CITB

Workforce and Skills Profile

of the South Australian Construction Industry

August 2020

The Construction Industry Training Board (CITB) is a whole-of-industry led organisation that provides support to attract, train and retain South Australian building and construction workers through leadership in training and skills development.

For more information, visit www.citb.org.au

Contents

Summary of Key Points 4
Employment 4
Skills 4
Training 4
Metropolitan/Regional Breakdown 4
Megatrends 5
Background 6
Purpose 6
Research Methodology 6
The Construction Skills Context 7
The Drivers of Change 9
What does the Future Construction Workforce look like? 10
Challenges 10
A Profile of the Construction Industry 11
National Future Outlook for Construction 12
South Australian Construction Sector – Australian Bureau of Statistics Definition 13
South Australian Construction Sector – CITB Definition 14
Qualifications 16
Training Rates 18
Age 19
Median Age 21
Regional Breakdown 23
Gross Replenishment Ratio 26
Apprentice Completions 26
What does the Research tell us about Construction Skills and Employment? 28
Skills and Labour Shortages 28
Labour Mobility 29
Apprentice Pipeline 32
Conclusion 33
Where to From Here? 33
APPENDIX 1: Summary of Major Literature 35
APPENDIX 2: Australian Bureau of Statistics Definition of the Construction Industry 48
APPENDIX 3: Apprentice Support — CITB-Supported Vocations 49
APPENDIX 4: CITB's Construction Worker Definition 50
Notes 51

Summary of Key Points

EMPLOYMENT

- Nationally and in South Australia, construction is the third largest employing industry for people aged 15-24.
- Females remain significantly underrepresented within construction trades.
- Employment in South Australia's construction industry was at near record highs just prior to COVID-19.
- The Construction Industry Training Board (CITB) supported 46,922 construction workers across 38 occupation groups in South Australia as at the end of 2019 (in addition to the 5,000 construction apprentices).
- Construction workers who have post-school qualifications have relatively low turnover rates whereas those without qualifications have a higher turnover rate.
- Analysis of national data shows that construction workers tend to change employers at a rate similar to other occupations, however they tend to stay in their occupation longer.
- Most construction workers who leave their jobs (regardless of whether they stay in the same occupation or not) do so when they are under the age of 35.
- Data from 2018 shows that nationally the construction workforce was younger than the average of the entire workforce.
- Of all construction workers in South Australia, civil construction has the highest number of workers over 50 years of age, making up over one-third of its workforce.

SKILLS

- Construction workers will require different skill mixes as a result of factors such as technological change. As the skills profile changes for construction it will attract a new type of workforce.
- Upskilling and reskilling construction workers will be critical to minimise skills mismatches.
- Skills shortages nationally and in South Australia across construction trades are common, especially during strong economic periods.
- Construction workers have skills that are transferable to other industries such as mining. For example, in Western Australia in 2012, 25% of people recruited into mining came from construction.

TRAINING

- Overall, South Australia's training rate[1] for construction is considered suboptimal and, consequently, is not keeping pace with turnover rates. Some of the major trades, however, such as electro-technology, have healthy training rates.
- Apprentice completions in construction in South Australia were, even prior to COVID-19, showing a downward trend; but the CITB supported more than 5,000 construction apprentices.
- A sizable proportion of the state's construction workforce does not have apprentice qualifications.

METROPOLITAN/REGIONAL BREAKDOWN

- 70% of CITB-supported construction workers reside in metropolitan Adelaide.
- 40% of all civil construction workers live in regional South Australia, well above the all-industry average (30%).
- Job roles were overrepresented in the following Adelaide metropolitan areas — civil construction workers in Northern Adelaide; construction managers in Eastern Adelaide; and carpenters and plumbers in Southern Adelaide.

[1]Defined as the percentage of that occupation's workforce that are apprentices.

Megatrends

SKILL SHORTAGES

Despite a long established and well-regarded apprenticeship pipeline, the construction sector historically experiences skill shortages nationally and in South Australia.

LOW TRAINING RATES

Data presented in this report suggests that training rates (the percentage of the workforce that are apprentices) are healthy in some of the bigger employing construction trades in South Australia, but relatively low among other construction trades.

TECHNOLOGICAL CHANGE

Skilling and training in the industry will need to adapt to respond to factors such as changes in technology.

COVID-19

The economic uncertainty as a result of the COVID-19 pandemic means that the ability of employers to commit to taking on apprentices will be challenged at the same time as skilled migration from overseas is severely curtailed.

Background

The CITB is an industry-driven organisation that has supported training and skills development in the South Australian building and construction workforce for over 25 years.

In 2020-21, CITB will invest $4.3 million into its Construction Skills Training (CST) Program[2] . The CST Program delivers subsidised training across more than 220 short courses approved by CITB's Sector Advisory Committees. These courses are designed to develop workforce skillsets in core construction, safety, licencing, regulatory and compliance requirements not generally addressed within current Training Packages.

Courses are delivered by 40 training providers who are endorsed by CITB through a Quality Assurance Framework.

An objective of the CST program is to help address skill shortages of construction workers. The shortages are largely attributed to the cyclical nature of the industry. The CST program helps to support training through downturns, so the industry is well positioned to deal with subsequent upswings in the wider economy. Upskilling and cross-skilling is also important to meet the 'drivers of change' impacting on construction that are described in more detail later in this report.

Given the importance of upskilling and cross skilling the construction workforce, it is timely to analyse their demographic and skills profile.

Purpose

The purpose of this report is to provide a detailed analysis of the construction workforce in South Australia, drawing on CITB's internal datasets (as at the end of 2019) as well as other public sources of data, within the context of:

- Skill shortages.
- Training rates.
- Ageing of the construction workforce.
- Labour mobility.
- The apprentice pipeline for construction.

The findings from this research will help inform training and skills development policy within CITB and the state government for the construction sector.

A summary of authoritative literature, including skill shortages and labour mobility with direct reference to construction, is provided in Appendix 1.

Note: this report draws on data relating to a pre-COVID-19 workforce. An update of this major report two years from now will include the impact of COVID-19 on the health of the construction workforce, skill and training needs. CITB will, however, also continue to publish monthly Economic Update reports that summarise trends in the sector.

Research Methodology

The report's research methodology comprises analysis of:

- Qualitative and quantitative data from the Australian Government Department for Employment.
- Australian Bureau of Statistics historical employment data on the construction sector.
- CITB's internal database of the construction workforce that it supports.
- A literature review of training, skills and workforce development trends in the construction sector.

[2] See CITB 2020-21 Annual Training Plan.

The Construction Skills Context

The construction industry is characterised by global and national skill shortages, a number of well-documented challenges to its profitability, and changing skill needs resulting from (among other factors) the impact of technology.

Box 1: Automation and Digitisation

Industry-wide shifts in digitisation, industrialization, consolidation, and rising technology investment are changing the industry and will require a different mix of skills across the value chain.

Building and construction methods are evolving in response to new technology, innovation, and environmental and policy changes. To support a modern, productive industry, the workforce will need to develop new skills.[3]

Over the longer term, automation and digitisation are providing opportunities in construction in three ways:

1. Automation of what are considered traditional, repetitive physical tasks - for instance, robotic bricklaying and automatic road paving machines.
2. The automation of modular construction (or production) in factories, including 3-D printing of components such as facades. It is estimated that about 15-20 per cent of new building construction will be modular in the United States and Europe by 2030. It is unclear how much modularisation will occur in Australia, but there is no reason why these trends will not be evident here.
3. Digitisation and the subsequent automation of design, planning, and management procedures. For example, Building Information Modelling (BIM) improves efficiencies with planning, on-site delivery, clash detection and workforce coordination.[4]

Generally, on-site construction activity is expected to be enhanced by machine automation. For example, the future on-site construction worker may be expected to use a tablet to access building plans or operate a drone in place of a physical site walkthrough.[5] Consequently, the risk of job losses in the construction workforce from automation is not expected to be as noticeable compared to industries such as manufacturing with repetitive types of activities. The easiest tasks to automate are repetitive, physical activities in predictable environments. By contrast, construction environments vary, except where modular-construction techniques are used.[6]

Despite this, upskilling the construction workforce is required because of the impact of automation on skills mismatch. Skills and roles such as data analysts, coders and modellers will become increasingly prominent in construction processes.[7]

[3]Construction Sector Accord New Zealand (2020), Construction Sector Transformation Plan

[4]Chui, M & Mischke J (2019), 'The Impact and Opportunities of Automation in Construction', in Voices on infrastructure: Workforce of the Future

[5]ibid

[6]ibid

[7]Mahon, L (2019), Forging the Workforce that will Transform the World, in Voices on infrastructure: Workforce of the Future

Box 2: Defining Digital Skills[8]

Digital skills are becoming more integral to the world of work and the construction sector is no exception. For example, workers involved in infrastructure projects operate increasingly complex plant - such as plant with GPS mapping and profiling software - and equipment whilst applying workplace safety and environmental sustainability practices. Proficiency in digital skills will however become a wider requirement as new technology becomes more prevalent.

Digital skills can be described as a combination of:

- Digital knowledge (theoretical comprehension and understanding).
- Cognitive knowhow (involving the use of logical, intuitive, and creative thinking).
- Practical knowhow (including the use of digital tools such as hardware, software, information and security systems).
- Competence (ability to learn, adapt and apply digital knowledge in a new setting). and
- 'Digital' attitude (value and beliefs), which workers need to master and demonstrate in the digital age.

Within the construction industry, digital skills have direct application to a range of technologies. These may exist in isolation or in combination with construction-specific skills, such as the ability to control equipment that is linked or partially controlled by software systems (e.g., plant with integrated GPS and profiling software). This could also include the skills to work effectively in relation to:

- GPS mapping and profiling software on plant.
- 'Smart' materials.
- Supply chain applications.
- Cloud applications.
- Virtual and augmented reality.
- Mobile devices and tablets.
- Drones and automated vehicles.
- 5G, artificial intelligence and BIM.

The industry acknowledges that as construction becomes more sophisticated, workers will need to be proficient in the use of plant and equipment with integrated technology and control systems. Training packages and pathways will need to reflect this.

The industry acknowledges that as construction becomes more sophisticated, workers will need to be proficient in the use of plant and equipment with integrated technology and control systems. Training packages and pathways will need to reflect this.

[8] Reproduced from CITB and Department for Innovation and Skills (2019), How Ready is South Australia's Building and Construction Sector for Technological Change?

The Drivers of Change

Social, technological and policy changes driving rapid industry-wide change in construction nationally and internationally include: [9]

Technology (as described above)

Although the industry is yet to experience significant digital disruption (see Box 1), major technological advances in everyday digital technology, automation of low skill jobs, BIM and prefabrication will require retraining the workforce for new jobs and tasks. Prefabrication is gaining more acceptance in Australia and will require construction workers with different skill sets.

Workforce Demographics

The skill replacement gap is increasing with the percentage of younger construction workers nationally remaining relatively constant over the last 20 years. The need to replace larger numbers of high skilled workers in the future raises the issue of the supply and whether the current apprenticeship system can produce the numbers required. Additionally, there is a lack of gender diversity with the percentage of

Demand for green and smart buildings

Green and smart construction is on the rise in Australia. Workers will need to update their skills and knowledge about advances in both sustainable building practices and the use of smart technologies.

Micro-credentialing and life-long learning

Skill sets could be used to enable workers to reskill or upskill or move to a related field of employment. This is also a training priority identified in South Australia's Training and Skills Commission Training Priorities Plan 2020-21, which highlights that "examining and piloting innovative ways to invest in and deliver short form, non-qualification-based training, delivered in parallel with critical entry level qualifications, will develop the priority skills students and industry demand."[10]

Trade specialisation

Construction businesses are typically small with fewer than 20 employees. As such, it can be difficult to offer apprentices the full range of skilling opportunities needed to fulfil the requirements of a traditional apprenticeship. Therefore, these employers may look outside the traditional apprenticeship system to meet their skill requirements.

Compliance and regulation

The National Construction Code (NCC) is the building and plumbing code that combines all on-site construction requirements into a single code. Recent failures in building performance and issues of non-conforming materials and building products have highlighted the standards outlined in the NCC are not always complied with.[11]

The Skilling Australians[12] and Skilling South Australia[13] government policies are also drivers of change by funding innovative projects aimed at increasing apprenticeship numbers, both nationally and in South Australia.

---

[9]This is taken from Australian Industry and Skills Committee Construction Profile

[10]Training and Skills Commission, Training Priorities Plan 2020-21

[11]Quoted in Australian Industry and Skills Committee Construction Profile

[12]See https://www.employment.gov.au/skilling-australians-fund.

[13]See https://www.skills.sa.gov.au/business/hiring-an-apprentice/skilling-south-australia-projects#:~:text=Projects%20guidelines%20(PDF)-,Skilling%20South%20Australia%20Projects,to%20demand%20and%20budget%20availability.

What does the Future Construction Workforce look like?

- The construction workforce of the next 5-10 years is expected to have the following attributes:
- Adaptability — for example, to technology and environmental demands.
- Digital proficiency.
- Machine mastery — workers overseeing repetitive machine tasks performed by autonomous vehicles or robots.
- More senior workers as Australians live and work longer.
- More non-traditional work arrangements and greater diversity.

Taken together these attributes are accelerating the construction industry in a positive way — toward a **new kind of workforce:** "Future generations will see construction careers as fast paced, high-tech, gender-neutral, lucrative, and worthy of the world's best talent—wherever it is found."[14]

Challenges

The construction sector also faces challenges that will impact on profitability, innovation and workforce development. They include:

- Difficulty to innovate and adopt new technologies in construction practice, design and materials.
- A lack of collaboration and knowledge-sharing to take the sector forward.
- Fragmented leadership in an industry of many small players.
- Limited understanding of risk and who should bear it.
- Poor business management practices.
- Low margins.
- An unclear understanding of applicable regulations and the inability of the regulatory environment to keep pace with industry trends.
- Poor procurement skills.
- Distrust between parties.[15]

[14]Nguyen, T 7 Wilson, D (2018), Expert Insight: What are three essential qualities of the workforce of the future that will distinguish it from the workforce of today? In Voices on infrastructure: Workforce of the Future.

