed full-time and this includes people who are employed in two or more jobs and in total worked more than 35 hours per week. There is no classification for 'casual' employment; anyone who works less than 35 hours is classified as part-time.

Both demand and supply-side factors, including the transition towards a service-based economy, the increased propensity to combine work and study and the Australian tax/transfer system, have influenced these changes to the composition of employment (Cassells et al., 2018). While part-time work is on the rise, the reasons for this are contested. Some commentators promote part-time work as a 'choice' (AiG, 2018a) while others contest that people are being 'forced' into part-time work (ACTU, 2018b).

Cassidy and Parsons (2017) (Figure 15) identified the three most common reasons for undertaking part-time work are:

- to accommodate study
- a preference for part-time hours
- caring for children.

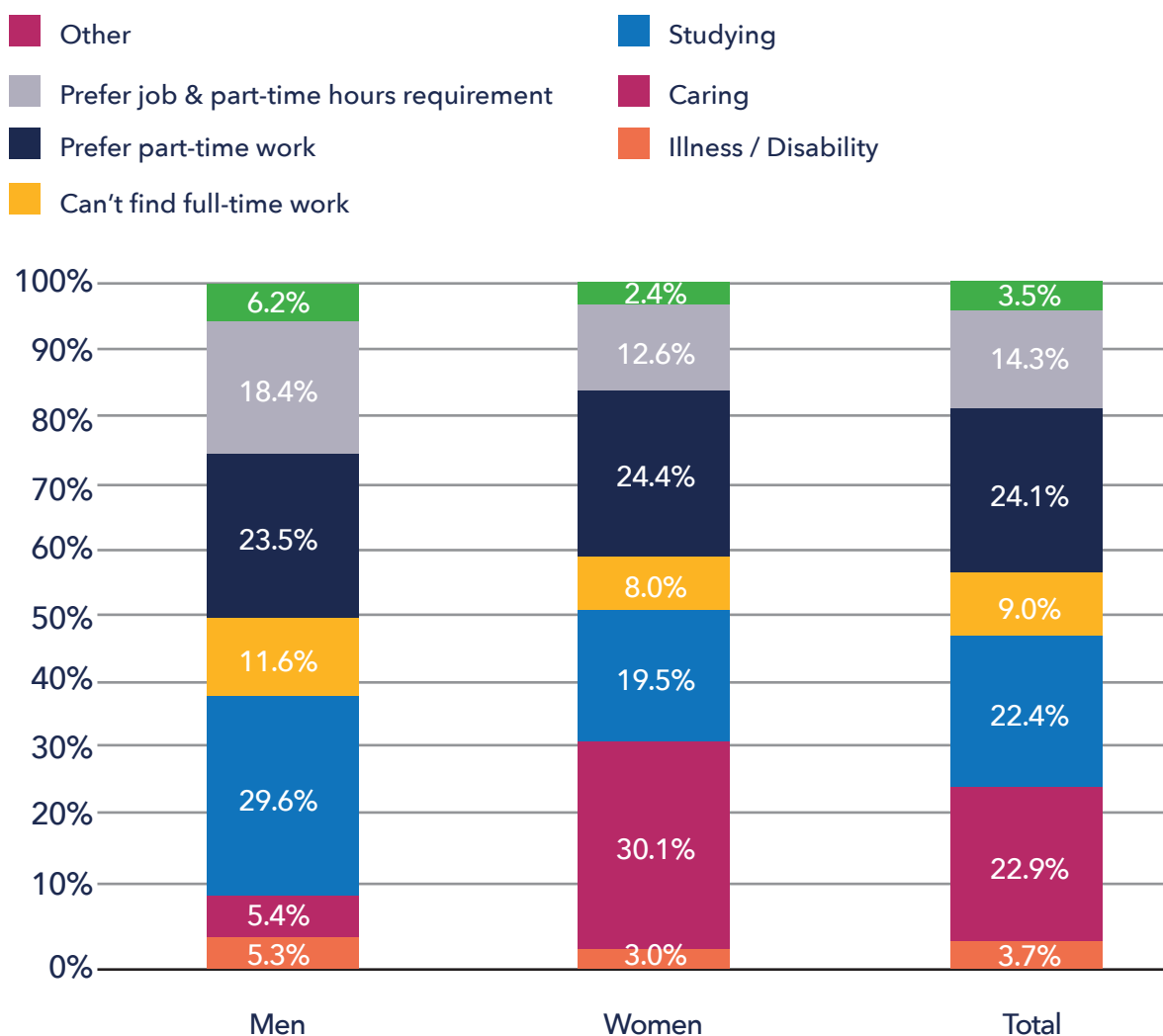
Figure 15: Reasons why people in Australia work part-time by age and sex, 2001-2015



Source: Cassidy and Parsons, 2017, based on HILDA and RBA data.

A study by the Bankwest Curtin Economic Centre (Cassells et al., 2018) found similar reasons with a slight variation between men and women in that women put 'caring for others' as the most common reason (30.1 per cent) while men cited 'combining work and study' as their most common reason (29.6 per cent) (Figure 16).

Figure 16: Main reason for working part-time rather than full-time, Australia, 2015



Source: Cassells et al., 2018, based on HILDA data.

Both these studies highlight that for many people part-time work may be a choice made to meet other priorities in their life at the time. In contrast, the OECD (2018b) contends that Australia has a high proportion of 'involuntary part-timers' or those who would prefer to work full-time if they could.

Nevertheless, there are some evident trends. In October 1998, 26 per cent of Australian workers were employed part-time; by August 2018, this had increased to almost 32 per cent¹⁵. Rates of casual employment have increased (ABS, 2018)¹⁶. Labour underutilisation rates have been increasing since the GFC (Cassidy and Parsons, 2017; Eslake, 2017).

Precarious work

The concept of 'precarious work' is multidimensional, encapsulating underemployment, insecure/lack of employment rights, benefits and entitlements as well as job insecurity (Cassells et al., 2018). It is difficult to define as even people in full-time permanent employment may perceive their employment to be precarious for a variety of reasons (Foster and Guttman, 2018).

15. ABS, 291.0.55.001 - RM1 - Labour force status by Age, Labour market region (ASGS) and Sex, October 1998 onwards.

16. There is no definitive measure for casual workers in Australia. The most commonly used proxy is the 'employees without paid leave entitlements' data in ABS 6333.0 - Characteristics of Employment.

Conditions, wages and levels of precariousness are dependent on a number of factors. Manyika et al., (2016) contend that the attributes of occupations and workers will affect both the feasibility of work being performed by independent contractors and the experiences of workers engaged in this work. For example, they put forward that occupations requiring high levels of contextual knowledge (of bureaucratic or institutional processes, for instance) are less suited to independent contracting while professionals with highly desirable or scarce skills will have the capacity to negotiate favourable pay and conditions.

The Independent Inquiry into Insecure Work in Australia (2012) defined insecure work as that which provides workers with little social and economic security, and little control over their working lives. Indicators of insecure work are:

- unpredictable, fluctuating pay
- inferior rights and entitlements, including limited or no access to paid leave
- irregular and unpredictable working hours, or working hours that, although regular, are too long or too few and/or non-social or fragmented
- lack of security and/or uncertainty over the length of the job
- lack of voice at work on wages, conditions and work organisation.

Lass and Wooden (2017) attempt to identify the rates of employment types in Australia while noting the different figures attained depending on the data and definitions used. For instance, using Household, Income and Labour Dynamics in Australia (HILDA) data, this study identified that 19 per cent of workers were in casual employment; this increased to 26 per cent using data from an ABS survey.

The impact of the rise in alternative forms of employment such as part-time and casual work, labour hire, independent contracting and gig work is contested. For employers there may be some short-term gains from such arrangements through greater worker flexibility and cost savings (Roos and Shroff, 2017; AiG, 2016c). Over the longer-term, this can lead to loss of productivity due to erosion of firm-specific skills which limit the ability of businesses to respond to changing market demand (Aleksynaka and Berg, 2016, cited in Balliester and Elshiekhi, 2018).

Concerns about precarious work centre around both the impact on individual workers and the impact on the community (Quinlan, 2015). The stability of the SER enabled workers to make decisions about, and access funding for, significant consumer purchases including home ownership and investment in further education. Lass and Wooden (2017) found that casual and permanent-part time workers earn between one-third and 40 per cent of the mean weekly wage of those employed in standard employment. As such, making these types of decisions when a worker's ability to earn a stable and adequate income is in doubt can be significantly constrained (Carney and Stanford, 2018).

Both Stanford (2017) and Whiteford (2018) state that Australia's systems of social institutions, such as social security, taxation and labour protections, are predicated on the SER as a norm; movements away from standard employment both risk undermining the financing of, and community support for, these social institutions. As Whiteford (2018) says:

Governments... recognise that social protection both promotes economic efficiency and productivity and supports high levels of participation in paid labour markets and promotes a socially inclusive and more equal society (pg. 1).

Reports chronicle the effects of non-standard employment (including under-employment) on both physical and mental health, with some showing that rates of depression are equivalent to those for the unemployed (Quinlan, 2015; Dooley, Prause, and Ham-Rowbottom, 2000). In addition, workers in precarious employment may not have adequate protections under Work Health and Safety regulations, access to worker's compensation or access to sick leave (Quinlan, 2015; Whiteford, 2018).

Anxiety around the diminution of the SER and changes to the labour market often manifests in discussions around inequality, which is a growing issue that negatively affects both social cohesion and economic growth (OECD, 2015a). The Productivity Commission (2018a) state that wealth and income inequality in Australia has risen since the 2000s. Stanford (2018) points out that the changing distribution of income away from labour and toward capital is one of the factors behind income inequality, with other commentators pointing out that the period since the post-mining boom has been characterised by low wage growth but high capital returns (Peetz, 2018; Bishop and Cassidy, 2017).

