

Chapter 2. Building tools to assess and anticipate skill needs in Australia

Skill assessment and anticipation exercises are carried out in every OECD country, but the approaches used vary and each has its advantages and disadvantages. This chapter first provides an overview of the main tools for assessing and anticipating skill needs in Australia, both at the national and sub-national levels. It then reviews the methodological challenges associated with each exercise and discusses steps that Australia has taken to address these challenges. The third section analyses the policy relevance of the information produced and the fourth section focuses on how SAA information is disseminated.

Policy can help to mitigate the costs of skills imbalances for individuals and economies, provided that actors have access to high-quality, reliable and timely information about the labour market. Skill assessment and anticipation exercises are tools to generate information about the current and future skills needs of the labour market, and the available skill supply (OECD, 2016^[1]). Such information can help to improve the allocation of resources in Australia's largely market-driven labour market, but should not be regarded as a blueprint for planning the labour market from the top down.

SAA exercises are carried out in every OECD country, although the approaches taken vary in terms of the methods used, the time span covered, frequency, how skill needs are defined or approximated, and the level of disaggregation chosen for the analysis (national/regional/sectoral, or a combination of these) (OECD, 2016^[1]). Each approach has its advantages and limitations. Many countries carry out multiple exercises, which can reduce potential bias associated with a particular approach (OECD, 2016^[1]). In Australia, the SAA system is well-developed, and a wide variety of exercises are carried out, which reduces the bias associated with any one type of exercise.

Several strengths of the Australian SAA system stand out. The cornerstone skill assessment exercise, the Survey of Employers who Recently Advertised (SERA), is conducted regularly, in a consistent manner across all states and territories, and includes built-in validation mechanisms. Australia's skill shortage research – into which SERA feeds – also takes a holistic approach to assessing current skill needs, by combining the use of qualitative and quantitative information.

On the other hand, some weaknesses and gaps in Australia's SAA system present opportunities for improvement. Forecasting of future skill needs should be undertaken on a more regular basis (every 2 or 3 years), as the national government currently commissions external consultants and academics to conduct forecasts, though on an ad hoc basis.

There is also room for improving sub-national exercises. In particular, while there are valid reasons for states to conduct their own analyses, more collaboration and sharing of methodologies across states could facilitate consensus on skill needs. Also, analysis of skill needs in remote and rural regions of Australia is weak. At the sectoral level, Industry Skill Forecasts provide regular analysis of skill needs by sector; however, these analyses vary in quality, and tend to be mainly qualitative.

Finally, as in other OECD countries, there is a need to develop more sophisticated proxies that better identify skills in SAA exercises. Currently, occupation and qualification level are used to approximate skills in Australian SAA exercises, though these are imperfect measures of the skills needed in the labour market. Sharpening the focus on skills, per se, is important in the context of preparing the workforce for the future of work, and the changes in skill demand associated with globalisation and technological change. For instance, it facilitates a modular approach to adult learning whereby workers can build on their existing skills by acquiring new ones that are in high demand, as opposed to retraining from scratch without capitalising on their past training and experience.

This chapter first provides an overview of the main tools for assessing and anticipating skill needs in Australia, both at the national and sub-national levels. The second section reviews the strengths and weaknesses associated with each of the major types of SAA exercises, discusses steps Australia has taken to mitigate these limitations, and highlights remaining challenges. The third section analyses the policy relevance of the information produced and the fourth section focuses on how SAA information is passed on to the end user (individuals, employers, policy makers).

2.1. Main findings

- Australia's SAA system is well-developed and consists of several exercises including employer surveys, surveys of graduates, quantitative forecasting models, sector studies, qualitative methods, and labour market information systems. By international standards, this variety is found in only a few countries.
- The two major national-level skill assessment exercises (skill shortage research and review of the skilled occupation lists for migration) are conducted regularly and have a relatively short time span. This makes them suitable for informing shorter-term policies like the selection of temporary skilled workers and active labour market policies. Indeed, the recently-introduced Short Term Skilled Occupation List (STSOL) is specifically intended to address the short-term skilled workforce needs of Australian business. On the other hand, the skill shortage research does not have a clear policy objective. Its usefulness for informing active labour market policies might be limited by its focus restricted to skilled occupations.
- The proposed new methodology for reviewing the skilled occupation lists for migration appears to be an improvement over the methodology used for the annual updates to the former Skilled Occupation List as it is based on a more comprehensive set of quantitative signals of labour market supply and demand for skilled occupations. However, few details about weighting and indicators are provided, though Jobs and Small Business intends to publish a more detailed methodology.
- No regular national-level forecasts are currently carried out in Australia, though they have been commissioned on an ad hoc basis. More regular forecasting (i.e. every 2-3 years) is needed to identify potential labour market imbalances in the longer-term (10-year time span), so that policy makers can set skill targets and develop policy to avoid these imbalances. Such forecasts could inform education and training policy, as well as migration policy, particularly construction of the Medium and Long Term Strategic Skills List (MLTSSL).
- SAA exercises at the state/territory and sectoral levels suffer from lack of consistency. The Survey of Employers who have Recently Advertised (SERA) is an exception, as researchers from the federal government do a good job of validating the results, and ensuring a consistent methodology across states and territories. But the state-level exercises to determine which vocational education and training (VET) qualifications merit subsidies, as well as the Industry Skill Forecasts, vary widely in their methodologies. This potentially compromises the capacity to achieve consensus on skill needs.
- There seems to be value in conducting SAA exercises for rural and remote regions based on pilot exercises, as these exercises generate recommendations tailored to the specific skill needs of the region.
- Australia, like other OECD countries, currently lacks good proxies for skills – most SAA exercises focus on qualifications or occupations. A more skill-based approach to SAA would help Australia to respond to changing demand for skills due to technological change and other global trends. There are several promising initiatives already underway to improve measures for skills. Australia should continue to pursue efforts to build a skill-based occupational classification, as this

would provide demand-side information about skills which could help to inform VET training packages, and leverage the existing competency-based VET framework to support a modular approach to adult learning.

- All SAA exercises are linked to the Australia and New Zealand Standard Classification of Occupations (ANZSCO), which was published in 2006, and updated in 2009 and 2013. ANZSCO should be updated again to reflect emerging occupations, many of which have specialised skill requirements and could contribute to skill imbalances.

2.2. Overview of main tools to assess and anticipate skill needs in Australia

Table 2.1 outlines some of the main tools and methods that countries employ to assess and anticipate skill needs. Australia is one of only six countries surveyed (out of 28 countries) which carries out at least one of each type of exercise (other countries in this group include Austria, Canada, France, Germany, and Norway). Having a variety of SAA exercises in place is recognised as good practice, since each type of exercise is associated with advantages and limitations, as summarised in Table 2.4. Carrying out multiple exercises simultaneously reduces potential biases arising from any one type of exercise (OECD, 2016^[1]). At the same time, if not well coordinated, a multiplicity of exercises can create a confusing system whereby different actors initiate ad hoc SAA exercises that are narrowly-designed for their own purposes. This can pose difficulties for achieving consensus on skill needs.

In Australia, the major skill needs assessments carried out nationally are labour market information systems, which draw from a variety of data sources, including employer surveys, graduate outcome surveys, and state/territory and sectoral analyses. The main exercises to anticipate future skill needs are undertaken by Commonwealth Scientific and Industrial Research Organisation (CSIRO) and external consultants. Department of Jobs and Small Business is the major player in the production of skill needs information in Australia, but other stakeholders also lead exercises, including the Australian Bureau of Statistics (ABS), the National Centre for Vocational Education Research (NCVER), the Department of Education and Training (DET), as well as state-level training authorities, state-level Jobs and Small Business offices, and industry reference committees.

Table 2.1. Tools and methods used in skills assessment and anticipation systems

	Employer surveys	Surveys of workers or graduates	Quantitative forecasting models	Sector studies	Qualitative methods	Labour market information system	Other
Australia	X	X	X	X	X	X	X
Austria	X	X	X	X	X	X	X
Belgium (Flanders)		X	X	X	X	X	
Belgium (Wallonia)				X	X	X	X
Canada	X	X	X	X	X	X	X
Chile	X			X	X	X	
Czech Republic			X	X			
Denmark	X	X	X	X	X		
Estonia			X				
Finland	X		X		X	X	
France	X	X	X	X	X	X	
Germany	X	X	X	X	X	X	X
Greece	X			X		X	
Hungary	X				X		
Ireland			X	X		X	
Italy	X	X	X	X			
Japan	X	X		X		X	X
Korea	X	X		X	X	X	
Netherlands	X		X	X	X	X	
Norway	X	X	X	X	X	X	X
Poland		X				X	
Portugal	X	X		X	X	X	
Slovak Republic						X	
Slovenia	X						X
Sweden	X	X	X		X	X	
Switzerland							
Turkey	X	X		X	X	X	
United States		X	X		X	X	X

Note: Only the 28 countries that replied to either the Ministry of Labour or the Ministry of Education questionnaires are included. If a tool or method is mentioned in either questionnaire it is marked as used.

Source: (OECD, 2015) Questionnaire on Anticipating and Responding to Changing Skill Needs: Ministry of Labour and Ministry of Education questionnaires.

2.2.1. Assessing current skill needs

When it comes to identifying current skill needs in the national labour market, a key skill assessment exercise is Jobs and Small Business' **skill shortage research**, which relies heavily on employer surveys, but also incorporates other labour market information and consultations with experts.