[15]Construction Sector Accord New Zealand (2020), Construction Sector Transformation Plan

A Profile of the Construction Industry

Table 1 below summarises the key attributes of construction occupations and job roles.[16] Note that the titles of these roles (developed by the Australian Government) sometimes differ from those used by CITB and the industry more generally.

Table 1: National Job Outlook, Construction Industry Job Roles (taken from Australian Government Job Outlook website)

Occupation (% of total workers employed in construction sector)	Unemployment Rate[17] (compared to average)	Average Age (average across all industries is 40)	Gender (% female)	Skill Shortages (Current market rating) – South Australia	Job Openings Number next 5 years (i.e. new jobs and turnover) – national	Growth Outlook (compared to all other occupations)[18]
Air-conditioning and Refrigeration Mechanics (45%)	Lower	33	1%	Shortage	18,000	Stable
Architectural, Building and Surveying Technicians[19] (60%)	Lower	42	11%	Not assessed	22,000	Stable
Bricklayers and Stonemasons (84%)	Lower	38	1%	Shortage	13,000	Stable
Building and Plumbing Labourers[20] (80%)	Higher	34	3%	Not assessed	70,000	Strong
Carpenters and Joiners (88%)	Lower	32	1%	Shortage	69,000	Moderate
Civil engineering professionals[21] (28%)	Lower	36	12%	No shortage	28,000	Strong
Concreters (91%)	Average	36	1%	Not assessed	51,000	Strong
Construction Managers[22](80%)	Lower	44	7%	Shortage (Australia)	54,000	Strong
Crane, Hoist and Lift Operators (50%)	Average	44	3%	Not assessed	5,000	Decline
Earthmoving plant operators[23] (70%)	Lower	45	2%	Not assessed	30,000	Stable
Electrical Distribution Trades Workers (21%)	Lower	38	1%	Not assessed	6,000	Decline
Electrical Engineering Draftspersons and Technicians (21%)	Lower	42	7%	Not assessed	5,000	Strong
Electricians (63%)	Lower	34	2%	Shortage	26,000	Moderate
Fencers (87%)	Average	42	4%	Not assessed	9,000	Moderate

[16]Some job groups in the Australian Government report have not been included in this report because of their more marginal link to construction or CITB. They include: bookkeepers, gardeners, industrial spray painters, insulation and home improvement installers, land economists and valuers, other mobile plant operators, railway track workers.

[17]A lower unemployment rate shows people who work in this job are less likely to be out of work than people who work in other jobs.

[18] Pre COVID-19.

[19]Comprises architectural draftspersons, building associates, building inspectors, construction estimators, plumbing inspectors, surveying and spatial science technicians and other architectural, building and surveying technicians.

[20]Comprises builder's labourers, drainage, sewerage and stormwater labourers, earthmoving labourers and plumbing assistants.

[21]Comprises civil engineers, geotechnical engineers, quantity surveyors, structural engineers and transport engineers.

[22]Comprises construction project managers and project builders.

[23]Comprises earthmoving plant operators (general), backhoe operators, bulldoze operators, excavator operators, grader operators, loader operators.

Occupation (% of total workers employed in construction sector)	Unemployment Rate[17] (compared to average)	Average Age (average across all industries is 40)	Gender (% female)	Skill Shortages (Current market rating) – South Australia	Job Openings Number next 5 years (i.e. new jobs and turnover) – national	Growth Outlook (compared to all other occupations)[18]
Landscape Gardeners (82%)	Average	5%	5%	Not assessed	Not assessed	Strong
Glaziers (73%)	Lower	37	1%	Shortage	6,000	Strong
Handypersons[24]	Average	52	4%	Not assessed	45,000	Strong
Other construction and mining labourers[25] (28%)	Average	35	5%	Not assessed	6,000	Moderate
Paving plant operators (88%)	Lower	41	2%	Not assessed	Not assessed	Strong
Painting Trades Operators (93%)	Average	42	4%	Shortage	19,000	Moderate
Paving and Surfacing Labourers (63%)	Higher	42	2%	Not assessed	8,000	Stable
Plasterers (98%)	Average	37	1%	Shortage (Fibrous)	19,000	Strong
Plumbers[26] (90%)	Lower	33	1%	No shortage	29,000	Strong
Roof Tilers (97%)	Lower	32	1%	Not assessed	4,000	Stable
Structural Steel Construction Workers[27] (76%)	Average	35	1%	Not assessed	31,000	Strong
Wall and Floor Tilers (97%)	Lower	37	2%	Shortage	9,000	Stable

The table above shows that at the national level construction occupations are:

1. Younger than the average of all occupations. The average age is below 40 in 16 of the 25 job roles. Lower average ages can mean two things: a steady supply into these occupations of young people through the apprenticeship system, or that workers in these occupations tend to leave the occupation prior to retirement age.
2. Subject to 'lower' unemployment rates than the average – i.e. people who work in these roles are less likely to be out of work than people who work in other jobs.
3. Linked to widespread skill shortages reported across the industry, both in South Australia and nationally.[28]
4. Identified as having a mixed employment outlook, depending on individual job roles.
5. Underrepresented by females.

National Future Outlook for Construction

According to the Australian Jobs 2019 publication,[29] construction is:

- The third largest employing industry in Australia and
- The third largest employing industry for people aged 15-24.

The projected employment growth in construction over five years to May 2023 (forecast per-COVID-19) was 10.0%, compared with 7.1% across all industries. In numerical terms, construction was expected to generate the second largest number of new jobs following health care and social assistance.

[24]Defined as people who clean, paint, repair and maintain buildings, grounds and facilities.

[25]Includes Crane Chasers, Driller's Assistants, Laggers, Mining Support Workers and Surveyor's Assistants.

[26]Also Includes air-conditioning and mechanical services plumbers, drainers, gasfitters and roof plumbers

[27]Includes riggers, scaffolders, steel fixers and structural steel erectors

[28]Noting again that this analysis is pre-COVID-19 impact.

[29]Australian Government Department of Jobs and Small Business (2019), Australian Jobs 2019

South Australian Construction Sector – Australian Bureau of Statistics Definition

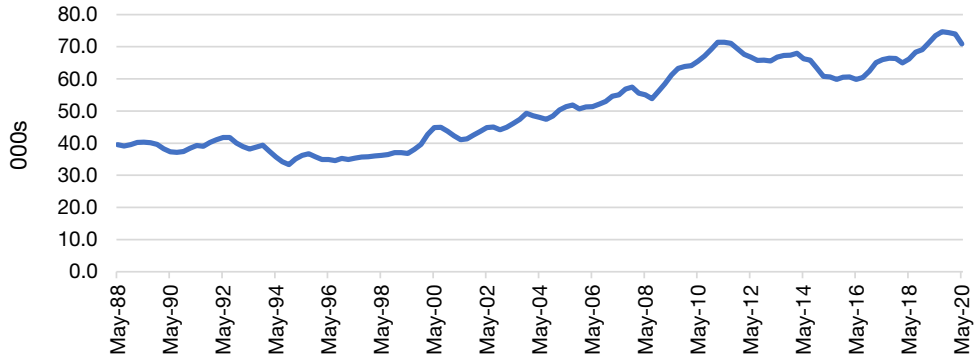
There are many ways the construction sector in South Australia can be defined and measured. The Australian Bureau of Statistics (ABS) defines the construction industry as businesses whose predominant activity is *"mainly engaged in the construction of buildings and other structures, additions, alterations, reconstruction, installation, and maintenance and repairs of buildings and structures. It also includes businesses engaged in demolition or wrecking of building and other structures and clearing of building sites, as well as "blasting, test drilling, landfill, levelling, earthmoving, excavating, land drainage and other land preparation".*[30]

The sector is then broken down, according to the ABS definition, into activities under the following subdivisions:

- Building Construction
- Heavy and Civil Engineering Construction and
- Construction Services[31]

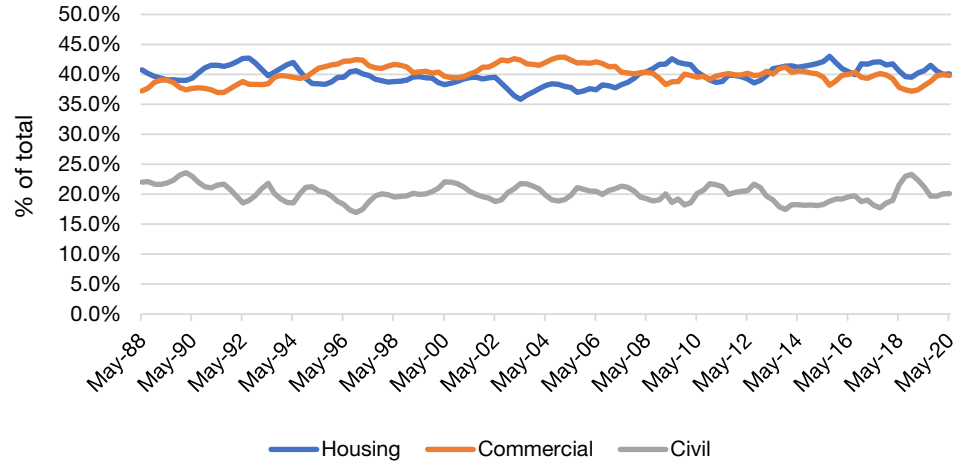
According to the ABS, total employment in construction in South Australia reached a near all-time high of 74,700 in the year to the May quarter 2020 but has fallen to 70,900 as the impact of COVID-19 starts to emerge (see Chart 1 below).

Chart 1: Total Employment - South Australia



Source: ABS Cat. No. 6291.0.55.003, Table EQ06

Chart 2: Share of Total Construction Employment - South Australia



Source: CITB estimates based on ABS Cat. No. 6291.0.55.003, Table EQ06

[30]Australian Bureau of Statistics/Statistics New Zealand (2006), Australian and New Zealand Industrial Classification (ANZSIC) 2006.

[31]ibid.

Chart 2 shows that, during the period May-1988 to May-2020, on average, the housing and commercial sectors made up around 40% each of construction industry employment, with the civil sector making up the remaining 20%.

Moreover, construction oscillates between being the 3rd or 4th largest employing sector in South Australia, employing approximately 8% of the workforce.

Appendix 2 provides more detail on the ABS definition of the construction industry.

The Housing Industry Association (HIA) has estimated how many people working in the residential construction industry are actually in 'construction' roles and how many are in non-construction (admin) roles.[32] The HIA estimates that nationally around 70% are in construction roles, and 30% in non-construction roles and that therefore *"there is a misalignment between industry classifications as reported by the ABS and the naturally-occurring segmentation within the industry"*.[33] Looking at what the HIA calls the Residential Building Industry Workforce, the HIA estimates this workforce in South Australia totals 50,690, of which 36,734 (72%) are in construction roles and 13,956 (28%) are in non-construction roles.[34]

South Australian Construction Sector – CITB Definition

CITB define construction workers and apprentices according to 'eligibility'. An eligible person not currently in training as an apprentice is described as a construction worker. In terms of **apprenticeships**: if an apprentice is undertaking an apprenticeship in any one of the 37 trades that CITB supports (see **Appendix 3** for a list of CITB-endorsed qualifications) **and** the employer is considered 'eligible' for CITB funding, then the employer may receive CITB Support Funding which includes payments for training undertaken on-the-job and discounted trade school fees.

For **construction workers** applying for training fee subsidies on short courses and a CITB number (a unique identifier), the following eligibility criteria apply, relating to their employer:

- **High Industry Relevance:** these employers have been determined to conduct 80% or more of their work in construction industry relevant sectors. All employees, regardless of their occupation, are eligible to be members of CITB.
- **Medium Industry Relevance:** these employers have been determined to conduct less than 80% of their work in the construction industry relevant sectors. Employees that apply from these companies are assessed on their specific job roles.
- **Low/None Industry Relevance:** These employers have been determined to conduct an insufficient amount of work within construction relevant sectors to be deemed eligible and therefore all employees from these companies are ineligible.

Anyone who has made an application for a CITB number over the past 25 years is recorded on CITB's internal database called TALAS.

A report from the database was downloaded on **1 November 2019 reflecting the database as of that date.**

From there, the authors devised a definition of the 'construction workforce' based on attributes in the database. This is detailed in **Appendix 4.**

After these definitional attributes were applied, it is estimated that there are **46,922** active CITB-supported construction workers in South Australia as at the end of 2019. This is fewer than the employment estimate of construction employment by the ABS because of 'eligibility' reasons described on the previous page.

This list of 46,922 people was then classified by **38** occupational groups determined by CITB to be most relevant to construction activity in the state. This occupational grouping is detailed in Table 2.

Table 2 key findings:

- 21% of the CITB-defined construction workforce work as civil construction workers – more than the combined total of electrotechnology, carpentry and joinery, and plumbing and gasfitting (21.0%).
- A further 9% are employed as trades assistants (the overwhelming majority of whom have no apprenticeship qualification).
- A further 7.8% are employed in building and construction management.
- The remaining 41% (19,275) of construction workers are employed across the other 32 occupational categories, of which a large number are declared vocations (i.e. ones that can have apprenticeships).

[32]Housing Industry Association (2020), South Australian Outlook, Autumn Edition.

[33]ibid.

[34]This does not take in account civil construction employment.