The 'new' gig economy

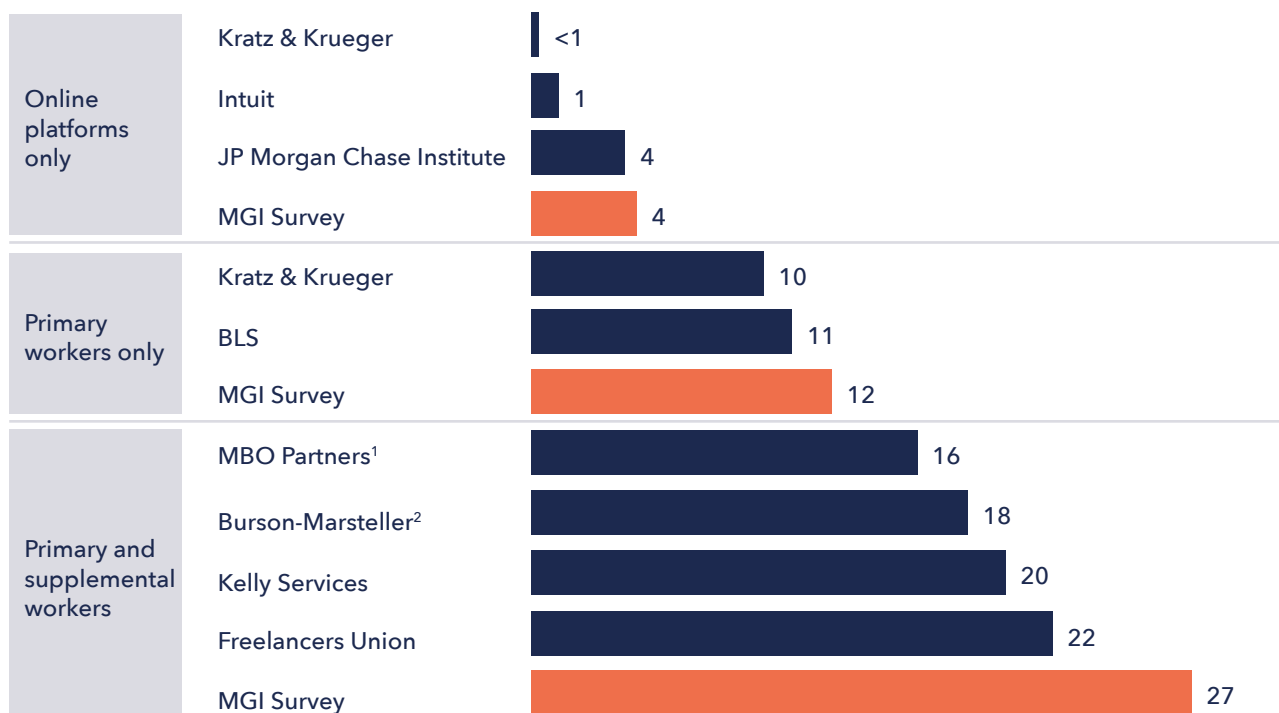
One of the alternative forms of employment attracting recent attention is associated with the 'gig economy'. The gig economy is most commonly described as involving the following characteristics:

- work is not ongoing and is performed on-demand
- payment is by task or unit of output
- workers are responsible for providing capital (location, tools and equipment)
- a triangular contractor or subcontractor relationship exists
- work and payment is organised via a digital platform (Stanford, 2017; Minter, 2017; Manyika et al., 2016; Lapanjuuri, Wishart, and Cornick, 2018).

Well-known examples of these digital platforms in Australia include Uber, Airtasker and Deliveroo. The definition of who actually engages in the gig economy is problematic, with various studies including or excluding freelancers, independent contractors, agency temps, business owners and 'moonlighters' (Cassells et al., 2018; Carney and Stanford, 2018; AiG, 2016c; Wooden, 2014).

Given the variability in just who is a 'gig' worker, estimates vary as to the prevalence of this form of work, with definitional differences producing wide variations. In the US, estimates of workers involved in the 'independent workforce' vary widely (see Figure 17). Upwork's (2017) freelancing report shows that the number of full-time freelancers in the US grew by 70 per cent between 2014 and 2017, while the percentage of part-time and moonlighting freelancers fell over this period. Farrell and Greig (2017) argue that growth in online platform participation in America is actually slowing.

Figure 17: Estimates of the US independent workforce as percentage of working-age population, 2016



1 Includes those who work full time (16.9 million), part time (12.5 million), or occasionally (10.5 million) as consultants, freelancers, on contract, or performing temporary or on-call work each week.

2 Includes labor services and some leasing but excludes selling goods.

Source: Manyika et al., 2016.

Writers note the challenges these modes of employment pose to established methods of regulation in systems such as employment, health and safety, and taxation (Healy, Nicholson and Pekarek, 2017). Campbell (2013) wonders whether existing labour and social frameworks, based on standard employment, are suited to new modes of working. Stewart and Stanford (2017) suggest the solutions may lie in radical redefinitions of a ‘worker’ and/or an ‘employer’.

The Productivity Commission (2018a) states sustained economic growth and reliable access to employment, accompanied by skills and education advances, offer the best opportunity of overcoming inequality in Australia.

A survey of European¹⁷ countries estimated that between 60 and 94 million people were independent earners (Manyika et al., 2016) while according to Lapanjuuri et al (2018), 4.4 per cent of people in Great Britain were reported as working in the gig economy in the 12 months to February 2018.

The number of people engaged in the gig economy in Australia is also difficult to accurately determine (Cassells et al., 2018; AiG, 2016c). One 2015 report estimated that 30 per cent of the Australian workforce was involved in freelancing (Cassells et al., 2018) while another reports that fewer than 0.5 per cent of Australian adults were actively working on labour platforms (Minifie and Wiltshire, 2016). McCrindle Research (2018b) cited the growth of part-time workers in the latest Census as evidence that the gig economy is ‘on the rise’.

17. In this report, Europe refers to Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

However self-employment figures from the most recent HILDA survey showed no discernible growth in this variable and it was concluded that:

If the gig economy is growing as rapidly as commonly believed, then either it involves the substitution of one type of self-employed worker for another (as might be happening in the taxi industry) or it is largely consigned to second jobs (Wooden, 2018).

The ABS (2018) released figures which show that just 6.5 per cent of all jobs were secondary jobs as of June 2018, an increase of only 0.3 percentage points since September 2010¹⁸.

Some researchers warn that discussions around the gig economy should acknowledge that many digital start-ups have faltered, unable to achieve economies of scale or compete effectively against already established companies or platforms, or to penetrate beyond mainly unskilled labour markets (Healy, Nicholson and Pekarek, 2017; Manyika et al., 2016). Given the difficulty in quantifying the size and impact of the gig economy in Australia, why is so much attention focused on it?

Expectations of the gig economy are that its inherent disruption will generate economic growth while driving innovation and entrepreneurship (Burtch, Carnahan and Greenwood, 2018). Prassl (2018) argues that advocates of the gig economy promote it as revolutionary, offering freedom, autonomy and self-determination. Its potential for disruption and association with technology infuses it with the 'glamour' of Silicon Valley and the excitement of entrepreneurial endeavour. Bailey (2018) equates this 'new way of working' with an anti-establishment vibe.

It would appear there is nothing particularly new about the gig economy. Stanford (2017) and Prassl (2018) both argue that, apart from the use of a digital platform, the features of the gig economy outlined above actually represent a reversion to previous labour practices, such as outworking.

The main aspects of their work organization - on-demand work, piece work compensation, home work, and a triangulated relationship between producer, intermediary, and end-user - are visible in long-standing practices of private businesses stretching back through the history of capitalism (Stanford, 2017, pg. 9).

Nevertheless, both Stanford and Prassl acknowledge the technological innovation inherent in this mode of work. This technological innovation is decreasing the costs of doing business - jobs can be broken into component tasks and technology can then be used to cheaply source, coordinate and pay for performance of these tasks, at the lowest possible price (Healy, Nicholson and Pekarek, 2017; Manyika et al., 2016). Rating systems and user reviews, introduced to establish trust between otherwise unknown parties, actually transfer the responsibility of monitoring workers to customers while offering a low-cost method of control over work (Stanford, 2017; Manyika et al., 2016). Prassl (2018) takes this argument further, asserting that:

nearly every aspect of on-demand work is shaped by the rating algorithms' constant hovering... from vetting potential entrants and assigning task to controlling how work is done and remunerated and sanctioning unsatisfactory performance - often without any transparency or accountability (2018, pg. 55).

It is this substantive control that critics cite when contesting the designation of some gig workers as contractors or independent workers, governed by commercial, rather than employment law. With no definition of employment under Australian law, courts apply a multi-factor test (see Appendix one) to determine whether a worker is an employee and therefore covered by minimum standards of employment (Minter, 2017; Minifie and Wiltshire, 2016). Digital platform providers argue that they do not provide services but instead serve as a marketplace that enables transactions between independent workers and customers.

18. ABS, 6150.0.55.003 - Labour Account Australia, Quarterly Experimental Estimates, June 2018.

The deeming of those performing the work via digital platforms as independent contractors enables the platforms to avoid the responsibilities and obligations imposed on traditional employers (Prassl, 2018; Stanford, 2017). This assertion has been subject to challenge across the globe, with differing results.

In Australia, a Fair Work Commission case found that Uber drivers were not employees, while the United Kingdom Employment Tribunal found that Uber drivers should be considered workers and thus entitled to additional rights. In New Zealand, the court found in favour of workers challenging their designation as independent contractors by LSG Sky Chefs New Zealand (Dosen and Graham, 2018).

Prior to its exit from Australia, delivery company Foodora was subject to accusations of sham contracting by the Fair Work Ombudsman, and both the Australian Tax Office and Revenue NSW have raised debts with the company for outstanding superannuation and payroll tax respectively (Chau, 2018).

