

The future of work: using skills data for better job outcomes

Australian Government Department of Employment, Skills,
Small and Family Business.



5

Employment—and the economic resources and social ties it provides—can be crucial for the wellbeing of individuals, families and communities, and for the functioning of society. In a changing economy it is critical to understand which skills can lead to greater employment opportunities.

Work and workplaces in Australia are being changed by new technology, globalisation, demography and consumer preferences. While Australia's economy and workforce have successfully navigated previous periods of change, there is uncertainty about which jobs might be lost in the current shift, which new jobs will be created and what skills will be needed for the future.

The future of jobs report (WEF 2018a) states that:

New technology adoption drives business growth, new job creation and augmentation of existing jobs, provided it can fully leverage the talents of a motivated and agile workforce who are equipped with futureproof skills to take advantage of new opportunities through continuous retraining and upskilling.

Conversely, skills gaps ... may significantly hamper new technology adoption and therefore business growth.

Analysis of the skills involved in current Australian jobs and how these are changing over time will provide valuable information to support workers, job seekers, businesses, regions and policymakers to be ready for future change and help to minimise skills gaps.

In particular, skills-based analysis could help workers and job seekers to understand the skills they need as technology changes the way work is done in their current jobs and to set themselves up for future jobs. It could help employers to better articulate the skills that they are looking for and assist them in workforce planning and training current workers. Educational institutions would benefit from up-to-date information to tailor courses to local labour market demand. Skills-based analysis can also assist policymakers to guide people from declining sectors into areas of growing employment demand, and improve the targeting of welfare interventions to support job seekers.

This chapter provides a brief analysis of the predictions of the impact of automation on jobs and explores how a more granular skills approach using static and dynamic data can offer new insights to help answer some of the questions surrounding the future of work (see Box 5.1 for 5-year employment projections in Australia).

Box 5.1: Department of Employment, Skills, Small and Family Business employment projections

The 5-year employment projections of the Department of Employment, Skills, Small and Family Business reflect the continual evolution of the economy responding to an ageing population and shift towards service industries.

Health care and social assistance is expected to make the largest contribution to employment growth in the 5 years to May 2023, followed by *Construction*, *Education and training* and *Professional, scientific and technical services*. Together, these 4 industries are projected to provide almost two-thirds of total employment growth over this period.

Occupation groups projected to grow in Australia in the 5 years to May 2023 include *Professionals* and *Community and personal service workers*, consistent with strong projected growth in service industries. Occupations projected to decline in Australia over this period, where work includes routine elements or is susceptible to automation, include *Contract, program and project administrators*, *Secretaries*, *Personal assistants*, *Information officers* and *Bank workers* (Department of Employment, Skills, Small and Family Business 2019a).