Table 2: Construction Workforce – South Australia (CITB definition)

Occupational Category	Number	Percent
Civil Construction	9,892	21.1%
Electrotechnology	4,706	10.0%
Trades Assistant	4,216	9.0%
Building and Construction Management	3,660	7.8%
Carpentry and Joinery	2,954	6.3%
Crane Services and Rigging	2,786	5.9%
Professional Services	2,366	5.0%
Plumbing/Gasfitting	2,219	4.7%
Data & Voice Communications	1,217	2.6%
Painting and Decorating	1,173	2.5%
Administration	1,139	2.4%
Concreting	1,117	2.4%
Air-conditioning and Refrigeration and Mechanical Services	964	2.1%
Landscaping	785	1.7%
Scaffolding	780	1.7%
Wall & Ceiling Lining	776	1.7%
Roof Plumbing	669	1.4%
Other	641	1.4%
Wall & Floor Tiling	491	1.0%
Cabinet Making	488	1.0%
Bricklaying/Blocklaying	446	1.0%
Demolition	389	0.8%
Plastering	369	0.8%
Internal and External Fittings	350	0.7%
Quality, Health, Safety & Environment (QHSE)	348	0.7%
Electrical Supply Industry	287	0.6%
Offsite Construction	282	0.6%
Glass and Glazing	280	0.6%
Steelfixing	277	0.6%
Flooring Technology	235	0.5%
Fire Protection	194	0.4%
Cleaning and Maintenance	102	0.2%
Driver	97	0.2%
Shopfitting	74	0.2%
Stonemasonry	72	0.2%
Waterproofing	32	0.1%
Steel Frame Installer	26	0.1%
Cladding	23	0.0%
Total	**46,922**	100.0%

Qualifications

Of these 46,922 people, 7,151 (15.2%) have commenced a CITB-supported apprenticeship or traineeship.[35] This suggests that the overwhelming majority of the construction workforce do not possess a relevant tertiary qualification. However, this understates the number of qualified construction workers, for several reasons:

- They represent construction workers considered 'active' by CITB whose apprenticeship was supported by CITB. Therefore, it does not include qualified workers who undertook a qualification with an employer that CITB considered ineligible.
- It excludes qualified tradespersons who gained their qualification interstate, overseas or prior to CITB financial support being available.

The occupational groups with the highest share of people with CITB-supported qualifications are the licenced trades of electrotechnology (46.6%) and plumbing (43.7%) and carpentry and joinery (45.7%) - see Table 3.

[35]CITB estimates that around 75% of individuals that commence a CITB-supported apprenticeship successfully complete.

Table 3: Construction Workforce – South Australia (CITB definition): Qualifications Profile

Occupational Category	Number#	Number with qual	Percent with qual
Electrotechnology	4,706	2,192	46.60%
Carpentry and Joinery	2,954	1,349	45.70%
Plumbing/Gasfitting	2,219	970	43.70%
Air-conditioning and Refrigeration and Mechanical Services	964	346	35.90%
Bricklaying/Blocklaying	446	111	24.90%
Fire Protection	194	45	23.20%
Wall & Floor Tiling	491	97	19.80%
Roof Plumbing	669	123	18.40%
Glass and Glazing	280	41	14.60%
Plastering	369	51	13.80%
Cladding	23	3	13.00%
Painting and Decorating	1,173	136	11.60%
Shopfitting	74	8	10.80%
Civil Construction	9892	880	8.90%
Steel Frame Installer	26	2	7.70%
Cabinet Making	488	31	6.40%
Concreting	1,117	71	6.40%
Electrical Supply Industry	287	17	5.90%
Building and Construction Management	3660	202	5.50%
Wall & Ceiling Lining	776	42	5.40%
Other	641	33	5.10%
Scaffolding	780	34	4.40%
Trades Assistant	4,216	169	4.00%
Offsite Construction	282	11	3.90%
Data & Voice Communications	1217	45	3.70%
Landscaping	785	27	3.40%
Demolition	389	11	2.80%
Internal and External Fittings	350	8	2.30%
Driver	97	2	2.10%
Crane Services and Rigging	2,786	50	1.80%
Stonemasonry	72	1	1.40%
Professional Services	2,366	28	1.20%
Steelfixing	277	3	1.10%
Cleaning and Maintenance	102	1	1.00%
Flooring Technology	235	2	0.90%
Administration	1,139	7	0.60%
QHSE	348	2	0.60%
Waterproofing	32	0	0.00%
Total	46,922	7,151	15.20%

Training Rates

Table 4 uses data from CITB-supported apprentices as well as ABS employment data to calculate training rates[36] for major construction vocations.

Table 4: Comparison of CITB-Supported Apprentices to Total Employment by Major Qualification

Qualification	Apprenticeships Supported by CITB as of 04/05/2020	Employment Number (ABS)*	Training Rate Percent **
Certificate III in Air Conditioning and Refrigeration	333	1,736	19%
Certificate III in Electrotechnology Electrician	1,736	10,500	17%
Certificate III in Carpentry and Joinery	1,427	9,352	15%
Certificate III in Plumbing	908	6,169	15%
Certificate III in Glass and Glazing	56	408	14%
Certificate III in Cabinet Making (Kitchens & Bathrooms)	230	1,796	13%
Certificate III in Civil Construction	315	3,675	9%
Certificate III in ESI - Power Systems	48	865	6%
Certificate III in Solid Plastering / Wall & Ceiling Linings	136	2,177	6%
Certificate III in Wall and Floor Tiling	93	1,570	6%
Certificate III in Bricklaying/Blocklaying	114	2276	5%
Certificate III in Painting and Decorating	130	3,462	4%
Certificate III in Flooring Technology	33	1,566	2%
Certificate III in Concreting	22	2118	1%
Certificate III in Roof Tilers	0	703	0%
Total (Major Qualifications)	**5,581**	**48,373**	**11.5%**

* Average year to February 2020 ABS Figures
** Percent of apprentices to total employment

For these major qualifications, the average training rate (the number of apprentices in training as a percentage of the trade workforce) is 11.5%. Research detailed by the Western Australian Building and Construction Industry Training Board in its 2018-19 Annual Report says that *"…national research on age distribution in the workplace…has confirmed that industry needs to train at a training rate of 15% to replace tradespeople leaving the industry through normal circumstances such as retirement."*[37]

For the major trades, such as carpentry, plumbing and electrical, it is encouraging that the training rate is above the 15% threshold. The training rate calculation used is likely to understate the true training rate because it only includes CITB-supported apprenticeships (whereas the employment number in Table 4 above includes tradespeople employed in those occupations across all industries).

[36]Training rates are defined as the percentage of apprenticeships to total employment.

[37]Building and Construction Industry Training Board Western Australia (2019), 2019 Annual Report.

Age

The issue of an ageing workforce within construction is complex. As mentioned earlier in this report, there is concern that the percentage of construction workers who are young has remained relatively constant over the last 20 years. This skill replacement imperative in turn, puts pressure on the apprenticeship system to produce the qualified workers required to replace those exiting the industry.

On the other hand, also as mentioned earlier, the construction workforce is generally younger than the average of all occupations.

What constitutes an ageing workforce and is it a problem?

A common view is that if an occupation has a relatively high proportion of its workforce aged over 50, then there will likely be skill shortages over the next 10 years, as this cohort retires and the training system struggles to attract new entrants in sufficient numbers to replace them. However this only tells part of the story. Occupations with low median age (otherwise known as 'younger' occupations) may have an artificially young workforce simply because workers leave that occupation well before a 'normal' retirement age. If people are leaving their occupation in their 40s or 50s rather than their 60s then the median age is lower, but it also means that these occupations struggle to retain workers through their working life.

The nature of construction (largely manual work with risk of physical wear and tear and a higher incidence of injury) means that early retirements are more common than in other sectors.

For trade-based occupations, a robust supply of apprentices is critical to meet future workforce needs (see discussion on training rates and gross replacement rates below). This then brings into focus issues such as:

- Quality of training.
- Attractiveness of construction careers to school students (relating to the image of the industry).
- Pay rates for apprentices.
- General economic and business conditions, which are the major influencer on the demand for apprentices – but are clearly beyond the scope of CITB to influence.
- A high-quality apprenticeship system that creates confidence for both employers and potential applicants.

Outside of the apprentice pipeline, there are many ways to replenish skills lost through retirements/people leaving the industry, these include:

- Changes in job design (e.g. through technology) that enables people to stay in their occupations longer.
- Overseas or interstate migration.
- Upskilling or reskilling people already working in construction (such as trades assistants).
- Enticing people who have left the construction industry to return.

Construction competes for skilled labour with industries such as defence and mining, and like employment patterns in both those sectors, demand for labour can be very volatile depending on the timing and number of major projects requiring significant numbers of workers. This is especially a factor in smaller states like South Australia.

Tables 5 and 6 show:

1. The proportion of the workforce aged over 50 by occupational group.
2. The median age of the workforce by occupational group.

Table 5 ranks the construction workforce by ageing profile. As mentioned in **Appendix 4,** people aged over 70 are excluded from this analysis even if they are still working in the industry. Similarly, CITB acknowledges that construction workers of working age may not have an 'active' CITB registration but may still be working in the industry.

Table 5: Construction Workforce – South Australia (CITB definition): Age Profile (Ranked highest to lowest number over 50)

Occupational Group	Aged Over 50	% of the occupation aged over 50	% of total construction aged over 50
Civil Construction	3,397	34.3%	26.8%
Building and Construction Management	1,442	39.4%	11.4%
Electrotechnology	1,113	23W.7%	8.8%
Trades Assistant	761	18.1%	6.0%
Crane Services and Rigging	708	25.4%	5.6%
Professional Services	677	28.6%	5.3%
Carpentry and Joinery	548	18.6%	4.3%
Plumbing/Gasfitting	497	22.4%	3.9%
Administration	429	37.7%	3.4%
Painting and Decorating	346	29.5%	2.7%
Data & Voice Communications	305	25.1%	2.4%
Concreting	223	20.0%	1.8%
Air-conditioning & Refrigeration & Mechanical Services	216	22.4%	1.7%
Other	199	31.0%	1.6%
Wall & Ceiling Lining	174	22.4%	1.4%
QHSE	153	44.0%	1.2%
Roof Plumbing	153	22.9%	1.2%
Landscaping	133	16.9%	1.0%
Electrical Supply Industry	114	39.7%	0.9%
Bricklaying/Blocklaying	114	25.6%	0.9%
Cabinet Making	104	21.3%	0.8%
Scaffolding	91	11.7%	0.7%
Glass and Glazing	90	32.1%	0.7%
Offsite Construction	87	30.9%	0.7%
Plastering	82	22.2%	0.6%
Internal and External Fittings	75	21.4%	0.6%
Demolition	70	18.0%	0.6%
Flooring Technology	61	26.0%	0.5%
Fire Protection	60	30.9%	0.5%
Wall & Floor Tiling	53	10.8%	0.4%
Driver	49	50.5%	0.4%
Steelfixing	49	17.7%	0.4%
Cleaning & Maintenance	43	42.2%	0.3%
Shopfitting	19	25.7%	0.1%
Stonemasonry	18	25.0%	0.1%
Waterproofing	9	28.1%	0.1%
Steel Frame Installer	5	19.2%	0.0%
Cladding	2	8.7%	0.0%
Total	**12,669**	27.0%	100.0%

There is significant variation in the age profile of the construction workforce. Some occupations have a high percentage of people over 50, but relatively low numbers whereas the opposite is true for other occupations.

Civil construction makes up 21% of the total construction workforce as defined by CITB, but it makes up almost 27% of construction workers 50 and over years old. Within the civil construction occupation, more than one-third of workers are 50 and over. This partly reflects the fact that people are drawn to civil construction apprenticeships at an older age than all other construction trades – around 80% of civil construction apprentices are over 21 at commencement.

Conversely, the apprenticeship vocations most popular with school leavers, such as carpentry, electrotechnology and plumbing have relatively young workforces, due largely to this steady influx at school-leaver age.

Median Age

The median age of the total Australian workforce across all industries is 39.[38] The median age of the CITB-supported construction workforce (excluding apprentices) is 38, and when apprentices are included in the calculation, the median age falls marginally to 37 (thus there is no material difference)– see Table 6 on the next page. The median age of CITB-supported apprentices in training is 21.

Looking solely at construction workers (i.e. excluding apprentices in training), occupational groups with a high median age include drivers; quality, environmental, health and safety workers; and electrical supply workers. Conversely, occupations with more 'wear and tear' attributes such as cladders, scaffolders, demolition workers and trade assistants are relatively young.

[38] https://lmip.gov.au/default.aspx?LMIP/GainInsights/IndustryInformation, accessed in May 2020.

Table 6: Median Age of Construction Workforce – South Australia

Occupational Group	Median Age
Driver	52
QHSE	48
Electrical Supply Industry	46
Administration	45
Building and Construction Management	45
Cleaning and Maintenance	45
Waterproofing	43
Civil Construction	43
Glass and Glazing	43
Stonemasonry	43
Flooring Technology	41
Offsite Construction	41
Other	41
Painting and Decorating	41
Professional Services	41
Shopfitting	41
Fire Protection	40
Crane Services and Rigging	39
Data & Voice Communications	39
Steel Frame Installer	39
Internal and External Fittings	39
Bricklaying/Blocklaying	38
Cabinet Making	38
Plastering	38
Air-conditioning and Refrigeration and Mechanical Services	37
Electrotechnology	37
Wall & Ceiling Lining	37
Concreting	36
Roof Plumbing	36
Plumbing/Gasfitting	36
Carpentry and Joinery	35
Landscaping	35
Wall & Floor Tiling	35
Steelfixing	34
Trades Assistant	34
Demolition	33
Scaffolding	32
Cladding	31
Construction Workers	**38**
Apprentices	**21**
Whole construction workforce	**37**

Of the construction occupations that employ many people:

- Civil construction has a relatively high median age (44). Civil construction is unique in having the overwhelming majority of commencing apprentices aged 21 or over. For every other construction trade, people aged under 21 account for the majority of apprentices.
- Construction managers are relatively older than other construction occupations, in large part due to the many years' experience required to take on such a role.
- Carpentry, plumbing and electrotechnology have a relatively young workforce, mainly due to the popularity of these trades among school leavers seeking an apprenticeship.

Regional Breakdown

CITB has a regional definition that mirrors the State Government Uniform State Boundaries (with a small number of minor differences). The regional breakdown of the construction workforce is shown in Table 6 below.