Uncertainty around the categorisation of workers is not confined to 'gig workers'. In the wake of the Federal Court finding that an employee classified as casual was actually working in a capacity that entitled him to paid annual leave, the New South Wales Business Chamber has applied to the Fair Work Commission to create a new 'perma-flexi' category of worker. Under this categorisation, casual workers who work regular hours would be entitled to access to annual and sick leave entitlements, but their leave loading would be reduced and employers would retain the right to vary weekly hours (Elmas, 2018).

Regulation of technology

While much of the literature about the future of work deals with technology and its supposedly inexorable progress, technology is not neutral and there is nothing inevitable about the way technology develops (Stanford, 2017; Kranzberg, 1986).

Technology does not develop in a vacuum and its uptake and usage is dependent on economic, scientific, political, organisational and educational influences (Little, 2010). Little cites the example of the development of electric power in the West, pointing out that the 'social implementation' of electrical power was influenced by numerous non-technical factors and its proliferation depended on the development of vertically integrated production systems including banks and factories. Technology is a tool, it still requires human decision making (Williamson et al., 2015).

This has implications for the technological impact on the future of work. Technologies touted as being potentially transformational may end up having a minimal or reduced impact due to a number of non-technological constraints. For example the ACS warns that Australia's competitiveness in information and communications technology (ICT) is average or below average on a number of measures and risks falling due to on-going skill shortages (Deloitte Access Economics, 2018a). This not only affects work and training in the ICT industry but has flow-on effects for the uptake of ICT in other industries and the economy as a whole.

Why regulate?

Technologies have a moral dimension, sometimes intentional (such as the development of the internet to increase accessibility) and sometimes unintentionally, reflecting the values and biases of their creators (Philbeck, Davis, and Larsen, 2018). The latter has consequences for services increasingly reliant on algorithms and AI, which may impinge on basic rights for workers. For example, Amazon has been forced to abandon its autonomous recruitment tool because it has shown a gender bias against women (Hamilton, 2018). Such biases have implications (such as reducing workforce diversity and further disadvantaging already disadvantaged cohorts) for

recruitment practices within organisations that rely on such technology to recruit and evaluate employees (Mone, 2017; Knight, 2017).

The intermeshing of technology with contemporary society bring benefits but it also creates risks. As well as personal risks concerning cyber security, data privacy and sovereignty, cyber-attacks on infrastructure (such as the 2016 Census data collection) are serious and have the potential to shut down a business, network or region (ACS, 2016). The vulnerability to hacking for autonomous vehicles and networked medical devices may see the implementation of such technologies slow down or even abandoned (Burrows, 2016).

Approaches to regulation

Regulation of technology is important not only for moderating and mediating the effects of technology but in also influencing the actual development of particular technologies. According to Solomon (2016) there are four questions that need to be asked around the governance of technology. These are:

1. Should a technology be developed at all?
2. If a technology is going to proceed, how should it be used?
3. If a technology is to go forward, how should it proceed?
4. Once norms have been set, how will the field be monitored to ensure adherence?

The literature identifies a number of approaches to the regulation of technology.

Some commentators propose a human-centred approach towards regulation (Philbeck et al., 2018; Australian Centre for Robotic Vision, 2018). That is, regulation must be designed to reinforce human values and ethics and to enhance human intelligence rather than supplant it (Carrico, 2018; World Economic Forum, 2016). These concerns have been reflected in a number of international agreements and conventions as far back as the 1970s (Malsch, 2013).

Gunningham and Sinclair (2017) endorse 'smart regulation', which surpasses the traditional notion of regulation as a 'bipartite process involving government (as the regulator) and business (as the regulated entity)' (pg. 133) and instead recognises the multiplicity of formal and informal mechanisms which play a regulatory role in contemporary society. They note this concept evolved as the limitations of both control-and-command regulations and the free market emerged.

Marchant and Wallach (2015) argue that the complexity around new technologies, the speed of development and the innovative products emerging makes it difficult for one entity to oversee and regulate effectively. They state that a new coordinating body, acting as an issues manager, provides a possible solution. Kimber (2018) argues that Australia should establish a governing body comprised of government, innovators, business and academia to institute standards of behaviour around technologies such as AI.

Malsch (2013) acknowledges the prevailing view that sovereign states are ill-equipped to govern technological development and innovation but queries the apportioning of regulatory responsibility across both state and non-state actors (such as companies and the research community). She contests that it is necessary to balance innovators' rights to freedom with the rights of safety and security of other citizens, and that it is difficult to determine a fair division of moral labour concerning research and innovation. Nevertheless, Malsch concurs that collective responsibility is necessary under specific circumstances.

Trust is central to regulatory effectiveness. Governments rely on the trust of their citizens and enforcement regimes depend on trust between the regulator and the regulated (Eccles, 2015; Gunningham and Sinclair, 2017). Trust in institutions, including government, has been

declining for some time, (Bachmann, Gillespie, and Priem, 2015). Recent Royal Commissions into misuse/abuse of power have further damaged institutional trust (Danckert, 2018). In addition, trust in technology itself is weak, with concerns around data security, online verification and transparency (Kimber, 2018; Hautala and Kettunen, 2017).

Effective regulation of technology must address these issues of trust. As Jeleva and Rossignol (2008) note, scepticism towards government leads to scepticism towards risk reduction. One of the ways to do this may be to ensure that civil society is more embedded in regulatory and policy design and processes (Philbeck et al., 2018; Haley, 2016; Malsch, 2013).

Swanepoel (2018) argues that community-based guidelines for ethical use are essential to guarantee the acceptance and adoption of artificial intelligence.

Regulation is, of course, a balancing act.

Regulation may place a compliance burden on businesses, causing a diversion of resources away from innovation or compliance may actually drive innovation, as businesses seek to minimise the costs. To this end, regulations should be designed for transparency (to reduce information asymmetry) and flexibility, yet also be unambiguous and rigorous (Kramer and Wrightson, 2016). A review of the impacts of 12 regulatory factors on innovation in the European Union found that industry and regional effects varied, but that overall regulation has a neutral or positive impact and generated both investment and jobs (Peter et al., 2017).

One of the unintended consequences of technology has been the disruption of social cohesion and deepening inequality (World Economic Forum and The Boston Consulting Group, 2018). Technology is disrupting the jobs of both skilled and unskilled workers and the monetary benefits are flowing predominantly to the owners of new businesses and their highly skilled personnel (Burrows, 2016). Regulation directly affects the way in which workers engage with technology, including the digital platforms underpinning the gig economy. For example, regulations imposed by France means that driving for Uber there is very different to driving for Uber in the US. As Manyika et al. (2016) explain:

France created an autoentrepreneur designation in 2008, which increased the number of individuals who were self-employed by streamlining tax filing and the process of becoming self-employed. However, regulators have imposed higher requirements specifically for drivers, including 250 hours of formal training and an additional cost and time investment for a 'DRE license', although drivers can avoid these costs by working through an existing transportation company. These hurdles, especially compared to the lower investment required in the United States, have encouraged a different segment of the French workforce to participate on the Uber platform. (pg. 59)

Rawling and Kaine (2018) call for better regulations to avoid the use of technology to evade labour market regulation and weaken workers' conditions. If governments do not address widening inequality and notions of fairness, they further undermine trust in governments and other public institutions, which threatens the effectiveness of any regulatory policy and compliance levels (Lind and Arndt, 2016).

According to the World Values Survey (2014), around 60 per cent of Australians agreed that 'because of science and technology, there will be more opportunities for the next generation', an increase of more than 20 percentage points since 2005. To maximise these opportunities, it is vital that we 'guide the direction of technological change so that the benefits are maximised and equitably distributed across Australian society and potential negative impacts are minimised' (Select Committee on the Future of Work and Workers, 2018).

Implications for employment

Quality work

Given the multitude of changes discussed thus far, it is almost inevitable that the structure of employment in Australia would be changing as well.

In the current discussions about the future of work, many have stressed in the context of existing and projected changes to technology, demography, society and business/employment models there needs to be emphasis placed towards ensuring that quality work and work opportunities still exist heading into the future (Select Committee on the Future of Work and Workers and various submissions, 2018).

But how does one define quality work? It has long been held that this is achieved through full-time employment defined by Stanford (2017) as the 'standard employee relationship'. There has been a noticeable move away from full-time towards part-time employment which some commentators have equated with 'precarious employment'. If part-time work offers the same conditions and protections as full-time work (i.e. regular/set hours, regular income, stable and ongoing employment with all the entitlements of full-time employment), can it be considered to be 'precarious'?

Recent data suggests that there are many reasons for choosing to work part-time other than an inability to find full-time work (Cassidy and Parsons, 2017). Potential changes such as a longer/changed working life, increased probability of lifelong learning and the changing division of labour between the workplace and household suggest that further adjustments in worker preferences are likely to occur into the future.

Does this then mean that quality work is indeed declining in Australia or is it a reflection of changing demographics (or both)? Research conducted by Burgess, Connell and Dockery (2013) considers quality work to be the extent to which a set of job attributes contributes to, or detracts from, workers' wellbeing in their work and non-work domains. This is a very broad and employee-centred definition and the relationship between work and wellbeing can be viewed from many different perspectives and disciplines. The authors state that an important caveat to any assessment of job quality is that individual workers have different preferences - being employed part-time is not in itself a feature of low quality work, but rather hours of work have to be assessed relative to workers' preferences.

Key findings

Areas of consensus in the literature

- Key structural and economic reforms in Australia over the last 40 years have changed our labour market.
- Work is changing as a result of both technology and societal and demographic changes.
- We are not powerless in shaping our own futures.

