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Australian Women in Security Network

INTERVIEW ANALYSIS

Investigating factors influencing the attrition of women in the cyber security workforce

RMIT UNIVERSITY Centre for Organisations and Social Change

RMIT UNIVERSITY Centre for Cyber Security Research and Innovation

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EXECUTIVE SUMMARY

This report details the findings of a qualitative study investigating the factors that contribute to the low retention and recruitment of women in the cyber security sector in Australia.

This empirical work follows on from Phase I which was completed in 2023. Phase I included a review of the literature on the cyber security workforce, an exploration of the latest Australian Census from 2021, and quantitative analysis of an online survey.

In the first section of this report, we detail the gendered barriers in cyber security in Australia. We explore both gendered workplace barriers and gendered professional barriers.

We identify numerous gendered workplace barriers in Australia, including: poor work life balance; lack of flexible work practices; masculinised culture; gender-based microaggressions; and bullying, harassment and discrimination. Participants highlight how demanding job structures, especially the 24/7 nature of cyber security roles, make balancing work and personal responsibilities difficult, especially fo women with caregiving responsibilities. Limited organisational support for returning mothers and a culture that penalises career breaks for parental leave were also noted. This lack of flexibility drives many women out of the sector.

An entrenched male-dominated culture in cyber security contributes to exclusionary behaviours that diminish women's sense of belonging. Experiences of harassment and microaggressions, such as questioning women's technical abilities, negatively impact emotional safety and professional identity. These challenges align with international studies that report similar conditions in cyber security and STEM workforces.

Several key gendered professional barriers are also identified in this report, which include: the under-representation of women, lack of career advancement and leadership opportunities, gender pay gap and gendered stereotypes and biases. Women's low representation in cyber security is a recurring issue, with some participants noting pay discrepancies and limited opportunities for advancement, particularly into leadership. Gender stereotypes further influence recruitment and retention, affecting young. While some participants notice progress toward gender equality, overall change remains slow, indicating that substantial gendered challenges persist in the Australian cyber security sector.

In the second section of the report, we highlight the gendered enablers - both workplace and professional - that can enhance gender equity in the cyber security sector in Australia. We identify several factors that have and can continue to support women's career growth and retention in cyber security workplaces. These include: flexible work arrangements and changes to job design, mentoring programs and professional development, including for leadership roles.

Flexible work options are highly valued, particularly for those with caregiving responsibilities. The global pandemic has encouraged more open attitudes toward flexible work but such arrangements remain limited in operational roles. Some participants suggest that managers could adopt a more flexible approach to job design to accommodate experienced women seeking part-time roles, a practice shown to help attract and retain women in STEM fields. Mentoring and sponsorship, including support from male colleagues, are noted as confidence-building and important for fostering an inclusive culture.

Participants emphasise that male allies play a critical role in advocating for women in the workplace. Professional development opportunities, such as those provided by AWSN and MBA programs, are instrumental for career growth, aligning with literature that highlights the importance of such training for women in STEM.

Several gendered professional enablers are also identified in this report, which include: promoting the benefits of working in cybersecurity, addressing gender biases in hiring and fostering a positive mindset towards cybersecurity in girls. To improve societal attitudes, participants recommend better promotion of the social benefits and collaborative nature of cyber security work. Participants suggest that gender quotas may be implemented, however should accompany complementary initiatives such as unconscious bias training and allyship programs. Encouraging interest in cyber security among school-aged girls is also highlighted as a way to counteract early gender-based stereotypes. Increasing the visibility of female role models could further play a significant role. This aligns with extant literature which advocates for increased outreach to girls and young women to challenge stereotypes and make the sector more appealing.

Overall there is a need for more inclusive work practices, strengthened professional development, and targeted recruitment strategies to make cyber security more attractive to women. However, changing mindsets, especially among younger generations, is also crucial.

1. INTRODUCTION

The aim of this report is to gain an understanding of why the cyber security workforce in Australia remains male dominated, including investigating factors that could contribute to low retention and recruitment of women. To that end, we conducted a qualitative research study encompassing interviews with 30 women currently or previously working in cyber security roles in Australia with over five years' of experience. Interviews offer insights into the lived experiences of participants, including the motivations for entering the profession, the gendered barriers they have confronted in the early, middle and more advanced stages of their career, how they have sought to navigate those barriers, and the extent to which their career advancement has benefited from the implementation of organisational policies and practices designed to improve gender diversity and inclusion.

The analysis of gender in the cyber security workforce is motivated by several factors. First, the workforce remains overwhelmingly male dominated pointing to the persistence of gender disparities, with various estimates suggesting that women account for less than one in four cyber security professionals in Australia and globally (ISC2, 2018; Risse et al., 2023). Second, it is striking that the cyber security workforce has remained male dominated given that the profession is a contemporary phenomenon which has emerged at a time when there has been a greater organisational and societal focus around gender equality and inclusion in the workplace (Hideg & Krstic, 2021). Third, there is a growing consensus that the profession needs to broaden the diversity of its workforce to address the global shortage of cyber security professionals, including targeting recruitment and retention initiatives to women and people from disadvantaged communities (OECD, 2023).

