

# PERFECT FOR A WOMAN

Increasing the Participation of Women in Electrical Trades

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*...perfect for women*

## **Increasing the Participation of Women in Electrical Trades**

### **Summary**

This report suggests a new approach to increasing the participation of women in electrical and other traditionally male trades. It is based on a fresh look at the relevant literature, previous commissioned research work by the research team and on our recent study into the participation of women in electrical and electrotechnology trades.

Over the last three years Victoria University's Work-based Education Research team has undertaken a series of studies into the recruitment and retention of women in traditionally male trades such as automotive and electrical. In our most recent research we investigated the experiences of tradeswomen and female apprentices in the electrical and electrotechnology industry. Stakeholders in this industry including tradeswomen's networks, employers, unions, other industry organisations, have initiated actions to increase the participation of women in electrical trades. Despite these efforts, the number of women in training for electrical trades has not risen above 2% in the last ten years. The purpose of our work is to assist industry stakeholders to increase the participation of women in electrical trades roles and, potentially, to develop a knowledge base that other industries seeking to decrease occupational gender segregation may use.

Learning from published reports of recent successful approaches to solving complex problems like that of increasing female participation in traditionally male occupations, the research team used a socio-ecological model to investigate, analyse and understand the experiences and perceptions of female apprentices, tradeswomen and their employers. We looked at the whole social ecosystem which influences the recruitment and retention of tradeswomen.

The ecological approach has produced deep insights into the breadth of factors that influence the recruitment and retention of electrical tradeswomen. It strongly indicates that previous interventions have failed because (i) the interventions have not addressed the core problem of culture and behaviour, and (ii) stakeholders have not taken the needed holistic approach, have acted alone and often have been unable to sustain their interventions. Our findings suggest that the best approach to change must be collaborative and could be based on a *site-based saturation* approach: a comprehensive, coordinated, change program initially involving all stakeholders at a limited site in sustained, shared, reinforcing change actions.

We recommend that committed stakeholders work together to pilot a series of site-saturation programs. Within each pilot site the important stakeholders: tradeswomen's networks, employers, unions, Registered Training Organisations, would work together on a sustained program of change. While the core of such a program would be cultural and behavioural change, the following actions must be prioritised:

1. Government and/or industry investment in: the development/adaptation of cultural change programs such as respectful relationships education, piloting and evaluation of pilot programs, coordination of stakeholders to achieve mutually reinforcing action.
2. Cultural and behavioural change programs in workplaces and training organisations.
3. Implementation of incentives for employers to take on mature age apprentices since women are more likely to enter the trade at a later age.
4. Re-design of apprenticeships to acknowledge the prior skills mature aged apprentices bring into the industry.
5. Employment selection processes which focus on the key attributes and capabilities needed to perform the job well, rather than on stereotyped ideas about what a tradesperson should look like.
6. Changes in workplace infrastructure such as: provision of well-fitting, appropriate uniforms and protective clothing for all employees, provision of appropriate toilets and sanitary bins including solutions for remote locations

7. Changes in work practices such as redesign of work protocols and equipment to ensure that employees of varying physical types can perform tasks
8. Changes in conditions for workers such as availability of part-time and flexible work hours including shifts to accommodate parental and other carers' needs, provision of paid parental leave
9. Significant work with schools to change perceptions of the value of apprenticeships generally and of the opportunities traditionally male trades such as electrical can offer women

*Note on terminology:*

*Throughout this report we use the phrase 'electrical trades' to refer to all electrical and electrotechnology trades. Pseudonyms are used for all individuals confidentially interviewed as participants in this study. Pseudonyms are also used for any individuals or organisations mentioned by the participants in their confidential interviews.*

## 1. Introduction

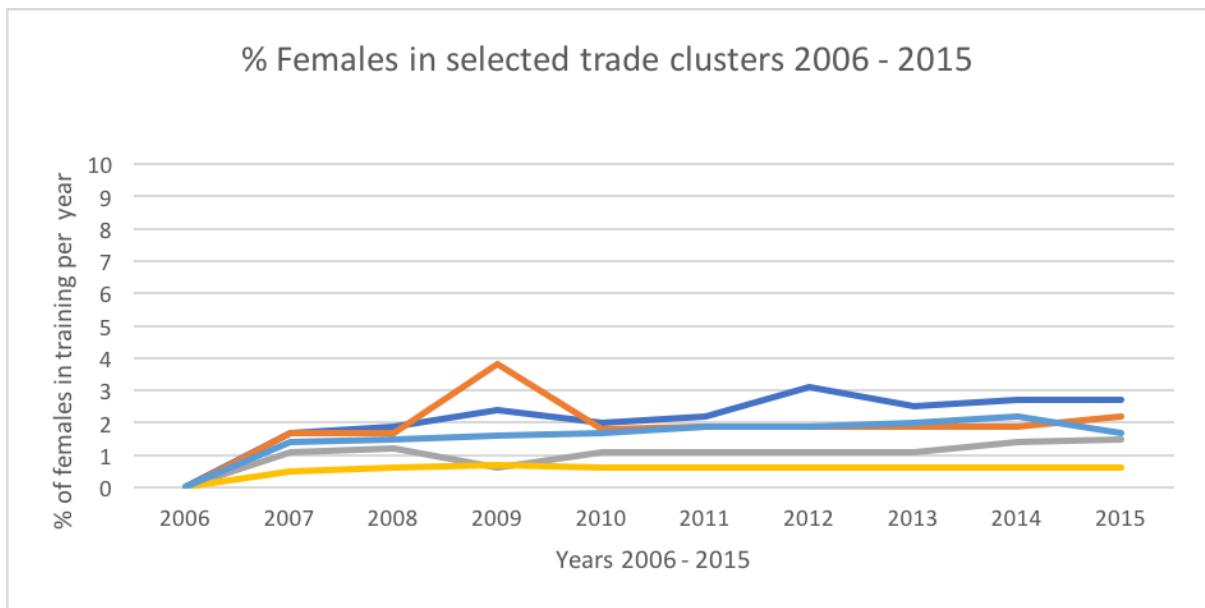
In Australia, female participation rates in traditionally male trades have remained stubbornly low despite decades of interventions (Smith, 2013). The 2011 report *Apprenticeships for the Twenty-first Century* concluded that '...despite a number of initiatives undertaken by governments and industries, such as the Queensland Government's *Women in Hard Hats* and Group Training Australia's *Gender on the Agenda*, very little progress has been made' (McDowell et al., 2011). Since that publication there has been no improvement as Figure 1 below shows. This figure is based on data provided to the project by the National Centre for Vocational Education Research in 2016. It shows female apprenticeship levels for selected traditionally male trades from 2006 to 2015. Note that the proportion of females in electrical trades, nationally sat at around 2% over this ten year period.

Details of commencements and completions by state and nationally for the 10-year period is provided in Appendix Three. The average national commencement and completion rates for female electrical and electrotechnology apprentices over this period were both 2% of all apprentices. This suggests that female electrical apprentices are completing their apprenticeships at the same rate as males; a

conclusion supported by E-Oz data (personal communication Bob Taylor and Melinda Hill, E-Oz 22 September 2016).

*Figure 1: % of female apprentices in training per annum for selected trades from 2006 – 2015*

This chart shows the proportion of female apprentices, as a percentage of all apprentices, in training each year from 2006 to 2015 for five groups of traditionally male trades identified in the legend below.



*Legend – the numbers refer to national qualification identifiers*

	321 Automotive Electricians and Mechanics; 324 Panel Beaters, and Vehicle Body Builders, Trimmers and Painters		322 Fabrication Engineering Trades Workers; 323 Mechanical Engineering Trades Workers
	341 Electricians; 342 Electronics and Telecommunications Trades Workers		331 Bricklayers, and Carpenters and Joiners; 332 Floor Finishers and Painting Trades Workers
	334 Plumbers		

## 1.1 Why gender segregation in electrical trades matters

Gender inequality in electrical trades means that individuals, businesses and the industry are missing out. First, for individual women, increased access to electrical trades jobs would unlock opportunities for interesting work, above average remuneration (Corliss & Lewis, 2012) and varied career prospects:

For me, a big one was you really do feel like you're contributing something, to community, to people. So, it's really rewarding when even if it's something small as putting in a new power point for somebody versus when I was with XXX, we'd build whole substations. There's chamber substations, there's zone substations to power a whole building or a whole suburb. So, it's pretty cool driving round in your community and seeing things that either you've built or contributed to or whatever (Carolyn, electrician).

Electrical trades jobs offer women much needed access to one of Australia's 'highly paid and secure industries' called for in the Australian Human Rights Commission's March 2017 publication *A conversation in gender equality* (Australian Human Rights Commission, 2017).

Second, many researchers have reported that employers who recruit more women not only have access to more potential employees but to skills that tend to be scarce in male-dominated workforces such as improved communications and customer relationships, better team work, work processes, and problem-solving (Department of Family and Community Services Women NSW, 2013; Schuck, 2014). Internationally and in Australia, research demonstrates that increased employment of women improves business productivity by broadening the range of capabilities available in a workplace. For example, Goldman Sachs have calculated that the rise in female labour force participation between 1974 and 2009 improved Australia's economy by 22% and that closing the gap between male and female labour force participation rates could boost the Australian GDP by 11% (Toohey, Colosimo, & Boak, 2009). These views are supported by employers of tradeswomen we have interviewed for this and previous studies (unpublished work conducted for Auto Skills Australia included interviews with 42 employers, 17 automotive tradeswomen and 26 female apprentices). They reported that women in trades roles are more organised and better problem solvers than males. Such a view was expressed by Fiona who works as the apprentice



recruitment coordinator for a large electrical industry group training organisation (GTO). She is responsible for selecting approximately 80 electrical apprentices each year and told us:

Our contractors say yeah, this person is really - they're just switched on. They know what they're doing. They've researched. They know what they're doing before they get to site. They've got all their tools. They're ready to go. We always have that comment come back from the female apprentices that we send out.

Another reflection comes from Michael, the General Manager for a state branch of a large national electrical contracting company which unusually employs 20% female in trades roles:

...my personal experience has been that the working with female tradespeople and apprentices is they're - they have been incredibly diligent. They have been the ones that came off the tools - as you say - and came into the office. Became great managers - project managers and CAD drafting people - and they built their careers from the tools through into the office.

Gender segregation in many Australian industries contributes to Australia's poor gender gap ranking, 46<sup>th</sup> out of 144 participating countries, in the 2016 World Economic Forum *Global Gender Gap Report* (Wadhwa & Farquhar, 2016; World Economic Forum, 2016). Each gender segregated industry represents individuals and businesses that are failing to reach their potential.