Areas of contention in the literature

- Definitions (e.g. worker/employee) are contested, resulting in anxiety and confusion.
 - As a result, empirical data is also contested.
 - In some areas there is an insufficient amount of data to substantiate claims.
 - The lack of empirical evidence is leading to confusion and anxiety and driving endless debate on what is 'important'.
- How and to what extent modes of employment are changing is contested.
 - There is little agreement on the importance and prevalence of new work arrangements such as teleworking and platform-mediated employment arrangements.
 - The rise of precarious work is also contested, due to deficiencies in the availability of data, differences in measurement and varied motivations of those engaging in this mode of employment.



Challenges and questions for consideration

- How prevalent are 'new' work arrangements (e.g. gig/platform-mediated work) in the Queensland economy?
 - Who is participating, why and to what extent?
 - How can we define and measure uptake/use/participation in these new arrangements and quantify their impacts on participants?
- What is the role of institutions (government, vocational education and training, etc.) in the process of transition?



section four

IMPLICATIONS FOR TRAINING AND SKILLS

Education, be that school, VET or higher education, will be one of the most critical factors shaping workforce outcomes in the future.

What the literature says

The research suggests that most of the new jobs of the future will require higher levels of skills. It also suggest that continual investment in education will be required in order to keep up with the rate of change brought about by developments in digital technology.

Yet Australian workers do not appear to consider that education will be important to remaining relevant in the workforce. Only six per cent of respondents to a future of work survey by the Australian National University (Sheppard, Biddle, and Gray, 2018) reported that they were 'very concerned' that the technical skills required to their job would outpace their current skill levels. According to MYOB, Australian businesses also do not appear to be prepared for the transformation that is happening across the economy. A lack of investment in training is hampering the introduction of new technologies (Kilimanjaro Consulting, 2018).

The impact of technology development and changing societal and demographic expectations is already impacting the education and training sector from early childhood education to universities. The demand for higher skills and knowledge comes not just from industry but also from individuals. In Australia, funding constraints and changing regulation are impacting almost all parts of the sector, e.g. new national regulations for early childhood education and care services stipulate the qualifications required to work in the sector and the minimum educator to child ratios (Queensland Government, 2018, February 1).

Multiple intersections with education and training throughout people's working lives will drive the demand for a more closely integrated education system that supports changing skills and knowledge requirements at different points in individuals' careers (Business Council of Australia, 2018; Nedelkoska and Quintini, 2018; Brungs, 2018 cited in Select Committee on the Future of Work and Workers, 2018). An integrated education sector that supports seamless transitions from school - further education - work as well as close collaboration with industry (employers and unions) is a key recommendation arising from the Select Committee on the Future of Work and Workers (2018). Jobs Queensland's work with stakeholders from the tourism and manufacturing industries have also reiterated this need (Jobs Queensland, 2017b; Jobs Queensland, 2018a).

A 'job ready' workforce

There is much discussion in the Australian media and by business groups that graduates from Australia's education system are not 'job ready' (Business Council of Australia, 2018; AiG, 2018b). The VET sector has a pivotal role in supporting the workforce of the future to have the skills needed to participate productively and meaningfully throughout their working life (Reeson, et al., 2016; Select Committee on the Future of Work and Workers, 2018). According to the

Department of Jobs and Small Business (2018), the majority of new jobs projected up to 2022 will be in occupations supported by the VET sector.

This makes the VET sector vital for ensuring Queenslanders have the skills, knowledge and attributes needed to participate successfully and productively in an increasingly digitised, automated and global economy.

Since 2015 the VET sector has been undergoing major reform (Australian Government, 2017, August 23). It is facing decreasing public funding (Noonan, 2016) and extensive criticism of its lack of agility and flexibility to meet the needs of a changing economy (Schubert, Geodegebuure, and Meek, 2018; Australian Financial Review and KPMG, 2017).

The sector, particularly the public provider, TAFE, has an ageing workforce (Productivity Commission, 2011). There has also been a loss of confidence in the sector due to the VET FEE-HELP crisis (Saccaro and Wright, 2018).

The Productivity Commission (2017a) highlighted some of the issues being experienced within the VET sector as it strives to produce job-ready graduates in a modern economy. This includes a widening student demographic and increasingly diverse needs that the sector is expected to address. It has been beset with issues such as rising student debt, high student non-completion rates and poor labour market outcomes. Existing training packages, the main vehicle for the production of job-ready workers, are not always serving the needs of employers and students.

The perception of VET also needs to be addressed, particularly in a working life embodied by ongoing learning (Billett, 2018). There is a persistent tendency for many parents (Australian Government, n.d.) students and schools to view VET as a much less prestigious and valuable pathway, compared to the academic pathway that leads to university. However a university education may not be a good fit for all young people, and not necessary for all jobs (Norton, Cherastidtham and Mackey, 2018; Torii and O'Connell, 2017).

Lifelong learning

A common theme running through much of the literature was that, in order to participate effectively in the workplace of the future, the working age population will need to engage with learning throughout their lifespan (Select Committee on the Future of Work and Workers, 2018; Gratton and Scott, 2016). The concept of 'lifelong learning' is not new. The Australian Centre for Educational Research (ACER) in 2000 (Bryce, Frigo, McKenzie, and Withers, 2000) investigated how the skills for lifelong learning could be embedded into the secondary school curriculum.

The importance of lifelong learning has been highlighted in recent publications by the WEF (Simmons, 2018; Centre for the New Economy and Society, 2018; Yuen, 2018). According to the WEF:

[t]he half-life of a skill has dropped from 30 years to an average of 6 years. This holds true even for fresh university graduates. This means that the model of 'learn at school' and 'do at work' is no longer sustainable and constant reskilling and lifelong learning will be a way of life at work. (Yuen, 2018)

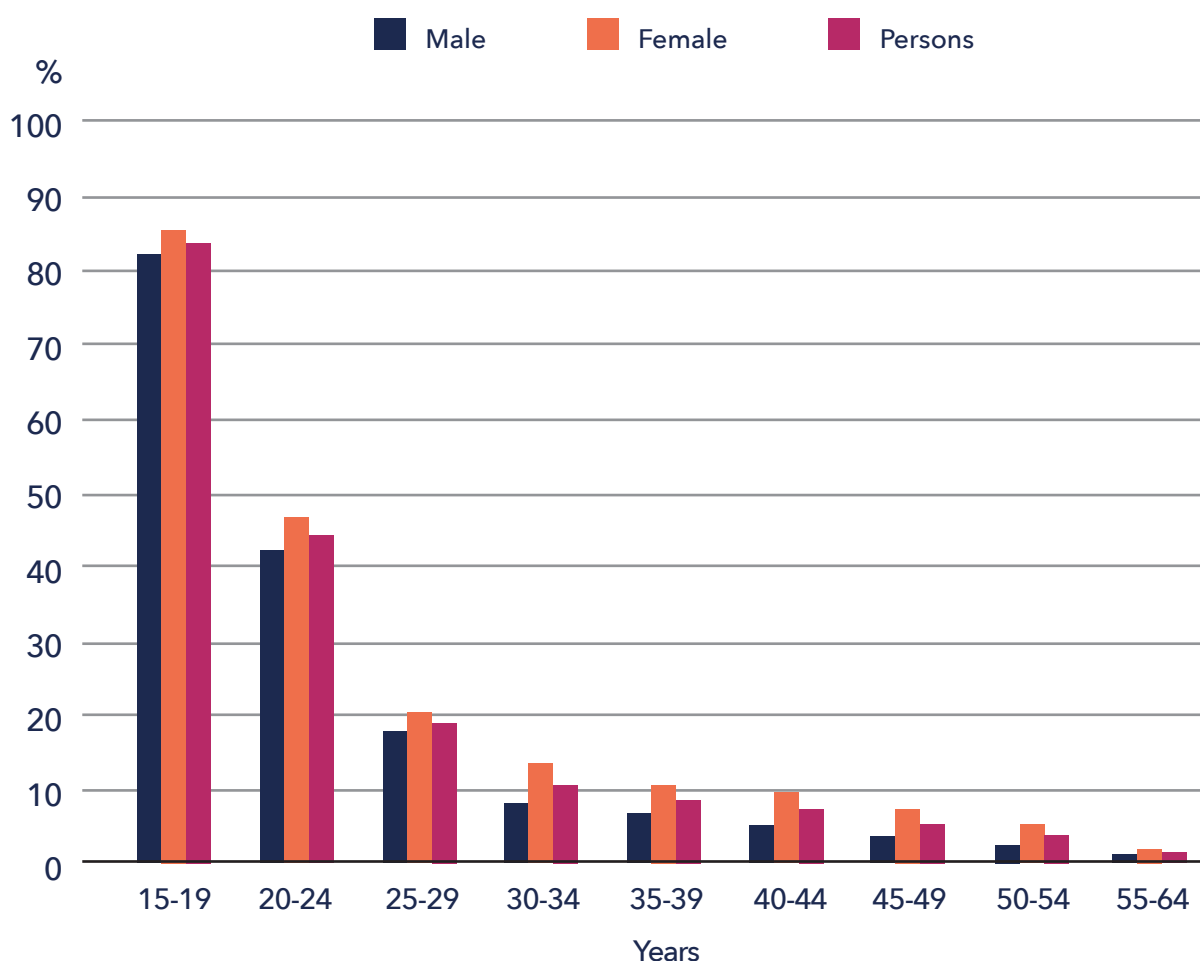
The top priority for organisations looking at their future workforce development strategy is reskilling their existing workforce (Centre for the New Economy and Society, 2018; AiG, 2018b). AiG's latest Workforce Development Needs Survey (2018b) found that the main strategy used by employers (68 per cent of respondents) to meet skill needs is upskilling existing staff. The WEF (Centre for the New Economy and Society, 2018) predicts that by 2022, at least 54 per cent of employees will need significant re-skilling and/or upskilling. The WEF emphasise that those most in need of training (those whose jobs were most at risk) were the least likely to be

offered training by employers. This is in line with research undertaken by the OECD (Nedelkoska and Quintini, 2018) which found that workers in roles that are fully automatable are more than three times less likely to participate in on-the-job training. They are also about twice as likely to not participate in formal education. Distance education is also shown to significantly not be accessed (around 3.5 times less likely to engage) (pg. 9).