This report is structured as follows. In **Section 2** we briefly discuss the methodology used and the data collected, while **Section 3** explores participants' perspectives on gendered barriers in cyber security in Australia that contribute to gender disparities. The discussion of gendered barriers distinguishes between gendered workplace barriers **(Section 3.1)** and gendered professional barriers **(Section 3.2).**

Section 4 discusses enablers to enhance gender equity in cyber security, which is divided into workplace enablers for retaining women **(Section 4.1)** as well as professional enablers for recruiting women **(Section 4.2)**. **Section 5** contains some brief concluding remarks and recommendations.

2. METHODOLOGY AND DATA

Interviews were conducted with 30 women participants (see Table 1, page 9), all of whom are either currently employed in the cyber security workforce with at least five years' of experience or previously worked in the profession. Their participation was voluntary with each participant responding to an invitation email that was disseminated by the AWSN. Participants were not paid to be interviewed. The interviews were conducted via Microsoft Teams and were held between late April and early July 2024, with the average duration being 48 minutes. Identifying information about the participants is not disclosed in this report. To that end, participants in the report were assigned a randomised ID.

The interviews were analysed through thematic analysis, which represents a method of identifying patterns and recurring themes that are present in qualitative data (Braun & Clarke, 2006). NVivo qualitative data analysis software was used to store, manage and code the interview transcripts, whereby codes reflected themes that correspond to gendered barriers and disparities evident in the profession. In this report, the selection and structure of themes were guided by the literature review and through an inductive approach, where common responses from interview participants also shaped the selection and structure of themes (Braun & Clarke, 2006).

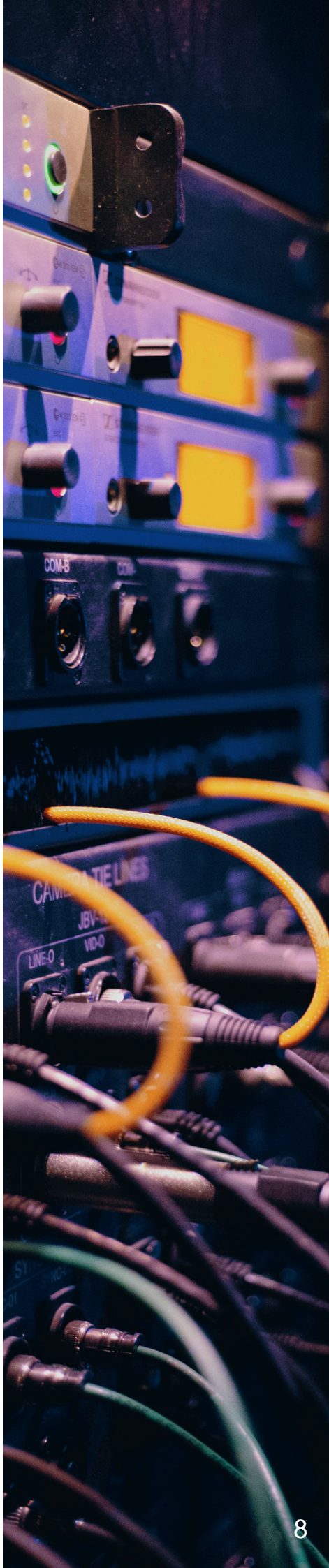


Table 1. Participants interviewed for this report

Participant number	Years in industry	Employment	Education
1	22	Part-time	Postgraduate Certificate
2	30	Full-time	None
3	11	Full-time	Bachelor's degree
4	25	Full-time	Professional certificate
5	20+	Full-time	Degree
6	30	Full-time	Graduate Certificate
7	21	Full-time	Master's degree
8	16	Full-time	Higher national certificate
9	22	Full-time	Bachelor's degree
10	15	Full-time	Master's degree
11	15	Full-time	Bachelor's degree
12	18	Full-time	Master's degree
13	30	Part-time	Degree
14	24	Part-time	Bachelor's degree
15	20	Full-time	Bachelor's degree
16	15	Full-time	Master's degree
17	11	Full-time	Master's degree
18	10	Full-time	Higher national certificate
19	10+	Full-time	Doctorate
20	7	Full-time	Bachelor's degree
21	10	Full-time	Master's degree
22	8	Full-time	Graduate diploma
23	14	Full-time	Bachelor's degree
24	24	Part-time	Bachelor's degree
25	25	Full-time	Certificate
26	25+	Full-time	Master's degree
27	17	Full-time	Master's degree
28	17	Full-time	Bachelor's degree
29	14	Full-time	Bachelor's degree
30	20	Full-time	Degree

3. GENDERED BARRIERS IN CYBER SECURITY IN AUSTRALIA

Given the low representation of women in Australia's cyber security profession (Risse et al., 2023) and attendant skills shortages (Crumpler & Lewis, 2022), there is a pressing need to understand and address these persistent challenges by identifying key barriers. The discussion of gendered barriers facing women is divided into two categories: gendered workplace barriers and gendered professional barriers.