Finally, as many researchers have shown, traditionally gendered workplaces can be associated with rigid attitudes to gender roles reflecting and reinforcing community and societal stereotypes about masculinity and femininity (Australian Human Rights Commission, 2017; E. Butler, Clarke, & Simon, 2014; Our Watch, 2015). There is now ample evidence that such attitudes can be associated with cultures that disrespect women and male peer relationships that nurture aggressive behaviours (Our Watch, 2015). In this report we use the terms 'traditionally masculine culture' and 'traditionally masculine behaviour' to refer to cultures and behaviours that reflect stereotyped beliefs about male and female roles, disrespectful attitudes towards women and overly aggressive male interactions. The consequences of such cultures were highlighted by the 2016 Victorian Royal Commission into Family Violence which reminded us that there is a strong direct link between rigid beliefs about gender roles and support for, and perpetration of, violence against women (Royal Commission into Family Violence (Victoria), 2016; VicHealth, 2014). Another example of social harm associated with

traditionally masculine workplace cultures is the high suicide rate among construction workers aged 15 to 24 which is ‘...more than two-times the Australian male 15-24 year old rate’ (Heller, Hawgood, & De Leo, 2007, p. 109). This has been partially attributed to traditionally masculine workplace behaviours such as tolerance of bullying, ‘...particularly directed towards apprentices and those new to the industry’ (Heller et al., 2007, p. 113). The persistence of traditionally masculine workplace cultures in traditionally male trades is concerning in this context.

### A contrary view

Some researchers and commentators support the view that many women prefer and choose to work in traditionally female occupations and that since this choice is exercised freely the resulting gender segregation is not discriminatory. For example, Dockery and Buchler’s 2015 study examined the relationship between occupational gender segregation and women’s job satisfaction by analysing data collected through the annual Household, Income and Labour Dynamics in Australia (HILDA) Survey (Melbourne Institute, 2017). These researchers concluded that women do gravitate towards ‘women’s work’ but not necessarily because they prefer this type of work. The researchers emphasised that the evidence reveals a complex picture, framed by the male breadwinner tradition, in which women’s choices seem to be influenced by their (i) need for part-time and flexible work to accommodate traditional female caring responsibilities and (ii) societal norms that consider women’s work and incomes as ‘secondary to that of their male partner’s’ (Dockery & Buchler, 2015, p. 1). Consistent with this analysis, they found that younger and unmarried women without caring responsibilities were more likely to exercise occupational choices like men’s.

Our study has been undertaken in the belief that increased participation of women in electrical trades would be good for individual men and women, for businesses, for the industry and for the community and Australian society more generally. It demonstrated the importance of two neglected foci for change:

- A focus on sustained and collaborative action on the part of all stakeholders involved in recruiting and retaining tradeswomen, and
- A focus on cultural change in workplaces and associated sites such as Registered Training Organisations (RTOs) and schools to ensure that women feel they belong in electrical trades workplaces.

## 1.2 Why repeated interventions have failed

Many Australian and international researchers have identified the barriers to female participation in traditionally male occupations including electrical trades. The Australian Human Rights Commission summarised these findings in its 2013 publication *Women in male-dominated industries: A toolkit of strategies* as follows:

- lack of exposure to women working in male-dominated industries early in life;
- stereotypes and bias against women working in such trades, starting early and reinforced at school;
- negative perceptions of the industry and a lack of awareness of opportunities and career paths such trades offer;
- stereotypes and myths about women in male dominated workplaces and women's supposed lack of the capabilities and qualities women needed to perform the work;
- workplace cultures which are non-inclusive, traditionally masculine or 'blokey' with a higher tolerance of inappropriate behaviours – such as bullying, aggression and objectification of women;
- biases against recruiting, developing and advancing the careers of women in male dominated trades;
- workplace practices and issues such as unavailability of flexible employment opportunities, appropriate workplace facilities and uniforms (Australian Human Rights Commission, 2013)

The depth and breadth of this list of barriers helps explain the persistence of low rates of female participation in occupations such as electrical trades and is unsurprising since stereotyped gender attitudes are deeply embedded throughout Australian society and, consequently, in its workplaces. To explain the continuing failure of interventions aimed at increasing the participation of women in male-dominated trades the research team used a socio-ecological model to investigate, analyse and understand the experiences and perceptions of female tradeswomen and their employers. Socio-ecological models have been used to understand and address complex problems deeply rooted in societal beliefs and norms and previously have been used to understand gendered career choices (Cook, Heppner, & O'Brien, 2005; Hickey, Harrison, & Sumsion, 2012). This approach, little used to analyse women's choices respecting traditionally male trades in Australia, offers new insights and new opportunities for change.

Socio-ecological models consider that complex problems such as changing female participation in traditionally male occupations are influenced by the whole social

ecosystem of relationships, behaviours, cultures and practices that surround women who may be choosing to enter and then to remain in a trade. These multiple factors include women's *individual attitudes and capabilities* and their *immediate relationships* with family, friends, school teachers, employers and work colleagues. They also include *community and societal level* factors that influence the experiences women have within male dominated traditional trades. As investigators, we looked at the whole social ecosystem which influences the recruitment and retention of tradeswomen.

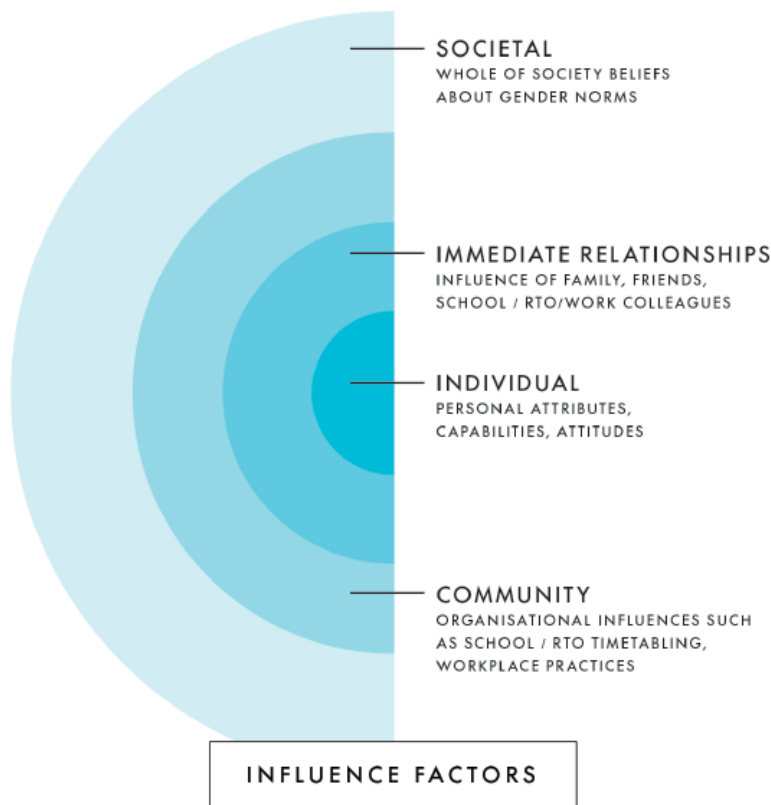
Children are believed to develop gender identities by age two to three and consequently their career aspirations are gendered at a very early age (Hutchinson, Moore, Davies, Thomas, & Marriott, 2013). Societal attitudes towards gender infuse every aspect of a young woman's life including her relationships with her family, friends and teachers, and the images she sees in the media. Hence career decision-making is strongly constrained by '...deeply ingrained cultural attitudes about what is appropriate work for women and for men' (Elaine Butler, Woolley, Shewring, & Women in Adult and Vocational Education (WAVE), 2011). These societal perceptions lead individuals to make gendered subject choices at school and to prefer gendered occupational choices. Similar perceptions can also lead employers to make discriminatory recruitment choices.

Taking an ecological perspective makes it clear that no single factor explains young women's career aspirations. Instead, young women's career choices are seen to result from the interplay of multiple variables that influence an individual's choice to enter and remain in an occupation. The ecological approach strongly indicates that previous interventions aimed at increasing the participation of women in traditionally male trades have failed because they have been short term and largely one-dimensional. It suggests that strategies to increase the participation of women in male occupations must, like the problem, be multidimensional and complex. This project used a simplified ecological framework developed by the World Health Organisation (Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002).

### 1.3 An ecological approach

The framework, illustrated in Figure 2 below, consists of four nested, interacting levels of factors that influence women’s occupational choices: the individual, their immediate relationships, their surrounding community and the wider society. It is important to note that the four layers of influences are interactive and dynamic. The interconnectedness of the levels helps explain the intransigence of problems with a socio-ecological basis such as increasing the participation of women in traditionally male trades (Kwok, 2013). The discussion that follows explains the factors that influence career choice and persistence in a chosen occupation for each level.

Figure 2: Ecological framework for trades occupations based on model developed by Krug et al. (2002)



## 2. Our Study

This study built on our own and others' previous work to develop a new approach to increasing the participation of women in traditionally male occupations. The data collection and analysis focused on tradeswomen's experiences which 'shed light' (Denissen, 2010) on why trades such as electrical remain male dominated despite attractive work and remuneration and many attempts at increasing female participation in these trades.

The study addressed the following questions:

1. What factors encourage or inhibit successful female participation in traditionally male trades?
2. What STEM background is typical of female apprentices and tradeswomen in the electrical and electrotechnology trades?
3. What impact do female trades employees have on the businesses that employ them?
4. What would a model look like for addressing the problem of how to increase the participation of women in electrical and electrotechnology trades?
5. How can stakeholders increase the recruitment and retention of women into traditionally male trades occupations?

Participants were undertaking (apprentices) or had completed (tradeswomen) trades qualifications which form part of the current Electrotechnology Training Package or its predecessor training packages (<http://training.gov.au/Training/Details/UEE111#>). Their qualifications prepared them for the occupation of *electrician* as categorised under the Australia and New Zealand Standard Classification of Occupations Minor Group 431 Electrician (<http://www.abs.gov.au/ausstats/>). We have used the phrase *electrical trades* throughout this report to refer to all licensed electrical and electrotechnology trades.

The study was primarily based on individual, in-depth interviews with members of the electrical and electrotechnology industries. Open ended questions were used '...to yield in depth responses about people's experiences, opinions, feelings and knowledge' (Patton, 2002, p. 4). Such an approach allows researchers to understand 'how and why things happen as they do' (Miles & Huberman, 1994, p. 10).

The participants consisted of 19 tradeswomen, 11 female apprentices, one discontinued female apprentice and nine employers of female apprentices or tradeswomen drawn from metropolitan, regional and rural locations in every state and territory except Tasmania. They worked in a mix of small, medium and large businesses representing many sub-sectors of the industry including residential, commercial electrical services, construction, mining and power.

With the participants' permission each confidential, hour long interview was recorded, de-identified, transcribed and thematically analysed using NVivo. In addition, demographic information on each participant was collected through a short verbal survey. The study also included analysis of quantitative data provided by the National Centre for Vocational Education Research (NCVER) for the period 2006 to 2015 showing numbers of apprentices in training, commencing and completing identified by state and gender for selected groups of traditionally male trades.