Currently in Australia, the majority of education occurs in the first 20–25 years of a person’s life. According to the ABS (2017, November 6), 84 per cent of people aged 15–19 years and 44 per cent of people aged 20–24 years were fully engaged in education in May 2017 (Figure 18). It is possible that young people currently engaged in post-school education may be preparing for a job that will not exist upon completion of their studies (FYA, 2017a).

The WEF 2016, (cited in Siekmann and Fowler, 2017) estimates that as many as 65 per cent of primary school children may end up working in jobs that don’t exist today. The lifecycle of skills is increasingly shortening (Yuen, 2018; ManpowerGroup, 2018). This has implications for individuals, employers, industries, educational institutions and governments.

Figure 18: Enrolled in formal study, by sex and age group, Australia, 2017



Source: ABS, 2017, November 6, Education and Work, Australia, 2017.

Strengthening the affective aspects of education and instilling a lifelong learning habit, especially among males and students from disadvantaged backgrounds who tend to have lower levels of motivation, is a further area of interest for policy makers (Bakhshi et al., 2017). Individuals need to nurture their learnability: their desire and ability to learn new skills to stay relevant and remain employable (ManpowerGroup, 2018).

While progress is already being made, the education sector needs to continue to address and match the efforts of industry to eliminate persistent gender bias associated with certain professions/fields of study. For example, the (improving but persistent) low rates of female enrolment in science, technology, engineering and mathematics (STEM) and ICT-related disciplines, and male enrolment in health and care-based disciplines need to be addressed. Women comprise three quarters of enrolments in the growth areas of health and education, while men continue to dominate engineering and IT (Cassells et al., 2018).

Similarly, apprenticeships and traineeships will need to be promoted, particularly as opportunities for the workforce attraction and retention of mature-aged workers and workers from diverse backgrounds (Jobs Queensland, 2017a; 2018a). Whilst offering much needed experience for young people about to enter the labour market, there remains a significant diversity imbalance across occupations. Apprenticeships are largely focused on traditional trade occupations which are male-dominated. Expanding the model to more future focused industries through the introduction of higher apprenticeships has the potential to increase their attractiveness and diversity (FYA, 2017c; Jobs Queensland, 2017a).

Participants at the policy roundtable convened by the Mitchell Institute (Torii and O'Connell, 2017) explored the role of apprenticeships in future workplaces. It was agreed that the concept 'offers a strong value proposition for young people today and in the future' (pg. 18). However there is a need to explore innovative apprenticeship models to meet the needs of future workplaces.

As discussed previously, a significant part of a redefined working life involves the transition towards continual reskilling and upskilling - one of lifelong learning. However the purchase of ongoing education comes with ongoing costs for the individual, the employer and governments.

This raises an important question of who should bear the costs of increased purchasing of education. If borne by the individual, there exists a trade-off between working and studying, which may act as a deterrent depending on personal circumstances. Although many employers provide assistance, this avenue might become less common if contingent work arrangements such as contract or casual work becomes more commonplace. Rising education costs are likely to create an increasing burden on public and private expenditure, but also have the potential to exacerbate inequality if an increasingly expensive education is required to access a good job (Hajkowicz et al., 2016).

A paradigm shift towards lifelong learning would also significantly increase the demands on the education system (such as an increase in the number, knowledge and skill level of teachers, investment in upgraded infrastructure, etc.). A recently completed research project into the effects of teacher/trainer qualifications on the quality of VET teaching/training (Smith, Yasukawa, Harris and Tuck, 2018) identified that for VET teachers, higher level VET qualifications, i.e. a diploma or degree, made a significant difference to the quality of teaching within the sector.

Current funding (entitlement) models are focused on supporting an individual's acquisition of an initial post-school qualification, be that through the VET system or higher education. The question of whether current funding/government support models need a similar paradigm shift has been raised by Noonan (2016). This is a question that governments across most of the developed world are grappling with.

Foundation skills

Foundation skills are defined in Australia as:

the combination of:

- English language, literacy and numeracy (LLN) – listening, speaking, reading, writing, digital literacy and use of mathematical ideas; and
- Employability skills, such as collaboration, problem solving, self-management, learning and information and communication technology (ICT) skills required for participation in modern workplaces and contemporary life (Australian Government, [2012] National Foundation Skills Strategy for Adults, pg. 2).

Often the terms ‘foundation skills’ and ‘LLN’ are used interchangeably in the literature with the focus largely on LLN. For example the AiG report ‘Tackling Foundation Skills in the Workforce’ refers extensively to LLN skills (2016b). This may be to the detriment of the other skills required to participate productively and successfully in the future workforce. According to Cotgreave (2018), digital literacy will be key to unlocking the productivity gains that technology such as AI offers. At the same time, there is an increased focus on the development of ‘soft skills’/‘21st century skills’ to ensure the development of a flexible and adaptable workforce for the future (AiG, 2018b; OECD, 2018b).

Language, literacy and numeracy (LLN)

Participating in lifelong learning requires proficiency in language, literacy and numeracy (LLN) (ABS, 2013). While Australia has high levels of education (OECD, 2018a), results from the Programme for the International Assessment of Adult Competencies (PIAAC) 2011–12 showed that a concerning 43.7 per cent of the Australian workforce had literacy skills below Level 3¹⁹ and 53.5 per cent lacked proficiency at Level 3 in numeracy (ABS, 2013). The next Survey of Adult Skills will occur in 2022²⁰. The OECD (2017, October 18) expects that the average LLN proficiency of the working age population to have improved slightly in most countries. This improvement will be driven by changes in demography (as older cohorts who have not had the benefit of longer access to education opportunities leave the workforce) and rising education levels across the participant countries. For Australia, this is projected to be a five-point improvement.

Research undertaken by AiG (2018b) found that 99 per cent of employers report that inadequate levels of LLN skills in their workforces are impacting their businesses in some way. Impacts include:

- poor completion of workplace documents and reports
- teamwork and communication problems
- a lack of employee confidence
- an unwillingness to take on new work (pg. 13).

Foundation skills were also ranked by industry as a priority skill need area in 27 per cent of Industry Reference Committee (IRC) Skills Forecasts (Australian Industry and Skills Committee [AISC], 2018). A majority of the industries which prioritised these skills have been identified as growth industries by the Department of Jobs and Small Business (2018).

19. Level 3 is considered to be the level of competency required to participate successfully in society and work (ABS 2012 cited in Mayer, 2016).

20. Australia will not participate in the 2022 OECD survey of adult skills (Matchett, 2018).

Digital literacy

Technology is all-pervasive in our lives. For many of us, it improves our lives and enhances our ability to do our jobs and live our lives. In the education and training space, technology has the power to create access to high quality learning opportunities (Halsey, 2018). For those living on the other side of the 'digital divide', the inability to interact with technology in a meaningful way inhibits their ability to participate in society and in employment in particular (Innovation and Business Skills Australia, 2013).

Digital literacy has become an increasingly important core skill in Australia. All workers, even those in low-skill occupations, will need some form of digital skills to navigate the workplaces of the future. Access to digital technologies such as the internet and online learning environments will be crucial if education inequality is not to worsen. Regional areas struggle the most to access quality internet connections and also to access educational opportunities (Bond-Smith, Duncan, Kiely and Salazar, 2018; Jobs Queensland, 2017b).

Across both industry and education, it is unclear what 'digital literacy' refers to. Initially the term was used to describe the acquisition and utilisation of computer skills or ICT skills. As workplaces have become increasingly automated, the definition of digital literacy has been broadened to consider the range of competencies required to function in these more complex and demanding environments. Yet for many employers, it refers solely to the use of a particular technology or software program rather than this more encompassing definition (Gekara, Molla, Snell, Karanasios and Thomas, 2017).

Digital skills have been identified as 'vital' for a workforce that is agile and with the necessary skills to participate in the future of work (AISC, 2018). Sixty four per cent of Australia's IRCs identified these skills as a priority. Among the digital skills identified by the IRCs as priority for their industry are:

- coding and programming
- development and use of robotic and automation technologies
- leveraging ICT skills in business
- exploring the world of cloud computing and the 'Internet of Things' (AISC, 2018, pg. 6).

In 2017, the AISC commissioned a number of cross-sectoral projects to identify the skills needed across a broad range of industries in Australia. One project was the 'digital skills' project which focused on the following skills:

- digital analytic/diagnostic skills - arising from the digital augmentation occurring in many industries where there is a need for people with the technical skills to analyse and respond to data provided by the machines in their workplace,
- additive manufacturing (3D printing) skills, and
- programming/coding skills (IBSA Manufacturing, 2017, pg. 5).

Science, technology, engineering and mathematics (STEM)

Science, technology, engineering and mathematics (STEM) skills have been identified in the literature as essential skills which underpin work and learning both now and in the future. They have been described as the 'lifeblood' of emerging industries and are required to ensure competitive advantage in a globalised economy. They also provide some of the generic skills identified as required in the workplace of the future - creativity, problem solving, critical thinking and communications skills (Office of the Chief Scientist, 2016).

As Dr Alan Finkel says 'As time moves on it becomes increasingly difficult to decide who is and who isn't a STEM worker' (Office of the Chief Scientist, 2016, pg. iii). PricewaterhouseCoopers (PwC) (2015) estimated that if one per cent of the Australian workforce moved into STEM roles, it would grow GDP by \$57.4 billion.

The OECD (2018a) has found that Australia has significant skill shortages in the area of science and mathematics. Of the six industries that employ 61 per cent of STEM qualified people, five are in the services sector (Office of the Chief Scientist, 2016). Both AISC (2018) and AiG (2018b) have identified these skills as a priority needs area. Across most education sectors, participation in STEM has been declining (Chapman and Vivian, 2016; PwC, 2015) and there is also a significant gender divide within the STEM workforce (Chapman and Vivian, 2016; Office of the Chief Scientist, 2016) with only 16 per cent of the workforce being female.