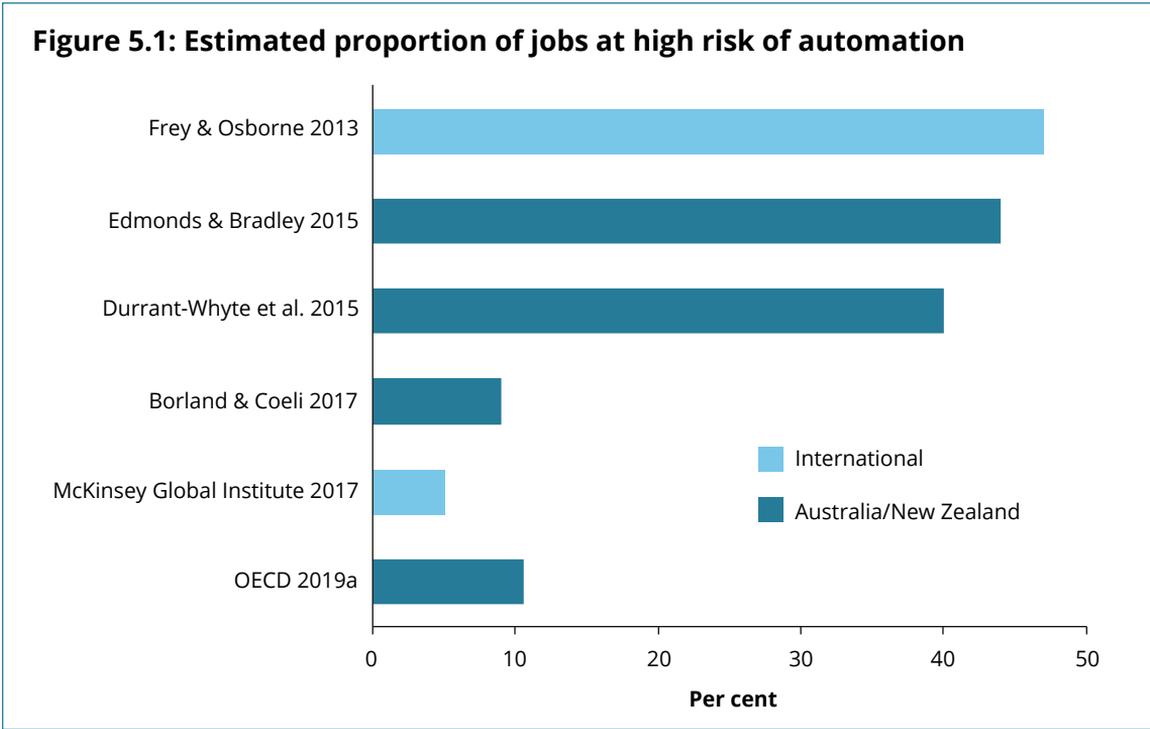
Impact of automation on jobs

Historical experience has demonstrated that while some jobs no longer exist because of automation, other jobs have been created. Until now, new technologies have increased prosperity by increasing productivity in the long term, but have tended to disrupt parts of the labour market in the short and medium term. In particular, new technologies have automated some routine and manual work in lower to middle-skilled occupations while enhancing higher skilled occupations.

As an example, the number of workers in traditional printing trades declined by 17,000 between 1994 and 2014. At the same time, the number of graphic designers rose by 35,000. Automation in the printing industry caused a shift away from repetitive, mechanical work and towards more skilled and creative work (Hajkowicz et al. 2016).

Estimates of the potential impacts of automation on employment vary widely. Figure 5.1 shows a number of studies undertaken to estimate the share of employment that could potentially be automated. These studies produce varied predictions despite a similar underlying methodology, which involves assessing the extent to which occupations are protected from automation by engineering bottlenecks.

The earliest study, by Frey and Osborne (2013), predicted that 47% of total employment in the United States had the technical potential to be automated. This work was replicated using Australian data, producing estimates that ranged from 40% to 44% (Durrant-White et al. 2015; Edmonds & Bradley 2015). The adoption of finer task-based analysis by the Organisation for Economic Co-operation and Development (OECD) resulted in a more credible estimate of 10.6% of jobs in Australia being at high risk of automation (OECD 2019a), with a further study using the OECD methodology by Borland and Coelli (2017) estimating 9%. A study of 46 countries—representing about 80% of the global labour force—analysed work activities rather than whole occupations, and found that less than 5% of occupations can be fully automated (McKinsey Global Institute 2017). This variation shows the impact different methodologies, classification systems and assumptions have on predicted outcomes of automation.



Despite the continuing evolution of the labour market, the employment to population ratio for people of workforce age is at a historical high. This indicates the national economy, jobs market and workforce continue to be responsive to change.

Thirty years ago, *Manufacturing* was the largest employing industry in Australia, accounting for 15.2% of total employment. By February 2019, it has dropped back to seventh position and accounted for 6.8% of total employment. While employment in manufacturing dropped by 24.4% over the period, employment across all industries grew by 68.4%. The creation of new jobs outstripped the loss of jobs as the traditional manufacturing sector declined.

Recent analysis by the OECD (2019b) found that 70% of retrenched workers regain employment within 1 year, with 80% regaining employment within 2 years. This is not to underestimate the hardship experienced by those people who are made technologically redundant. Not all transitions will be seamless in the short to medium term. The OECD analysis also found that women, older workers, less-educated workers and casual and part-time workers have a significantly lower chance of finding new employment within 2 years of being displaced from their job.

In addition to the 10.6% of jobs at high risk of automation, the OECD found a further 25% of Australian jobs may change substantially in the way work is done (OECD 2019a). This suggests that 'job change' will be as important in managing the workforce impacts of automation as 'job loss'. This is, for example, reflected in the changing demand for digital skills (Box 5.2).

Box 5.2: Basic and advanced digital skills

The tasks making up current jobs are changing with the adoption of digital and other new technologies. As tasks change, the skills required by workers to undertake those tasks are changing.

Analysis of online job advertisements indicates that demand for advanced digital skills changes more quickly than other skills. Employability skills (for example, communication, organisation or teamwork) and specialised skills (for example, first aid, forklift operation or accountancy) have remained relatively stable while digital skills change as new technology is developed and software packages come in and out of favour.

This change is most evident in the ability to use software packages. Job advertisements mentioning Tableau (data visualisation software) were 19 times more prevalent in 2018 than 2012. The proportion of employers seeking experience with Confluence (a collaboration program) increased by a factor of 9 over the same period. At the same time, Adobe Photoshop (graphics editing) skills dropped from being the 10th most popular digital skill to the 31st.