A second major skill assessment exercise is the **review of skilled occupation lists for migration purposes**. Before July 2017, DET was responsible for providing advice to the Assistant Minister for Vocational Education and Skills who made recommendations to the Minister of Home Affairs on the composition of the Skilled Occupation List (SOL), while Department of Immigration and Border Protection (now under Department of Home Affairs) managed the Consolidated Sponsored Occupation List (CSOL). Under

reforms announced in April 2017, the CSOL and SOL have been replaced by the Short Term Skilled Occupation List (STSOL) and the Medium and Long Term Strategic Skills List (MLTSSL), respectively. Jobs and Small Business is now responsible for providing advice to the Australian government on updates to both lists, as well as the new Regional Occupations List which was introduced in March 2018. Jobs and Small Business' proposed methodology draws from survey results, data on temporary visa usage, employment projections, and submissions from stakeholders.

Both of these exercises are examples of labour market information systems, in that they monitor the labour market by tracking a set of indicators on a regular basis, with the specific aim of assessing the relative supply and demand for skills (OECD, 2016^[1]). This section provides an overview of these two exercises by making comparisons about their objectives, coverage, frequency, and methodology.

Overview of exercises

Skill shortage research

Jobs and Small Business' skill shortage research, which began more than three decades ago, is undertaken on an ongoing basis with the aim of identifying shortages in skilled occupations where long lead times for training mean that shortages cannot be quickly addressed. The results are taken into consideration when formulating a range of education, training, and employment programmes and are publicly available on the Jobs and Small Business website (<https://www.jobs.gov.au/skillshortages>).

The backbone of the skill shortage research is an employer survey, the Survey of Employers who have Recently Advertised (SERA), although researchers also take into account a range of other data in conjunction with the results of the SERA. The SERA is a telephone-based survey of employers who have recently advertised in selected skilled occupations. It is conducted in a consistent manner by each of the state and territory offices of Jobs and Small Business, as well as the national office. Researchers collect a pool of vacancy details from newspapers and internet sites, and randomly select vacancies for an interview. During the interview, information is collected about the skill and qualification requirements of the position; the number of jobs available; whether vacancies were filled; the number of applicants, qualified applicants and suitable applicants; and the reasons for applicants being considered unsuitable.

A low proportion of vacancies filled is taken as a signal of skill shortages – though Jobs and Small Business emphasises that the reasons for vacancies remaining unfilled are complex and may not necessarily relate to a lack of qualified applicants. For instance, workers may choose not to accept jobs where the pay is below market rate, there are barriers to transport, or working arrangements do not meet their expectations. Similarly, employers may have highly specialised skill requirements.

To complement the results from the SERA, researchers consider other secondary data relating to the demand for skills (e.g. industry activity statistics and projections, changes in employment levels, vacancy trends, graduate employment outcomes and anecdotal information from employers and industry contacts) as well as data on the supply of skills (e.g. training completions and commencements, people leaving the occupation, net migration and informal supply) where data are available.

Taking account of available information, researchers decide on one of three ratings for each occupation: shortage, recruitment difficulty or no shortage. Occupations are deemed to be in “shortage” when:

“...employers are unable to fill or have considerable difficulty filling vacancies for an occupation, or significant specialized skill needs within that occupation, at current levels of remuneration and conditions of employment, and in reasonably accessible locations.” (Department of Jobs and Small Business, 2017^[2])

But if some employers have difficulty filling vacancies (e.g. for a limited set of specialised skills) while there is an overall adequate supply of skilled workers for the occupation, a rating of “recruitment difficulty” is assigned. Finally, a rating of “no shortage” is assigned if there are no signs of significant difficulty filling vacancies in an occupation.

Review of skilled occupation lists for migration purposes

Prior to reforms announced in April 2017, there were two skilled occupation lists for skilled migration purposes: the Skilled Occupation List (SOL) and the Consolidated Sponsored Occupation List (CSOL). The SOL was relevant for independent points-based skilled migrants, while the CSOL was relevant for most other types of skilled migration (see Table 3.6). DET had responsibility for reviewing the SOL, while (former) Department of Immigration and Border Protection (DIBP) was responsible for the management of the CSOL and the (former) Department of Employment was involved in an advisory role in this process, with other departments providing input on specific occupations (for example, the Department of Health was responsible for health workforce modelling as an input into the SOL).

DET’s review of the SOL followed two steps. The first step involved the use of four criteria: long lead time (several years of study or training), high use (a high share of persons employed in the occupation had studied in the same/related field of education), high risk (short supply of such skills can disrupt the economy) and high information (quality of information that is adequate to inform the first three criteria). An occupation was shortlisted for further consideration if it met two of the first three criteria, plus the fourth criterion.

The second step involved assessing the medium to long-term skill needs of the economy for each occupation identified in step one, to determine if the occupation would benefit from independent skilled migration. An occupation successfully passed step two if a surplus of skilled workers was unlikely in the medium to long-term. The assessment in the second step was based on a wide range of indicators in addition to consultations with stakeholders. Over time, occupations could be removed from the list if they were expected to be in surplus in the medium to long term. The second list, CSOL, was not developed as a result of an analytical and consultative exercise as the one that the SOL underwent.

Under the reforms, the SOL and CSOL have been replaced by the Medium and Long Term Strategic Skills List (MLTSSL) and the Short Term Skilled Occupation List (STSOL), respectively. Jobs and Small Business is responsible for providing labour market and stakeholder advice to the Australian government on updates to both lists on a regular basis. Jobs and Small Business has also introduced a third list, the Regional Occupation List (ROL), which will be used to supplement the MLTSSL for certain skilled visa subclasses.

According to its draft methodology (Department of Employment, 2017^[3]), Jobs and Small Business considers 11 national-level sources of data in its labour market analysis for the migration occupation lists. Jobs and Small Business classifies each data source into two categories: primary factors (robust and statistically reliable and available for most occupations); and secondary factors (data is not available for all occupations or where the factor may be less relevant). The primary factors include: skilled migrant employment outcomes, reliance on temporary visa holders, educational attainment of workers compared to ANZSCO skill level, low visa grants, and projected employment growth.

A points system is used to determine if an occupation is of concern from a labour market perspective, or if it requires further analysis. Jobs and Small Business intends to refine this system over time, and updates to the methodology will be published and will provide further information on the labour market demand and supply factors, and how they are weighted. Occupations where there may be labour market concerns are flagged via a “traffic light bulletin,” which is published on the Department of Jobs and Small Business website for further examination and stakeholder consultation. The traffic light bulletin will also identify occupations that support Australia’s international trade commitments, those for which Australian citizenship is a pre-requisite for employment, and those identified as supporting Australia’s science and innovation agenda. Stakeholders are invited to provide evidence on occupations identified for possible removal (highlighted in red), addition (blue), or movement between lists (orange and yellow).

Comparison of exercises

Objective

The review of the skilled occupation lists for migration has a clear policy purpose. The STSOL identifies occupations required to meet short-term, critical skill needs in the labour market and is used to select migrants for the short-term Temporary Skill Shortage visa (which is good for two years or up to four years if an international trade obligation applies). The MLTSSL identifies occupations needed to meet medium-term projected skills shortages in the labour market and occupations required in the longer-term to build productive capacity in the economy. It is used to select migrants for the medium-term Temporary Skill Shortage visa (up to four years) as well as all permanent skilled visas. Finally, the Regional Occupation List (ROL) identifies occupations that are in specific need in regional Australia and is used to supplement the MLTSSL in certain skilled visa subclasses.

But while the review of the skilled occupation lists for migration has a clear policy purpose, the policy objective of the Department of Jobs and Small Business’ skill shortage research is less narrowly-defined. The research serves a general need for information about skill needs on a national and state/territory basis, and results are considered in a range of policies and programmes.

Coverage

Both exercises undertake analysis for selected occupations defined in the Australian and New Zealand Standard Classification of Occupations (ANZSCO) at the six-digit level. Both exercises also limit their analysis only to skilled occupations (defined as ANZSCO Skill Level 1-3, which corresponds to occupations requiring at least Certificate 4 or Certificate 3 including at least two years of on-the-job training). The skill shortage research focuses on a core group of about 70 consistently-assessed occupations which are

concentrated among Professionals, and Technicians and Trade Workers, though a small number of assessed occupations are Managers and Community and Personal Service Workers as well. For its review of the skilled occupation lists for migration, the Department of Jobs and Small Business will undertake labour market analysis for all ANZSCO Skill Level 1–3 occupations. (Department of Employment, 2017^[3])

Attempts are made in Jobs and Small Business' skill shortage research to achieve coverage of both metropolitan and non-metropolitan areas. When carrying out their telephone-based research, SERA researchers at the state level attempt to survey employers from both metropolitan and more remote areas. By comparison, the review of the skilled occupation lists for migration is currently limited to national-level sources of data, since data at the state, territory or regional level is either not available or not statistically robust. The Department used available regional labour market data to construct the Regional Occupation List (ROL), with a more robust methodology under development for future updates to the ROL (from 2019).

For occupations where the vacancy numbers are low, the SERA is supplemented by cold canvassing a wider sample of employers to assess whether they have advertised vacancies in the target occupation in the last six months. The sample and the occupations researched are targeted¹ in order to be cost-effective, and thus they are not statistically representative which limits the comprehensiveness of the outputs (Coelli and Wilkins, 2008^[4]); however, in a review of the methodology the Australian Bureau of Statistics found it to be appropriate for its purpose (Department of Jobs and Small Business, 2017^[2]).