Given the relative urbanisation of South Australia, it is not at all surprising that over 70% of the CITB-defined construction workforce live in metropolitan Adelaide[39] and that the next two largest regions for construction workers (Barossa, Light and Lower North and Adelaide Hills) border metropolitan Adelaide.

Of greater interest is whether this regional breakdown is consistent across occupational groups. The metropolitan regional breakdown of workers across these groups is provided in Table 8.

Table 7: Construction Workforce – South Australia (CITB definition): Regional Breakdown

Region	Number of Construction Workers	Percent
Southern Adelaide	11,718	25.0
Northern Adelaide	11,187	23.8
Western Adelaide	6,156	13.1
Eastern Adelaide	4,825	10.3
Barossa, Light and Lower North	2,286	4.9
Adelaide Hills	2,111	4.5
Yorke and Mid North	1,811	3.9
Murray and Mallee	1,672	3.6
Limestone Coast	1,580	3.4
Fleurieu and Kangaroo Island	1,463	3.1
Eyre and Western	1,348	2.9
Far North	734	1.6
Unknown	31	0.1
Total	**46,922**	**100.0%**

[39] Comprising Norther, Southern, Eastern and Western Adelaide

Table 8: Employment by Occupation – Metropolitan/Regional Split[40]

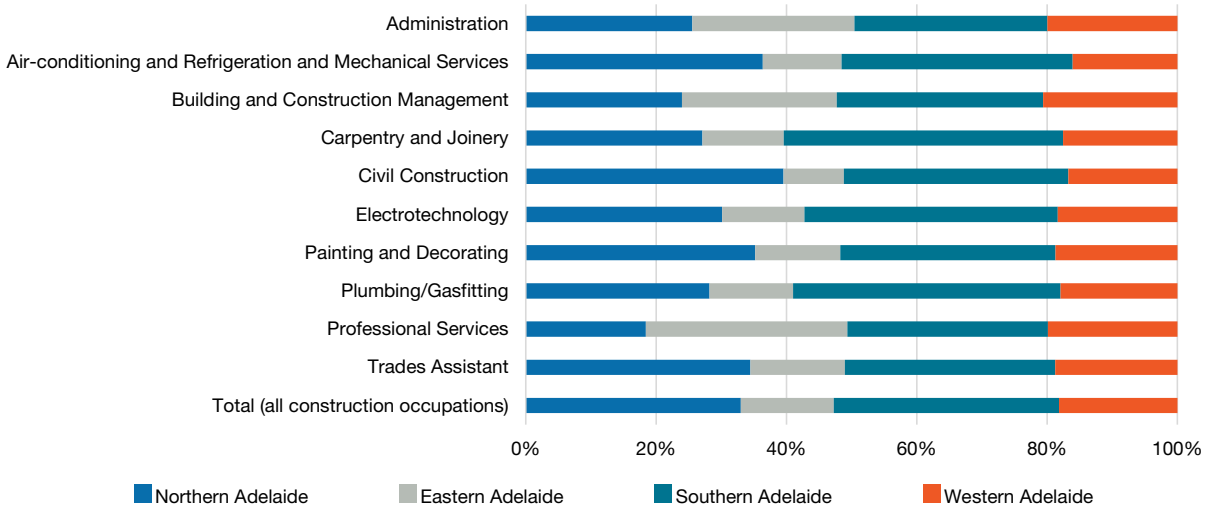
	Metro	Percent	Regional	Percent
Shopfitting	70	95%	4	5%
Wall & Floor Tiling	427	87%	64	13%
Data & Voice Communications	1,050	86%	167	14%
Fire Protection	167	86%	26	13%
Wall & Ceiling Lining	669	86%	105	14%
Professional Services	1,985	84%	374	16%
Waterproofing	27	84%	5	16%
Flooring Technology	194	83%	41	17%
Offsite Construction	234	83%	48	17%
Painting and Decorating	974	83%	199	17%
Scaffolding	631	81%	149	19%
Administration	908	80%	231	20%
Plastering	294	80%	75	20%
Air-conditioning and Refrigeration and Mechanical Services	759	79%	205	21%
Demolition	307	79%	82	21%
Glass and Glazing	220	79%	60	21%
Cladding	18	78%	5	22%
QHSE	272	78%	75	22%
Concreting	860	77%	256	23%
Electrical Supply Industry	220	77%	67	23%
Other	493	77%	147	23%
Steelfixing	213	77%	64	23%
Roof Plumbing	511	76%	157	23%
Trades Assistant	3,219	76%	994	24%
Bricklaying/Blocklaying	334	75%	112	25%
Building and Construction Management	2,744	75%	913	25%
Cleaning and Maintenance	77	75%	25	25%
Driver	72	74%	25	26%
Landscaping	580	74%	205	26%
Stonemasonry	53	74%	19	26%
Electrotechnology	3,457	73%	1,247	26%
Internal and External Fittings	254	73%	96	27%
Plumbing/Gasfitting	1,589	72%	629	28%
Carpentry and Joinery	2,020	68%	933	32%
Cabinet Making	322	66%	166	34%
Crane Services and Rigging	1,760	63%	1,026	37%
Steel Frame Installer	16	62%	10	38%
Civil Construction	5,886	60%	3,999	40%
Total	**33,886**	**70%**	**13,005**	**30%**

Table 8 shows that 40% of civil construction workers live in regional South Australia, well above the all industry average. There are only five occupational groups whose share of regional employees is greater than the industry average.

[40]Totals may not add to 100 due to rounding. For a small number of people, their residential address is unknown.

Of those who live in metropolitan Adelaide, the major trades have the following splits (Chart 3).

Chart 3



The data shows that:

1. Northern Adelaide accounts for about one-third of construction employees (33%) in metropolitan Adelaide, but has a much greater share of civil construction workers (40%) and a much lower share of professional services workers (18%)
2. Eastern Adelaide makes up just over 14% of the metropolitan construction sector workforce, but has a much higher share of construction workers in the following occupational groups: administration (25%), building and construction management (24%) and professional services (31%)
3. Around 35% of construction workers who live in metropolitan Adelaide live in Southern Adelaide, and the region has an over-representation of carpenters and joiners (43% of the total metropolitan workforce) and plumbing and gas fitting (41%)
4. Approximately 18% of construction workers from metropolitan Adelaide live in Western Adelaide, and this rate is relatively consistent across the major occupational groups – ranging from 16% for air conditioning and refrigeration mechanics to 21% for building and construction management.

Gross Replenishment Ratio

The gross replenishment ratio is defined as the ratio of apprentice completions to an adjusted total employment estimate.[41]

For this calculation, construction employment (ABS estimates) and apprentice completions for 2019 are used, – see Table below. From a skills replacement perspective, a higher gross replenishment ratio is

Table 9: Gross Replenishment Ratio — Selected Trades, 2019

Construction Worker Trade	CITB- supported Apprentice completions 2019	Number of construction workers ABS*	Percent Gross replenishment rate
Electrician	266	8,587	3.1%
Carpenter and/or Joiner	257	7,933	3.2%
Plumber	142	5,308	2.7%
Air-conditioning and Refrigeration Technician	55	1,385	4.0%
Cabinet Maker (Kitchens and Bathrooms)	41	1,565	2.6%
Civil Construction Worker (incl. Cert II and Plant Ops)	45	3,404	1.3%
Painter / Decorator	37	3,312	1.1%
Bricklayer / Blocklayer	32	2,159	1.5%
Wall & Floor Tiler	24	1,468	1.6%

Table 9 shows that the strongest capacity to replenish the workforce are for:

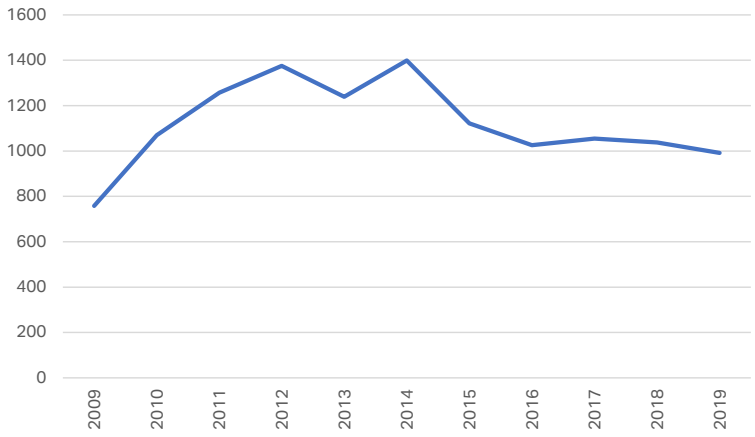
- Air-conditioning and refrigeration technicians.
- Carpenters/joiners.
- Electricians.

Conversely, for painters and decorators for example, only 37 newly qualified people (1.1%) were available to replace those retiring or leaving the industry in 2019.

Apprentice Completions

More broadly, the number of apprentice completions in 2019 in South Australia for the qualifications that CITB supports dropped to under 1,000 for the first time since 2009 and is almost **30% below its 2014 peak** – see Chart 4 below. This is a reflection of a sustained decline in commencements that followed the finishing of an economic stimulus measure associated with the Global Financial Crisis. Completions by individual qualification are detailed in Table 10.

Chart 4: Apprentice Completions, CITB-Supported Trades



[41]In this case the adjusted employment estimate is the ABS number for total employment minus the number of apprentices in training.

Table 10: Apprentice Completions by CITB-Supported Qualification

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Electrician	259	312	382	405	373	438	410	315	319	310	266
Carpenter and/or Joiner	155	264	333	373	318	351	225	223	254	246	257
Plumber	125	183	238	209	194	223	146	153	189	142	142
Air-conditioning and Refrigeration Technician	47	58	67	90	67	70	48	59	59	73	55
Cabinet Maker (Kitchens and Bathrooms)	0	0	1	0	1	2	2	13	27	46	41
Civil Construction Worker (incl. Cert II and Plant Ops)	33	43	42	68	87	112	98	88	62	40	45
Roof Plumber	17	20	12	27	28	34	28	13	21	33	28
Painter / Decorator	28	58	42	44	41	35	33	28	29	28	37
Bricklayer / Blocklayer	35	56	62	52	42	33	26	17	26	33	32
Wall & Floor Tiler	23	34	26	41	28	32	17	21	23	16	24
Wall & Ceiling Liner	17	12	21	25	30	18	13	13	9	14	5
Linesman or Powerline Worker	1	1	0	1	1	2	3	4	7	25	21
Glazier	7	11	16	12	6	14	10	9	7	9	9
Solid Plasterer	9	13	8	12	10	11	14	2	4	8	9
Civil Construction Supervision	0	0	0	0	0	6	17	52	7	7	4
Fire Protection Technician	2	5	5	10	5	6	3	8	7	5	11
Concreter	0	0	0	6	7	10	16	2	1	0	1
Builder (General)	0	0	1	0	0	2	4	0	1	0	0
Stonemason	0	0	0	0	0	0	0	1	0	0	0
Scaffolder	0	0	0	0	0	0	4	4	0	2	3
Shopfitter	0	0	1	0	1	0	5	1	3	1	2
Total	**758**	**1,070**	**1,257**	**1,375**	**1,239**	**1,399**	**1,122**	**1,026**	**1,055**	**1,038**	**992**

Apprentice completion trends can be an indicator of skill shortages. For example, declining numbers of apprenticeship completions were found to account for much of the persistent shortage in the electrotechnology and telecommunications trades nationally during the 1990s and 2000s. However, the subsequent recovery in training rates provided a skills pipeline to the industry.[42] Although completion **numbers** are declining, individual apprentice completion **rates** for most CITB-supported construction trades are relatively high (around 75%).

[42]National Centre for Vocational Education Research, 2011, Skill shortages in the trades during economic downturns.

What does the Research tell us about Construction Skills and Employment?

A comprehensive summary of reports on skills and employment issues related to construction is presented as Appendix 1. The key findings of the research are summarised below:

Skills and Labour Shortages

"Skills shortages occur as a result of an imbalance between demand for qualified workers and the number (supply) of skilled workers available. This may occur as a consequence of a low number of skilled people entering the workforce, aged workers leaving the workforce or growth in the demand for skills which might result in high competition for workers between growing industries, or employers within these industries".[43]

Key points:

- A number of construction trades are continually assessed as being in shortage, especially during strong economic periods
- 'General' (as well as technical) skills are highly sought after by employers
- Employers have expressed concern about the suitability of applicants
- Trends in apprentice completion can be an indicator of skill shortages
- Perceived skill shortages can co-exist with high unemployment

The construction sector is facing a labour shortage due to retirement, a working-age population with different workforce preferences, and increasing degrees of automation that leave workers worried about the sustainability of their jobs.[44]

The breadth and depth of skills shortages in South Australia is spelled out in the most recent Australian Government report on Construction Trades in South Australia published in 2018,[45] before the impact of COVID-19. The key points are as follows:

- In general, supply to the workforce has declined over recent years, as indicated by a reduction in the number of construction trades apprenticeship completions.
- The South Australian labour market for construction trade workers tightened for the third consecutive year (meaning that construction jobs became harder to fill).
- Of the six construction occupations surveyed at a state level, five were rated 'in shortage'.

Construction employers in South Australia reported attracting approximately 12 applicants per vacancy; however, 67% of qualified applicants were considered unsuitable[46].

Electrical trades were also found to be in shortage in metropolitan Adelaide as at September 2018.[47]

The Construction, Plumbing and Services Industry Reference Committee (IRC) 2019 Skills Forecast also listed skills shortages nationally in the occupations of building associate (site supervisor), construction project manager, bricklayer and stonemason, carpenter and joiner, fibrous plasterer, plumber, wall and floor tiler, painting trades worker, and roof tiler.[48]

According to the Construction, Plumbing and Services IRC's 2019 Skills Forecast[49] the top generic skills required for the construction industry are:

- Language, Literacy and Numeracy (LLN)
- Learning agility/Information literacy/Intellectual autonomy and self-management
- Design mindset/Thinking critically/System thinking/ Solving problems
- Communication/Virtual collaboration/Social intelligence
- Technology.