Advanced digital skills, like coding and data visualisation, attract a wage premium (Bradley et al. 2017), but may become redundant quickly. In contrast, demand for familiarity with a small number of simple software packages is high and remains stable. For the past 7 years, the most requested digital skill was experience in Microsoft Excel (spreadsheets), followed by Microsoft Office (word processing) and then SAP (business operations).

While the latest and most advanced technical skills represent a lucrative niche in the labour market, basic digital literacy will be valuable for all workers and job seekers.

Analysis of the amount of time workers spend on different tasks shows that, on average, Australian jobs experienced 9.3% change between 2011 and 2016. New tasks in jobs contributed 0.9 percentage points to this result and reallocation of time across existing tasks contributed 8.4 percentage points (AlphaBeta 2018). Figure 5.2 shows the estimated task change for 3 occupations over this period.

AlphaBeta (2018) found the occupations experiencing the least task change were most susceptible to redundancy and business failure. Conversely, jobs where tasks evolved more quickly had better labour market outcomes. Higher skilled occupations, middle-aged workers and urban workers are experiencing greater task change than other groups.

This analysis indicates while some future jobs may be lost to automation, a key challenge for current and future workers is to be flexible and able to acquire new skills as tasks within jobs change. This points to the need for planning, financing and delivering reskilling and job-transition programs.

Figure 5.2: Examples of task changes within occupations between 2011 and 2016



Note: Total task change over 5 years is across all tasks, not limited to the top 5 tasks.

Source: AlphaBeta 2018.

In addition to changing jobs, new technology is also creating new jobs that were previously unimaginable. In some cases, this is due to increased productivity and new production methods in existing industries; in others, technology enables humans to do things that were previously impossible, spawning entirely new industries. Yet other new jobs result from combining tools and techniques from across different industries in novel ways, creating new fields of expertise, as well as 'hybrid jobs' (Box 5.3).

Box 5.3: Hybrid jobs

Hybrid occupations are among the fastest growing in the labour market. They are jobs requiring a diverse mix of skills, such as technical, software, business, creative and interpersonal skills. Analysis of real-time job-advertisement data has shown in-demand jobs increasingly require a range of these employability skills, specialised skills and digital skills.

Projections by Burning Glass Technologies (Sigelman et al. 2019) show that in the United States, jobs with a very high hybridisation score are projected to grow nearly 16.0% by 2026 compared with 8.7% for all jobs.

As an example, a 'user experience' (UX) designer makes sure products are useful and relevant to customers in terms of branding, design, usability and function. The role requires a combination of research, software, marketing and design skills. This skill portfolio may not be available in a single educational qualification, but could be acquired through micro-credentials, short courses and online learning.

Traditional occupations are also becoming 'hybridised', such as *Human resource managers* needing data analytics skills and *Data scientist* roles requiring strong communication and presentation skills.

Using data on skills to improve job outcomes

Adopting skills-based approaches to analysing the labour market will help Australia respond to changing demand for skills due to technological change and other global trends (OECD 2018; WEF 2018b).

For example, identifying workers' skills and seeing how they could transfer to other jobs was a key feature of the collaborative response to the closure of the car manufacturing industry. The Australian Government, automotive manufacturers and relevant state governments established a response strategy to support firms and workers to plan and develop new capabilities. The strategy was pre-emptive and based on the provision of labour market information, career advice, skills and training, and employment support. Outstanding transition outcomes were achieved by Holden's workers, with 83% of workers successfully transitioning into the next stage of their lives.