During our study, we spoke with other stakeholders in the electrical trades recruitment and retention process: TAFE institute and other RTO staff, a large electrical trades group training organisation, an electrical trades employer organisation and representatives of two electrical trades women's networks. We also attended the E-Oz and Skills Oz 2016 conference which included a workshop on increasing the participation of women in the electrical and construction industries (Sam Shepherd & Stanton, 2016). We kept notes on these discussions and refer to these with permission from the stakeholders concerned. Some individuals from other stakeholder groups such as the ETU and some electrical trades women's networks participated in our study as apprentice, tradeswomen or employer participants. These participants did so under the usual confidentiality arrangements and so their comments are not attributed to their organisations.

More detail on the methodology of the study is provided in Appendix One. Note that pseudonyms are used throughout this report to identify individual study participants and their organisations. Individual organisations are named where they provided information on a non-confidential basis. We sometimes use the term *participant* to

refer to the female apprentices and tradeswomen as a group; the employers are always referred to as *employers*.

Our analysis of the participants' responses generated several large themes that are relevant to the problem of increasing the participation of women in electrical trades:

- Gendered stereotyping of trades occupations and of women's capabilities permeates our society and deters women from considering trades careers;
- Some schools discourage students, particularly women, from entering traditionally male trades;
- Some female electrical apprentices have negative experiences at their RTOs;
- Electrical trades workplaces are, to varying degrees, masculine environments making it difficult for many women to feel comfortable and accepted as trades employees;
- Many electrical trades workplace lack the flexibility and adaptability needed to accommodate female trades employees due to traditional industry practices;
- The characteristics of women who become electrical tradeswomen include the *survival skills* often needed to navigate unwelcoming workplace and RTO environments;
- Most employers of electrical trades women have observed that these employees add value to their businesses.

In the following sections, we will explore these themes as a basis for developing a potential strategy for increasing the recruitment and retention of women into electrical trades.

### 3. What makes a female electrician?

The women interviewed for this study represent a significant body of experience in the electrical trades industry. Among them the female apprentices and tradeswomen had 220 years of experience in the electrical trades industry including eight tradeswomen who had worked in the industry for ten or more years. Many (19) of the participants were qualified or apprentice electricians; others were line workers, communications and radio specialists, electrical fitters and systems electricians. Their combined wisdom gave us a rich picture of the experiences of women in electrical and electrotechnology work. The women's personal attributes, as reported by them and



the employers, were consistent and aligned with our own and others' findings. These data provide a useful picture of the women who are currently thriving in the electrical trades. They show that women who become electricians have attributes that are common to aspiring male and female electrical tradespeople such as exposure to trades through their family background, STEM (science, technology, engineering, mathematics) capabilities and an interest in hands-on work and practical problem solving. They also have a range of attributes that appear to be specific to female electrical trades workers and which enable them to thrive in the masculine cultures found in many electrical trades workplaces; these we have labelled *survival skills*.

### 3.1 *I love working with my hands*

Researchers have shown that parental influences are particularly powerful shapers of young people's career aspirations, that students' knowledge of occupations is very dependent on family knowledge and experience (Bednarz, 2014; Parris, 2013) and that many young people consider an apprenticeship due to early exposure to trades work through family, friends (Pearce, 2014). Aligning with this, for our participants the commonest predictor of being a female electrical apprentice or tradeswoman was having close family members who work in electrical trades or related occupations:

My brothers are builders and my mum's an architect and my dad's a handyman so when I was about 21 I got home from travelling around the world and I thought I needed to do a career. I focussed on a career and I chose electrical so I thought maybe a trade would be better than a university for me (Erin, tradeswoman).

Twenty-two out of the thirty-one participants had exposure to traditionally male trades through their father, uncle or brother's occupation, twelve of whom were electrical tradesmen. Interestingly all eleven participants who had vocational learning in school experiences came from such 'tradie' families. Organisations working in the industry such as the Women in Power Network and E-Oz also identified the influence of families that include tradespeople in making women aware of the opportunities in electrical trades (Taylor & Hill, 2016; Twemlow, 2016).

The main personal preferences and capabilities that influenced the participants' interest in electrical trades were a love of hands-on work with (in some cases) the

possibility of working outdoors, a passion for practical problem solving, an interest in maths, science and technology and a keen interest in electrical trades work. As Carolyn, a tradeswoman who had previously completed an honours degree in science, put it:

What I really enjoyed was the hands-on element of it ... learning knowledge and then applying practically. So, that's why I came up with transitioning to a trade really (Carolyn, tradeswoman).

A third of the participants said that their enthusiasm for maths, science or technology was a key influence in their career decision:

I've probably always been a bit of a maths person. I did enjoy maths in high school, and chemistry, and some of these sort of more academic subjects. I loved tech studies in high school as well though. So really it's not a surprise that I've ended up here. I loved doing the woodwork and everything in high school (Gabrielle, tradeswoman).

Not surprisingly, 20 of the participants had completed mathematics at Year 12 level or above including seven who had completed at least one mathematics subject at university. Employer, Fiona, stressed the importance of mathematical aptitude:

We're looking for a mechanical and a mathematical aptitude. The fundamentals of the electrical apprenticeship sit upon certain elements within mathematical components that, without having a basic understanding of maths, you would really struggle with a lot of the detailed areas of the Certificate III in electrotechnology, but you would also struggle for the rest of our life as an electrician if you were to be successful (Fiona, employer).

### *3.2 Maybe it is a maturity thing*

The second group of attributes consist of personal experiences and traits that enable women to make the unusual choice of a career in electrical trades and then, to survive in the traditionally masculine cultures of today's electrical industry. These attributes could be summarised as maturity, resilience and persistence.

Almost 70% of our apprentice and tradeswomen participants commenced their apprenticeships at least a year after leaving school and half of the current apprentices were aged 25 or over. As noted earlier, these late entrants had studied extensively or worked in another occupation before choosing the trade. This circumstance indicates that for many electrical tradeswomen, the decision to enter the trade is a considered one made with the benefit of experience and maturity. With this maturity apparently

comes the self-efficacy needed to make an atypical career choice and the resilience needed to survive and thrive in what is an atypical working environment for a woman. Schultz et al. 2013 looked at electrical apprentices based on 2006 ABS data. They found that 26% were aged 25 or over compared with 42% of our apprentice participants; and 19% held VET qualifications at Certificate IV or above, compared with 42% in our study. In our study only ten of the tradeswomen and apprentice participants commenced their apprenticeships immediately after completing school. The others (68%) worked or studied in areas as varied as remedial massage, bar work, the army and the Commonwealth Public Service before deciding to pursue a trade; this included six who completed, and three who partially completed, bachelor degrees mainly in science or engineering. Appendix Two contains full details of the demographic data the participants shared with us.

Group Training Organisation (GTO) apprentice recruitment coordinator, Fiona, commented on the trend for females to apply for electrical apprenticeships at a later age; 'rarely will we have a female apprentice approach us when they're just out of school, or they haven't worked or haven't studied or haven't done something else'. She acknowledged that, consequently, many of them bring valuable maturity to their work, but said that for her organisation this comes at a cost because the award requires adult apprentices to be paid significantly more than non-adult apprentices. This increased cost is a disincentive for many GTO employers.

Several researchers have found that young women base career choices on personal preference rather than employment trends or job availability (Women in Adult and Vocational Education & Security4Women, 2005). Others have shown that these preferences are influenced by gendered identities developed at a very early age leading young women to feel a lack of interest in STEM occupations (Beck, Fuller, & Unwin, 2006b, p. 282) or to perceive trades as 'dirty, dangerous, heavy' (Department of Family and Community Services Women NSW, 2013, p. 32). Add to these influences the pressure to attend university, described by many of the participants, and it is unsurprising that women who make non-traditional career choices exhibit high levels of self-efficacy (Pearce, 2014). Self-efficacy develops with maturity as do persistence, resilience and tolerance of the traditionally masculine cultures prevalent in many of the industry's workplaces. Given their later commencement age, the female

electrical apprentices and tradeswomen interviewed tended to experience electrical trades workplaces as adults with the wisdom reflected in many of the observations quoted in this report.

As many have previously reported, female apprentices and tradeswomen often have difficult experiences in their workplaces and training organisations (Australian Human Rights Commission, 2013; Denissen, 2010). These range from the 'hard yards' (Olivia, apprentice) dealt to all electrical apprentices to challenges that apply specifically to women in the trades. Almost all (28/31) of the female participants told us that women face a range of difficulties in electrical trades workplaces and training organisations due to their gender and these are discussed in Section 5.2 *It's a man's world*.

Dealing with these difficulties, most of the female apprentices and tradeswomen we interviewed demonstrated a high degree of persistence and resilience, with several speaking specifically about the need for female apprentices and tradeswomen to have these qualities to survive in the industry. Many of the participants echoed tradeswoman Carolyn, 'I think if you don't have that thick skin it makes it a lot harder to cope.' Their responses suggest that maturity and experience helped each of them to develop the necessary thick skin. As Belinda, an apprentice line worker with a previous career in the Navy, said:

I've always worked in male dominated - obviously the navy is male dominated. I don't take a lot of things personally and I don't - I guess for me, maybe it is a maturity thing. In the fact that they're your workmates and not your friends. If things don't happen the way you think they're going to happen at work, you just have to go yeah...

## 4. Recruitment

Our discussions with the 31 electrical tradeswomen and apprentices showed that their awareness of and interest in electrical trades overwhelmingly arose from their personal attributes and preferences and their exposure to trades opportunities through their families and friends. Participants reported mainly positive responses from family and friends to their decisions to seek apprenticeships, perhaps related to the later age at which many participants decided to become apprentices. From the industry's

perspective, the consistency of the attributes, interests and background characterising these successful electrical tradeswomen may provide a key to recruitment. There are likely to be other women with similar characteristics who could potentially be attracted to the trade. Therefore, it is interesting to explore factors beyond family and friends that influence recruitment into electrical trades. In this context, we investigated the influence of secondary schools on participant's career choices and their experience of seeking an electrical trades apprenticeship. We also asked the employers how they selected apprentices.

#### 4.1 *They did not ever once mention the trade*

Researchers have shown how schools filter boys and girls into gender stereotypical career choices and that girls who do not participate in trades related learning at school are less likely to choose trades occupations (Elaine Butler et al., 2011; Hutchinson et al., 2013). In addition, several studies have shown that school-based careers education often reinforces gendered post-school pathways and occupational stereotyping (Beck et al., 2006b; Elaine Butler & Woolley, 2005; Elaine Butler et al., 2011).

The complexities of young people's career aspirations are analysed in the Australian Institute of Family Studies' latest, August 2017, Longitudinal Study of Australian Children (LSAC) report, *The career aspirations of young adolescent boys and girls*. The report analyses the career aspirations of 14-15 year olds' and compares these with a range of demographic factors and influences (Baxter, 2017), drawing several conclusions relevant to our study:

- Most young people aspire to professional careers even though only 35% of people employed in 2016 worked in professional occupations (Baxter, 2017, p. 33);
- Parents are the main careers counsellors for young people (Baxter, 2017, p. 30);
- Career aspirations are highly gendered, the number of 14-15 year old girls aspiring to enter technical or trades occupations in the electrics and communications industry is negligible (Baxter, 2017, p. 33);
- Young people aspiring to electrics and communications trades (almost entirely boys) tend to be in the lowest academic achievement quartile for numeracy, reading and writing based on NAPLAN performance (Baxter, 2017, p. 23).