Perceptions of skill shortages are more obvious in industries with high labour turnover. This is due to the ongoing engagement of employers in recruitment. A perceived skill shortage may also arise where the available supply of skilled labour is systematically understated.

Furthermore, perceived skill shortages are influenced by:

- employers reporting shortages of 'specialised and experienced workers';
- high unemployment in an occupation;

[43]OECD/ILO (2017), Engaging Employers in Apprenticeship Opportunities, OECD Publishing, Paris.

[44]Global Infrastructure Initiative (2019), Voices on infrastructure: Workforce of the Future.

[45]See Labour Market Research – Construction Trades September 2018

[46]ibid.

[47]Australian Government Department of Jobs and Small Business (2018), Electrician (General), South Australia

[48]Quoted in Australian Industry and Skills Committee Construction Profile

[49]ibid.

- large numbers of newly trained people with little experience; and
- unemployed people with skills that are considered redundant or not in demand.[50]

The inability of employers to attract suitable workers and fill vacancies may arise for many reasons other than genuine shortages of skill, such as: unattractive wages; poor and precarious working conditions; lack of career prospects; and geographic and other administrative barriers (for example, lack of international recognition of qualifications).

In the face of genuine skill shortages, when required technical skills are just not available, employers may also be forced ultimately to adjust their skill demand by hiring workers who are less qualified for the specified tasks then upskilling. In the long term, employers may also invest in a different mix of technology, capital and labour, to overcome skill deficiencies.[51]

Labour Mobility

Key points:

- Construction workers have skills which are transferable to other industries, especially mining.
- Qualified construction workers have relative low attrition rates, but the same can't be said for labourers.
- Construction workers tend to change employers to a similar extent as other occupations, but tend to stay in the occupation longer.
- Most construction workers who leave their job (regardless of whether they stay in the same occupation or not) do so when they are under the age of 35 years.

The skills transferability of construction sector workers suggests they are sought after by other industries, most notably mining. Consistently, mining is considered the sector most likely to compete for skills of construction workers.[52] Here, a distinction needs to be made between **resource construction** employment (the construction phase of mining infrastructure); and **ongoing operational** employment in mining (after the construction has taken place).

The skills required for resource operations are quite different from those required during resource construction (although there is some overlap). In particular, operational workers are generally more likely to be professionals and machinery operators and drivers, while resource construction workers are more likely to be technicians and trades workers.[53]

The construction phase of major resource projects is very labour-intensive, requiring many employees to start work straight away to ensure projects are completed on time and on budget. In this context, employers require significant numbers of work-ready candidates who meet licensing requirements.[54]

Between 2005 and 2010, national estimations showed the numbers of workers moving into the mining industry from other industries more than doubled. During 2012 in Western Australia, 25% of people recruited into mining came from the construction industry.[55]

Despite labour mobility, qualified tradespeople in construction have particularly high retention and low attrition in their chosen trade; more so than construction labourers (i.e. those without formal qualifications). Labourers, technicians and tradespersons are twice as likely to change their occupation within the 12-month period analysed.[56]

A study comparing construction with the aged care and automotive sectors found that construction workers (excluding labourers) were much less likely to have any intention to change either occupation or industry. However, construction workers had just as much intention of changing their employer as those in the other industries.[57]

An NCVER study in 2011 found that across several occupational groups after 15 years there are less than 50% of an entering cohort remaining in that occupation

[50]ibid.

[51]Cedefop (2015) Skill shortages and gaps in European enterprises: striking a balance between vocational education and training and the labour market. Luxembourg: Publications Office http://dx.doi.org/10.2801/042499

[52]Especially for civil construction workers, as confirmed by CITB Sectors Committee feedback, November 2018.

[53]Mary-Alice Doyle, Reserve Bank of Australia (2014), Labour Movements during the Resources Boom

[54]Georgina Atkinson and Jo Hargreaves, National Centre for Vocational Education Research (2014), An exploration of labour mobility in mining and construction: who moves and why.

[55]OECD/ILO, 2017.

[56]Richard Sweet (2011) The mobile worker: concepts, issues, implications.

[57]Dr Sandra Haukka, Occupational mobility in Queensland's Aged Care, Automotive and Civil Construction sectors, Australian Research Council Centre of Excellence for Creative Industries and Innovation, Queensland University of Technology, Brisbane, Australia.

(see Table 11 below), despite variability across occupations. Among the trades, those with the least attrition are construction, automotive and engineering, electrotechnology and telecommunications trades workers and, perhaps surprisingly, the food trades[58] (many food trade employees leave their employer but not their occupation).

Table 11: Gross attrition: the percentage of a cohort remaining in the occupation by period since entry, for trades and professional occupations, 2008, males

ANZSCO sub-major group occupations	0	l yr	5 yrs	15 yrs	25 yrs
Arts and media professionals	100	90	64	38	28
Business, human resource and marketing professionals	100	86	50	17	7
Design, engineering, science and transport professionals	100	90	62	31	18
Education professionals	100	90	63	35	21
Health professionals	100	93	71	37	19
ICT professionals	100	93	72	42	24
Legal, social and welfare professionals	100	74	27	5	2
Engineering, ICT and science technicians	100	82	43	15	6
Automotive and engineering trades workers	100	89	58	24	10
Construction trades workers	100	91	66	35	20
Electrotechnology and telecommunications trades worker	100	88	55	20	9
Food trades workers	100	87	53	20	9
Skilled animal and horticultural workers	100	86	49	14	4
Other technicians and trades workers	100	88	55	18	6

Source: Generated from ABS Survey of Labour Mobility, 2008, confidentialised unit record file, cat.no.6209.

Source: Tom Karmel, Patrick Lim & Josie Misko (2011), Attrition in the trades, NCVER MONOGRAPH SERIES 07/2011

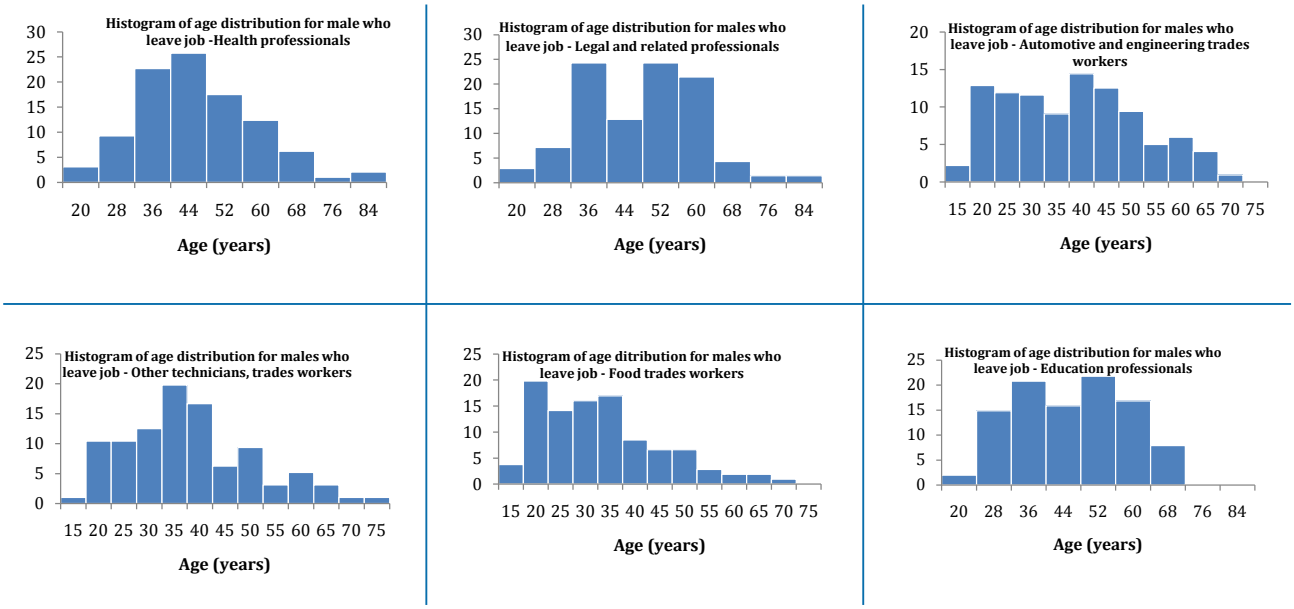
[58]Tom Karmel, Patrick Lim & Josie Misko (2011), Attrition in the trades, NCVER MONOGRAPH SERIES 07/2011

More recent economy-wide data shows that on average, today's Australian employee changes jobs 12 times throughout their life, with an average tenure of 3.3 years. With the rise of the gig economy and a casualised workforce, that average tenure is further trending downwards. For workers over 45, the average job tenure is 6 years and 8 months, while for under 25s it's just 1 year and 8 months.[59]

Most people who leave their job (regardless of whether they stay in the same occupation or not) do so when they are under the age of 35. Mobility declines with age: young people are most likely to change occupations, experiencing intense job shopping and job search activities early in their careers. Chart 4 below shows this pattern for construction and electrotechnology.[60]

Labour mobility that involves industry or occupational changes has implications for (among other things), skill and qualifications portability and therefore, the breadth, nature and training content of qualifications. These changes can potentially have wider implications for issues of retraining and career change.[61]

Chart 5: Age Distribution of Males who leave their job, by Occupation



Source: Tom Karmel Patrick Lim Josie Misko, Attrition in the trades NCVER MONOGRAPH SERIES 07/2011

[59] Australian Institute of Business (2018), https://www.aib.edu.au/blog/career-development/changing-jobs-how-often-is-too-often/#:~:text=On%20average%2C%20today's%20Australian%20employee,average%20tenure%20of%203.3%20years.

[60] Shah, 2009, quoted in Tom Karmel, Patrick Lim & Josie Misko (2011), Attrition in the trades, NCVER MONOGRAPH SERIES 07/2011E.

[61] ibid.

Apprentice Pipeline

A robust pipeline of construction apprenticeships is important for replacing exiting workers. Best practice standards of apprenticeship training can raise the number of people in employment, increase individual and company productivity, and enhance economic growth.[62]

The difference in attributes between "normal apprenticeships" and "world class apprenticeships", based on international comparisons, is summarised in the table reproduced below.

Table 12: Indicators of 'Normal' Apprenticeships and 'World Class Apprenticeships' – International Comparison

Indicators	Apprenticeships	World-class apprenticeships
1. Training		
1.1 entry requirements	school leavers who have completed compulsory schooling	school leavers who have completed compulsory schooling with a good level of home language and mathematics education
1.2 years of training	1–2 years	3–4 years
1.3 scope of training	company/job-specific training supplemented with some broader skills	scientific and industrial skills and knowledge in breadth and depth
1.4 aim of training	increase the company/job training and overall competences	increase occupational training and enhance productivity
1.5 on-the-job training	by a workplace trainer in the company	by the 'master' in the company
1.6 off-the-job training	competence-based training	knowledge-based education
2. Skills and expertise		
2.1 skills and knowledge	to acquire the skills and knowledge necessary for a job	to acquire all the skills and knowledge necessary to work effectively in an occupation
2.2 developmental goal	to be a skilled worker	to be a skilled worker within an occupational area with a critical and creative approach
3. Recognition		
3.1 assessment	assessment of the company/job-specific and broader skills acquired	assessment of the scientific and industrial skills and knowledge acquired
3.2 qualification	industry and/or nationally recognised vocational qualification	nationally and/or internationally recognised occupational title
4. Progression		
4.1 employment	to be job ready	to secure a long-term position in an occupational area
4.2 education and training	opens up opportunities for further training	opens up opportunities for further training and/or higher education
4.3 productivity	increases individual productivity	increases company productivity

Source: Mieschbuehler, R. and Hooley, T. (2016)

[62]Mieschbuehler, R. and Hooley, T. (2016) 'World-Class Apprenticeship Standards: Report and Recommendations', Derby and London: International Centre for Guidance Studies (iCeGS), University of Derby and Pearson Education UK.

Conclusion

The skill needs of the construction sector are evolving over time. Before COVID-19, the sector was experiencing regular skill shortages. The economic downturn that will now ensue will negatively impact on work opportunities for construction workers (and many other sectors). The economic recovery from COVID-19 may require stimulus for construction activity and so reskilling, upskilling and attracting quality candidates from the school system will be fundamental. This will ensure that skill needs are met and that training rates remain at a level that is sufficient to replace workers leaving the industry.

The longer-term impacts on the construction industry due to the pandemic are greatly uncertain. Temporary and skill migration from overseas is likely to be at a subdued level for a considerable time, putting more pressure on the apprenticeship system to do the 'heavy lifting' to generate a pipeline of skilled workers. At the other end of the work lifecycle, retirement incomes have recorded a significant fall due to the pandemic. Consequently, workers across all industries are more likely to delay their retirements and stay in the workforce longer. These changing trends have implications for the type of training required and the way it will be delivered.

Where to From Here?

The analysis in this report will help inform training purchasing decisions of CITB and the state government. For example:

- The findings of low training rates in certain construction trades could result in pilot programs to encourage greater apprenticeship take up in these trades.
- The impact of technology could mean greater investment by CITB through its Innovation Program in initiatives that accelerate the innovative use of digital skills.
- The profile of the CITB-supported construction workforce (age, geographic breakdown, etc.) suggests policy interventions are required to address ageing workforces in some occupations and regional imbalances within certain occupations.

Finally, the persistent skill shortages recorded pre COVID-19 are expected, in time, to be a constraint in some key construction, high employment, occupations. Initiatives to bring more people into these occupations at the entry level and to assist with upskilling so that they remain in the construction industry for longer will assist in reducing the foreseen shortages.