There is an emerging argument that to meet the future needs of global economies and support sustainable development, STEM needs to become STEAM where the 'A' represents the addition of the humanities. Including the humanities is needed to provide a moral and cultural compass that will ensure that technology can deliver on its promise of human betterment (Vestberg, 2018).

New skills

While technology will drive the need for STEM and digital skills, automation will also drive the need for 'uniquely human skills' - skills such as creativity, communication, collaboration, critical thinking, etc. (Torii and O'Connell, 2017). Researchers are predicting that once automation has replaced the tasks that can be codified, the remaining tasks within a job will be those that are 'uniquely human' (alphaBeta, 2017). Gratton and Scott (2016), citing Autor, group these skills (or 'capabilities' as they call them) into two streams - one associated with complex problem solving involving expertise, inductive reasoning or communication skills and the other drawing on interpersonal interactions and situational adaptability (pg. 61). Consequently there is a push to include a wider range of non-technical skills/attributes in curricula across all levels of education.

21st century skills

Researchers and commentators are increasingly talking about '21st century skills', 'work-ready skills', 'enterprise skills', 'future work skills' and others similar terms (Australian Government, 2017, 7 December). Such skills are those skills and attributes other than the technical or foundation skills (language, literacy and numeracy, digital literacy) that are needed for work. Included in this group of skills and attributes are emotional intelligence, self-awareness and resilience along with communication, teamwork, collaboration and other 'soft' skills. The growing demand for these skills and attributes may be driven by the transition to a services dominated employment sector which emphasises human interaction (Oliver et al., 2018).

This conversation is not new. Australia has been developing policy around 'generic skills' since the development of the Mayer Key Competencies in 1992. The Employability Skills Framework was approved in 2004-05 and remains in place in Training Packages today (Cushnahan, 2009). In 2016, further work led to the development of the Core Skills for Work Developmental Framework²¹ (Department of Education and Training, 2018). Buchanan et al. question the approach currently being taken to embedding these skills in training packages. International research cited in their report highlights a changing rhetoric around generic skills which focuses less on developing these skills and more on improvements in four distinct areas:

- anticipating emerging skill needs and adapting policies accordingly
- reinforcing the role of training and work-based learning

21. This framework has not been mandated for inclusion in training packages.

- enhancing the adaptability of workplaces
- promoting labour mobility (OECD et al., 2016 cited in Buchanan et al., 2018).

There is also discussion in the literature as to whether and how these skills and attributes can be developed. Lamb, Maire, and Doecke (2017) highlight the global efforts to identify the key skills for the 21st century and develop frameworks to support the development and assessment of these skills and attributes. One approach to developing 21st century skills and attributes is to develop 'T-shaped' graduates (Tisdell, 2016) (Figure 19). This approach was first proposed by Medhat and Peers (2012) to develop science and technology graduates in the United Kingdom. Now it is being broadened to encompass workers in all industries and graduates from all levels of education (Deloitte, 2018; Finkel, 2018; European Political Strategy Centre, 2016).

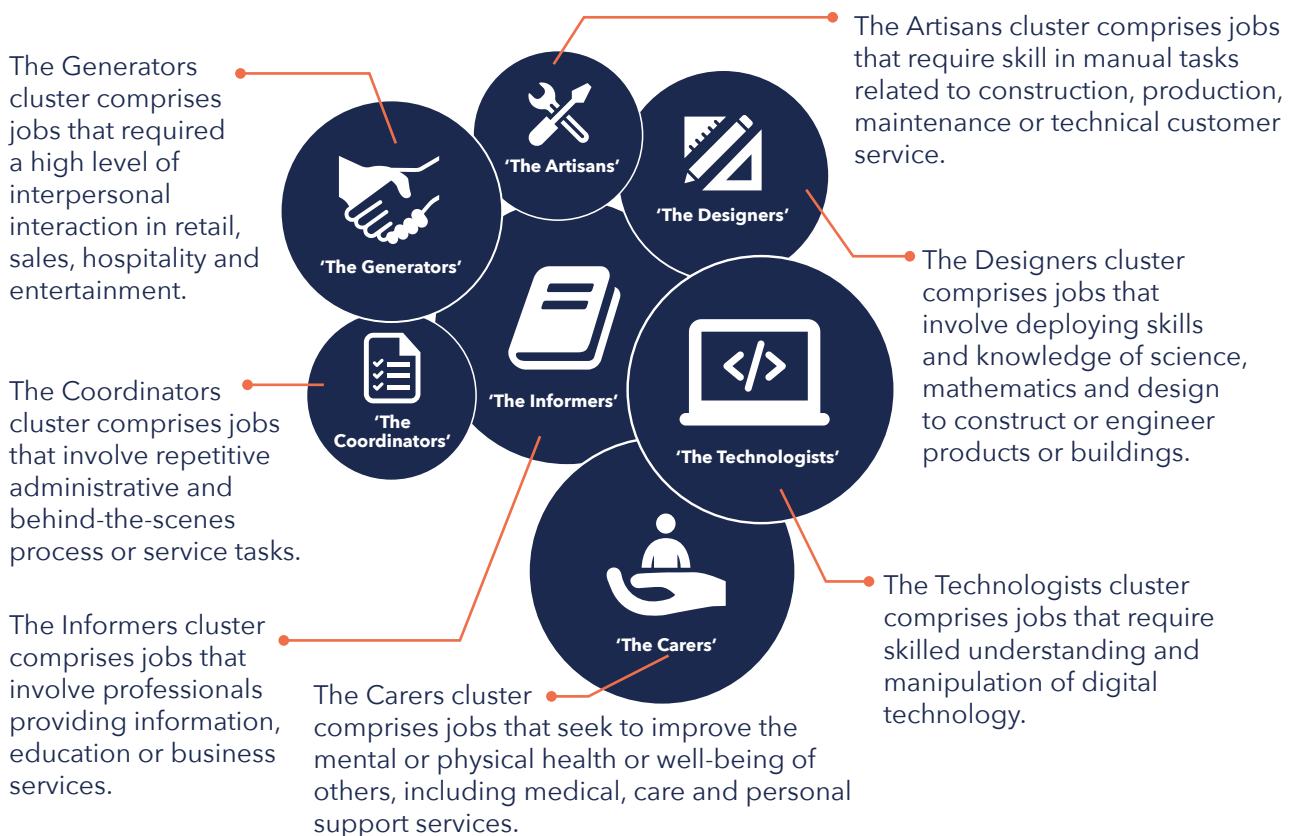
Figure 19: The T-shaped graduate



Source: Tisdell, 2016.

FYA (2017a) analysed millions of job advertisements in Australia and identified that there are broadly seven 'clusters' of work that occupations can be grouped in according to the skills required for the job. These clusters are illustrated in Figure 20.

Figure 20: Work clusters in Australia



Source: The Foundation for Young Australians, 2017a, pg. 7.

Capabilities and vocational streams

The work by FYA builds upon the work by other authors around capabilities and vocational streams²².

A report (Wheelahan and Moodie, 2011) commissioned by the NSW Board of Vocational Education and Training (BVET) proposed that there is a need to focus more broadly if the VET sector is to provide the workforce of the future. The authors propose moving from a focus on a competency-based framework to a focus on a capability framework which is described as:

... the conditions individuals need to engage in work and to progress through a career with the requirements of broad occupations. It focuses on what people need to be able to do to exercise complex judgements at work and what they need to be able to do in the future, rather than on workplace tasks and roles that have been defined for them or based existing or past practice. (pg. 2)

The concept of capabilities is not new nor is consideration of it limited to Australia. There already exists a number of capability frameworks globally (Lucas, 2018). These frameworks provide insight into possible future directions for the education system in Australia.

Wheelahan, Buchanan, and Yu (2015) identified that there was a mismatch between the knowledge and skills of graduates from VET and higher education and the skills and knowledge identified as needed by employers. This mismatch has also been identified by the OECD (2018a) with up to 60 per cent of individuals mismatched to their occupation in 2012. SkillsIQ (2017) found that the cost to the Australian economy in foregone income was almost \$4 billion due to time spent in unnecessary study.

Wheelahan et al., (2015) propose a new approach to vocational education which is built around the premise of vocational streams. This would enable people to move both vertically within an occupational field of practice or laterally into related occupations. This approach has been endorsed at the policy roundtable facilitated by the Mitchell Institute (Torii and O'Connell, 2017). Buchanan et al. (2014) found that for many workers, movement within the labour market is 'like a flow within a limited number of loosely connected streams' (pg. 33). People rarely move out of the stream they have chosen, however progression isn't linear or always upwards as is assumed in our current education system.

These skills are distinct from the technology skills currently codified in training packages and qualifications. There is agreement that technology skills/occupation and industry skills will continue to be important with 71 per cent of IRCs that support Australia's VET system identifying these skills as their top priority for the future (AISC, 2018).

Modular education and training

There are range of 'new' education and training options in the marketplace, often referred to as modularised training, microcredentials and nano-degrees (Fawcett, 2018; The Economist, 2017b). These options offer the learner the opportunity to gain skills and knowledge in 'bite-sized chunks' that can build into full qualifications or meet the needs to rapidly gain skills and knowledge in a specialist area. MOOCs have been available within the higher education sector since 2012 (The Economist, 2017b) while in the VET sector, skill sets are available as a mechanism for people with full qualifications to upgrade their skills (Mills, Crean, Ranshaw and Bowman, 2012).

22. Vocational streams consist of linked occupations that share common practices, knowledge, skills and attributes (Wheelahan et al., 2015, pg. 7).