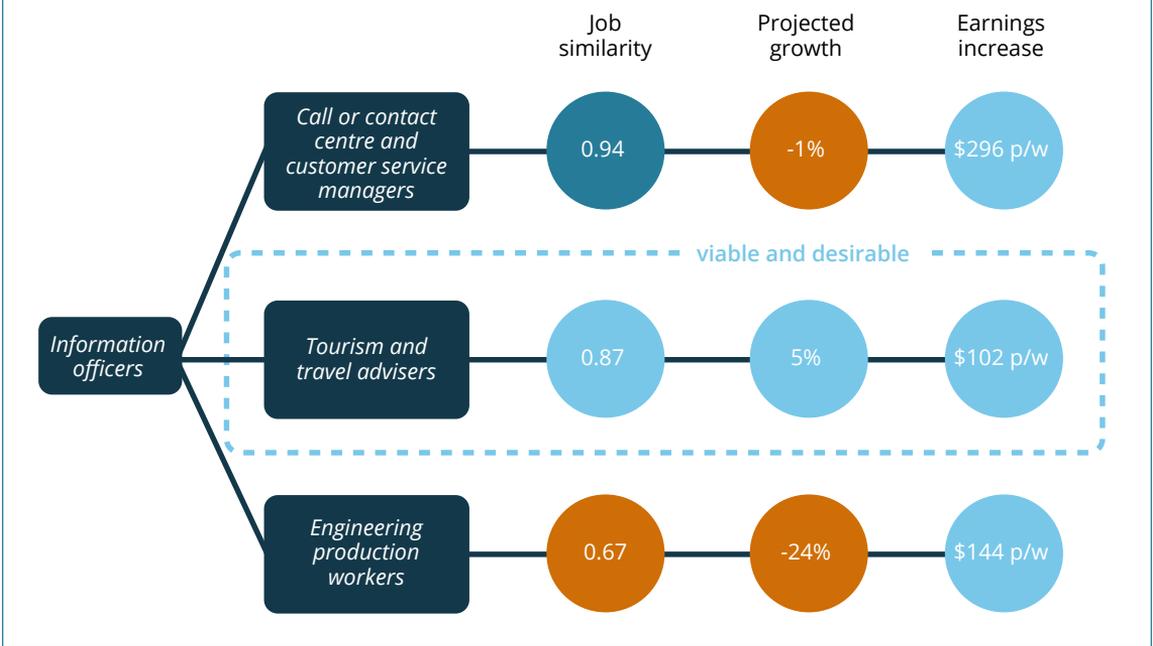
The Department of Employment, Skills, Small and Family Business is working to develop tools to make it easier for all Australians to identify their skills and see how they transfer across occupations. Part of this work has involved adapting the approach of the World Economic Forum's (2018b) report, *Towards a reskilling revolution*, for Australian conditions. This analysis breaks down jobs into a series of relevant, measurable components (skills, education, experience, abilities and work activities). This makes it possible to calculate the similarity between the requirements of 2 jobs and identify viable transition pathways.

This approach uses granular skills data from Burning Glass Technologies, United States careers database O-Net and the Australian Bureau of Statistics. It provides a combined analysis of job similarity, projected growth or decline of relevant occupations, and expected earnings. This information could support someone looking for a career change to identify a fuller set of job opportunities.

Figure 5.3 details an example of a viable and desirable transition for an *Information officer*. *Information officers* respond to personal, written and telephone inquiries and complaints about an organisation's goods and services, provide information and refer people to other sources. Digital communications and advances in information processing are affecting this occupation. The number of *Information officers* is projected to shrink from 62,500 in May 2018 to 58,400 in May 2023, with an overall decline of 7% by 2030.

Skills analysis shows that *Information officers* have skills and attributes that allow a smooth job transition into *Tourism and travel advisers*, which might not initially be obvious as a next career move. The transition from *Information officer* to *Tourism and travel adviser* is theoretically viable because the 2 occupations are similar. It is also desirable because *Tourism and travel advisers* are projected to grow by 5% to 2023, and there is an average estimated income gain of \$102 per week from this transition.

Figure 5.3: Viable and desirable job transitions for *Information officers*



The analysis also includes a 'leadership lens', a practical planning tool for government and business decision makers. This lens uses linear programming to optimise the outcomes for all individuals in declining jobs and provide an economy-wide simulation of ideal pathways across the entire labour market.

The job-similarity algorithm shows the power of supplementing occupational analysis with skills information. Several prominent research organisations, including Data61 (Hajkowicz et al. 2016), National Centre for Vocational Education and Research (NCVER) (Siekman & Fowler 2017) and the OECD (OECD 2018), have advocated going further and focusing analysis primarily on skills.

As our discussion of hybrid jobs (Box 5.3) shows, occupational boundaries are becoming blurred and expertise in one field is often proving more powerful when combined with another (Hajkowicz et al. 2016). It is likely that businesses will increasingly look at prospective employees' skill sets rather than specific occupation titles; and workers will need to be able to work across and outside traditional job descriptions. In the future, it may be less useful to know how many people have *Data scientist* as their job title than to understand the supply and demand for data science skills.

This kind of analysis is currently hampered in Australia by the lack of a common language and framework for understanding skills. A standardised approach to skills has the potential to create a large range of labour market efficiencies. It would enable education providers to take a more modular approach to course design and ensure graduates have

marketable skills. It would assist businesses in better workforce planning and in finding better candidates. National professional associations could analyse skills needs and anticipate workforce shortages in their industries. Cities and regions could identify skills gaps and develop creative strategies to boost local employment.

Next steps

The Department of Employment, Skills, Small and Family Business is working to support deeper understanding of the labour market and more up-to-date, detailed, skills-based analysis.