Appendices

APPENDIX 1

SUMMARY OF
MAJOR LITERATURE 35

APPENDIX 2

AUSTRALIAN BUREAU OF
STATISTICS DEFINITION
OF THE CONSTRUCTION
INDUSTRY 48

APPENDIX 3

APPRENTICE SUPPORT -
CITB-SUPPORTED
VOCATIONS 49

APPENDIX 4

CITB'S CONSTRUCTION
WORKER DEFINITION 50

Appendix 1: Summary of Major Literature

Skills Shortages

Definitions[63]

- Skill shortages arise when the supply of workers is not enough to meet the demand in a given occupation or region, at the prevailing wages and conditions (Richardson 2007, p.12). In practice, the term 'skill shortage' is widely used by employers, government and the media to describe a range of difficulties involving the supply of and demand for skilled labour. The Department of Education, Employment and Workplace Relations (2009) distinguishes three categories:

1. Skill shortages exist when employers are unable to fill or have considerable difficulty in filling vacancies for an occupation—or if there are specialised skill needs in the occupation—at current levels of remuneration and conditions of employment, and a reasonably accessible location.
2. Recruitment difficulties occur when employers have some difficulty filling vacancies for an occupation. There may be an adequate supply of skilled workers, but employers are still unable to attract and recruit sufficient suitable employees.
3. Skill gaps exist where existing employees lack the required qualifications, experience and/or specialised skills to meet the firm's skill needs for an occupation. Skill gaps may apply to new employees, or where employers are unable to find suitable applicants for an occupation and recruit workers who need further training and/or experience to meet the firm's skill needs for the occupation.

A further definition is provided in the following box[64]:

Skill mismatch
A situation where there is a (qualitative) discrepancy between the qualifications and skills that individuals possess and those that are ll8'8ded by the labour market

Mismatch
A situation where industries, occupatiollS, locatiollS or groups with different levels of education/skill diverge over time in the unemployment-to-vacancies ratio.

Skill imbalance
A difference between the aggregate quantities of demand and supply of individuals with different levels of skill in an economy.

Recruitment/vacancy bottleneck
A situation where a given vacancy (posted in a recent time period) is hard to fill by employers

Skill shortage (or talent shortage)
A situation where the demand for a particular type of skill exceeds the available supply of that skill at the marketclearing rate of pay.

(Internal) skill gap
A situation where the level of skills of the existing workforce in a firm is less than required to perform a job adequately or to match the requirements of a job

(Economic) skills obsolence
A situation where skills previously used in a job are no longer required or have diminished in importance.

[63]Taken from D Oliver - National Centre for Vocational Education Research, 2011 Skill shortages in the trades during economic downturns.

[64]Cedefop (2015). Skill shortages and gaps in European enterprises: striking a balance between vocational education and training and the labour market. Luxembourg: Publications Office

- Skill shortages are usually defined as instances when the demand for a particular skill exceeds the supply of available people with that skill at market clearing wage rates.
- Business cycle movements, geographic barriers, information gaps (about available job vacancies, the skills of job applicants, the wider employment and career prospects of alternative occupations) and institutional constraints (such as wage inflexibility, stringent employment protection legislation, occupational licensing and regulations) that prevent the market from clearing, may also lead to skill shortages that last a considerable time.
- In the face of genuine skill shortages, when required technical skills are not available in the labour market, employers may also be forced, ultimately, to adjust their skill demand by hiring less qualified workers for the specified tasks and seeking to upgrade their skills through training. In the long term, employers may also invest in a different mix of technology, capital and labour, to overcome skill deficiencies; this embodies the skills in the capital equipment rather than in people.
- The term 'skill shortages' typically refers to a skills-related labour market shortage, i.e. when there are not enough individuals with the required skills within the economy to fill existing vacancies at market-clearing wages. This is the most conventional definition. However, in the context of the continuing adverse demographic evolution in most advanced economies, many also refer to the anticipated quantitative shortfall of workers in the economy as a 'skill shortage'.[65]

Extent and Reasons of Skill Shortages

The construction sector is facing a labour shortage due to among other factors, retirement, a working-age population with different workforce preference.[66]

The breadth and depth of skills shortages in South Australia is spelled out in the latest Australian Government report on Construction Trades in South Australia published in 2018.[67]

The 2018 survey of employers who had recently advertised for construction tradespersons found that 38 per cent of vacancies were filled within four weeks, compared to 40 per cent in 2017. This is well below the five year average of 60 per cent.

- The proportion of vacancies being filled have continued to decline dramatically since 2013 where the proportion of vacancies filled were at a high of 87 per cent of vacancies filled.
- Suitable applicants per vacancy have remained on par in the last two years with figures at (0.9) in 2018 and (0.8) in 2017.
- It is important to note that although the average number of suitable applicants was low (0.9) in 2018 there was an average of 11.6 applicants per vacancy.

The main reason for unsuitability of applicants included:

- Lack of basic and additional qualifications or specific experience. Some applicants were unsuitable due to remuneration expectations.
- Applicants were unsuitable because they could not demonstrate sufficient work experience, or work experience in a specialised field.
- Other reasons for unsuitability included lack of sufficient technical skills and competency in the role. There were also applicants that lived too far from the place of work or were not happy to take the job due to the remuneration offered.
- Several applicants failed to present for trial and or interview and were therefore deemed unreliable.
- In addition, some unsuitable applicants lacked the relevant building and workplace safety licenses, ABN or access to own transport required by employers.
- A high number of employers claimed applicants were unreliable and lacked a good work ethic.

The Australian Chamber of Commerce and Industry argues that training is one of four elements of a solution to skill shortages, the others being labour mobility, better skills utilisation and migration.[68]

The top five other employability skills requested by employers were life skills (including money and time management, organisation and planning), adaptability, a good work ethic (attitude, reliability, desire to work hard); work health and safety and resilience.

According to the job vacancy data, the top requested skills by employers were communication and planning. The most advertised Construction occupations were Architectural, Building and Surveying Technician followed by Contract, Program and Project Administrator.

[65]ibid

[66]Global Infrastructure Initiative (2019), Voices on infrastructure: Workforce of the Future.

[67]See Labour Market Research – Construction Trades September 2018.

[68]Tom Karmel, Patrick Lim Josie Misko, (2011), Attrition in the trades, NCVER MONOGRAPH SERIES 07/2011.

Other Skill Shortages Findings[69]

Skill Shortages During Economic Downturns

- There is no evidence of persistent skill shortages during economic downturns in the construction, automotive and engineering trades, and unconvincing evidence of persistent shortages in the electrotechnology and telecommunications trades, the food trades and hairdressing.

Role of Completions

- Declining numbers of apprenticeship completions accounted for much of the persistent shortage in the electrotechnology and telecommunications trades during the 1990s and 2000s, but apprenticeship completions (expressed as a proportion of employment) for this trade then recovered to pre-1992 levels. If recent completion numbers are maintained, it should be possible to avoid future skill shortages.

Job Churn vs Skill Shortages

- Very high job churn creates the perception of persistent skill shortages in the food trades and in hairdressing. Many food tradespersons and hairdressers swap employers but remain in their occupation.

Perceived Skill Shortages

- Perceived skill shortages are most likely to be felt in industries with high turnover, since employers will be constantly engaged in recruiting new workers, even when workers who have left one firm to work in another remain within the same industry. A perceived skill shortage may also arise where the available supply of skilled labour is systematically understated.
- Furthermore, since employers typically report shortages for 'specialised and experienced workers', perceived skill shortages can co-exist with relatively high unemployment overall in the occupation if there are large numbers of newly trained people with little experience, or unemployed people with skills that are considered redundant or not in demand.

Link with Economic Cycle

- Skill shortages in the construction, engineering and automotive trades are linked to the economic cycle. There is some evidence of persistent skill shortages in the electrotechnology trades, the food trades, and in hairdressing, but it is neither consistent nor overwhelming.

Why do some firms find it difficult to fill vacancies?

There are situations where firms may consistently find it difficult to meet their demand for skilled labour over the economic cycle. In one example, there is a permanent structural barrier preventing equilibrium from occurring. Either the training system is unable to supply the number of completed apprenticeships to replenish the current stocks of workers, or already-trained workers are unwilling to work at the price offered by employers.

Any problems with the number of trained apprentices being supplied can be quickly ascertained by comparing the ratio of apprentice completions to current employment over time.

Gross Replenishment Ratio Comparisons

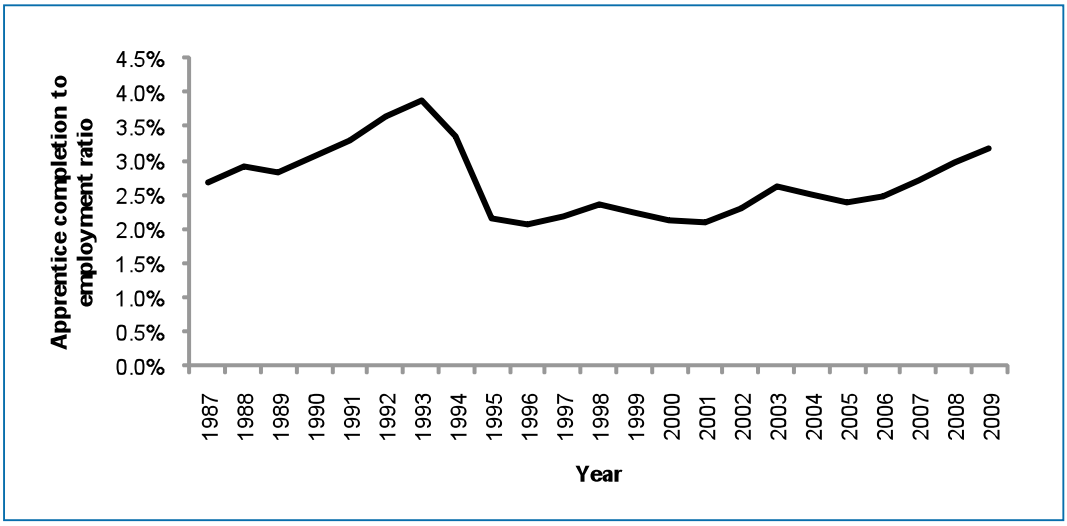
For all trades, the gross replenishment ratio varies across the economic cycle. The replenishment ratio for the electrical trades is particularly sensitive to the economic cycle, whereas the food trades and hairdressing ratios experience less variation.

Following the 1992 recession and the privatisation of government-owned power companies, the gross replenishment ratio for electrical trades collapsed, falling from 3.7% in 1994 to 1.8% in 1996. The gross replenishment ratio for electricians recovered much more slowly than for the engineering and automotive and construction trades. It was only in 2008 that the replenishment ratio returned to pre-1992 recession levels. Thus persistent shortages in the electrical trades, to the extent they exist, can be explained by an inadequate supply of skilled labour through the apprenticeship system.

To the extent that there may have been persistent skill shortages in the food trades and hairdressing, they cannot be accounted for by deficiencies in the apprenticeship system, since the replenishment ratio for these trades is **consistently much higher than the average for all trades**. Instead, any explanation for apparent skill shortages in the food trades and hairdressing must lie in the pool of existing tradespeople.

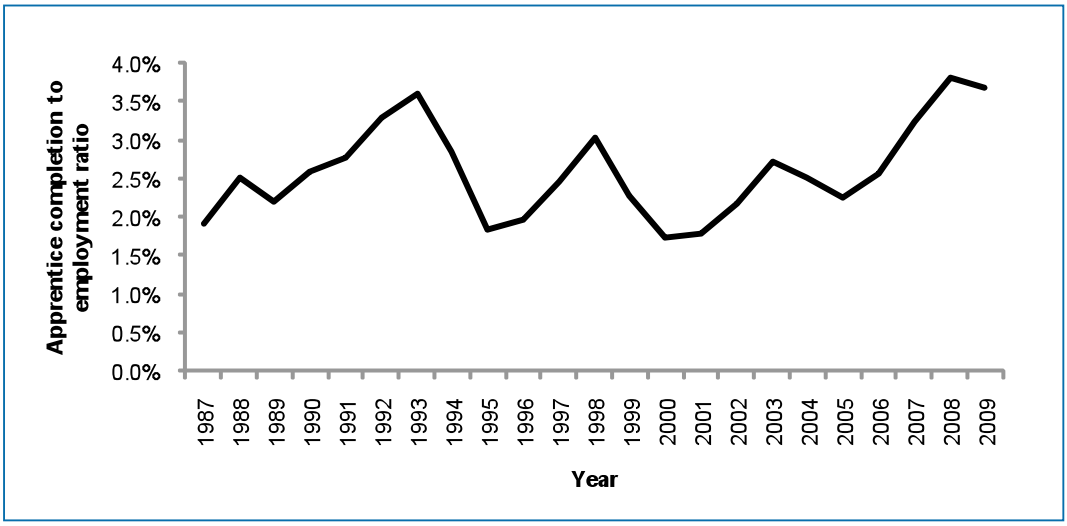
[69] Taken from D Oliver (2011), Skill shortages in the trades during economic downturns National Centre for Vocational Education Research.

Chart 6: Ratio of Apprentice Completions to Total Employment, all Trades 1987-2009



Reproduced from D Oliver (2011), Skill shortages in the trades during economic downturns National Centre for Vocational Education Research.

Chart 7: Ratio of Apprentice Completions to Total Employment, Construction Trades 1987-2009



Reproduced from D Oliver (2011), Skill shortages in the trades during economic downturns National Centre for Vocational Education Research

European Research on Skills

Cedefop (2015). Skill shortages and gaps in European enterprises: striking a balance between vocational education and training and the labour market. Luxembourg: Publications Office

Why are employers faced with significant difficulties in recruitment at a time when the European workforce is the most highly qualified in its history and is characterised by high un(der)employment?

The coexistence of high unemployment and unfilled vacancies in the post-crisis era is indicative of declining matching efficiencies in EU labour markets. Many observers have attributed such inefficiencies to skill mismatches, which arise primarily for lack of work experience and of appropriate work-related skills (or employability) of (younger) individuals.

The inability of firms to attract the 'right' workers and fill their vacancies may arise for many reasons other than genuine shortages of skill: unattractive wages, poor and precarious working conditions, lack of career prospects, geographic and other administrative barriers, such as lack of international recognition of qualifications. To encounter fewer difficulties in finding and retaining a skilled workforce, European companies must commit to offering high-quality apprenticeship places and good quality jobs, and take a long-term perspective to hiring and managing talent. This talent-management approach is dependent on widening the potential applicant pool (in particular females, older individuals and migrants) and on strengthening the internal talent pipeline.