Both approaches limit analysis to occupations included in ANZSCO. This unfortunately excludes occupations which have emerged with technological progress – like, cybersecurity or artificial intelligence experts – since these are not included in ANZSCO, which was last updated in 2013. Emerging occupations may require specialised skills which contribute to skill shortages. Excluding such occupations from the analysis is a gap in Australia's skill assessment exercises which could have negative impacts on skill shortages and productivity if not addressed, either by updating the ANZSCO or by better formalizing consultation processes with employer and industry groups.

Frequency/time span

Jobs and Small Business updates its skill shortage research on a regular basis, and conducts the SERA every six months, with each occupation generally assessed annually on a rotating basis. Under recent reforms, Jobs and Small Business is now also responsible for reviewing occupations on the STSOL and MLTSSL regularly.

Both the skill shortage research and the review of the STSOL have a short-term time span, in that they identify pressures in the labour market arising either immediately or in the very short-term. This makes them suitable for informing short-term skill policies, like the selection and integration of temporary migrants, or active labour market policies. The MLTSSL is intended to identify occupations appropriate to the medium and long-term needs of business and industry. Each of these exercises considers the Department of Jobs and Small Business' 5-year employment projections in their analysis. However, forward-looking exercises with a longer time horizon (e.g. 10 years) may be needed to identify the medium and long-term needs of business and industry for the MLTSSL

While the skill shortage research covers the right time-span to inform active labour market policies (i.e. short-term), it may not be suitable in practice. The skill shortage research captures demand for skilled occupations which require at least an Australian

Qualifications Framework (AQF) Certificate 4 or an AQF Certificate 3 with at least two years of relevant work experience. According to Jobs and Small Business' records, only 4% of job seekers who received accredited training through *jobactive* (Australia's quasi-market employment services system) undertook training at Certificate 4 or higher. Most received training at Certificate 3 (46.9%), or else they undertook accredited skills or units at an unspecified level (46.5%). The long-term unemployed, who stand to benefit the most from training (Card, Kluve and Weber, 2015^[5]), are less educated and may not have the necessary pre-requisites to enter into a Certificate 3 or 4 programme. By focusing on skilled occupations, the skill shortage research may not be suitable for informing active labour market policies, despite covering the appropriate time span.

Methods and data sources

As highlighted in (OECD, 2016^[1]) and (Cedefop, 2008^[6]), it is considered good practice in SAA exercises to combine the use of qualitative and quantitative data sources to improve the robustness of results. Furthermore, the accuracy and reliability of SAA exercises can be improved by a combination of "top-down" and "bottom-up" approaches, where top-down evidence comes from national-level sources and bottom-up evidence comes from information from employers, industry groups, researchers, and educators (Thomas, 2015^[7]; Migration Advisory Committee, 2010^[8]).

This type of holistic approach is employed for both the skill shortage research and the review of the skilled occupation lists for migration purposes. During the telephone interview of the SERA, for instance, SERA researchers collect two types of information about employers' experience recruiting skilled workers: qualitative information from discussions with employers and recruitment professionals, and quantitative data, including the proportion of vacancies filled and the number of applicants, qualified applicants and suitable applicants. Jobs and Small Business will rely mostly on quantitative and national-level evidence in its review of the skilled occupation lists for migration; however, it will invite stakeholders to submit additional evidence in support of adding or removing particular occupations from the lists. For example, during the January 2018 review, the Department of Jobs and Small Business received more than 600 submissions from a range of stakeholders, which contributed new quantitative and qualitative data. Jobs and Small Business also undertakes bilateral meetings and roundtables with relevant industry stakeholders as part of its consultation process.

Other skill assessment exercises

In addition to Jobs and Small Business' skill shortage research and review of skilled occupation lists for migration, the Department for Education and Training (DET) also produces surveys of recent graduates in higher education and the National Centre for Vocational Education and Research (NCVER) manages a similar exercise for recent graduates in vocational education and training. The results from these surveys are compiled on websites (*Quality Indicators for Learning and Teaching*, *MySkills*) to assist prospective students in making informed decisions about investing in education and training (see Section 3.4 for more on the use of *QILT* and *MySkills* in career guidance). The results of these exercises also serve as important inputs into the skill shortage research and the review of skilled occupation lists for migration.

2.2.2. *Anticipating future skill needs*

Beyond understanding current skill needs, there is also value in anticipating future ones. Forecast and foresight exercises can help to plan or steer education and training provision and acquisition based on projected labour market demand. Such forward-looking exercises are critical to ensuring the availability of a pipeline of relevant skills which may take several years to acquire through education and training. In Australia, a regular national forecast exercise does not yet exist, but national foresight exercises have been carried out by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) on an ad hoc basis.

Unlike many countries, including Canada, the United States and New Zealand (see Box 2.7), Australia does not yet have a regular national **forecast exercise**. Instead, it commissions forecasting on an ad hoc basis. Most recently, DET commissioned an external consulting company, Deloitte Access Economics, to develop a macroeconomic modelling framework to forecast Australia's medium and long-term qualification needs. Looking 10 years ahead to 2027, the model will forecast qualification demand and supply by industry, occupation and nationally, by state and territory, and at a regional level.

While Australia does not yet have a regular national forecast exercise, Jobs and Small Business carries out 5-year employment projections every year for 474 occupations (4-digit ANZSCO code) across all five skill levels. Compared to quantitative forecasting, Australia's employment projections are less data-demanding and do not capture the complexities of an inter-connected economy². The Department of Jobs and Small Business' employment projections are instead based on a time-series model about employment growth at the occupational level. The model makes assumptions about "wastage" (i.e. the degree to which graduates from one field find employment in other fields) and turnover, as well as the expected employment impact of new infrastructure projects. Total employment growth is constrained to match the projections for total employment growth as published in the budget. These projections are used in the Department of Jobs and Small Business' career guidance web portal (*Job Outlook*) to inform individuals about the employment prospects of their intended occupation, and projections on the *Labour Market Information Portal* feed into updates of the skilled occupation lists for migration, which was discussed in the previous section.

Though less common than forecast exercises (see Figure 2.1), many countries also run **foresight exercises** to understand the future demand and supply of skills (Box 2.1). Foresight exercises are generally more qualitative in nature than forecasts, and rely upon consultations with stakeholders and experts to build scenarios about how the demand and supply of skills might change in the future. In Australia, national foresight exercises are carried out by CSIRO, an independent agency of the Australian government.

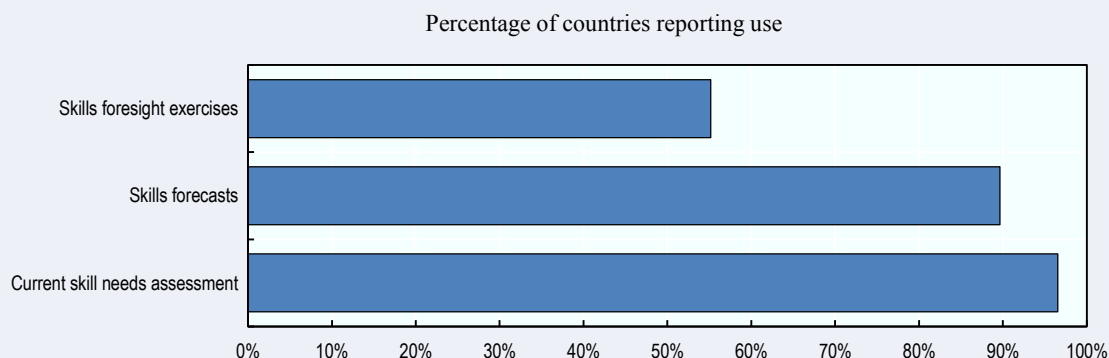
CSIRO's foresight process involves first conducting a background study of current conditions, then doing an "environmental scan" to identify and synthesise key trends, followed by a validation of such trends through interviews with experts. The most recent exercise, *Tomorrow's Digitally Enabled Workforce*, considered four future scenarios around the risks of automation. The report made the following projections about the future demand for skills: "aside from core STEM [science, technology, engineering, and mathematics] knowledge and skills, our aging population means that the healthcare and aged care sectors will be the largest employers and thus workers will need some hybrid of technical, business, creative and interpersonal skills" (Hajkowicz et al., 2016^[9]). One of the conclusions of this study was that better labour market modelling is needed to (i) predict tasks and jobs likely to be automated, (ii) to identify new jobs likely to be created, and (iii) to identify pathways between jobs and sectors in order to facilitate transitions in the face of changing demand.

Box 2.1. Foresight vs. forecast exercises in OECD countries

Forecasting involves starting with data points from the past and extrapolating into the future using a set of tools and assumptions. However, as pointed out by Policy Horizons Canada, “at a time when the underlying systems are changing in fundamental ways, users of forecasting should take care to confirm that the supporting assumptions are still correct” (Policy Horizons Canada, 2016_[10]).

Many countries run foresight exercises to better understand the future demand and supply of skills, although such exercises are less common than forecasts (OECD, 2016). The European Training Foundation draws this distinction between forecasting and foresight exercises: “foresight has a participatory and networking dimension involving a wide range of stakeholders. In addition, it explores long-term futures through holistic analysis that goes beyond typical forecasting. Foresight combines qualitative approaches and provides the link between reflection and action.” (European Training Foundation, 2014)

Figure 2.1. Use of SAA exercises



Note: Percentages based on responses from 28 countries (Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the United States). If more than one questionnaire was received per country, a use is considered if reported in any questionnaire received.

Source: OECD (2016) Getting Skills Right: Assessing and Anticipating Changing Skill Needs.