The experiences of the apprentices and tradeswomen in our study align with the findings of the LSAC report and indicate that many schools could do more to

encourage students in general to consider trades, and a lot more to encourage young women to think of trades careers.

On the positive side, five participants reported that their school teachers actively encouraged them to enter the trade or to undertake work experience in electrical trades. One such participant, Brooke said:

Initially I wanted to be either an engineer or a scientist because of my dad's background being an engineer, but I also loved working with my hands and the outdoors and everything. So I spoke to a careers advisor and they said look engineering is more sitting at a desk doing that sort of stuff, so why don't you try electrical. So I did a - what are they called - work placement and absolutely loved then, and then I think a month later I did another work placement. Absolutely loved it and thought this is what I'm going to do (Brooke, apprentice).

On the other hand, nine of the participants reported that the option of considering traditionally male trades was never mentioned in their schools; seven reported that their schools actively discouraged girls' interest in traditionally male trades and a further six participants said that their schools urged them to consider university rather than trades:

I went to a careers day with the careers advisor... he said, okay, so the people who want to see the home economics, the childcare, line up over here. The ones that want to see the metal workshops and all that line up over here. I lined up with the metalwork because I did metalwork as a subject. I thought this would be pretty awesome. He said to me, Victoria are you sure you want to go with the boys, wouldn't it be better if you went with the girls? (Victoria, tradeswoman)

The 2017 Australian Human Rights Commission publication, *A conversation in gender equality*, cites similar anecdotes from schools (Australian Human Rights Commission, 2017).

The influence of vocational learning in schools on career choice is problematic with research in Australia and internationally showing that perception of VET in schools as inferior to academic studies inhibits female participation in post school trades (Beck, Fuller, & Unwin, 2006a; Clarke & Volkoff, 2012; Polesel et al., 2004; Whitehead, 2011). In our study, the participants' VETiS experiences demonstrated the complexities associated with the program. A third of the participants undertook related vocational learning programs such as pre-apprenticeship courses, school-based apprenticeships or work experience. The fact that these participants had close family members in electrical or similar trades, suggests that schools are not attracting young women into

electrical trades related learning who have not already had exposure to electrical or similar trades. This impression was reinforced by the participants who told us that their schools actively excluded girls from vocational learning based on traditionally male trades:

Somehow, I ended up getting put on a makeup course, or a hair course, or something, which - that really didn't interest me. I put down welding and mechanics and something else, and somehow ended up on this (Amy, tradeswoman).

Consideration of these discouraging experiences alongside the later commencement age of female electrical apprentices suggests that schools delay rather than support young women's decisions to enter the trade. When we asked the female apprentices and tradeswomen how they thought more women could be encouraged to enter electrical trades, their commonest response was that the industry needs to promote itself to young women, particularly through schools. There is an opportunity for schools to work with tradeswomen's networks to improve their understanding of, and promote, traditionally male trades and the careers these offer women.

Several researchers have shown that young women's career preferences can change. In the United Kingdom, Beck and her colleagues found that even though young people's career interests were strongly gendered girls expressed more willingness than boys to make non-traditional choices. In recent Australian work, Gemici and his colleagues analysed Longitudinal Surveys of Australian Youth (LSAY) data concluding that early socialisation can be overcome and that the data showed 'only a loose relationship between original aspirations at age 15 years and the actual job obtained at age 25 years' (Gemici, Bednarz, Karmel, & Lim, 2014). In the case of our participants, a variety of post-school experiences positively influenced their decisions to seek electrical trades apprenticeships. These included marrying an electrician, disappointment with university or TAFE studies, experiencing a difficult deployment in the navy, leaving a violent relationship to make a new start, and many more. As GTO apprentice recruitment coordinator, Fiona, put it:

We actually think that women discover themselves as far as trades are concerned. We think that women are constantly pushed into moulds that don't necessarily fit them, but they believe that they fit them and they try to make them fit. Then they realise, once they're old enough, this is not working for me and I want to be an electrician... I wanted to be an electrician when I was 12. I still want to be an electrician.

## 4.2 Finding an apprenticeship

Only eight out of the 31 tradeswomen and apprentice participants reported their experience of finding an apprenticeship as difficult, including four who applied immediately after Year 12:

When I originally went for apprenticeships, I went for like, 16. I always made the interviews, and I always made the last stage, but I never, ever got the job. This time I - I kept bugging them. I went to my interview, and they said to me in a week you'll find out. Two weeks later I'm sat ringing them, and annoying them, and stuff like that, and then I got a phone call and got the job, basically (Natalie, apprentice)

Unlike these eight, others considered their apprenticeship hunt to be relatively easy perhaps because they had the maturity to make the choices needed to achieve the goal. For example, apprentice Zoe moved to a rural area for the opportunity to obtain an apprenticeship as a line worker. Seven obtained apprentices through big power or mining companies, four after completing school-based apprenticeships, two gained apprenticeships with family members, eight through Group Training Organisations.

## 4.3 What employers look for in electrical apprentices

The nine employers used varying recruitment approaches ranging from word of mouth recommendations from other employees to sophisticated selection tools administered by their own companies or group training services. When asked what they looked for when recruiting an apprentice, six of the group prioritised cultural and behavioural attributes:

...the culture or the personality of the person to make sure that they fit into the culture of our company (Scott, Employer)

...the group generally tends to look for an apprentice or a tradesperson that is looking to learn, of looking for work as part of the team and be part of our team (Michael, Employer)



GTO apprentice recruitment coordinator, Fiona, described her organisation's systematic, staged selection process including aptitude testing, phone and personal interviews.

## 5. Retention

For any apprentice, their workplace experience is the main influence on whether they complete their apprenticeship and remain in the trade (Bednarz, 2014); the apprentice and tradeswomen participants' stories demonstrated the complex influences involved. On the one hand, the participants described the attractions of their very rewarding work in electrical trades and, on the other, most identified the pressure of coping daily with being an anomaly in 'a man's world'. Their experiences show that the traditionally masculine cultures prevailing in many electrical trades workplaces lie at the heart of the problem of increasing the participation of women in electrical trades. We will now consider what the participants told us, first, about the attractions of electrical trades for women and then, about the challenges.

### *5.1 Kind of perfect for a woman*

Electrical tradeswoman, Megan, who has worked in security and electronic controls for five years considers that she has a job that is '...kind of perfect for a woman'; based on our conversations with the thirty-one tradeswomen and apprentice we interviewed it is hard to disagree with her. These participants gave us many reasons for liking the trade but three stood out and these are: the stimulation that comes with challenging and varied work, the opportunity to contribute to their communities and the security and good remuneration available in the industry.

When asked what they like about the trade, several of the tradeswomen commented on the intrinsic satisfaction they get from electrical trades work and from solving challenging technical problems daily:

Like seeing a job from a concrete foundation to a finished building and have people working in it and go yeah, they're using the stuff that I put in, it's pretty cool (Emily, tradeswoman).

I think I really have found a passion for instrumentation and I think it's the fault finding and repairing something, that's the real draw card to it. Having that win that nobody else has gone to try and fix it and you've found the answer to why it's not working or you've implemented something to make it work better and yes, that's - it's really rewarding (Victoria, tradeswoman)

The participants also value the many career opportunities available through electrical trades:

So I knew they were government, I knew that it would be a very good career path either way because they've got so many sections within Energy Co. I also knew we're basically the supply chain to power throughout the state (Zoe, apprentice)

I would say learning, because there's always learning. You never know everything about electrical because it's changing so quickly. The pay and then getting to work in an outdoor and indoor environment; just getting to be out there and moving around (Chloe, tradeswoman).

Other benefits mentioned by the apprentices and tradeswomen included the opportunity to travel with a licence recognised by other countries and the satisfaction of passing on knowledge to the next generation of apprentices.

## 5.2 *It's a man's world*

Balanced against the real attractions of electrical trades jobs for women are the many challenges arising from being a woman working in a strongly masculine environment. All the apprentices and tradeswomen mentioned that they work in 'a man's world,' thirteen of them using this exact phrase. This environment affects participants in differing ways. Some are like tradeswoman Emma who enjoys being 'one of the boys' and doesn't 'want to be treated differently just because I am female'. Others, like apprentice Georgia, describe needing a 'thick skin' to cope with the constant pressure of working within infrastructure, work practices, culture and behaviours that reflect men's needs and preferences and often cause discomfort to female electrical trades workers. We use the accepted phrase *traditionally male behaviours* to refer to a range of negative behaviours such as unnecessary competition, aggression and objectification of women. Such behaviours are prevalent in some electrical trades

workplaces and are associated with rigid ideas about gender roles. Natasha, an electrical fitter and mechanic with 18 years' experience in the industry, commented:

I'd like to know that if my daughter went on to do a trade it would be a safe environment for her, and sometimes I don't feel it is a safe environment mentally because of some of the stuff and the attitude of the guys, and you don't have that backup from the bottom up, if there's a problem.

The women's most commonly reported issue was their constant feeling that they need to prove themselves, to overcome manager, co-worker and client prejudice against their presence in the 'man's world' of electrical trades:

I feel like every single time, even within the same company, every single time I get given a new project with a different project manager or a different...manager or supervisor that I have to start again at proving myself. (Danielle, tradeswoman with nine years' experience).

These findings align with those of other researchers. For example, tradeswomen interviewed by Butler and her colleagues in 2011 also identified that women working in traditionally male trades feel that they must overcome the perception that women are not competent at trades work (Elaine Butler et al., 2011).