Some commentators have argued that employers' difficulties in filling their vacancies are related to the fact that young graduates and individuals are ill-prepared for the skills demanded by modern enterprises. Skill mismatch in labour markets is therefore believed to be caused by structural shifts that have rendered the skills of individuals insufficient or irrelevant in relation to the rising demand for high-level skills in advanced economies. Others reject the proposition that there are skill deficits in the EU labour force and argue that the true reasons for firms' hiring challenges include the offer of low quality jobs, inadequate investment in employer-provided training or other inefficient human resource management practices.

Without additional information on the skill requirements of jobs, firms' recruitment efforts, wages and working conditions offered, or the typical time to fill a vacancy, it is very difficult to say whether the reported difficulties in hiring applicants with the desired skills are a sign of genuine skill shortages.

No strong evidence has been found to suggest that the skills of young students have declined over the past decade or that younger individuals are less skilled relative to older cohorts of individuals.

Too often employers also confuse skill shortage with a general lack of work experience or of work readiness on the part of young labour market entrants. Work readiness covers the set of desirable attitudes and behaviours for the workplace but such skills are often better acquired in work-based learning (such as apprenticeships), rather than in a school-based environment.

The difficulty in fill vacancies is an imperfect indicator of the extent to which an employer may be truly facing a deficiency of available skilled labour in the labour market. It has been shown that such an indicator may mask other important constraints faced by firms, such as the inability to offer a competitive wage, job offers characterised by poor working conditions or by precarious contracts and other administrative complexity.

Construction Skill Needs

Concerns for Skills Shortages in the 21st Century: A Review into the Construction Industry, Australia Michelle Watson, (Spotless Services Limited)

"The causes of skill shortages and skill gaps are often complex and multi-faceted with the specific causes varying with the industry and occupation"

The National Industry Advisory Body (2003) identified a diverse range of factors contributing to current and future skill shortages. These include: an ageing workforce and forthcoming retirement rates; changing skills required from various occupations; differences in demand and/or supply of skilled workers as a result of employment arrangements; poor educational qualifications translating into smaller and lower numbers of successful job applicants; inadequate apprenticeship rates and difficulties in attracting and retaining employees

"the apprentice training rate will often need to increase in order to resolve the skill shortage and meet new training needs associated with employment growth and to replace retirements and attrition".

When reviewing the correlation between an ageing population and skills shortages, attention was drawn to the high demographic trends of early retirement

seen within the construction industry. Concern was established, as an inadequate percentage of people are entering the industry, which do not accommodate for retirement losses.

Labour Mobility

One factor that can cause labour shortages and skill gaps in construction is leakage of workers to other occupations, industry or jobs. On this, the main findings of the research are as follows:

The Relationship between Construction Sector Employment and Mining Employment

The transferability of skills of construction sector workers mean that they are sought after by other industries, most notably mining. Consistently, mining is considered the sector most likely to compete for skills of construction workers.[70] Here, a distinction needs to be made between resource construction employment (the construction phase of mining infrastructure; and ongoing operational employment in mining, post this construction.

Resource construction employment grew rapidly during the investment phase of the resources boom in the early 2010s.[71] A range of sources suggest that this increase in resource construction employment largely drew on workers with experience in other types of construction, and that demand for their skills from other sectors is expected to be relatively strong in coming years. As a consequence, resource construction workers are generally expected to be able to find employment outside of the resources sector.

The majority of people who moved into resource construction jobs had previous experience in other types of construction. As a consequence, these workers have skills that should allow them to transfer back to non-resources sectors, such as residential and civil construction. The smoothness of this transition will also depend, in part, on geographical labour mobility, as many relevant job opportunities will lie outside of Western Australia and Queensland where most resource construction workers currently reside.[72]

Many employers reported losing workers to the resources sector during the investment boom period, especially from the construction, agricultural, manufacturing and business services industries. A large number of these workers apparently moved into resource construction on a short-term basis. Some workers returned after a few months, typically before construction projects were complete. There appears to have been frequent turnover of on-site labour. Part of that reflected the reportedly high level of **voluntary turnover** in the industry. In addition to this, resource project construction usually occurs in stages, each lasting a few months and requiring different skills (such as earthmoving, construction of on-site infrastructure and assembly).[73]

Resource construction firms reported that they had a strong preference to hire experienced and qualified workers, with opportunities for low-skilled workers or first-time job seekers fairly limited.

The skills required for **resource operations** are quite different from those required during construction, though there is some overlap. In particular, operational workers are generally much more likely to be professionals and machinery operators and drivers, while resource construction workers are more likely to be technicians and trades workers.[74]

The most commonly cited barrier to moving from resource construction to other industries is the high wage expectations of these workers.

The construction phase of major resource projects is very labour-intensive and requires significant numbers of employees to commence work straight away to ensure projects are completed on time and on budget. Without this timely access to employees, projects cannot be built and sustain ongoing employment opportunities during their operational phase. In this context employers will require significant numbers of work-ready candidates who already possess appropriate licensing requirements.[75]

Civil Construction employees work in busy work sites within a complex, dynamic, unpredictable, and intensely competitive industry sector. Training is constrained by a sector dominated by subcontracting and casual employment. Workers are increasingly required to have

[70]Especially for civil construction workers, as confirmed by CITB Sectors Committee feedback, November 2018.

[71]Labour Movements during the Resources Boom.

[72]ibid.

[73]ibid.

[74]ibid.

[75]Georgina Atkinson and Jo Hargreaves, National Centre for Vocational Education Research, An exploration of labour mobility in mining and construction: who moves and why.

skills in project management, business skills, customer service, and new technologies. In the case of new technologies, some workers need specialist knowledge on new construction materials and skills in computer-based applications in design, procurement, communication and management. Workers also need to be aware of occupational health and safety, regulatory and licensing requirements that are relevant to their jobs.[76]

Construction Labour Mobility More Broadly[77]

Labour mobility is part of a well-functioning labour market and is a relatively common phenomenon in Australia. The Australian economy, during its various cycles, often experiences both labour and skills shortages.

When the labour market is buoyant, competition for workers is high and poaching is common. This can lead to cycling through the same group of workers and an increase in the temporary movement of workers, especially those who have the desired skills and experience.

Why do people leave of stay in jobs, industries or occupations?

Workers leaving the firm may be:

- leaving to start a new job in the same occupation (intra-occupational job mobility, or job churn)
- leaving to start a new job in a different occupation (occupational mobility)
- entering unemployment
- leaving the labour market to retire, for family reasons, because of ill health or for other personal reasons.[78]

Table 13: Percentage of Workers Leaving a Trade, 1994 and 2008, males

Occupation	Weak economy (1994)	Strong economy (2008)
All trades (no technicians)		
Job stayers	78.2	78.1
Moving to same occupation or losing and going to same occupation	9.2	10.1
Losing for different occupation, unemployment or out of the labour force	8.4	4.5
Moving to different occupation, unemployment or out of the labour force	4.2	7.3
Engineering and automotive		
Job stayers	80.8	79.6
Moving to same occupation or losing and going to same occupation	8.2	9.9
Losing for different occupation, unemployment or out of the labour force	7.4	4.1
Moving to different occupation, unemployment or out of the labour force	3.6	6.5
Construction		
Job stayers	69.7	77.1
Moving to same occupation or losing and going to same occupation	12.6	11.3
Losing for different occupation, unemployment or out of the labour force	13.6	4.5
Moving to different occupation, unemployment or out of the labour force	4.1	7.1
Electrical		
Job stayers	85.8	79.4
Moving to same occupation or losing and going to same occupation	6.5	9.0
Losing for different occupation, unemployment or out of the labour force	4.3	4.6
Moving to different occupation, unemployment or out of the labour force	3.4	7.0
Food		
Job stayers	66.3	69.1
Moving to same occupation or losing and going to same occupation	17.5	16.9
Losing for different occupation, unemployment or out of the labour force	9.2	2.9
Moving to different occupation, unemployment or out of the labour force	7.1	11.1

Note: Because of differences between the ANZSCO classification used in 2008 and the ASCO classification used in 1994, we exclude technicians from the 2008 analysis and exclude categories that cannot be easily matched between 1994 and 2008.

Taken from Skill shortages in the trades during economic downturns National Centre for Vocational Education Research, 2011.

[76]Dr Sandra Haukka, Australian Research Council Centre of Excellence for Creative Industries and Innovation, Queensland University of Technology, Brisbane, Australia.

[77]ibid.

[78]Taken from *Skill shortages in the trades during economic downturns National Centre for Vocational Education Research, 2011.*

After an initial peak of tradesworkers leaving the occupation shortly after completing apprenticeships, occupational attrition stabilises.

Where the trades differ from the professions is that people continue to enter the professions as they age, replenishing the stocks of workers leaving professions, whereas the supply of trades workers is much more front-loaded.

Table 14: Percentage of a Cohort Remaining in a Job and Occupation by Period since Entry, for Trades Only, 2008, Males

Occupation	Job retention			Occupational retention		
	Age 20	Age 25	Age 35	Age 20	Age 25	Age 35
Engineering, ICT and science technicians	100	29.7	9.9	100	27.3	6.6
Automotive and engineering trades workers	100	37.6	20.7	100	58.5	24.2
Construction trades workers	100	40.3	24.5	100	66.4	34.9
Electrotechnology and telecommunications trades workers	100	41.2	23.1	100	55.2	20.1
Food trades workers	100	28.5	14.3	100	52.5	19.6
Skilled animal and horticultural workers	100	47.4	19.7	100	49.3	13.6
Other technicians and trades	100	40.8	15.0	100	55.0	18.0

Taken from Skill shortages in the trades during economic downturns National Centre for Vocational Education Research, 2011.

Apart from pay, there are many employment-based reasons for changing jobs, some tangible (working hours and employment security), others intangible.[79]

When it comes to reasons for changing jobs, most people do so because they are dissatisfied and want to find a better job. This includes satisfaction with the level of pay, job security, the nature of work, the hours of work, and the flexibility to balance work and life commitments.

Mobility also reflects competition between industries, when one industry (for example, mining) attracts its workforce by offering higher wages, benefits and flexible working arrangements, in order to attract labour from other industries, which struggle to retain their own workers.

[79]Taken from *Skill shortages in the trades during economic downturns National Centre for Vocational Education Research, 2011.*

Voluntary and Involuntary Job Separation

Involuntary job separation, which accounts for about one-third of job change, is initiated by employers and includes retrenchments and the end of temporary jobs. Voluntary job separation, which accounts for the other two-thirds and the majority of job changing, is initiated by employees and includes those who resign to look for other work, or resignations for personal or lifestyle reasons. Over the past two decades, there has been a decrease in involuntary job change, which is reflective of the more buoyant labour market during that time.

Job changers are fairly mobile when it comes to changing occupation and/or industry. Of those who change jobs:

- Only about a quarter to a third changes their employer and stay in the same kind of job;
- Around one-fifth changed their industry but kept the same occupation; and one-tenth changed occupation but stayed in the same industry.
- Around 30% changed both industry and occupation.

Qualified tradespeople in construction have particularly high retention and low attrition in their trade, more so than construction labourers.

Distinction needs to be made between churn and attrition. Employers often think that attrition has gone up, but in reality it is job churn, as people move between employers without changing their occupation.

Looking at occupational mobility in three industries — construction, automotive and aged cared — in Queensland, Haukka (2011) finds that **labourers** working in the construction industry are much more likely to change their occupation and the industry they work in than are qualified tradespeople. For those tradespeople who did report working in a different occupation, most still worked in occupations related to construction.

Comparing construction with the two other sectors, aged care and automotive, the Haukka report found that people working in construction (excluding labourers) **were much less like to have any intention to change either occupation or industry.** However, workers in the construction industry had just as much intention of changing their employer as did those in the other industries.

Overwhelmingly, **younger** workers are more likely to change jobs than older workers. Roughly 20% of job changers are between the ages of 20 and 24. Workers aged younger than 30 years are almost twice as likely to change jobs compared with workers in their 50s and over.

In bad times more tradespeople lose their jobs and **exit from that occupation**, while in good times more tradespeople **leave their jobs for other occupations**. A point of interest is that the pattern of job mobility changes, with many employees **leaving one job for another in the same occupation in the good times.** Thus, from an employer's point of view attrition has increased, but from the occupation's point of view such a pattern is better thought of as job churn rather than attrition.[80]

Attrition in the trades[81]

Shortages in an occupation are as much related to the rate at which individuals leave the occupation as the rate at which the occupation attracts new entrants.

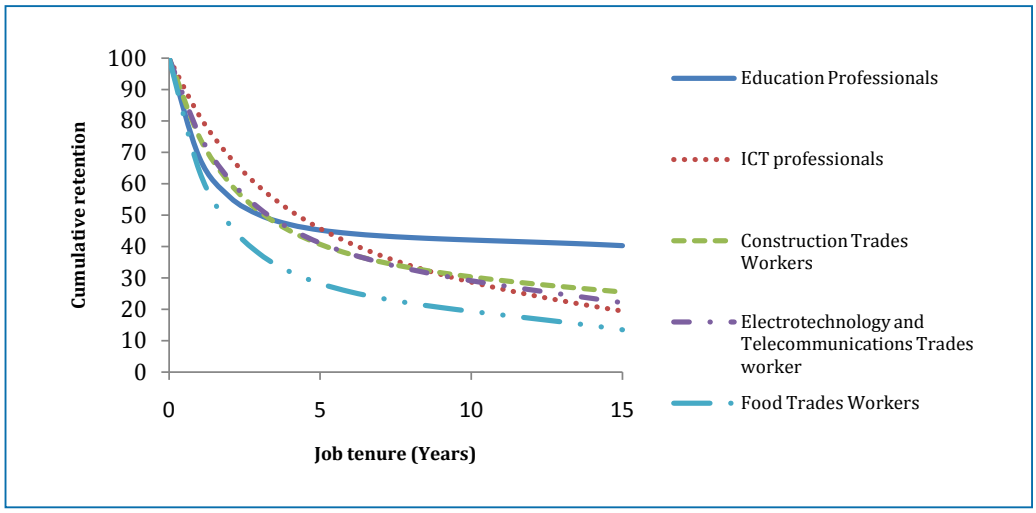
Job and occupational mobility in the trades is not particularly different from that experienced in the professions, although there is considerable variation across the trades (and across the professions).