2.2.3. Sectoral, state/territory and regional analyses

As national-level skill needs exercises can sometimes overlook skill imbalances in a particular state, region or sector, sub-national skill needs exercises can be useful complements. Sectoral, state and regional analyses can improve the accuracy and reliability of national-level assessments through “bottom up” evidence, as noted previously. In a country as diverse as Australia, state/territory and regional analyses help to tailor skill policies to the diverse needs of different parts of the country.

Sectoral analyses

In Australia, skills service organisations (SSO) receive government funding to conduct sectoral skills analyses on behalf of a number of industry reference committees (IRC).

This intelligence supports the IRCs in their role in advising the Australian Industry and Skills Committee (AISC) regarding the updating and development of vocational education and training packages (VET) (see Box 2.2). Some peak bodies also conduct sectoral skills analyses, as is the case in the construction sector (Box 2.3). In addition, the Department of Health undertakes regular projections of the skill needs of the health sector (see Box 2.4).

Prior to its closure in 2014, the Australian Workforce and Productivity Agency used to carry out in-depth workforce studies on a number of key sectors and occupations, including the resource sector, retail, engineering, construction, mining, ICT, food and beverage, accounting, and manufacturing.

Box 2.2. Australia's VET training packages

A “**training package**” specifies the skills and knowledge required to perform effectively in the workplace and is detailed in units of competency. They also describe how these units can be encompassed into nationally-recognised qualifications that are aligned to the Australian Qualifications Framework (AQF) and industry-recognised skill sets (or part qualifications). Training packages form the basis for most of the programmes delivered in the vocational education and training system, including Australian Apprenticeships, training courses offered by registered training organisations (RTO), VET in Schools programmes, recognition of existing skills and occupational licensing.

The Council of Australian Governments (COAG) Industry and Skills Council introduced new arrangements for strengthened industry leadership in the VET sector in January 2016. Industry now has a formal, expanded role in decision-making for the VET sector through the establishment of the Australian Industry and Skills Committee (AISC) and its network of almost 70 Industry Reference Committees (IRCs). IRCs are voluntary committees made up of people with experience, skills and knowledge of their particular industry sector and drive the process of VET training package development.

IRCs are supported by contestable, professional and independent Skills Service Organisations (SSOs) that have replaced the former Industry Skills Councils that were previously responsible for training package development.

Currently, there are 68 training packages, about 1 470 qualifications, and over 17 000 units of competency published on the National Register of VET training website.

Source: DET website; Australian Industry Skills Committee (2016), “Industry Reference Committees: Operating Framework for the Development of Training Packages.”; National Register of VET training website (training.gov.au).

Industry Skills Forecasts

Each year IRCs develop an “industry skills forecast” (ISF) and a proposed schedule of work which are submitted to the AISC for approval. The ISFs help to identify skills gaps, emerging skill needs and associated training needs for their industry sector and whether there is a need to update training packages. Despite their name, they are not forecasts but rather qualitative snapshots of current and future skill needs in the industry.

IRCs consult widely with key industry stakeholders to develop the ISFs. They also draw on research tools, including:

- **Future Skills and Training**, which is a type of foresight exercise that was commissioned by the AISC in order to spark conversations within IRCs about how emerging trends may affect their industry, and the implications for skills and training. The exercise gathers and analyses data on Australian and international skills trends and megatrends to build an understanding of the potential impacts on Australia’s workforce in the future. Drawing upon the analysis, focused workshops are held to develop and refine potential future scenarios and implications for the industry sector.
- **The National Industry Insights Report** is a web-based resource developed to provide an accessible platform for industry stakeholders and IRCs to access data and industry intelligence on their sector. The website provides easy-to-access data and information by industry sector on economic and employment trends, and education and training patterns.

ISFs are intended to support the development of VET packages, and each IRC sets the methodological approach taken, with the support of a SSO. As a result, there can be considerable variation in the methods used across industries. ISFs replace the former “Environmental Scans,” and stakeholders from the Department of Education noted that the new ISFs improve upon Environmental Scans in two ways: by introducing a template to facilitate the consistency of responses across industries, and by engaging a more representative group of stakeholders in consultations. The template for the ISF requires, for example, that IRCs prioritise the most important skills out of a generic list of 13 broad skill categories.

Box 2.3. Social partners’ skill assessment exercises

Twice a year, the Australian Industry Group and the Australian Constructors Association deliver an update on conditions in the country’s **construction sector**, called the “Construction Outlook,” which includes an assessment of labour and capital supply constraints. The assessment is based on a survey of 100 major construction companies employing 51 000 persons. The most recent Construction Outlook noted that 64% of respondents reported major or moderate difficulty in recruiting skilled labour in the previous six months, an increase from the trough of 30% two years prior.

Between 2014 and early 2017, activity in the construction sector contracted as a result of the decline in mining-related engineering construction. But engineering construction is expected to rise in 2017/18, reflecting new road and rail projects, telecommunications infrastructure and new pipeline infrastructure for gas supply. As a result, respondents reported rising labour costs pressures in the construction of infrastructure and building projects, as contractors compete for the same pool of skilled labour in the ramp up of major infrastructure projects.

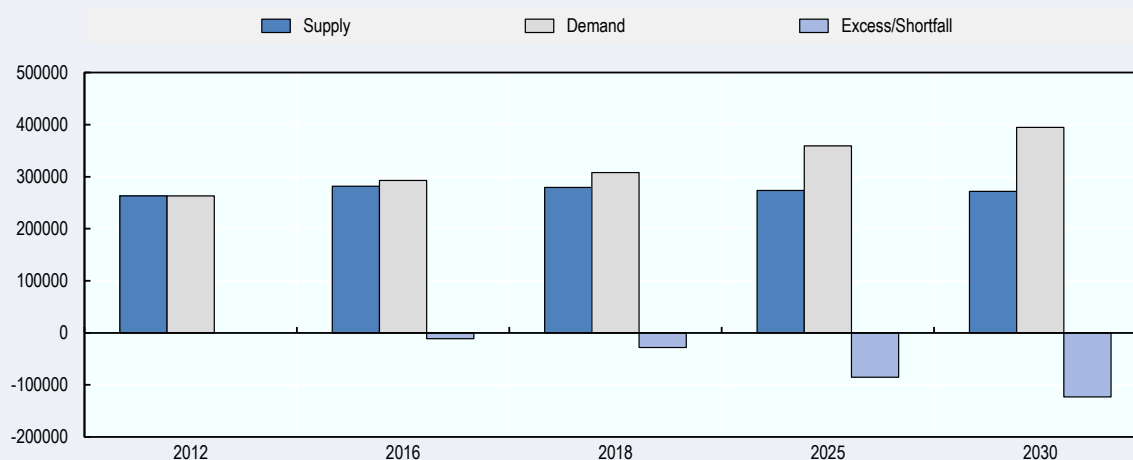
Source: AI Group and Australian Constructors Association (November 2017), “Construction Outlook.”

Box 2.4. Forecasting Skill Needs in the Health Sector

The Department of Health carries out national-level projections for the demand and supply of health professionals (see Figure 2.2 for registered nurses example). There is a recognised role for workforce planning in the health profession, given the importance of health professionals to public welfare, particularly in the context of an ageing population, and in view of the long lead times and public expense required to train for a medical occupation. Such planning is also viewed as essential to bring about a better geographic distribution of the medical workforce, as disparities continue to exist between metropolitan areas and the rest of the country. It is also needed to ensure that there are adequate training places available.

There are 16 regulated professions that are included in the biannual exercise, and include doctors, nurses, oral health workers and allied health professionals.

Figure 2.2. Projected shortfalls of registered nurses and enrolled nurses



Source: Health Workforce Australia (2014) “Australia’s Future Health Workforce – Nurses Overview Report”

To assemble the required demand and supply data for their projections the Department of Health exploits administrative data, as the Labour Force Survey does not allow for sufficient disaggregation to obtain detailed information about health professions. The Census, which offers this level of disaggregation, is only updated every five years. On the supply side, the department gathers information from the annual registration process for health professionals, together with findings from a voluntary survey. To this is added administrative data about commencements and completions of medical students, as well as numbers of foreign health professionals in the country. Researchers make assumptions about the rate of ageing, migration, and graduation to project supply from 2012 to 2030. Demand projections are built by computing utilisation rates (calculated as billing information against number of doctors).

State/territory and regional analyses

In a country as vast as Australia, mismatches or shortages for a particular skill may exist in particular states, territories or regions but not in others. Shah and Burke (2005) note that inclusion of a regional dimension to the analysis is important as internal migration is sometimes part of the solution to skills imbalances. In Australia, the state and territory governments carry out two types of skill assessment exercises:

- State and territory offices of Jobs and Small Business conduct telephone surveys of employers in their state or territory, as part of the **SERA**. Findings are then aggregated to produce the national-level skill shortage results, but are also available on a disaggregated basis by state and territory.
- State training authorities are responsible for managing the distribution of subsidies for VET. Most states and territories conduct **occupational labour market analysis** to assess which VET qualifications ought to be funded, and by how much. This analysis is also often used in compiling State Migration Plans (SMPs), which are used to inform state/territory-nominated migration.

While Jobs and Small Business sets a consistent methodology to be applied across state and territory offices for the first exercise, each state and territory government sets their own methodology for the second one, resulting in considerable variation in methodologies and quality (Table 2.2). For example, in Tasmania no formal or quantitative analysis is carried out. Instead, Tasmania relies on industry consultation to decide which VET qualifications should be subsidised. In Victoria, industry consultations are combined with quantitative exercises. Victoria commissions an occupational forecasting exercise and conducts its own survey of students and employers, which provides a rich and state-specific source of information about student outcomes to inform which VET qualifications should receive a subsidy.