Tradeswomen's perception of themselves as outsiders is not surprising when we consider that in traditionally male Australian trades such as electrical, work task protocols, clothing, equipment and work scheduling are all designed to suit the physical and scheduling needs of white males (Smith, 2013, p. 862). The participants were aware of this circumstance and most of them described one or more of the following types of problems associate with the traditionally male cultures found in their workplaces:

(1) Lack of equipment and other infrastructure suitable for women including toilets and bins, uniforms and protective clothing sized and fitted for women's bodies:

...we just got women's pants so that's pretty awesome... It's nice just to have room for your hips (Victoria, tradeswoman),

'...I was doing HVAC work, so heating, ventilation, air conditioning work, and he was really displeased that we had to get taller steps or a higher platform ladder because it weighed more. It was 24 kilos, so it did actually require a two-man lift. But he would make me carry it by myself (Nicole, tradeswoman);

(2) Unwillingness to schedule work differently to accommodate caring responsibilities, especially of children; tradeswomen we interviewed who had children either ran their own businesses or had stopped working for a time,

...It was ironic considering how flexible they were with their apprentices that got drunk and had no licence, there was no flexibility. Do you know what I mean, bent over backwards picking them up and driving them around because they had DUIs but somebody who would be, I was willing to come back to work and do standardised hours but maybe slightly reduced (Melissa, tradeswoman);

(3) Acceptance of aggressive behaviour in the workplace making women feel unconfident or scared,

...I walked up to him and I said I'm really excited because I think you can teach me a lot. I'm hoping I'd go with you. He said be prepared to get yelled out. I said why? I don't come to work to get yelled out. He goes well I've got a short fuse. I said but that's not my problem. Like you're supposed to be my mentor and I don't work under that sort of pressure (Amanda, apprentice);

(4) Resentment of the presence of tradeswomen and of their perceived special treatment,

'...one female apprentice who came out of her time, she walked straight into a team leader role which was good for her, she won apprentice of the year [in the state], which was great...behind the scenes it's all about well she only go it because she was a female' (Kate, apprentice);

(5) Sexist comments, sexual innuendo, display or sharing of pornographic images,

Well I know that I worked in construction and I enjoyed working in construction. They had naked pictures of women up and I never complained because I don't think it's my role to be the person that goes 'that's offending me'. I'm trying to fit in. On the flipside why do I, or why does anyone want to look at naked women when they're eating a sandwich (Melissa, tradeswoman).

Many of these issues were also identified in a 2016 survey that Laura Birch from the Electrical Trades Union (ETU) Victoria conducted with female members (Electrical Trades Union Victoria, 2016). The ETU survey found among other results that 85% of female ETU members had 'difficulty in obtaining appropriately fitting work attire'.

Although we could speak with only one discontinued apprentice, we learned a lot about how not to retain female apprentices from several our of participants who described almost giving up. Jennifer's story below shows the impact of constant low level

harassment, the sort of culture which women survive by developing a 'thick skin' or 'being treated as one of the boys'.

### Jennifer's story

Jennifer, a tradeswoman with nine years' experience, described the difficult experiences which almost caused her to give up her apprenticeship; experiences shared by half of the women we interviewed. Jennifer had to deal with a persistent, low level harassment consisting of 'sly or subtle comments', co-workers not trusting her to do tasks, co-workers making sexist comments and 'management who are laughing along' complicit in their colleagues' bad behaviour. Jennifer attributed these bad behaviours to a culture in which 'a lot of people are pushing against it because it's unfamiliar for them and a bit scary to have women to be able to do the same job' supported by 'people that are higher up with an attitude against women then that trickles down'. Jennifer took a break overseas to think about her future and eventually decided that she wasn't going to be forced out of an industry she really enjoyed:

I think that for me was make or break for me. I'm like I've got to change something. I've got to make it - I don't want other people to go through - other girls to go through - what I did or if they do at least they've got someone there saying, don't worry, you're not on your own. I was there too. Having that support network, I think is vital in retaining girls as well.

Jennifer now works for a large infrastructure company and is active in networks to support women in electrical trades.

Hannah, the one discontinued apprentice we interviewed, had a very bad workplace experience leading to clinical depression and discontinuation of her apprenticeship:

I was pretty much - for most of it, I was just a cheap secretary. They sat me in the office, because I was a girl, and paid me apprentice wages, and then, when I'd go out to do something, I didn't know how to do it, and I'd get sworn at and yelled at, and they'd say to the other boys, don't make me baby you, like we have to baby Hannah, and all this, and, yeah, it was quite terrible. I really hated it.

Despite the problems, most of the women we interviewed were happy with their choice of occupation and had found a way of being content in the industry. More than half of them, while critical of industry culture generally, felt very fortunate in their own workplace:

We're all good mates. All the tradies are like my family. Most of them call me their children and stuff like that, because I've moved away so they invite me round for dinner

and they help me with my studies. I don't know, they're pretty brilliant (Natalie, apprentice).

The people that I've worked for - or the group of people that I've worked around - had been all very positive towards a female tradie. A lot of them are like I'd rather a female tradie because they know their - I know you're doing it because you want to do it and you're interested and you're good - otherwise you wouldn't stay in it (Chloe, tradeswoman).

Their perspective aligns with Smith's conclusion, reviewing literature relevant to women in construction, that 'most significant qualitative studies of women in trades suggest that women enjoy the work and deeply satisfied by seeing work complete' and that this joy 'motivates women to stay in their trades despite the difficulties they face' (Smith, 2013). The 2016 ETU survey similarly concluded that '94% would recommend a career in the electrical trade to female friends' (Electrical Trades Union Victoria, 2016). It must be remembered that the women who currently make it through the obstacle course of barriers to becoming an electrical apprentice, are unusually highly motivated and capable. The identification of electrical trades work with masculinity is no doubt a deterrent to many potential tradeswomen.

### 5.3 Women's physical abilities

Most of the women raised the matter of their physical capability to perform the work of an electrical tradesperson. This is not surprising given the public perception of all traditionally male trades as 'dirty', dangerous, heavy' (Department of Family and Community Services Women NSW, 2013, p. 32) and the tendency to design tasks around men's physical capabilities (Smith, 2013). Clearly, the participants have had to confront their own, their employers' or work colleagues' perceptions of their abilities to perform heavy lifting tasks, to work in confined spaces or at height. This concern mirrors the commonly held discriminatory attitudes of many employers in male dominated occupations who also assume that women do not have the strength to do the job required (Fiona Shrewing, 2009).

The participants convincingly made the case that they could perform the tasks required of them in the trade, that tradesmen could also be of smaller stature and that ways of working can be changed suit the abilities of team members:

Like, the biggest struggle I've ever had being an apprentice on my side is, underground. We have to terminate cable that is massive and it's heavy, and I struggle with it. But all you've got to do is ask for help, and then you find ways around it. Like, I can now terminate the cable, I couldn't a year ago, because I've figured out ways that I can do it. (Natalie, apprentice).

All nine employers interviewed for this study had in the past, or currently, employed female apprentices and/or tradeswomen. Eight out of the nine did not consider there were physical impediments to women working in electrical trades:

We had an issue earlier this year where one of our girls was being asked to carry more than she could, and we get that with our young boys as well from time to time. But we don't have a lot of really heavy work that requires a bit more core strength, or a bit more strength... Most of what we use is light enough to cart around and anyone can manipulate it and do the work (Scott, employer).

In the future, it is likely that technologies enabling people to work with heavy weights will make concerns about physical strength redundant. For example, several companies are developing *robotic exoskeletons* to help workers lift heavy objects for industries such as construction (Burgess, 2016).

### The RTO experience

As generally reported in the literature the female apprentices and tradeswomen perceived their RTO experiences as less significant than their time at work. Approximately one third had poor experiences at their RTOs due to disappointment with the teaching or discomfort with teacher and/or student behaviours influenced by similar masculine cultural norms to those already described for electrical trades workplaces.

Twenty-four of the female apprentices and tradeswomen we interviewed chose to comment on teaching quality or other aspects of their vocational education experience (most (23) of these women studied at TAFE. Thirteen were enthusiastic about their TAFE experience and the quality of the teaching:

I found it to be a fairly high quality actually...the teachers that we had were very hands-on - and because they'd worked in the field and in the industry, they had experienced and knew what they were talking about (Rachel, tradeswoman)

Oh, so far, all my teachers have been pretty good to deal with. Classes are good, it's been - yeah, it's really different to uni. It's really slow paced, they really hang around until you get it, I guess and they offer a lot of tutoring so like all of that's pretty good (Olivia, apprentice).

On the other hand, eleven of our participants described a disappointing TAFE experience often commenting on teaching that failed to engage them and meet their learning needs:

I think sometimes they forget that we're learning things for the first time, and that they're reading directly from a structured course note...If you could just stop for five minutes, give me a little bit more information so I can try and process it a little bit better (Belinda, apprentice).

For example, they have this thing called XXXX where you basically teach yourself on a computer. I can't do that, I have to be looking and watching and using my hands... They could see I was struggling and yet they wouldn't really take me aside and go righto, we'll go through these through your book instead of going - you having to read it all through on the computer (Zoey, apprentice).

Participants' stories included evidence of the persistence of rigid thinking about gender roles in their RTOs:

there was myself and another girl in the class, and he said - it was a controls class. He said I hate to say it to you girls, please don't take offence, he said, but you're going to struggle in this course. He said it's just the difference between the way the male and the female mind work. To me that was like a red rag to a bull. It was the class I got the best marks in, because again I was determined to prove him wrong (Lauren, tradeswoman).

...the women teachers at XX Institute that were teaching electrical got treated very differently by all the guys in the class. They were normally the rowdier classes and the harder classes to learn in. The guys didn't want to listen to the teachers (Chloe, tradeswoman).

During our study, we became aware of several training organisations, including NECA Education and Careers (and RMIT University that are implementing respectful relationships education in their apprenticeship programs (Joanne Rafferty and Philip Green, NECA Education and Careers, personal communication January 2017; Dan Mabilia, RMIT University, personal communication September 2017). These are very important initiatives and, if successful, will contribute to cultural and behavioural change within those educational institutions and in the wider industry.

### [Fiona's story](#)

The Group Training Organisation where Fiona is apprentice recruitment coordinator, is working actively towards building a respectful relationships culture in its RTO. Fiona explained how her organisation's RTO identified and addressed sexist behaviour in its classrooms:

We did have some challenges in the classroom as well. What we found is that in the classroom one of the ways that the teachers would get a bit of a giggle out of the class



and get them to work more cohesively together was to have a bit of a joke about females on site and what not. It got to a point that we would have perhaps four females in a classroom of 20, and they weren't putting up with anymore.

Of course, we weren't aware that this was the type of thing that was happening. We weren't aware that in the classroom there were these little jokes that were going on. As soon as we became aware of we thought well, do you know what? All we're doing is making our classrooms a non-safe place for females to be, and therefore females won't want to be a part of the industry because they won't want to be in the classrooms.

So we had to re-educate again quite a few of our teachers, just to say hey, guess what? It's actually not cool. We want more females in the industry, but if they're coming into your classroom they're not going to feel welcome, so why would they feel welcome in the industry if they don't feel welcome in your classroom? That was a bit of a learning curve for us as well, which we didn't know was happening until there were a few more female voices in the class that were able to say do you know what? That's not on.

## 5.4 Networks for women in trades

There is a remarkable number of tradeswomen's networks in the electrical trades industry. These include the Darwin Sparkettes, Supporting and Linking Tradeswomen (SALT), Women and Power, the National Association of Women in Construction, Trade Up, Tradie Ladies, Fanelle and women's committees convened by branches of the Electrical Trades Union (ETU). We were interested to know if these networks are effective and have the potential to play a larger role in changing cultures in the electrical trades industries.

Eleven of the electrical apprentices and tradeswomen had contact with one of more of these formal networks face to face or online and spoke to us about the impact networks can have on tradeswomen. A further seven women participated in informal networks with other electrical tradeswomen.