Net attrition occurs in the trades once age cohorts reach 25 years.

[80]Tom Karmel Patrick Lim Josie Misko, Attrition in the trades NCVER MONOGRAPH SERIES 07/2011.

[81]ibid.

Chart 7: Cumulative retention rates in a job for commencing individuals in selected occupations(a) by years of job tenure, males



Source: Tom Karmel Patrick Lim Josie Misko, Attrition in the trades NCVER MONOGRAPH SERIES 07/2011.

Less than half of people are with the same employers after five years, apart from the educators.

The construction industry trades have a **consistently low rate of attrition** that is similar to a number of the professional occupations. Second, the patterns are quite stable by age, with a tendency for the probabilities of leaving an occupation to decline with age (consistent with Shah & Burke 2003), although they do pick up at age 50 in a number of the occupations.

After 15 years we see that in every occupation there is less than 50% of an entering cohort remaining. Again, there is quite a bit of variability across occupations. Among the trades, those with the least attrition are construction, automotive and engineering, electrotechnology and telecommunications trades workers and, perhaps surprisingly, the food trades.

Our conclusion, that attrition in the trades is not such an issue, implies that inadequacies in labour supply should be the focus if skill shortages emerge. However, entrants into the trades could be either apprentices or ex-tradespersons.

Job Mobility[82]

Labour markets are inherently dynamic: at any one time people are changing jobs, moving in and out of the labour market, losing jobs, getting jobs after spells of unemployment, or getting jobs after periods out of the labour force.

- People with post-school qualifications are less likely to be mobile than those without. The people most likely to be mobile are young. This is neither surprising nor necessarily a problem. Young people tend to have few commitments and often desire the flexibility that will allow them to decide on their career path.
- People working in casual jobs or in small enterprises with limited career prospects experience greater mobility, while those with post-school qualifications are more likely to change jobs but not occupations.
- Most people change jobs because they dislike the one they have.
- The Australian labour force is highly flexible. While the measures might not be perfect, workers seem more likely to change jobs than in almost all other OECD

[82]Richard Sweet The mobile worker: concepts, issues, implications.

countries. Around 10% or more change their job each year, and of this number perhaps three in four change their industry, their occupation or both., These figures do not suggest that Australia has a significant labour mobility problem.

- Most people who leave their job do so when they are under the age of 35 years
- Labourers are twice as likely to change their occupation within a 12-month period as are technicians and tradespersons.

Mobility that does involve industry or occupational changes has implications for, among other things, skill and qualifications portability and flexibility, and hence for the breadth, nature and training content of qualifications. Potentially such changes can have wider implications for issues of retraining, career change and occupational rehabilitation.

Occupational mobility in Queensland's Aged Care, Automotive and Civil Construction sectors[83]

Dr Sandra Haukka, Australian Research Council Centre of Excellence for Creative Industries and Innovation, Queensland University of Technology, Brisbane, Australia.

In 2009, only one in three VET graduates in Australia ended up working in an occupation for which they were trained. This implies that VET enhances the employability of its graduates by equipping them with the knowledge and competencies to work in different occupations and sectors.

Research Findings

- Mobility declines with age. Young people are most likely to change occupations, experiencing intense job shopping and job search activities early in their careers (Shah 2009:11).
- The longer workers stay in a particular occupation, the less likely they are to change occupations.
- Workers with lower levels of skills and knowledge (e.g. sales and service workers) are significantly more likely to change occupations than workers with higher levels of skills and knowledge (e.g. professionals) who tend to make a job-to-job change in the same occupation.
- Workers in industries such as accommodation, hospitality, retail trade, communication services, and mining are most likely to change occupations, due to some extent to the large number of young people working in these industries and the seasonal nature of some of these industries.
- Males are more likely than females to move into different, higher paid occupations, which can be attributed to differences in preferences and opportunities for occupational movements.
- Non-married workers, part-time workers, and workers from non-metropolitan areas experience higher levels of occupational mobility.
- Workers with higher levels of investment in firm-based human capital (i.e. employed in firms where the level of training is high) experience lower levels of occupational mobility.
- Workers are most likely to change occupations when demand for other occupations is high. They may remain in their current occupation or be forced to change occupations during periods of high unemployment to ensure job security.
- Labourers were more likely than other participants from the Civil Construction sector to work in an occupation and industry that were different to their previous occupation (46.4%) and industry (39.3%). Other Civil Construction workers (e.g. tradespersons) indicated low levels of occupational mobility, with only 12.5% working in an occupation that was different to their previous occupation and 15.6% working in an industry that was different to their previous industry of employment. Those participants who reported previously working in a different occupation mainly worked in related occupations such as carpenter, mechanic, drainer operator, and boat builder.

This study found that workers in the sector vary in terms of their occupations, qualifications, participation in work-related training, employment type (business, self-employed), and mobility patterns. What participants seem to have in common is working for income-related reasons. This can result in skilled workers moving into related and unrelated occupations with higher wages as well as workers withdrawing from training or not pursing training because they can secure higher wages without having the necessary qualifications and training.

For example, factors associated with a higher likelihood of occupational mobility for participants were 'marital status of never married, 'engaged in work-related Certificate', 'previous occupation temporary/casual', and 'penalty rates/bonuses'. Factors associated with a lower

[83]Dr Sandra Haukka, Australian Research Council Centre of Excellence for Creative Industries and Innovation, Queensland University of Technology, Brisbane, Australia.

likelihood of 15 occupational mobility for participants were 'age', 'educational attainment of part Certificate', 'hours worked', 'years worked', 'years worked after returning to the workforce', 'pay above award with current employer', and 'promotional opportunities/higher income/sufficient income with current employer'.

Apprentice Pipeline

Jens Mohrenweiser and Thomas Zwick, Why Do Firms Train Apprentices? The Net Cost Puzzle Reconsidered, Centre for European Economic Research.

It is necessary to discriminate between different groups of occupations when assessing the costs and benefits of apprenticeship training. In particular, we find that the share of apprentices in trade, commercial, craft and construction occupations has a positive impact on contemporary gross profits and the apprentices are substitutes for unskilled or semi-skilled workers. In contrast, an increase in the share of apprentices in the manufacturing occupations reduces contemporary gross profits. This means that enterprises offering apprenticeships in manufacturing occupations do not cover their training costs during the apprenticeship period. The apprenticeship training rather is a human capital investment.

Jens Mohrenweiser, Thomas Zwick, and Uschi Backes-Gellner, Poaching and Firm-sponsored Training: First Clean Evidence, Centre for European Economic Research.

This paper solves the empirical challenges to identify poaching and shows that around three per cent of the German apprenticeship training firms are poaching victims. Poaching is more likely to be observed in large firms that pay high earnings, whereas smaller firms that pay lower earnings are able to retain their most productive apprenticeship graduates. We conclude that the overall importance of poaching on expected returns to apprenticeship training and firms' training decisions seems to be negligible.

Firms are more likely to poach employees during an economic downturn. Training firms respond to poaching by lowering the share of new apprentice intakes in the following years.

If poaching occurs, the training firm loses its training investment and the raiding firm can meet its skill demand without paying for training. Consequently, poaching and the threat of poaching can lead to underinvestment in training by firms concerned about losing their investment. Theoretical models predict a coexistence of poaching and firm-sponsored general training – training costs pay off because the poaching probability is small and the majority of trainees stay with the training firm.

Mieschbuehler, R. and Hooley, T. (2016) 'World-Class Apprenticeship Standards: Report and Recommendations', Derby and London: International Centre for Guidance Studies (iCeGS), University of Derby and Pearson Education UK.

The cost of apprenticeships is generally shared between employers and the government as well as apprentices, who are prepared to work on low salaries for the duration of the training.

Identifying and applying standards in apprenticeships is important because apprenticeship training, especially if delivered at a world class standard, can raise the number of people in employment, increase individual and company productivity and enhance economic growth. The findings from our research suggest that world class apprenticeship standards require:

- extended apprenticeships of between three and four years
- broad and in depth scientific and industrial skills and knowledge
- the presence of a 'master' in the company to train an apprentice
- high quality knowledge based education and training
- recognition through an occupational title on completion of the training
- apprentices to acquire all the skills and knowledge necessary to work effectively in an occupation
- apprentices to become skilled workers in an occupational area with a critical and creative approach and
- progression routes into employment as well as into further education and training

Financial arrangements vary significantly between countries but there is generally assumed to be a 'pay back' for employers which means the low wages at the beginning of an apprenticeship compensate the employer for the investment, training and low productivity that comes with employing an apprentice and that an apprentice's wages rise along with their productivity. In well-functioning apprenticeship systems such as, for example, Germany, Denmark and Switzerland, employers

can expect that their investment will be paid back by the end of the training period

The four areas that were considered in this report and to which the thirteen indicators that were identified are allocated are: (1) training, (2) skills and expertise, (3) recognition and (4) progression.

Apprentice Training and productivity growth – a case study of the Australian Construction Industry – Will Chancellor and Malcolm Abbott

A large intake of apprentices—everything else being equal—will lead to a higher proportion of qualified workers, resulting in an improvement in productivity

The quality of education in compulsory schooling is fundamental for developing higher-level workforce capabilities because achieving high academic standards within a country and for the largest proportion of school students supports high participation in post-school education and training.

Competence-based training was introduced in Australia in the late 1980s and it has been claimed that it led to poorly specified standards in apprenticeships because it shifted the point of reference to the individual workplace and 'strangled' the world-class system Australia had (interview Toner, 015). Training packages that specify the 'knowledge and skills that are meant to be required in apprenticeships exist, but they are 'specified in a very broad way' and 'subject to hugely different interpretations as to the actual requirements' (interview Toner, 2015). Too broadly defined training packages are a 'specific design feature of competence-based training' because they tried to be 'non-prescriptive' and to retain flexibility in training in order to 'meet the needs of the workplace'

Progression into employment on completion of an apprenticeship is indicative of the quality of an apprenticeship and of the satisfactory conclusion of an apprenticeship. It can be 'seen as being a bit of a waste in terms of both public and private investment if people shift to a radically different occupation' or are unable to find employment (interview Toner, 015)

Appendix 2: Australian Bureau of Statistics Definition of the Construction Industry

The ABS definition of construction is industry-based, not occupation-based. Therefore, if a person works in a traditional construction trade like carpentry, but the company's main activity is in the mining sector, then the worker is defined as working in mining. Conversely, a non-trade-based employee (such as a receptionist) working for a construction firm is classified as being employed in the construction industry.

Apprentices/trainees[84] are classified by the ABS as being employed by the industry of their employer. Therefore, a person undertaking a business management traineeship through a direct indenture with a construction company is classified as working in the construction industry, but a person undertaking a carpentry apprenticeship directly with a mining company is defined as working in mining.

All apprentices employed through Group Training Organisations (regardless of their vocation) are all defined by the ABS as working in the Administrative and Support Services industry division (under Employment Services).

[84] In this report, apprentices or trainees are referred to as 'apprentices' for simplicity.

Appendix 3: Apprentice Support - CITB-Supported Vocations

Qualifications
Certificate II
Civil Construction
Steel Frame Installer
Certificate III
Electrotechnology Electrician
Carpentry
Air-conditioning and Refrigeration
Bricklaying/Block-laying
Cabinet Making (Kitchens and Bathrooms)
Carpentry and Joinery
Civil Construction
Civil Construction (Plant Operations)
Concreting
Data & Voice Communications
Demolition
Power Systems - Distribution Overhead
Power Systems - Transmission Overhead
Fire Protection
Flooring Technology
Gas Fitting
Glass and Glazing
Joinery
Painting and Decorating
Rigging
Roof Plumbing
Roof Tiling
Scaffolding
Shopfitting
Solid Plastering
Steel-fixing
Stonemasonry
Wall & Ceiling Lining
Wall & Floor Tiling
Waterproofing
Certificate IV
Building
Site Management
Civil Construction Operations
Civil Construction Supervision

Appendix 4: CITB's Construction Worker Definition

On CITB's TALAS database people are classified as follows:

- Approved
- Declined
- Expired
- On hold
- Pending.

For the purposes of this report and from CITB's database, 'active' construction workers are defined as follows:

- All **approved** construction workers. A construction worker is approved if they are working for an eligible company and have received subsidised short course training in the past four years.
- Declined workers who work in **high relevance** companies also. There are several reasons why someone may have their eligibility application declined. In some cases, CITB deems the worker eligible but the applicant may not have got back to CITB with requested information by a certain period of time. In that case, the system automatically classifies them as being 'declined'.
- Some in the **'expired'** category. If a person was previously approved but has had no further contact with CITB (in terms of subsidised training) for four years or more, they are automatically classified as being expired; Therefore, in CITB's database construction workers who were classed as expired more than 20 years ago and have likely left the industry or retired; as well as people who recently expired because they have not applied for CITB-subsidised short course training in that time. These 'newly expired' construction workers are most likely still actively working in the industry. Therefore, anyone who has been classified as expired in the past 4 years is assumed to be active and is included in our calculations, as long as they work for a High Relevance company. Some working with a medium relevance company, were included depending on their occupation.

Further definition was applied regarding age, excluding anyone aged under 17, or over 70. As the analysis is focused on construction workers, current apprentices in training (accounting for more than 5,000 people) were also excluded from the analysis.

Notes

CONSTRUCTION INDUSTRY TRAINING BOARD
78 Richmond Road, Keswick SA 5034
(08) 8172 9500 | citb.org.au

CITB