Table 2.2. Comparison of state-level occupational labour market analysis

	Predominantly quantitative or qualitative?	Broad methodology type	Does the model incorporate forecasts?
Tasmania	Qualitative	N/A	No
Northern Territory	Qualitative	Indicator approach (4 indicators)	Yes. Victoria University Employment Forecasts (VUEF).
South Australia	Quantitative	Forecast	Yes. State government economic projections used to calculate economic forecasts and employment forecasts.
Queensland	Quantitative	Indicator approach (4 indicators)	No
New South Wales	Quantitative	Indicator approach (18 indicators)	Yes. Job growth and replacement demand projections based on Centre for International Economics modelling.
Western Australia	Quantitative	Indicator approach (6 indicators)	Yes. Combination of VUEF and Shah Consulting.
Victoria	Quantitative/Qualitative	Indicator approach (3 main metrics made up of 13 sub-metrics)	Yes. Employment and demand forecasts provided by Deloitte Access Economics.
Australian Capital Territory	Quantitative	Indicator approach (11 indicators)	Yes. Forecasts provided by Jobs and Small Business.

Source: Bent, Patrick (unpublished), “Scoping of labour force modelling and its application to VET subsidisation.”

DET has commissioned a comprehensive review of the different approaches states and territories take to assess which VET qualifications ought to be funded (Bent, 2018^[11]). This review (to be completed in 2018) could inform a more consistent approach across states and territories in the future, potentially encouraging more knowledge sharing around methods and data.

While most states take an indicator-based approach, drawing inspiration from the method developed by the National Institute of Labour Studies (NILS), the number and type of indicators vary considerably. The indicator-based approach that NILS developed is strongly informed by international experience, including the United Kingdom's Migration Advisory Committee (MAC) skill shortage indicator framework (Mavromaras et al., 2013^[12]). NILS proposes an array of skills imbalance indicators under four categories: state of the labour market, recruitment experience, student responses, and labour market entry (see Table 2.3). Unlike MAC's approach, however, which sets thresholds to decide whether an indicator value signals shortage or not, NILS eschews thresholds in favour of qualitative judgements. Each state and territory has adapted the NILS method to their own context, selecting those indicators which they see as relevant or for which they have data.

Table 2.3. NELS Indicator-based Approach for Assessing Skills Imbalances

	Indicator
State of the aggregate labour market	Male full-time employment/population ratio (per cent)
	Male total employment/population ratio (per cent)
	Female total employment/population ratio (per cent)
	National unemployment rate (per cent)
	Total hours worked (percentage change from previous year)
Recruitment experience	Proportion of vacancies unfilled after 6 weeks
	Average number of applicants per vacancy
	Average number of suitable applicants per vacancy
	Vacancy rate (percentage of employment)
Student responses	Occupational unemployment rate (percentage of employment)
	Average Australian Tertiary Admission Rank (ATAR)*
	Commencements ('000s)
Labour market entrants	Completions ('000s)
	<u>University graduates: 4 months after graduation</u>
	Percentage employed full-time
	Percentage not employed
	Mean full-time hours worked per week
	Mean full-time annual salary (\$'000)
	Percentage with education-job match
	<u>University graduates: 3 years after completion</u>
	Percentage employed full-time
	Mean full-time hours worked per week
	Median annual earnings of full-time workers (\$'000)
	<u>VET graduates: 6 months after completion</u>
	Percentage employed full-time
	Percentage not employed
	Mean full-time weekly pay
Percentage with education-job match	
<u>Skilled immigration intake</u>	
	Subclass 457 visas granted (as percentage of all new entrants)

Note: ATAR is a rank between 0.00 and 99.95 that indicates a high school student's position relative to all students who started high school in the same year. According to NELS, the more an occupation is in shortage, the higher will be the ATAR for the qualification that feeds into it (provided the number of places is kept constant).

Source: Mavromaras, Healy, Richardson, Sloane, Wei and Zhu (2013). "A System for Monitoring Shortages and Surpluses in the Market for Skills." National Institute of Labour Studies, Flinders University, Australia.

Several states incorporate forecast estimates from the Victoria University Employment Forecasting (VUEF) model in their methodology (Box 2.5). The VUEF is produced by the Centre of Policy Studies (CoPS), an independent research centre based at Victoria University. State governments wishing to use VUEF output to inform VET qualification subsidies must develop a methodology for mapping occupations to more finely-detailed qualifications, since there is no standard and broadly-accepted mapping procedure between occupations and qualifications.

Box 2.5. Macroeconomic forecast from the Centre of Policy Studies

The Victoria University Employment Forecasting (VUEF) exercise is a macroeconomic computer general equilibrium (CGE) model that can capture structural and demographic change. The model draws upon a range of inputs, including macroeconomic and demographic data, labour market statistics, education statistics, national and state economic and demographic forecasts, and expert industry forecasts. The main outputs of the model are eight-year employment forecasts. Occupation output is presented at the four-digit ANZSCO level (358 occupations), regions at the SA4 level (57 regions), level of qualification at broad ASCED levels (five levels), and field of study at broad ASCED levels (11 fields).

Since the VUEF is a “market clearing” model, it assumes that demand and supply are equal. The model cannot therefore be used to directly estimate an expected oversupply or undersupply of graduates, but movements in wages indicate where market pressures in the form of labour shortages or surpluses exist. The 2017 model, which includes forecasts from 2018-25, projects growth in employment coming mostly from services, particularly healthcare and social assistance, education and training and professional services.

While the model is capable of forecasting at both the national and state level, it is mostly contracted out to state-level governments in Australia.

Source: Dixon, J. (2017), “Victoria University Employment Forecast (VUEF): 2017 Edition,” CoPS Working Paper G-277, <http://www.copsmodels.com/ftp/workpaper/g-277.pdf> ; Bent, P (2018, unpublished), “Scoping of Labour Force Modelling and its Application to VET subsidisation.”

Analysis of skill needs in remote and rural regions

While not common, some states also run exercises to assess skill needs in remote and rural areas. Assessing skill needs in sparsely populated regions can be costly and time-consuming, and national-level data sources like the Census do not always capture this level of disaggregation accurately. Notwithstanding the cost, the results of such an exercise can be worthwhile. The Northern Territory government currently conducts a census of employers in small and remote towns within the Territory, and Victoria recently piloted a skill needs assessment in a rural area based on employer consultations which resulted in well-targeted policy recommendations about how to better address the region’s skill imbalances (Box 2.6). Western Australia conducted a similar pilot skill needs assessment in the Goldfields region, based on an employer survey. It intends to use the results of this exercise to inform annual discussions between the state and technical and further education (TAFE) colleges around funding and course provision.

Box 2.6. Skill Needs Exercises in Rural and Remote Regions

Victoria: A Skill Demand Profile of the Mallee Region

The Victorian Skills Commissioner recently piloted a taskforce to prepare a “skills demand profile” for the Mallee region, a largely agricultural district in Victoria. The taskforce consulted with local employers to first identify the industries where jobs would be coming from, based on where investments had been made. They then worked with employers and education providers to identify training needs in terms of VET qualifications and particular skills.

Many region-specific challenges emerged: difficulty accessing training infrastructure or suitable teachers due to geography; employees facing geographical barriers in reaching facilities of training providers; or lack of formal pathways to transition high-quality workers into managerial roles. The taskforce worked with employers to identify solutions to these challenges. For instance, to address some of the geographical challenges in participating in standard vocational training models in the horticultural sector, the report recommends “adopting models that take training to individual employers where possible” given that many employers in this region and sector have invested in customised equipment and processes to support farm operations.

Northern Territory: Census of Businesses in Remote Towns

The Northern Territory government currently conducts a census of employers in small and regional towns within the Territory. Carried out once every three years (2011, 2014, and 2017), the census picks up information useful to labour force analysis (vacancy fill rates, employment profiles, ANZSCO and ANZSIC employment distributions, and age profiles by occupation).

Source: Victorian Skills Commissioner (2017), “2017 Regional Skills Demand Profile: The Mallee.”; Bent (2018), “Scoping of labour force modelling and its application to VET subsidisation”

2.3. Limitations with SAA exercises and strategies for addressing them

As the previous sections have demonstrated, Australia has a number of exercises in place to assess and anticipate skill needs. Each approach is associated with advantages and weaknesses, which are summarised in Table 2.4. This section discusses these in more detail, and analyses approaches that are being taken to address them.

Table 2.4. Advantages and disadvantages of different types of skill assessment and anticipation exercises

Approach	Advantages	Disadvantages	In Australia
Surveys of employers	Direct user/customer involvement. Easy to set up and carry out.	Can be subjective and inconsistent across different surveys, with focus on marginal or temporary cases.	Employer surveys form the backbone of the skill shortage research in Australia. Jobs and Small Business' Survey of Employers who Recently Advertised (SERA) is carried out in a consistent manner over time and across states and territories. Findings are validated by cross-checking with other states, with other sources of labour market information and by consulting with industry groups. DET's new Employer Satisfaction Survey also monitors employers' levels of satisfaction with the quality of graduate training and employability.
Forecast-based projections and quantitative models at the national level	Allows for forward-thinking policy planning. Can provide a comprehensive picture of skill imbalances in the labour market, while being transparent about assumptions.	Data demanding, costly; not everything is quantifiable, and may provide a false impression of precision/certainty.	National forecasts are contracted out to external bodies (academics, consultants).
Focus groups/round tables, Delphi style methods, scenario development	Holistic method (considers a broader range of factors than just economic). Direct "user/customer" involvement.	Can be non-systematic, inconsistent, and/or subjective.	National foresight exercises are conducted by CSIRO.
Sectoral/occupational/regional studies	Picks up dynamics that are missed in national level analysis.	Can introduce inconsistency across sectors.	Industry Skills Forecasts scan skill needs in particular industries in a qualitative way. Certain sectors conduct more in-depth analyses (e.g. health and construction). Limited regional skills assessments for remote and rural regions.
Surveys of workers or graduates	Useful for career guidance, and for understanding the returns to education.	Survey of graduates does not capture demand for experienced workers.	DET oversees the Graduate Outcomes Survey (formerly, the Graduate Destination Survey) which provides employment outcomes for university graduates, while the NCVET conducts similar analysis for VET graduates.
Labour market information system	Incorporates a variety of labour market information, and allows for tracking labour market pressures over time.	Subjectivity involved in how to weight different sources of information.	Jobs and Small Business' skill shortage research aims to identify shortages in skilled occupations where long lead times for training mean that shortages cannot be quickly addressed. Jobs and Small Business is also responsible for providing updates to the skilled occupation lists for migration, drawing on labour market demand and supply factors, economic modelling, survey results and submissions from stakeholders.