Based on our interviews, both the informal and formal tradeswomen's networks seem to help retain women in the industry. The participants spoke about using their networks for support, camaraderie and for reassurance that each of them is *not* the only woman dealing with the experience of being an electrical apprentice or tradeswoman. Tradeswoman, Nicole, provided a typical picture when asked what she got from her membership of one of the formal networks:

Probably confidence, camaraderie. Sometimes having the perception or the label of being slightly singled out or slightly different can impact on your individualism as well and on your decision making, and I just found that unanimity amongst a group of similar minded people and people that perhaps had similar challenges or similar interests is quite empowering. So, I like that.

A few of the women participated in formal mentoring schemes which they all described as encouraging their aspirations. Apprentice Natalie gave a glowing description of her mentoring experience:

Yeah, so I worked with her virtually my whole year, and she's instrumentation, hence why I sort of got really interested in that. But it was really good. We just - I don't know, we're on the same path. We can talk about anything. Because really, really good friends, like she's a really good support system for me. When I first moved over there she invited me over to meet her friends and stuff like that. She's really - she's awesome (Natalie, apprentice)

The women involved in the more structured networks reported being involved in additional activities such as promotion of electrical trades careers to school groups and political lobbying for resources to support women in trades. A few women involved in union sponsored committees spoke about the support they received to address discrimination in their workplaces. For example, tradeswoman Natasha with union support persuaded her workplace to implement anti-discrimination training for all staff. From the participant interviews and on-the-record discussions with several women's networks operating in electrical trades, it seems that the networks that have access to organisational skills and political influence, such as Women in Power and those sponsored by the union, and networks that develop strong personal and social media following such as SALT, do increase the recruitment and retention of female electrical trades workers. With improved resourcing these networks could be significant players in a scaled up and collaborative approach to increasing female participation.

## 6. How women add value to electrical trades businesses

In the introduction to this report we quoted several Australian and international studies that conclude that increased employment of women in male dominated workplaces improves individual business productivity and the economy generally. We were

interested to know if the participants in our study had observed any impact resulting from the employment of female apprentices or tradeswomen in electrical trades.

The female participants and the employers all nominated several, mostly positive, impacts that they had observed in the industry. Interestingly, cultural and behavioural change were at the top of their lists. Eight of the nine employers described positive effects they saw women in trades roles having on their businesses such as cultural and behavioural change and improved attention to detail, organisation and planning.

## 6.1 Cultural and behavioural change

Employers observed that the presence of tradeswomen and female apprentices resulted in a shift from a traditionally masculine culture to a more civil and a better behaved, more work-focused culture:

The feedback we get is generally the girls can bring a little bit of civility to sometimes a little bit rough sites, I suppose. I think it probably helps the blokes to focus and get on with it, rather than muck around or be too blokey (Matthew, employer).

It's hard to explain but it's a positive impact having females around in the workplace. It just changes people's attitudes and I think it changes their views and changes how they behave. I think all in a positive way. (Scott, employer).

Nine of the tradeswomen and female apprentices also mentioned that the presence of women in trades roles leads to changed workplace behaviour. They specifically referred to decreases in swearing, aggression and disrespectful conversation about women, as tradeswoman Danielle put it '...people are less likely to swear and yell and scream and carry on when you're there'. Several women explained that although they, and some men, liked these changes, others experienced them as a negative impact:

Some people would say negative and others would say it's quite positive...For instance, putting up posters around lunchrooms and stuff. They're no longer allowed to do that. For some guys they really appreciate that because they don't want to see that all day but for other guys they feel like they're having to hide who they are because there's women there... (Jen, tradeswoman).

## 6.3 Improved attention to detail, planning and organisation

The second set of changes related to the capabilities that female apprentices and tradeswomen contributed to their workplaces. These were described as strengths in attention to detail, planning and organisation:

One is they've got a can-do attitude, no one can tell me I can't do this, kind of thing... So I think there's a lot of attention to detail and they're certainly better organised and you can see that they're well ahead of - sometimes ahead of their male counterparts because of these things (David, employer).

They're more diligent the way they do things. They look at things - technical wise they might be more structured in their thinking in regards to fixing technical problems. That's when they develop their skills. Not so much gung ho. Just more mindful I suppose rather than the physical aspect which other male apprentices bring to the job. They bring the physical aspect but they don't necessarily bring the thinking aspect to it. I think the females bring a far more thinking aspect to the role (Scott, employer).

## 6.3 Improved communication

Ten of the apprentices and tradeswomen mentioned women's better communication skills as an advantage for businesses in dealing with clients and in improving wellbeing among team members:

I've definitely seen a gender bias in the attention to detail and the inter-communication with people, actually assuring a confidence and instilling that, having those communication techniques to engage with the customer and put that customer's mind at ease that a job has been done well (Nicole, tradeswoman and employer).

## 6.4 Dedication and maturity

And, as we have already observed, electrical tradeswomen, as trailblazers, tend to be outstanding achievers and are often promoted into leadership roles or start their own businesses:

But I think ... women specifically have made a great impact to the business in - on projects, and in our office when they become part of the management team. It's just

the diversity, it's the experience that they bring and I think that - in my current role, and in my previous management roles, I've purposely gone out to seek females that are extremely competent and experienced in their roles. Because in my experience they've made better managers than many of the males that come through the process (Michael, employer)

## 7. How we can increase female participation

At the beginning of this report we established that despite decades of attempts to increase the participation of women in electrical trades, participation has not risen. We also emphasised the benefits likely to flow to individuals, workplaces and society if the participation of women in traditionally male trades could be significantly increased. Our analysis examined the social ecosystem in which a woman first chooses, and then elects to remain in electrical trades. The women's stories demonstrate that their decisions to enter and remain in the trade are progressively influenced by social interactions with their families and friends, at schools and other educational institutions and in the workforce. Their experiences demonstrate that the barriers to women considering, selecting and then remaining in electrical trades are rooted in: general prejudices against trades occupations particularly compared with university courses, stereotyped beliefs about appropriate occupations for males and females, and workplaces and RTOs that tacitly support traditionally masculine cultures and behaviours making the on-the-jobs and off-the-job environments uncomfortable for women. Given that men continue to enter trades, despite academic prejudices, it appears that that stereotyped attitudes about occupations for males and females and perceptions about the traditionally masculine culture of electrical trades are the most significant barriers to female participation. The women in the industry strongly believe that is the case:

Some of the males from, particularly Greek or Italian backgrounds that I work with, are younger, early twenties. Their mentality is still a woman should be at home providing. It's just like hello, what generation are you in (Kate, apprentice).

This guy he gave me certain tasks I think and didn't give me other tasks because I was a woman. For instance, moving a vehicle he gave it to a 16-year-old boy instead of asking me to move the vehicle a 26-year-old who had their licence since they were 18. It's much safer to give it to the learner driver! (Melissa, tradeswoman).

This understanding of the barriers to female participation allows us to propose a new approach for increasing the numbers of electrical tradeswomen. It supports our initial hypothesis that previous interventions failed because they were too narrowly focused and short-lived. As a generalisation past interventions have focused on promoting the trade to women through targeted recruitment activities and supporting women to remain in the industry through mentoring and similar programs. It is likely that these initiatives have been important in maintaining the numbers of women currently working in electrical trades. To make it easier for women to work in the industry and to significantly increase numbers beyond the current 2% will require sustained, coordinated effort by all stakeholders in the electrical apprentice and tradeswomen's ecosystem.

## 7.1 What an ecological approach looks like

An ecological approach to increasing female participation in electrical trades would consist of a program of sustained, coordinated, 'mutually reinforcing' (Our Watch, 2015) actions by individuals, tradeswomen's networks, industry organisations, employers, educational institutions and government. The suggested program centres on cultural and behavioural change, particularly respectful relationships education aimed at challenging stereotyped beliefs about males and females, decreasing aggressive male peer relations and on building respect for women and tolerance of diversity. It draws on lessons learned from programs such as Our Watch, a national program also trying to change gendered culture, behaviours (Our Watch, 2015), which also take an ecological approach to changing gendered cultures and behaviours, prevalent in Australian society, and rooted in stereotyped beliefs about males and females. We propose that a successful program initially follow a site-saturation strategy as a means of focusing and phasing change with limited resources.

In addition to cultural and behavioural change there are several important practical strategies which would enable the industry to better support female trades employees.

These changes, suggested by the participants and stakeholders, include actions for employers, tradeswomen's networks, industry organisations and government:

- Employment selection processes which focus on the attributes and capabilities needed to perform the job well, rather than on stereotyped ideas about what a tradesman looks like
- Provision of well-fitting, appropriate uniforms and protective clothing for all employees
- Provision of easily appropriate toilets and sanitary bins including solutions for remote locations
- Provision of part-time and flexible work hours including shifts to accommodate parental and other carers' needs
- Redesign of work protocols and equipment to ensure that employees of varying physical types can perform tasks
- Provision of paid parental leave
- Incentives for employers to take on mature age apprentices since women are more likely to enter the trade at a later age
- Re-design of apprenticeships to acknowledge the prior skills mature aged apprentices bring into the industry
- Investment in development/adaptation of programs such as respectful relationships education, piloting and evaluation of programs, coordination of stakeholders to achieve mutually reinforcing action.

This list consists of the most urgently needed practical changes suggested by the women we interviewed and reported by stakeholders; some of these require political or industrial negotiation and will take time. For an employer, a good starting point would be to think critically and creatively about how to accommodate the needs of employees with diverse physical and personal needs. Tradeswoman, Nicole, became adept at this when she ran her own business including women among her trades staff. Nicole described several imaginative changes:

'We didn't have Hiace vans. We had utes and station wagons and I've got a flatbed truck that was all lowered to reach. So, we quite easily made that work...

...We got her extra small clothing, we got her a slightly smaller tool belt. We joked about her boots. But it took a little bit of effort but not too much effort to just not go to the mainstream wholesaler that has the mainstream - where he's going to make sales and we sought out that diversity and really did what we could do to make her feel like she fit in. The jacket fitted her. It was her jacket. It wasn't some man's jacket that she had to kind of pour herself into.

...A lot of work is gained, and I can speak from this over the last nine years, 10 years, a lot of - there are a lot of missed opportunities by sticking to a 7:00 to 3:30 schedule. We put some staff on - I had... a performance athlete, on our payroll who we were able to preserve their training schedule, which was in the morning. They started at 10

o'clock and worked through until I think 6:30 from memory... If you applied the scenario of that person being a performance athlete to someone perhaps dropping off children...

Nicole achieved flexibility by providing out of hours maintenance services and using a generator to light up building sites at night. As she explained it's all a question of challenging tradition:

Coming from the security sector where we worked rotating shifts I think I was really comfortable with that perception. But looking even at my own family where my dad is a retired builder, he thought it was crazy that you worked after 3:30 or after four o'clock in the afternoon...he needed to be home at four to have his routine.

## 7.2 Cultural and behavioural change

As Elizabeth, a tradeswoman with 26 years' experience in the industry, put it:

I've given up now on thinking that the way to get more women in trades is to get more women in trades. I think that what we have to do is concentrate on making the men in trades more accepting of women in trades and getting them prepared to have more women in trades and starting at it from that angle.