In Jobs Queensland's (2017b; 2018a) work with industries and regions, stakeholders identified the need for a more flexible approach to education and training to meet emerging skill needs, such as modular training delivered onsite as needed for existing workers. While the majority of stakeholders contributing to this work agreed that full qualifications in an industry-relevant area form the basis for new entrants, existing workers often don't need a full qualification to obtain the necessary knowledge and skills for expanding or changing roles.

These findings have been reflected in work by NCVET (Payton, 2017) which also highlighted the impact technology will have on delivery methods.

There is some concern that a move to modularised training provision risks fragmenting Australia's VET system and will limit the transferability of skills for workers in transitioning industries (Jobs Queensland, 2018d; Buchanan, 2018 cited in Select Committee on the Future of Work and Workers, 2018; Wibrow and Circelli, 2016). The use of skill sets within the VET sector to meet the needs of industry for upskilling of existing workers is currently the subject of a research project by NCVET which is due to be completed in 2019 (Siekmann and Stanwick, 2018). While it can be hypothesised that the use of skill sets will be recognised across industries, other forms of skill acquisition such as microcredentialling and nanodegrees may not be as easily transportable (The Economist, 2017b).

Jobs Queensland (2018d) has identified that a key element for success in supporting industry transition, whether in an emerging or a declining sector, is providing education and training opportunities for affected workforces. Snell, Geraka and Gatt, 2016 (cited in Wibrow and Circelli, 2016) argue that '[i]n a labour market where qualifications are becoming increasingly important, undertaking formally recognised training is far more beneficial for workers as it results in qualifications that are recognised nationally' (pg. 6). It is important that vulnerable workers have access to training that will benefit their futures and provide the skills for quality jobs in growing and emerging industries.

The goal of training and skilling

In the midst of attempts to make sense of current and potential changes to the substantive content of work and working arrangements, and their greater implications for education, it is relatively easy for practitioners and policy makers alike to lose focus on the bigger picture of what makes the 'future of work' such an important and pertinent issue.

Perhaps before attempting to address the complex and uncertain future, it might be wise to first take a step back and ask ourselves what exactly is the purpose of education? While many factors have been covered in this literature review, consider that ultimately at the very core of the overall discussion around the 'future of work' is people.

According to the Business Council of Australia (2017), formal education was initially designed to prepare people to be good citizens – to teach them to think, give them confidence and independence and prepare them for the future. The 21st century has seen a strong push for formal education to be focused on preparing people for work.

Central to the four issues of an effective approach to guiding education policy and practice as identified by Buchanan et al. (2018) was the question around what types of [school] pupils are we developing: highly flexible labour or flourishing, productive citizens? Given all the considerations highlighted throughout this literature review, undoubtedly this question could and should be extended to consider all persons, both current and future.

Jobs are the cornerstone of our economic and social lives: they give people meaning, self-respect, income and the chance to make societal contributions (Bakhshi et al., 2017). The development of high functioning, well balanced people with the capacity to flourish is not just good for the individuals concerned – it is a great asset for any community and its associated economy (Buchanan et al., 2018).

The terms 'highly flexible labour' and 'flourishing, productive citizens' should not be considered mutually exclusive. The right mindset around employment and education heading into the future should result in the greatest benefits to society in general, both in tangibles such as economic output and wages, as well as intangibles such as a cohesive and well-functioning society.

Changing pedagogy

Technology is expanding the reach of education and offering alternate delivery methods. The Grattan Institute (Norton et al., 2018) found that over 20 per cent of higher education students study off campus and a further 13 per cent were enrolled on a multi-modal basis; that is they studied both on campus and also off campus in 2016. Many of these students were mature-age students and postgraduates. Improvements in educational technology as well as increased demand from people with significant work and family responsibilities have been identified as drivers for these changes.

Professor Tricia McLaughlin from RMIT (Ortolan, 2018) identified four ways in which education is changing:

- Classrooms will become increasingly connected, collaborative and co-creative as student learning spaces supersede traditional classrooms.
- Digital technology will increasingly drive 'anywhere, anytime learning' providing greater access and opportunities for participation.
- Customisation for a learner-first approach which will see increasingly individualised learning journeys.
- Grading systems that are evidence based, using measures that allow learning plans to be drawn up and personalised.

Already pedagogy is changing. For example the New South Wales Department of Education has developed a bank of resources that support different modes of delivery such as 21st century learning design, hackathons and gallery walks (NSW Department of Education, 2018).

Over-qualification and skill underutilisation

Skill underutilisation (or underemployment) is growing in Australia (ABS, 2018).

Underemployment is defined as the underutilisation of the productive capacity of the labour force (ILO cited in Parliament of Australia, 2017). One of the reasons for underemployment may be over-qualification for the job held. The OECD (2018a) found that around 20 per cent of Australian workers are over qualified for their jobs.

This data aligns with research undertaken by SkillsIQ (2017) which identified that the rate of over-qualification in the services sectors such as retail, tourism and sport could be as high as 51 per cent. Jennifer Westacott (Business Council of Australia, 2016) expressed concern about the 'creeping credentialism' which is becoming prevalent in Australia. Over-qualification is costing individuals \$3.6 billion in foregone income and \$555 million in unnecessary tuition fees (SkillsIQ, 2017). Both the OECD and SkillsIQ have found that employers may be selecting staff with higher qualifications than required due to a belief that these people have attributes that are likely to make them better workers.

The Select Committee on the Future of Work and Workers (2018) highlighted that this in turn denies lower-skilled workers opportunities to participate in work and increases the level of under-employment and unemployment.

Career advice and management

What is becoming clear is that successful participation in work in the future requires effective and accurate careers advice and the skills to successfully manage career transitions throughout the lifespan (FYA, 2017d; Select Committee on the Future of Work and Workers, 2018). The need for clear, timely and accurate advice for students is crucial in developing the workforce of the future (Siekmann and Fowler, 2017). Gore, Holmes, Smith, Southgate and Albright (2015) found that many students by Year 6 already had clear ideas of what jobs they wanted when they completed school.

This need has been clearly expressed by stakeholders contributing to work undertaken by Jobs Queensland. Both at industry level as well as at regional level, stakeholders have been almost unanimous in their call for better and earlier career advice for students and their parents/carers so that they are able to make better informed choices (Jobs Queensland, 2017; 2018).

Career advice needs not to be limited to those transitioning from school. Students exiting post-school education and workers transitioning from industries and/or regions in decline also need support to enter/re-enter the workforce (Select Committee on the Future of Work and Workers, 2018; Jobs Queensland, 2018a, 2018d).

Career management skills are becoming increasingly important for all working age people. A longer working life will result in multiple entries and exits into and out of the workforce as well as transitions throughout a person's working life (FYA, 2017c; Gratton and Scott, 2016).

Collaboration

A recurrent theme running through the literature in relation to skills for the future is the need for increased collaboration between government, education and training and industry. The importance of school-industry partnerships was highlighted at the Mitchell Institute's roundtable (Torii, 2018):

Both schools and industry play a role in ensuring that all children and young people are given learning opportunities that enable them to reach their full potential and develop the skills and capabilities that are needed in future jobs (pg. iv).

The Select Committee on the Future of Work and Workers (2018) heard that this collaboration needs to extend beyond schools to both the VET sector and universities if Australia is to have the skills required for a productive future. In consultations with stakeholders undertaken by Jobs Queensland (2017, 2018), the need for collaboration came through clearly and strongly. Time and again, stakeholders told us that stronger partnerships between government, education and training and industry is key to developing people with the right skills and attributes needed for future workforces.

Key findings

Areas of consensus in the literature

- Participation in lifelong learning will be key as jobs and workplaces are transformed by the drivers shaping the Queensland economy.
 - Workers will need to redevelop skills and attributes throughout their lifespan to remain in the labour force.
- Collaboration across all institutions (education and training, government, employment and society) is needed to ensure a high-skilled and adaptive workforce.

Areas of contention in the literature

- The skills, knowledge and attributes needed for the future are contested.
 - There is contention about whether attributes are teachable and/or assessable.
 - The role of context in the teaching of generic skills is also contested.
- The role of vocational education and training is unclear.
 - Industry is calling for VET to be transformed yet there is no agreement on what this 'transformation' should look like.



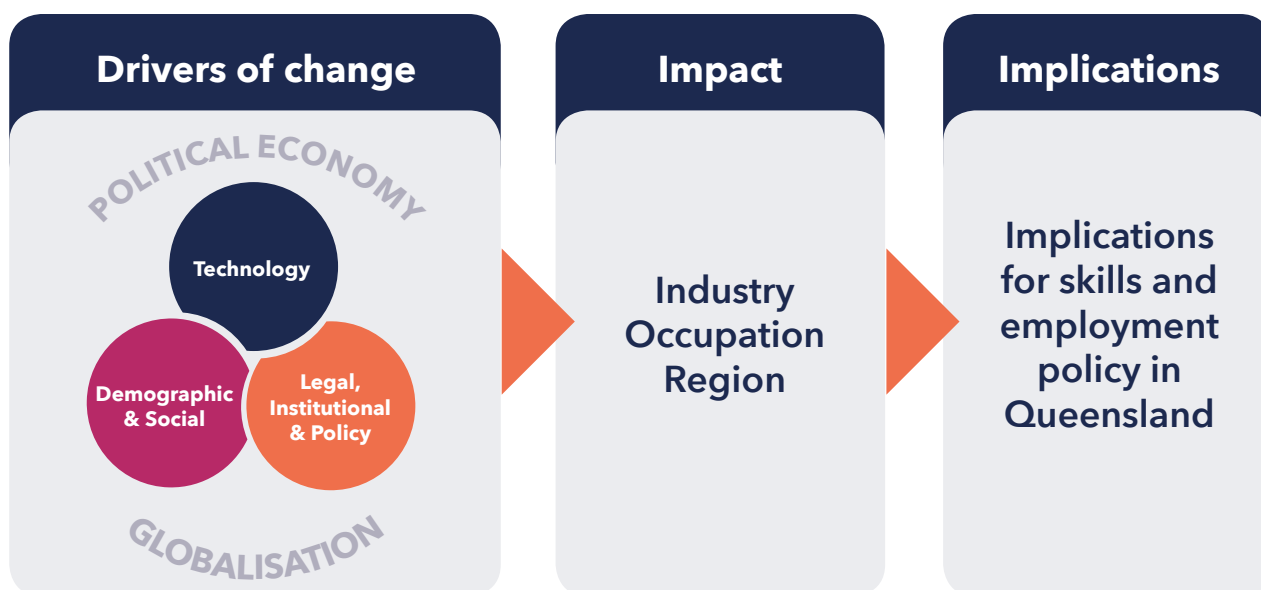
Challenges and questions for consideration