Source: Adapted from Cedefop (2008_[6]) and OECD (2016_[13]).

2.3.1. Employer surveys: Reducing subjectivity and validating results

Employer surveys are a cornerstone of Australia’s SAA system, and have the advantage of being fairly easy tools to set up, as well as providing direct input from the “users” of skills. Employer surveys generally focus on skill shortages and are not used to assess skills surpluses.

One weakness of this approach is that employer surveys can be subjective. The employer perspective is usually in terms of recruitment difficulties experienced by individual employers, and these difficulties do not necessarily reflect an actual lack of the sought skill in the labour market, though they may lead to rising labour costs that the employer regards as a shortage (Shah and Burke, 2005^[14]). Employers may also report skills shortages when in fact they are unwilling to increase their wages to a competitive level. Furthermore, employers do not interpret “skill shortages” in a uniform or consistent way: evidence shows that many employers equate skills shortages with unfilled vacancies, while others view internal skill deficiencies as equivalent to skills shortages (Green, Machin and Wilkinson, 1998^[15])

The SERA methodology is designed to mitigate these issues of potential subjectivity and inconsistencies in several ways. First, a possible advantage of the SERA employer survey over other types of employer surveys is that it is limited to employers who have actually posted a job vacancy in the given occupation within the last 6 months. This excludes the opinions of employers who are not in the process of recruiting. At the same time, however, it misses all employment activity where jobs are not advertised, e.g. where networks are used to fill positions. Second, the survey determines whether vacancies are still unfilled after four weeks (six weeks for professional occupations). Hard-to-fill vacancies are defined as those that are not filled after this period, which provides a consistent and objective benchmark between states and territories and over time.

The robustness of employer survey findings can be further strengthened through validation exercises. For instance, in Sweden, employers’ survey responses are checked for logical inconsistencies as a means of validation. Where inconsistencies are found to be substantial, Statistics Sweden contacts respondents by phone or email to collect additional information and to validate the information collected (OECD, 2016^[13]). Jobs and Small Business already employs several approaches to validate the results of its SERA employer survey. First, it conducts quarterly moderation discussions among researchers, including those from its state offices, to interpret findings and ensure consistency in use of collected data. Researchers are asked to justify their findings, particularly where their determinations appear to be in conflict with the national consensus. Second, Jobs and Small Business conducts an annual conference amongst SERA researchers which provides an opportunity to discuss broader methodological issues and ways of validating research results. Third, Jobs and Small Business supplements the SERA results with a range of other quantitative labour market information, and consults with selected employer and industry groups about the final list of occupations in shortage, as an additional robustness check.

2.3.2. Forward-looking SAA exercises: Building credibility

Forward-looking SAA exercises at the national level are relatively undeveloped in Australia, compared to those carried out in other OECD countries (see Box 2.7). While foresight exercises are carried out by CSIRO on an ad hoc basis and 5-year employment projections are regularly produced by Jobs and Small Business (see Section 2.2.2), a regular national-level forecast exercise is not undertaken, though DET is in the process of

commissioning a long-term forecast model of demand and supply of qualifications. Many stakeholders acknowledged the need to develop more regular forward-looking SAA exercises in order to better position Australia strategically for changing demand for skills and jobs as a result of global trends, including technological change. Maintaining a regular national forecast exercise with results published every two or three years is viewed as best practice (Thomas, 2015^[7]), since this ensures that major structural changes in the economy are captured in the time trends used in the model's estimation process, and that assumptions can be altered in the face of new economic or social developments.

In addition to more frequent forecasting, new methods could be explored to model the possible impact of technological change on different occupations. It is common for forecasting models to assume uniform technological change across occupations, even though the impact of technological change on employment varies by occupation. In their recent report, CSIRO emphasised the need for forecasting tools which can model the possible impact of automation on jobs and even tasks (Hajkowicz et al., 2016^[9]).

One of the challenges with forward-looking SAA exercises is defining clear expectations for users and policy-makers. Forecast and foresight exercises are not meant to predict the future demand and supply of skills with certainty or precision. Rather, they provide an internally-consistent framework within which to explore the impact of possible scenarios. By way of clarifying expectations, and building credibility around forward-looking exercises, two practices merit consideration.

First, anchoring foresight exercises with empirical evidence helps to allay criticisms that the method is not a useful activity because it can be dominated by intuition, impulsiveness and sometimes inexperience of practitioners (Policy Horizons Canada, 2016^[10]). Similarly, OECD (2016) argued that foresight advice should be “whenever possible backed up by empirical evidence, so that it can be contested and debated by others in the policy domain.” CSIRO's recent foresight exercise was grounded in empirical evidence in this way.

Second, foresight exercises can help to temper expectations from forecast exercises by widening the set of scenarios that are modelled. Doing so reduces focus on a specific number (e.g. employment growth), which may not be reliable, and instead shifts focus to mitigating risks and preparing for a range of possible future scenarios. Foresight can be a useful complement to forecast exercises in this way, by allowing the user to scan for possible disruptive events and to consider alternative scenarios. In addition, foresight helps to establish credibility around forecast estimates by building bridges between the different types of experts in order to improve readiness to face future challenges (OECD, 2016^[16]).

For example, the former Australian Workforce Productivity Agency (AWPA, earlier “Skills Australia”) used to conduct foresight exercises to gain insight into possible future scenarios around the demand and supply of skills. These scenarios were then used to define forecast modelling exercises. In their 2013 study (Australian Workforce and Productivity Agency, 2013^[17]), AWPA developed four scenarios that described plausible futures for Australia, taking into account the broad drivers that could be expected to influence work and workplaces to 2025 (e.g. social, demographic and cultural trends; economic trends, labour force and workplace trends, science and technology, governance and sustainability). These scenarios formed the basis for economic modelling of the supply and demand for qualifications, which was conducted by an external consultant.

Box 2.7. Examples of regular national-level forecast exercises

The **Canadian Occupational Projection System (COPS)** has been used in Canada for over 30 years to assist policy makers and to provide labour market information to assist Canadians and potential immigrants in their education and career decisions. Employment and Social Development Canada (ESDC) developed the model and every two years they publish detailed ten-year labour market forecasts at the national level. Their projections identify the potential level, composition and source of labour demand and labour supply in the future Canadian labour market, and highlight occupations where labour market imbalances may arise. Projections are made for 140 occupations at the three-digit National Occupational Classification (NOC) level. The projection models both expansion demand and replacement demand (including retirements, deaths, voluntary quits and involuntary firings) to arrive at a predicted path of labour requirements for each occupation. In addition, the COPS model estimates occupational supply by combining projections for immigrants, graduates, dropouts and re-entrants with forecasts for labour force participation rates. The model has large data requirements due to the detailed nature of the work, and the methodology is regularly updated to improve the quality of the model outputs.

The **United States** Bureau of Labor Statistics (BLS) undertakes occupational forecasting every two years through a program called Employment Projections (EP). The EP program develops ten-year forecasts of industry and occupational employment, covering 334 occupational profiles which represent approximately 84% of available jobs in the United States. Unlike COPS, the BLS projections do not carry out supply side estimations, choosing instead to focus on demand side estimation. EP also assumes a labour market in equilibrium where total labour supply meets labour demand except for some frictional unemployment, so it is not possible to predict where future labour market imbalances may arise.

The **New Zealand** Department of Labour (NZDoL) produces five-year and ten-year forecasts using a “top down” approach; meaning that it uses aggregate economic industry-level forecasts to generate forecasts for occupation growth. These projections are updated every six months and are produced at the three-digit level for 96 occupations.

Sweden’s statistical agency publishes results of its 20-year forecast every three years. Assuming that supply follows past trends, the forecast focuses on modelling the demand side.

Source: (Thomas, (2015), “Review of Best Practices in Labour Market Forecasting with an Application to the Canadian Aboriginal Population.” *Centre for the Study of Living Standards*; (OECD, 2016), “Getting Skills Right: Sweden.”

2.3.3. State/territory, regional and sectoral SAA analyses: Managing inconsistencies

Australia has several sub-national SAA analyses which help to identify skill imbalances that may not be evident in national-level analysis, and can facilitate the development of more effective policies which are well-targeted to the needs of particular regions or sectors.

A common challenge with sub-national analyses, however, is that they introduce inconsistencies in the way skill needs are measured across regions or sectors. This can complicate the interpretation of skill imbalances, which makes coming to a consensus about skill needs more difficult. It also represents unnecessary costs where resources could be saved by coordinating and sharing methods.