As we've seen the participants overwhelmingly described their workplaces as being 'a man's world'. They described reactions to this ranging from genuinely enjoying the masculine nature of the workplace to resigned tolerance of 'boys being boys'; as apprentice line worker, Zoe, put it '...you've got to have a bit of a thick skin. Especially if you want the boys and team members to like you or be able to work with you'.

There is clearly a lot of work to be done to make many workplaces more welcoming for female trades workers. On the other hand, there are workplaces that have learned how to welcome and retain women in trades roles, such as Nicole's business described above and the GTO where Fiona works. It may be helpful for employers, especially SMEs, to be able to access a curated collection of resources based on such organisations' good practices to help them adapt their businesses to accommodate female trades employees. During our project we spoke with five women who had worked in two large and very similar businesses that had proactively commenced groups of female apprentices resulting in less than successful outcomes. The women provided insights into what worked, what went wrong as a basis for better managing



such initiatives in the future. We have amalgamated the five accounts into one story, PowerLine Co.

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### The PowerLine Co. Story

During our field work we came across three organisations which had focused on recruiting female electrical apprentices, with mixed results. Two tradeswomen and two apprentice participants were part of an all-women program conducted by an energy company that we are calling Powerline Co. Amanda, Kate, Erin and Gabrielle provided some interesting insights into what did and did not work at Powerline Co. They told us that 30 out of Powerline's 500 electrical trades workers were women at the time of the interviews, three times the national average!

What worked at Powerline Co?

The participants considered the company's size to be an advantage, with over 1000 employees the company has good human resources and safety policies. It prides itself on its gender diversity work. Powerline Co leadership have been very committed to the female trades program which was initiated by a group of senior women in the company who *pushed and pushed* (Erin) to get the initiative off the ground. The CEO set up a committee to represent women in the Powerline Co workplace and a mentoring program to support the female trades employees.

The company worked with its local TAFE and other stakeholders to conduct a pre-trade bridging program which brought many of the women into Powerline Co. Erin told us how she participated in that course *...knowing absolutely nothing, and completely fell in love with the trade and everything that was involved in it.*

Once the apprentices commenced there were some positive supports put in place for them such as portaloos for all staff and help from some male co-workers to negotiate new ways of undertaking physical tasks. They helped each other to learn techniques that allowed them as shorter, less strong people, to do their work.

What didn't work at Powerline Co?

Unfortunately, despite senior management support, Powerline Co didn't do enough to change its masculine culture from the ground up. All apprentices were treated as the *lowest of the low* (Amanda) and trades team leaders were not tuned into optimising opportunities to teach apprentices.

Company trainers demonstrated procedures for physical tasks based on 'the capability of a man's strength' (Amanda), they didn't demonstrate alternative ways of doing things for people with lesser strength.

I overheard a trainer having a discussion about females being detrimental to the workplace and having to rearrange training procedures. There were two bosses at the same table and they didn't say a word...so even if perhaps it did make them feel uncomfortable, they weren't willing to say that's the wrong attitude. You want more females; you're going to have to change things. You can't just say oh well, that's how it is and always has been therefore it should be. It just doesn't work like that (Kate, apprentice);

When the women tried to ask questions, their preferred way of learning, they were accused of *back chatting*. When they attended TAFE they encountered an *old school* lecturer who made *some very sexist and sometimes racist comments in class* (Kate).

The worst aspect of the women's experience was the backlash against the female apprenticeship program from male co-workers. This included aggressive behaviour which tended to make the women lose their confidence, and male banter and social media interaction which made the women feel excluded. Women were belittled when they couldn't perform a physical task in the same way as the men and told not to use *the chick card*. Rumours circulated through the company that the women only got their jobs because they were women. The result was that attrition rates from the female apprenticeship program were high, *'they're getting women in but they're having a real problem retaining them'* Amanda.

The Powerline Inc. story is based on two companies that put a lot of effort into increasing female participation in electrical trades. Their experience signals what needs to be done differently in the future. The most significant gaps in these was the absence of a comprehensive intervention program aimed at changing culture and behaviour on the ground from the bottom up, as well as top down. Research into

change has shown that it is not enough to have enlightened senior leaders, change programs need to involve everybody. A key message from the Powerline Inc. participants was that their male colleagues resented women coming into their space. As we have already discussed, men's unwillingness to relinquish traditionally male workplace cultures and to welcome women is based on deeply ingrained, societal beliefs and values (Cockburn, 1991). Fortunately experience with other traditionally male occupations has shown that those beliefs and values can change. Increasing female participation has a powerful effect on work practices; once there is a critical mass of women in an industry, scheduling and the ways of working change. For example, in the resources sector, Chevron, Rio Tinto, ConocoPhillips and Woodside have implemented more flexible workplaces permitting job sharing, paid parental leave, part-time employment, working from home, purchased leave, compressed work hours and access to childcare. In mining women are now targeted for work as truck drivers. This was initially due to a shortage of workers but is now deliberate policy because of the women's record of safety. These women are given hours to accommodate school times" (Shewring, 2009, p. 21).

In other examples, growing numbers of women are participating as paramedics and as sworn officers in Australia's police forces. Ambulance Victoria recently celebrated the thirtieth anniversary of the employment of its first female paramedics in 1987 '...with females today making up about 57 per cent of graduate paramedic applicants' (Health Victoria, 2017). Australia's police forces are seeing slower but constant growth (e.g. 36% in the Australian Federal Police in 2016, 26.2% in Victoria in 2015, 26.1% in Qld in 2015) and all forces have plans to reach 50% female participation. In both the ambulance service and in policing supporters of female participation had to overcome arguments like those used to resist the participation of women in electrical trades such as women's incapacity to perform the physical work of the occupation (Robinson, 2013).

The problem for electrical trades is how to get from 2% to sufficient numbers of women for their presence to gather its own momentum and carry change forward; the answer is likely to be a site-based saturation approach.

## 7.3 Site-based saturation

Coordinated change involving all groups of influencers at a national or even a state level would be impossible without a significant level of resourcing. As a comparison, the 2017/18 Victorian Budget included \$6.2m to increase the participation of women in sport as part of the State's program to change 'gendered norms, stereotypes and expectations' (The State Government of Victoria, 2017). This investment is just one stage in a long-term approach which does not yet have a public timeline nor measures (The State Government of Victoria, 2016). To change the participation of women in traditionally male trades in Victoria alone would require comparable resourcing; change at a national level would require even more for an unknown number of years. The good news is that programs to change gendered norms, in any area of life will have a flow on effect for other problem areas, such as increasing the participation of women in traditionally male trades.

However, it is unlikely that gender equality in electrical trades will be improved as a side effect of increasing female participation in sport. We need a means of supporting coordinated, mutually reinforcing actions throughout the female apprentice and tradeswoman ecosystem. *Site-based saturation* provides a model that has worked elsewhere. The term *site-based saturation* is used to describe an ecological approach to a complex ecological problem such as increasing the participation of women in traditionally male occupations. It is an approach characterised engagement of '...as many partners, settings and population groups as can be realistically afforded by the one site so that tried and tested primary prevention activities ...are both established and can be continued well beyond the funding period' (Torney & Upston, 2015). One example is the New York City's *Jobs Plus* project which is 'using a site-based, saturation model, the Jobs-Plus program is designed to raise and sustain the level of employment and earnings among residents of public housing developments (New York City Centre for Economic Opportunity & The Mayor's Fund to Advance New York City, 2010). Closer to home Melbourne's City of Monash is using site-based saturation approaches to reduce the prevalence of both problem gambling and domestic violence (Torney & Upston, 2015).

To increase the participation of women in electrical trades one or more suitable site/s for saturation could be: a suitably small geographical location such as a city; a coherent sector such as a state or territory power and energy sector. At this scale, there is potential for collaboration action involving tradeswomen's networks, the union and large employer organisations. The *site* would need:

- Leadership with demonstrated commitment to the principle of improving gender equality in the electrical trades workforce
- Sufficient coherence to facilitate coordinated action
- An obvious and respected coordination entity to coordinate the program of work needed across the other stakeholders
- A site culture that is flexible enough to commit to change
- Resourcing for coordination, adaptation and evaluation of programs.

At any site it would be necessary to engage all stakeholders involved in retention and recruitment of women into electrical trades.

## RTOs and GTOs

During our research we have come across several training organisations that are trialling cultural and behavioural change programs.<sup>1</sup> Other providers must follow their lead with the vocational education and training sector adopting a systematic, evidence-based approach to respectful relationships education and related strategies needed to support inclusive cultures and behaviours in the electrical trades industries. This is already happening in the early childhood, school and university sectors (Universities Australia, 2017), VET should be included. As the participants told us, teaching staff have unique opportunities to make trades learning more inclusive through: zero tolerance of behaviours which are disrespectful of women; and through using a diverse range of teaching strategies, such as creating opportunities for conversation and interpersonal interaction, in addition to hands on work with equipment and e-learning. Changes such as these are likely to benefit to all apprentices.

The following table summarises actions that could be taken in a pilot site saturation approach. We emphasise that coordinated, simultaneous actions throughout an appropriately defined site is more important than any of the suggested individual activities. And, the coordinated program must include work on changing cultures and behaviours within workplaces and associated organisations such as training providers.

Table 1: Summary of potential stakeholder actions as part of an ecological approach

	Recruitment	Retention
Family and friends	<p>A <b>campaign</b> involving tradespeople in pilot site to encourage young women among their families and friends to try their trades, visit them at work, talk about trades careers; <b>Promotional information</b> designed for young women to share with family and friends could provide information about electrical trades work, remuneration, career opportunities</p>	<p>An <b>information kit</b> could be produced for pilot site female apprentices to share with their families explaining what they can expect from their work</p>
Schools	<p><b>Promotional campaign</b> with local schools to educate teachers, especially careers teachers, about the opportunities available through trades-based careers including opportunities to earn higher than median salaries, build a business, participate in innovation and the digital revolution; Show them how they can assist all young people to consider trades career options as equal to academic pathways; Encourage girls to participate in vocational learning in traditionally male trades areas <b>Engage local schools</b> in pilot site recruitment</p>	
Tradeswomen's Networks	<p><b>Engage local T/W networks</b> in recruitment as role models o work with educational institutions and industry organisations to provide role models for girls and young women demonstrating the opportunities for them in electrical trades Continue to influence other stakeholders to implement effective change strategies</p>	<p><b>Engage local T/W networks</b> in retention as mentors – work with them to develop an effective mentoring program Where local T/W networks are interested in deeper action, work with them to influence other stakeholders to implement effective change strategies</p>