- How do we identify and develop the new skills that are needed?
- How do we develop the workforce of the future if we don't yet know what skills and knowledge the workforce will need?
- How do we transition the workforce of today to the workforce of the future?
- What skills, knowledge and attributes will employers and workers need to succeed in this changing environment?
 - How do we recognise skills and knowledge gained through non-formal/non-accredited training and learning?
 - What is the role of modularised training/microcredentialling/nano-degrees?
- What is the role of the VET system now and in the future in developing workers? And how will it need to change/adapt to meet the needs of consumers in the changing work environment?

section five

FINDINGS AND QUESTIONS FOR EMPLOYMENT AND SKILLS POLICY IN QUEENSLAND

Figure 21: Factors influencing the future of work in Queensland



As Queensland's economy transitions as a result of technology impacts and demographic and social changes, it is important to acknowledge that while change is inevitable, the outcomes are within our control. We can manage and direct how we respond and harness the potential of digital disruption and an ageing workforce to create the society we want.

It will require all sections of society to work together to build this new future that provides quality work and the standard of living we aspire to. Each of us has a role to play - government, education and training, industry and individuals. Our success will depend on how well we can work together to create a vibrant and equitable society and thriving economy.

The key findings outlined in this section focus on the areas of consensus and contention within the literature. The future is not set in stone and there are many factors that can and will impact on the future of work. Much of what is in the literature is based on 'best guess' modelling. History has shown that both the best and worst of predictions can be correct and that there can often be other factors that have the biggest impact in the long term.

Technology impacts

Areas of consensus in the literature

- Change is not new – what is new is who will be impacted and the extent of the impact.
 - The demographic that is being impacted is different, with the impact most likely to be felt by ‘white collar’ workers with post-secondary school education qualifications such as diplomas and undergraduate degrees.
- There is growing consensus that the impact on jobs will be largely at task level.
 - While there is potential for some jobs to disappear, it is more likely that jobs will change; some so substantially that they will no longer be recognisable, others minimally.
 - At the same time, new jobs will be created which may require new skills that have not yet been identified.
- Participation in lifelong learning will be key as technology changes jobs and workplaces.
 - Workers will need to redevelop skills and attributes throughout their lifespan to remain in the labour force.

Areas of contention in the literature

- The extent and speed of the impact of new technologies such as artificial intelligence (AI) and machine learning (ML) on work and workplaces.
 - The extent of impact is contested with some authors arguing that all industries and all jobs and all sectors of the workforce will be impacted. Others argue that the impacts will vary due to a number of factors relevant to the country being impacted.
 - Some authors contend that the speed of change is faster than ever before while others disagree.
- The impact and the extent of impact of new technologies on employment and productivity both in the short-, medium- and longer-term.



Challenges and questions for consideration

- How do we identify and prepare for change associated with the impact of new technologies?
- What will government, industries, employers and workers need to prepare for and adapt to this change?
- What is the role of government in relation to the adoption/uptake of technology?
 - Accelerate, regulate or non-intervention?

Demographic and social changes

Areas of consensus in the literature

- Like many developed nations, Australia's population is ageing and this has implications for both employers and the labour force more broadly.
- People are living longer and many are expected to remain in the workforce longer.
 - Workplaces are changing as they endeavour to adjust to a multigenerational workforce.
- Australia is becoming more urbanised.
 - This trend is also evident in Queensland.
 - Regional restructuring often occurs as people migrate to where the jobs and opportunities are.
 - Rural and remote communities are becoming more marginalised and isolated.

Areas of contention in the literature

- The extent to which inequality is rising in Australia and how changes in technology and the broader economy will affect this projected trajectory.
- How technology and the move towards a more knowledge- and service-based economy will affect regional and rural areas.



Challenges and questions for consideration

- How do we promote equality through supporting people, especially those most at risk, to engage, stay engaged or re-engage with the labour force and/or education and training?
- How do we prepare Queenslanders for the predicted departure from the 'traditional three-stage' working life?
- How do we support employers in responding to potential transitions within their industry, including their workforces?

Legal, institutional and policy influences

Areas of consensus in the literature

- Key structural and economic reforms in Australia over the last 40 years have changed our labour market.
- Work is changing as a result of both technology and societal and demographic changes.
- We are not powerless in shaping our own futures.

Areas of contention in the literature

- Definitions (e.g. worker/employee) are contested, resulting in anxiety and confusion.
 - As a result, empirical data is also contested.
 - In some areas there is an insufficient amount of data to substantiate claims.
 - The lack of empirical evidence is leading to confusion and anxiety and driving endless debate on what is 'important'.
- How and to what extent modes of employment are changing is contested.
 - There is little agreement on the importance and prevalence of new work arrangements such as teleworking and platform-mediated employment arrangements.
 - The rise of precarious work is also contested, due to deficiencies in the availability of data, differences in measurement and varied motivations of those engaging in this mode of employment.



Challenges and questions for consideration

- How prevalent are 'new' work arrangements (e.g. gig/platform-mediated work) in the Queensland economy?
 - Who is participating, why and to what extent?
 - How can we define and measure uptake/use/participation in these new arrangements and quantify their impacts on participants?
- What is the role of institutions (government, vocational education and training, etc.) in the process of transition?

Implications for training and skills

Areas of consensus in the literature

- Participation in lifelong learning will be key as jobs and workplaces are transformed by the drivers shaping the Queensland economy.
 - Workers will need to redevelop skills and attributes throughout their lifespan to remain in the labour force.
- Collaboration across all institutions (education and training, government, employment and society) is needed to ensure a high-skilled and adaptive workforce.

Areas of contention in the literature

- The skills, knowledge and attributes needed for the future are contested.
 - There is contention about whether attributes are teachable and/or assessable.
 - The role of context in the teaching of generic skills is also contested.
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 - Industry is calling for VET to be transformed yet there is no agreement on what this 'transformation' should look like.



Challenges and questions for consideration

- How do we identify and develop the new skills that are needed?
- How do we develop the workforce of the future if we don't yet know what skills and knowledge the workforce will need?
- How do we transition the workforce of today to the workforce of the future?
- What skills, knowledge and attributes will employers and workers need to succeed in this changing environment?
 - How do we recognise skills and knowledge gained through non-formal/non-accredited training and learning?
 - What is the role of modularised training/microcredentialling/nano-degrees?
- What is the role of the VET system now and in the future in developing workers? And how will it need to change/adapt to meet the needs of consumers in the changing work environment?

Implications of the future of work

- **For employers this means:**

- managing a workforce of multiple generations
- identifying and managing the need to upskill and reskill the existing workforce to meet changing business and industry needs and maintain competitiveness
- recruiting, training and retaining skilled and knowledgeable employees
- developing and supporting a workforce that is adaptable, resilient and innovative
- providing opportunities for new entrants to gain experience and fine-tune skills and knowledge gained through education and training.

- **For individuals this means:**

- identifying, developing and maintaining a skills and knowledge base that supports ongoing participation in quality work
- developing the skills and attributes for lifelong learning.

- **For education and training this means:**

- the implementation of a seamless education and training industry that provides multiple entry and exit points for consumers through the lifespan
- greater collaboration with industry to identify and provide the skills needed to produce good global citizens as well as resilient and highly skilled workers
- upskilling and developing the skills of the education and training workforce
- exploring and investing in innovative delivery models to support a diverse range of learners.

- **For policy makers this means:**

- ensuring that no one is left behind during industry and economic transitions
- supporting and developing institutional responses to industry and skills demand
- supporting access to lifelong learning opportunities.

APPENDIX ONE

independent workers v employees

The difference between an independent contractor and an employee in Australia

Indicator	Employee	Independent contractor
Degree of control over how work is performed	Performs work, under the direction and control of their employer, on an ongoing basis.	Has a high level of control in how the work is done.
Hours of work	Generally works standard or set hours (note: a casual employee's hours may vary from week to week).	Under agreement, decides what hours to work to complete the specific task.
Expectation of work	Usually has an ongoing expectation of work (note: some employees may be engaged for a specific task or specific period).	Usually engaged for a specific task.
Risk	Bears no financial risk (this is the responsibility of their employer).	Bears the risk for making a profit or loss on each task. Usually bears responsibility and liability for poor work or injury sustained while performing the task. As such, contractors generally have their own insurance policy.
Superannuation	Entitled to have superannuation contributions paid into a nominated superannuation fund by their employer.	Pays their own superannuation (note: in some circumstances independent contractors may be entitled to be paid superannuation contributions).
Tools and equipment	Tools and equipment are generally provided by the employer, or a tool allowance is provided.	Uses their own tools and equipment (note: alternative arrangements may be made within a contract for services).
Tax	Has income tax deducted by their employer.	Pays their own tax and GST to the Australian Taxation Office.
Method of payment	Paid regularly (e.g., weekly/ fortnightly/monthly).	Has obtained an ABN and submits an invoice for work completed or is paid at the end of the contract or project.
Leave	Entitled to receive paid leave (e.g., annual leave, personal/ carers' leave, long service leave) or receive a loading in lieu of leave entitlements in the case of casual employees.	Does not receive paid leave.

Source: Fair Work Ombudsman n.d.

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