In Australia, the sub-national SAA exercises differ in the degree to which this potential inconsistency is managed. For the SERA research, there are templates to ensure that a similar methodology is employed for employer telephone surveys across states/territories. Jobs and Small Business also organises an annual training at the national level to bring together state/territory researchers to review and receive updates about the methodology. A national coordinator also liaises across states/territories to aid coordination. Finally, the annual conference mentioned above as a validation device is also useful in preserving the consistency of the methodology.

On the other hand, there is considerable inconsistency in the analyses conducted by states and territories to determine which VET qualifications to subsidise. Most states/territories follow a quantitative indicator approach in the style of the one introduced by NILS (Mavromaras et al., 2013^[12]), but there is variation in the types of indicators used and whether forecast results are considered. Tasmania does not use a quantitative method at all but relies solely on consultations with employers. There is very little coordination between states/territories around their methodologies and this makes it difficult to achieve consensus on skill needs. As noted above, the recent review of these approaches commissioned by DET could inform a more consistent approach across states and territories in the future, potentially encouraging more knowledge sharing around methods and data.

Similarly, although steps have been taken to try reduce inconsistencies in Industry Skills Forecasts (use of template), there is still large variation in the degree of rigour that IRCs and SSOs apply in their analysis of the skill needs of each sector. The experience of the United Kingdom in building a common framework for sectoral analysis could be instructive in establishing greater consistency and rigor in Industry Skills Forecasts (Box 2.8).

Box 2.8. Common SAA framework for UK Sector Skills Councils

Introduced in 2002, the Sector Skill Councils (SSC) used to play a central role in identifying and meeting skill needs in the United Kingdom. Licensed by the government, SSCs were required to collect sector-level data on the drivers of skill demand, current skill needs and anticipated future skill demand. The (former) UK Commission of Education and Skills outlined a common framework approach for all SSCs to follow when collecting this data, which facilitated comparison of labour market performance between sectors. SSCs were required to provide labour market information for all countries in the United Kingdom, identifying any differences across countries and regions and highlighting the most serious skill issues. SSCs were encouraged to take a holistic approach to forecasting local skill needs; an approach which included the use of econometric methods, surveys of employers' opinions, skill audits, Delphi methods, case studies, focus groups, scenario development and consultation with experts and employers.

Source: (UKCES, 2009^[18]), "Information to Intelligence: A Common LMI Framework for Sector Skills Councils."; Cedefop (2008), "Systems for Anticipation of Skill Needs in the EU Member States," *Cedefop Working Paper*, No 1.

2.4. Relevance of SAA exercises to policy making

Australia's current SAA exercises are generally useful in policy making, though improvements could make them more so.

In education and training policy, the lack of a regular national-level forecast exercise is a limitation to setting of skills targets and designing policy to steer investments in education. Regular forecast exercises would also provide a much-needed forward-looking dimension to inputs to the Medium and Long Term Strategic Skills List (MLTSSL) in order to ensure that skilled migrants accepted for permanent migration have good long-term labour market prospects. Australia should consider conducting national-level forecasts every 2-3 years. These forecasts should ideally have a 5-10 year time horizon which would enable individuals to potentially alter their education investment decisions based on projected labour market imbalances. A time horizon beyond 10 years, however, is not advised since assumptions are more likely to prove incorrect over that long of a period (Thomas, 2015^[7]).

With respect to employment policy, existing SAA exercises at the national level are not suitable for informing the training content of training for job seekers. Despite having a short-term time span, they are concentrated on highly-skilled occupations. This limits their suitability since most training for job seekers takes place at Certificate Level 3 and below, and the long-term unemployed (who benefit the most from training) are often less educated and may not have the pre-requisites to train for occupations which require a Certificate 3 or Certificate 4. State-based assessments of which VET qualifications merit a subsidy may be better suited to inform training for job seekers.

For informing the selection of temporary migrants, the methodology proposed by Jobs and Small Business to review the Short Term Skilled Occupation List (STSOL) appears to be an improvement over the old methodology in that it is well-grounded in a range of relevant quantitative data sources. The analysis covers occupations at Skill level 1-3,

which is appropriate to policy needs. The lists rely heavily on national-level data due to lack of reliable bottom-up evidence; for this reason, the ongoing formalised consultations with stakeholders are important to validate the results.

Based on the few SAA exercises that are conducted in remote and rural regions in Australia, it appears that these can be effective at tailoring policy response to the specific needs of non-metropolitan regions. However, evaluations of pilot initiatives should be conducted to assess whether the benefits justify the costs.

Furthermore, in order to position itself to respond to changes in skill demand that arise due to technological change and other global trends, Australia should consider developing more sophisticated proxies for skills, and exploring ways to track demand in emerging occupations.

2.4.1. Develop more sophisticated proxies for skills

As underlined at the start of Chapter 1, this report has generally referred to “skills” in a wide sense, to include qualifications, fields of study, and cognitive and non-cognitive abilities. This is because most countries approximate the measurement of skill needs in some way, as direct measures are difficult to obtain. Common proxies of skills include qualification level, field of study or occupation. The use of such proxies in SAA exercises is acceptable to the extent that the proxies map easily to variables that are relevant for policy making. For instance, information about which qualifications are in demand is useful to inform education policy, and migration policy requires an understanding of which occupations are in demand. However, misalignment between the skill proxies used in SAA exercises and their policy uses was reported by 50% of OECD ministries interviewed in a questionnaire on anticipating and responding to changing skill needs.³ A key challenge facing all OECD countries, including Australia, is to develop more sophisticated proxies for skills, which would enable a more flexible response to changing skill demand, as the existing proxies have certain limitations.

For example, education credentials do not necessarily map to skills on the job, and there is variability among individuals with the same credentials in terms of their skills (Quintini, 2011_[19]). Similarly, the skill requirements of an occupation are never fixed, and the task content of occupations changes over time in response to technological and organisational change, the demands of customers, and in response to the evolution of the supply of labour (OECD, 2013_[20]). The use of occupations as a proxy for skills fails to take into account the changing skill demands of occupations, as well as variation in skill requirements between jobs in the same occupation.

A skills-based approach to SAA exercises would enable a flexible response to changing skill demand, including by facilitating a modular approach to adult learning whereby workers can build on their existing skills by acquiring new ones that are high in demand, as opposed to retraining for new occupations from scratch. Such a skills-based approach to SAA would help to better leverage Australia’s competency-based framework for vocational education and training (VET) which is already set up for this type of modular learning.

While existing SAA exercises in Australia are more geared towards qualifications and occupations than towards skills, there are already a number of highly promising developments underway. A report from the Foundation for Young Australians recently made the case for a new mindset towards the labour market that is focused on skill “clusters” rather than occupations. Using online job vacancy data from Burning Glass, an

online data analytics company, together with clustering techniques, they identify sets of jobs that share similar skill requirements. This analysis also has a forward-looking dimension, in that it analyses skill requirements of occupation clusters that have experienced recent growth and that are less vulnerable to automation (see Box 2.9).

Box 2.9. Identifying transversal skills

While the demand for skills is changing rapidly, some skills have a high degree of transferability between different occupations and sectors and are likely to continue to be in high demand. The European Union recommends the use of the term “transversal skills” to refer to the category of skills which are, by nature, transferable across all sectors and occupations and have an important impact on success in life. **Transversal skills** can include soft skills – those that are non-job-specific and closely connected with attitudes (e.g. teamwork, leadership, entrepreneurship), but also generic hard skills, which are technical and job-specific abilities which can be applied effectively in most jobs (e.g. digital skills, communication in foreign languages).

“Skills clustering” is a tool used to identify skills which are highly transferable across the economy or within sectors. The Foundation for Young Australian’s new report, *The New Work Mindset*, uses a rich database of online job vacancies from Burning Glass and exploits clustering techniques to divide 625 occupations into seven “job clusters” which are defined on the basis of overlapping skill requirements. For example, the *Technologists* cluster includes jobs requiring “skilled understanding and manipulation of digital technology,” while the *Artisans* cluster comprises jobs requiring skill in “manual tasks related to construction, production, maintenance, or technical customer service.” The FYA estimates that when a person trains for one job, they gain skills in an average of 13 other jobs.

Using skills clustering techniques to identify transversal skills has numerous potential policy applications. Skills identified as highly transferable should be included in a consistent way in VET training packages. There is also potential to apply this methodology to processes of recognition of prior learning, and career guidance.

Source: European Union (2011), “Transferability of Skills across Economic Sectors.” ; Foundation for Young Australians (2017), “The New Work Mindset: 7 new job clusters to help young people navigate the new work order.” <https://www.fya.org.au/wp-content/uploads/2016/11/The-New-Work-Mindset.pdf>

A similar approach is being considered by New South Wales (NSW) for the assessment of VET qualifications deserving of subsidy. NSW currently assesses which VET qualifications to subsidise using an indicator method which draws upon a number of elements related to occupation demand, and then maps from occupation to qualification. However, NSW has recently partnered with the University of Sydney on a research project around “qualification clustering.” The idea of the project is to group together qualifications which are similar in terms of units of competency, and to give such qualifications a similar ranking in the funding assessment. Not only would this facilitate more rational funding decisions, but the clusters are also intended to inform general training package reform at the national level (Bent, 2018_[11]).

Jobs Queensland, a newly-established statutory authority created to provide advice to the Queensland government, is also exploring more sophisticated proxies for skills. A team of consultants has been commissioned to produce regional labour force forecasts with scenario analysis, to measure expected growth and shortage by occupation and industry. Jobs Queensland would like to undertake “Skills Forecasting” by applying a skills-based occupational framework (like O*NET in the United States) to their employment forecasts (Bent, 2018_[11]).