Skills Match tool

We have recently launched the Skills Match tool on the Job Outlook career advice information portal joboutlook.gov.au (Department of Employment, Skills, Small and Family Business 2019b). This tool helps individuals to identify transferable skills so they can follow pathways to new jobs.

Skills classification for Australia and emerging trends in skills

We have developed a dynamic skills classification. Its dynamic nature means it can also highlight emerging skills in the labour market, which could assist workers and job seekers to prepare for new jobs more quickly than currently possible. We will shortly begin consulting with industry experts to validate the classification and build it into a skills taxonomy for Australia.

A data infrastructure for a dynamic labour market

We are developing infrastructure to combine data sets from multiple sources and provide real-time access to reliable and trusted skills and jobs information. To date, the system includes data from Burning Glass Technologies, the United States careers database O-Net, the Australian Bureau of Statistics, the Department of Education and Training, the Australian Taxation Office and other administrative data sets. Combining these data sources will help answer questions including:

- How could job seekers or workers make a quicker and smoother job transition as task and skill requirements change?
- How can employers improve their workforce planning and recruit people with the required skills?
- How can educational institutions monitor the skills market to adjust course offerings quickly and as required?
- How can policymakers guide people from declining sectors into areas of growing employment demand and target welfare interventions to support job seekers better?

References

- AlphaBeta 2017. The automation advantage. Sydney & Singapore: AlphaBeta Consultants.
- AlphaBeta 2018. Mapping Australian workforce change. Sydney & Singapore: AlphaBeta Consultants.
- Borland J & Coelli M 2017. Are robots stealing our jobs? Australian Economic Review 50(4):377–97.
- Bradley B, Restuccia D, Rudnicki C & Bittle S 2017. The digital edge: middle-skill workers and careers. Boston: Burning Glass Technologies. Viewed 2 June 2019, <https://www.burning-glass.com/wp-content/uploads/Digital_Edge_report_2017_final.pdf>.
- Department of Employment, Skills, Small and Family Business 2019a. 2018 employment projections—for the five years to May 2023. Canberra: Department of Employment, Skills, Small and Family Business. Viewed 15 July 2019, <<http://lmip.gov.au/default.aspx?LMIP/GainInsights/EmploymentProjections>>.
- Department of Employment, Skills, Small and Family Business 2019b. Job Outlook. Canberra: Department of Employment, Skills, Small and Family Business. Viewed 15 July 2019, <<https://joboutlook.gov.au/>>.
- Durrant-White H, McCalman L, O’Callaghan S, Reid A & Steinberg D 2015. The impact of computerisation and automation on future employment. In: Australia’s future workforce? Melbourne: Committee for the Economic Development of Australia, 56–64.
- Edmonds D & Bradley T 2015. Mechanical Boon: will automation advance Australia? Canberra: Office of the Chief Economist, Department of Industry, Innovation and Science.
- Frey C & Osborne M 2013. The future of employment: how susceptible are jobs to computerisation? Oxford: Oxford Martin School, University of Oxford.
- Hajkowicz SA, Reeson A, Rudd L, Bratanova A, Hodggers L, Mason C et al. 2016. Tomorrow’s digitally enabled workforce: megatrends and scenarios for jobs and employment in Australia over the coming twenty years. Brisbane: CSIRO (Commonwealth Scientific and Industrial Research Organisation).
- McKinsey Global Institute 2017. A future that works: automation, employment and productivity, January 2017. San Francisco: McKinsey & Company.
- Nedelkoska L & Quintini G 2018. Automation, skills use and training: OECD social, employment and migration working paper no. 202, Paris: OECD Publishing.
- OECD (Organisation for Economic Co-operation and Development) 2018. Getting skills right: Australia. Paris: OECD Publishing.
- OECD 2019a. Employment outlook 2019: the future of work. Paris: OECD Publishing.
- OECD 2019b. Job displacement in Australia: evidence from the HILDA survey. Paris: OECD Publishing.
- Siekmann G & Fowler C 2017. Identifying work skills: international approaches. Adelaide: National Centre for Vocational Education Research (NCVER).
- Sigelman M, Bittle S, Markow W & Francis B 2019. The hybrid job economy: how new skills are rewriting the DNA of the job market. Boston: Burning Glass Technologies. Viewed 2 June 2019, <https://www.burning-glass.com/wp-content/uploads/hybrid_jobs_2019_final.pdf>.
- WEF (World Economic Forum) 2018a. The future of jobs report 2018. Geneva: WEF.
- WEF 2018b. Towards a reskilling revolution. Geneva: WEF.