Employers	<p><b>Create advertisements</b> and other recruitment tools that target women;  <b>Ensure selection processes</b> select apprentices and tradespeople based on capabilities needed to do the job – practical skills, demonstrated interest in the industry, problem-solving ability – rather than traditionally stereotypes of tradespeople such as physical appearance;</p>	<p><b>Implement whole of business cultural change program</b> to shift from traditional masculine to respectful, professional workplace culture and behaviours; ensure that staff participate in professional development such as respectful relationships education before and during employment of female apprentices and tradeswomen; ensure that team leaders have the tools to address inappropriate behaviour in the workplace; redesign and reschedule work where possible to accommodate the needs of a more diverse workforce; support female apprentices and tradeswomen to thrive in the workplace, giving appropriate.</p>
Employer organisations	<p><b>Coordinate members' actions</b>  Work with government, community organisations and media to promote the benefits of traditionally male trades based careers for women;  Disseminate information and tools to employers to support them in recruiting and retaining tradeswomen; sponsor professional development for employers in how to build inclusive cultures and encourage respectful relationships in their workplaces; make programs such as respectful relationships education available to industry  Negotiate changes to work practices, awards and regulations to accommodate the needs of female trades workers</p>	<p><b>Work with employers</b> to build and maintain respectful cultures in their workplaces; work with all stakeholders to adapt work practices and scheduling that align with contemporary values and requirements for workplace flexibility and inclusion</p>
Union	<p><b>Educate members</b> about the value that female apprentices and tradeswomen offer their workplaces. Incorporate respectful relationships into education programs.</p>	<p><b>Continue to support female apprentices and tradeswomen</b> to excel. Support cultural and behavioural change in the workplace.</p>



GTOs	<p><a href="#">Develop recruitment strategy</a> to attract women to electrical trades</p> <p>Engage partner employers in activities to recruit women into electrical trades</p>	<p><a href="#">Implement focused respectful relationships and cultural change program</a> prior to, and after recruiting women into electrical trades programs.</p> <p><a href="#">Develop teachers' skills</a> in working with female students in trades classes.</p> <p><a href="#">Implement comprehensive program</a> to ensure that young women fulfil their potential in trades studies</p> <p>Work pro-actively with employers to ensure that all apprentices have safe and professional workplace experiences</p>
RTOs	<p><a href="#">Develop promotional materials</a> to use with schools to encourage young women to participate in traditionally male trades experiences including pre-apprenticeship programs</p>	<p><a href="#">Implement focused respectful relationships and cultural change program</a> prior to, and after recruiting women into electrical trades programs.</p> <p><a href="#">Develop teachers' skills</a> in working with female students in trades classes.</p> <p><a href="#">Implement comprehensive program</a> to ensure that young women fulfil their potential in trades studies</p>
Government	<p><a href="#">Fund pilot</a> sufficiently and for a long enough period to effect lasting change in pilot site</p> <p><a href="#">Invest in resources</a> to support pilot program that can be adapted by future projects</p> <p><a href="#">Evaluate and disseminate learnings</a> to future sites</p>	<p><a href="#">Fund pilot</a> sufficiently and for a long enough period to effect lasting change in pilot site</p> <p><a href="#">Invest in resources</a> to support pilot program that can be adapted by future projects</p> <p><a href="#">Evaluate and disseminate learnings</a> to future sites</p>

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## Appendix One: Methodology

This study employed a mixed methods approach to investigate female trades employees' and employers' perspectives, expectations and experiences of female participation, as tradeswomen or apprentices, in the electrical and electrotechnology trades.

The largest component of the study was a qualitative investigation based on individual, in depth interviews including short verbal demographic surveys with 19 tradeswomen, 11 female apprentices, one discontinued female apprentice and nine employers of tradeswomen or female apprentices. Participants were recruited in New South Wales, Victoria, Queensland, South Australia, Western Australia, the Northern Territory and the Australian Capital Territory by distributing invitations to participate through public and private Registered Training Organisations (RTOs), formal tradeswomen's networks and employer organisations (CEOs of each organisation provided formal permission for recruitment activity).

Female apprentice, discontinued apprentice and tradeswomen participants were recruited through a snowball sampling method supported by distribution of invitations through RTOs, tradeswomen's networks and one union branch. Invitations to potential employer participants were issued through three employer organisations. The study was limited by lack of response from discontinued apprentices, however the experience of the single discontinued apprentice who agreed to an interview was congruent with those of the other female apprentice and tradeswomen participants. The research team's decision to target a small number of employers for this study was justified by the close alignment of the views of the participating employers with those of the 42 employers interviewed for our previous unpublished research in the automotive industry.

Information was gathered using semi structured interviews largely based on open questions developed and trialled in the previous study in the automotive industry. Interview protocols were developed to ensure data were gathered in a consistent manner across the team undertaking interviews. Interviews were approximately 60 minutes in duration and with participant consent, were digitally recorded, de-identified and transcribed. Permission to record the interview was obtained verbal form and recorded on the transcript in accordance with the procedures approved for the project. The de-identified transcripts were then thematically analysed using NVivo software to identify

themes, patterns and interrelationships (Bazely, 2013). The names of tradeswomen, apprentices, employers and organisations reported in the report are pseudonyms.

Tradeswomen and female apprentices were asked to describe: the business they worked in, their background in the industry, the reasons for their occupational choice, their understanding of the nature of the industry, their experiences at the RTO they attended, their STEM background, career path and aspirations, their perceptions of the barriers and enablers that influence female participation in electrical trades, their access to networking opportunities. The interview with the one discontinued female apprentices who participated covered similar topics with the addition of a focus on the reasons for her discontinuation.

Employers were asked to describe: their businesses/organisations, what factors influenced their recruitment decision making, their experiences with female trades employees, the impact of female trades employees on their businesses/organisations and their perceptions of the barriers and enablers to/or female participation in electrical trades.

To ensure consistent demographic data collection, a short demographic questionnaire was completed verbally as part of each interview covering, (i) for all participants, name, nature, location and size of business/organisation and well as numbers of female trades employees; (ii) for tradeswomen, female apprentices and discontinued female apprentice: the survey also included: age, RTO, title of apprenticeship undertaken, educational background, STEM background, parent's occupations.

This qualitative work was supported by some analysis of quantitative data provided by the National Centre for Vocational Education Research (NCVER) for the period 2006 to 2015 showing numbers of apprentices in training, commencing and completing identified by state and gender for several traditionally male trades.



## Appendix Two: Participant demographics

The following tables summarise the demographic data describing the participants. They cover:

- Data describing each participant's workplace – state or territory, regional/rural or metropolitan location; small (0-19 employees), medium (20 – 199 employees) or large (200+ employees) size, industry sector;
- Data describing individual tradeswomen and female apprentices – age range, TAFE, or private RTO attendance, highest level of education prior to commencing apprenticeship, highest level of mathematics studied prior to commencing apprenticeship, apprenticeship title/specialisation, year of apprenticeship for apprentices and years in industry for tradeswomen.

*Table 2: The participants' workplaces*

	<b>Female apprentices and tradeswomen N=31</b>	<b>Employers N=9</b>
<i>State or territory</i>		
ACT	6	1
NSW	10	
NT	4	
QLD	1	1
SA	4	
VIC	2	6
WA	4	1
<i>Size</i>		
Large (200+)	18	2
Medium (20 – 199)	3	6
Small (1-19)	9	1
Regional/rural	13	1
Metropolitan	18	8
<i>Industry sector</i>		
Power and Energy production and distribution	8	

control/instrumentation/security/automation, communication	6	1
General residential/commercial/maintenance	6	4
Construction	5	2
Mining	2	
Roads, sewerage, fire services, etc.	3	
Training/GTO/RTO	2	2

Table 3: Demographic characteristics of female apprentices and tradeswomen in study

	<b>female apprentices N=31</b>	<b>tradeswomen N=19</b>	<b>all apprentices and tradeswomen</b>
<i>TAFE or other RTO</i>			
TAFE	10	17	27
GTO/RTO	2	2	4
<i>Age range</i>			
18-25	7	2	9
26-35	5	12	17
36-45		4	4
46+		1	1
<i>Year of apprenticeship/years in industry</i>			
1 <sup>st</sup> year	1		1
2 <sup>nd</sup> year	6		6
3 <sup>rd</sup> year	3		3
4 <sup>th</sup> year	2*(includes 1 starting 2 <sup>nd</sup> apprenticeship)		
1-5		5	5
6-10		8	8
11-15		2	2
16-20		3	3
20+		1	1

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*Table 4: Educational background of female apprentices and tradeswomen*

<b>highest level of education</b>	<b>Highest Level of Education N=31</b>	<b>Highest Level of Maths N=31</b>
B.Sc. or B/Sc. (Hons)	6	4
Incomplete degree	3	3
VET Cert IV/Diploma	4	1
Other VET	1	0
Year 12	12	15
Year 11 or below	5	7
GSCE UK	1	1

Table 5: Apprenticeship title/specialisation

Apprenticeship			
C3 in Electrotechnology (Electrician)	19	C3 in Electrotechnology (Communications)	2
Electrical Fitting /Mechanics	5	Certificate of Proficiency in Radio Trades	1
Lineworker	1	C3 in Electrotechnology (Systems Electrician)	2
MEQ Electro Technological Technology (UK)	1		

N.B. In some cases exact title was unknown or had changed. Like apprenticeships were clustered for convenience.

## Appendix Three: Commencements and Completions Data

The following tables and charts are based on NCVER data provided to the project team in August 2016. Data were collected for Australian and New Zealand Standard Classification of Occupations (ANZSCO) codes: 341 Electricians; 342 Electronics and Telecommunications Trades Workers

Table 6: Female apprentices as % of total commencements by state 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2006-2015
	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀
NSW	1%	1%	1%	1%	1%	2%	1%	2%	2%	1%	1%
VIC	1%	2%	2%	2%	1%	2%	2%	2%	2%	1%	2%
QLD	2%	3%	3%	3%	3%	2%	3%	3%	2%	3%	3%
SA	1%	2%	1%	1%	2%	2%	2%	3%	2%	2%	2%
WA	1%	3%	2%	2%	2%	2%	3%	4%	3%	3%	3%
TAS	2%	2%	2%	2%	2%	0%	3%	2%	3%	0%	2%
NT	0%	3%	3%	0%	3%	0%	3%	2%	2%	8%	2%
ACT	2%	2%	2%	3%	2%	4%	4%	1%	2%	3%	2%
annual totals	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%

Table 7: Female apprentices as % of total completions by state 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2006-15
	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀	% ♀
<b>NSW</b>	1%	1%	1%	1%	1%	1%	2%	2%	1%	2%
<b>VIC</b>	1%	1%	1%	1%	0%	1%	2%	2%	2%	2%
<b>SA</b>	2%	3%	1%	1%	1%	3%	2%	1%	1%	1%
<b>WA</b>	2%	0%	1%	1%	2%	2%	2%	5%	2%	2%
<b>TAS</b>	0%	0%	0%	0%	2%	0%	2%	0%	0%	0%
<b>NT</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%
<b>ACT</b>	0%	5%	0%	3%	0%	0%	0%	0%	3%	2%
<b>Annual Total</b>	1%		1%	1%	1%	1%	2%	2%	2%	2%