NCVER notes in their recent review of international practices for identifying skills (Siekman and Fowler, 2017_[21]), that the lack of “an integrated skills information framework” in Australia means that individuals may fail to develop the appropriate set of skills for work and employers may have trouble finding people with the right skill sets. It also means that the full potential of Australia’s existing information about skill supply (e.g. the competency-based Australian Qualifications Framework) cannot be fully realised, given the lack of good data about demand for skills.

To facilitate the development of data about the demand for skills, Australia could consider investing in a database of skill-based occupational definitions, designed to be consistent with the ANZSCO occupational framework. The current ANZSCO occupational classification framework includes a list of the principal tasks associated with each occupation, but not in a systematic way that allows comparison of the importance and use of the task across occupations. This latter approach is a key feature of the occupational classification system of the US Bureau of Labour Statistics (Standard Occupational Classification, SOC) which is supplemented by O*NET, a database of occupational definitions managed by the U.S. Bureau of Labour Statistics (Box 2.10). O*NET is compatible with the SOC occupational framework, and users can search by SOC occupation (six-digit) to obtain detailed information about the knowledge, task, and skill requirements of occupations based on surveys of job incumbents and occupational experts.

Box 2.10. Mapping occupations to skills requirements

While the approach is not widespread, exercises in several countries link occupation-based assessment and anticipation information to specific skills through comprehensive occupational standards or descriptions of what skills are required in each occupation.

O*NET (“Occupational Information Network”) in the United States is a database containing detailed information about the knowledge, skills and ability requirements of more than 800 occupations. The database is sponsored by the US Department of Labour/Employment and Training Administration (USDOL/ETA). Originally populated by data collected from occupation analysts, the database is now continually updated by surveys of workers in each occupation as well as occupational experts.

Following O*NET’s model, and as a part of the **Occupations, Employment and Needs survey** (*Professioni, Occupazione e Fabbisogni*) Italy conducts a survey to identify the skill, knowledge, values and attitudes required by 800 occupations. An online career guidance tool allows users to browse the employment outlook of each occupation and learn about the types of skills and knowledge which are and will be required by the labour market.

At the European level, the **European Skills, Competences, Qualifications and Occupations** (ESCO) database links occupations to the knowledge, skills and competences that are essential or optional when working in a specific occupation. Unlike O*NET, ESCO does not provide information on the importance of particular skills to each occupation.

Source: OECD (2016), *Getting Skills Right: Assessing and Anticipating Changing Skill Needs*; OECD (2017), *Getting Skills Right: Skills for Jobs Indicators*.

2.4.2. Track demand in emerging occupations

Australia’s two skill assessment exercises are linked to the ANZSCO occupational classification. But this excludes emerging occupations that are not yet included in the ANZSCO classification, like cyber security and artificial intelligence experts. Understanding the demand for such emerging and often specialised skill occupations is critical to responding to skill shortages and keeping up with technological progress.

Jobs and Small Business has expressed interest in securing more real-time data which would be capable of keeping a pulse on emergent trends in demand for occupations and skills, as well as the changing composition of skills within an occupation. Online job vacancy series are potentially valuable as a source of labour market information given their large sample size and high frequency compared to traditional surveys. Such data provide more detailed information about job vacancies and skill requirements, as well as more regional level data. Policy applications could be vast, including assisting job seekers in deciding how to reskill or upskill based on the skills that employers actually need.

But online job vacancy data also has its limitations; for instance, postings may not be fully representative of all job openings. Souto-Otero and Brown (2016_[22]) compare vacancies in the United Kingdom using proprietary data from Burning Glass to employment estimates from the Labour Force Survey. They find that online job vacancies have a strong bias towards high-skilled occupations. Different information and

communications technology (ICT) penetration rates across segments of the labour also mean that jobs advertised on the internet may not be representative of the whole labour market. There are also questions about the degree to which employers articulate the skills they need explicitly in job vacancies. A recent working paper (Gekara et al., 2017^[23]) analyses Australian online job vacancies and finds that of the 1708 job vacancies searched, only 12% mentioned digital skills, despite the evident wide-reaching importance of such skills across occupations (Loveder, 2017^[24]).⁴

2.5. Dissemination of SAA information to end users

Ultimately, the goal of SAA exercises is to disseminate information about skill needs to policy makers to assist in their policy decisions, as well as to a wider range of actors, including educational institutions, workers, job seekers and students. Disseminating labour market information in a user-friendly way helps to resolve a fundamental market failure, that individual actors sometimes lack analytical tools necessary to navigate a complex labour market and to make rational career decisions.

Jobs and Small Business, the primary producer of SAA information in Australia, has a multi-pronged dissemination strategy. It publishes the results of its skill shortage research, employment projections, Internet Vacancy Index, and Survey of Employer Recruitment Experience as accessible reports online. It also produces and updates two web portals.

The first web portal, **Job Outlook**, allows users to browse by four-digit ANZSCO occupation to learn about the skillset required for that particular occupation, the educational pathways available, and the 5-year employment projections. Since Australia does not yet have its own skills classification, it applies the O*NET classification developed by the United States. Data is presented at the national level and by state.

The second web portal, the **Labour Market Information Portal** (LMIP), is focused on disseminating information about employment and unemployment rates at a fine regional level (e.g. economic regions, labour force regions, and employment service areas). The LMIP showcases the Department of Jobs and Small Business' employment projections, the Vacancy Report, and the Employers' Recruitment Insights based on the Survey of Employers' Recruitment Experiences.

Jobs and Small Business also publishes the annual *Australian Jobs* report, which synthesises a wide array of labour market information into a useful resource for career counsellors, job seekers and students. It reviews broad labour market trends at the national and state level, summarises the employment prospects of education and occupation pathways, and offers useful insights for job seekers from the Survey of Employers Recruitment Experiences, including tips on how to best market one's skillset.

Jobs and Small Business publishes the *Australian Labour Market Update* (ALMU) quarterly, to aid the understanding of the labour market for those seeking jobs in Australia, particularly migrants. The ALMU is intended to better inform recent migrants and potential temporary/permanent visa applicants on the Australian labour market, and is less technical than other labour market reports produced by the Department. Each edition includes a hot topic which is selected based on feedback from stakeholders (including Australian assessing authorities and industry bodies) on issues of concern or interest to the target audience.

A new web portal, the **National Industry Insights resource**, was recently developed by NCVET for the AISC in order to assist industry in preparing for future skill needs by providing easy-to-access information on economic and employment trends, education and training patterns by sector. It also shows priority skills by sector, as identified by industry skills forecasts (as they become available).

DET, NCVET and ABS also disseminate the SAA information they produce in a user-friendly way. Their dissemination strategy will be discussed more in the next chapter on how SAA is used in education policy.

2.6. Recommendations

- Pursue initiatives to build a more skills-based approach to SAA exercises. Australia should pursue efforts to build a skill-based occupational classification, which could help to inform VET training packages, and leverage the existing competency-based VET framework to support a modular approach to adult learning.
- Applying skills clustering techniques to identify skills with a high degree of transferability between occupations and within sectors is also encouraged to facilitate career transitions in the context of structural adjustment.
- While Jobs and Small Business currently conducts 5-year employment projections on an annual basis, these projections do not take into account the complexities of a dynamic economy. Australia should consider investing in a more sophisticated forecasting exercise, as countries like Canada, the United States and Sweden have done. Regular national-level forecasts (i.e. every 2-3 years) are needed to identify potential longer-term labour market imbalances (10-year time span), so that policy makers can develop policy to avoid these imbalances. Such forecasts could inform education and training policy, as well as permanent migration policy, particularly the construction of the Medium and Long Term Strategic Skills List (MLTSSL).
- Support efforts to promote sharing of knowledge and SAA methodologies between states and territories, national government, and between IRCs, for example, by expanding use of the new National Industry Insights web-based resource. Promoting consistent SAA methodologies between national government and states and territories could facilitate reaching consensus about skill needs, and also promote labour mobility.
- Evaluate pilot initiatives of regional SAA analyses and expand to more regions if benefits in terms of more tailored policy response seem to justify the costs. Innovative use of big data could also be explored to obtain a finer level of disaggregation.
- ANZSCO should be updated to reflect emerging occupations, many of which have specialised skill requirements. Explore options to track demand for emerging occupations, which are not yet included on the ANZSCO classification, and therefore do not show up on the skilled occupation lists for migration purposes.

Notes

¹ Most EU countries use targeted or non-targeted sampling stratified/weighted by type and size of enterprise/organisation/establishment (in terms of number of employees), sector and region. (Cedefop, 2008).

² For instance, Australia's employment projections are unable to capture complexities in the demand for labour, including the impact of the macroeconomic health of the domestic and global economy, capital investment and its allocation between industries, the pace of technological change, and changes in government policy (Meagher, Adams and Horridge, 2000_[25]).

³ The OECD in collaboration with the European Centre for the Development of Vocational Training (CEDEFOP), the European Training Foundation (ETF) and the International Labour Organisation (ILO) developed a questionnaire to identify effective strategies among countries for improving skills governance and turning qualitative and quantitative information on skill needs into relevant action for policy. A questionnaire was distributed to governments (Ministry of Labour and Ministry of Education) as well as to social partners. Replies from 29 OECD countries were received. (OECD, 2016_[1])

⁴ Online job vacancies are also more susceptible to double-counting which inflates estimates of demand; however, online data analytics companies have made strides in recent years to develop algorithms to sidestep this problem.

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