3.1 Gendered workplace barriers

Analysis of the interview data revealed five key gendered workplace barriers experienced by women cyber security professionals in Australia. These practices and conditions in Australian cyber workplaces reproduce gendered inequalities, namely: poor work life balance; lack of flexible work practices; masculinised culture; gender-based microaggressions; and bullying, harassment and discrimination.

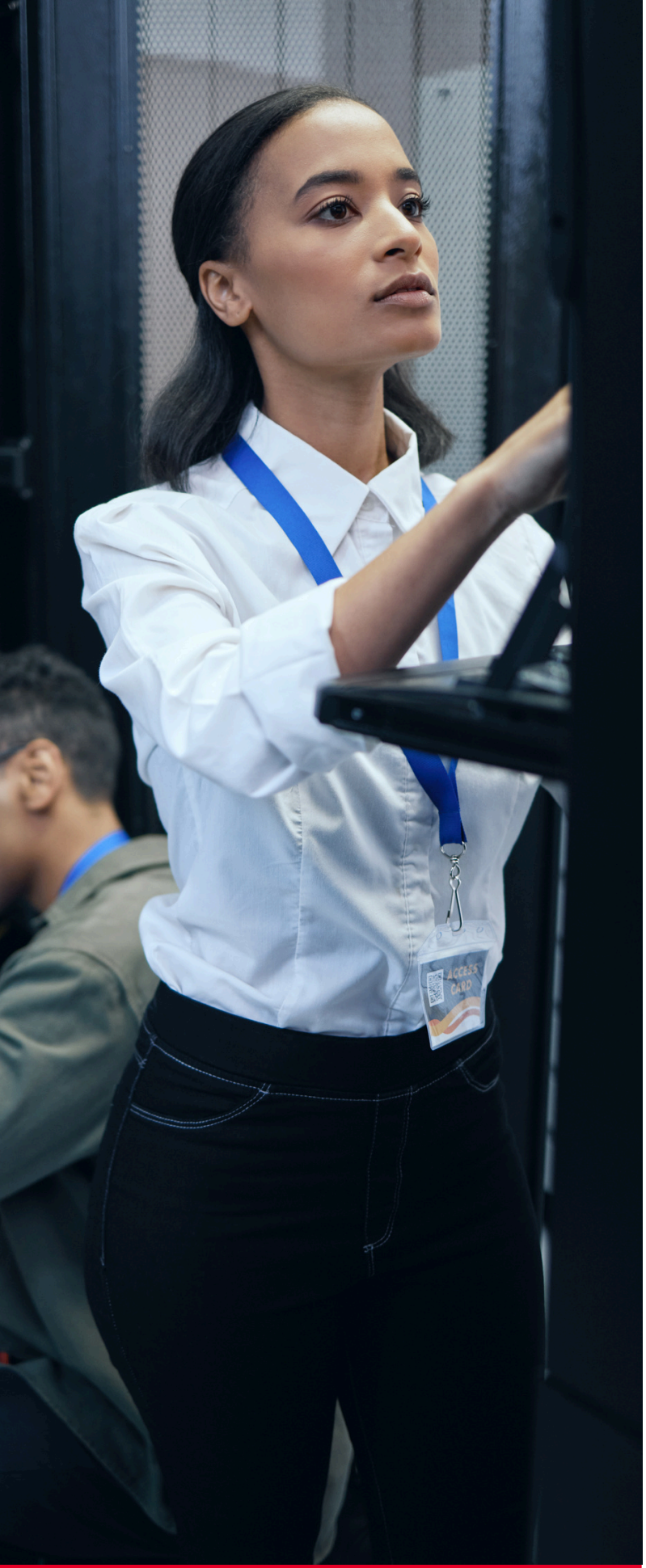
3.1.1 Poor work life balance

A recurring theme among participants was that the demanding nature of cyber security roles are typically not compatible with achieving work-life balance, particularly for women in senior leadership positions and/or those with child rearing/domestic responsibilities.

'*I think that's the hardest challenge is the work life balance with a job as a senior executive in cyber - managing work life balance with children, young children, and just the demands of the role. A few have left and said, "I'm gonna go and do something else," they come back, because, they've built all these years of discipline, and expertise and it would be such a waste to their profession to lose that expertise*.' – Participant 13

Participant 30 acknowledged that men in cyber security roles also are likely to juggle work commitments with domestic responsibilities, but that women – particularly those in executive roles – were more likely to find it challenging to achieve work life balance.

'*I know a lot of women in leadership now have got all the same stresses that their male colleagues have. But they weigh that up and ask, "Well, is this worth the impact to my family?" I'm not saying that men don't do that, they probably do. But maybe they're not articulating it, or maybe they've got it covered in other ways... maybe their partner does that. But I think a lot of the women I'm seeing in leadership are still bearing the load of their wellbeing and their family's wellbeing*.' – Participant 30



Participants attributed attrition of women from cyber security to the long hours and work commitments expected which are not family friendly, including work time outside of traditional business hours and, more generally, the persistence of a 24/7 work culture.

'*I definitely still see women leaving the industry, most of it has to do with burnout and that work life balance aspect because it can be really long hours. Your personal life tends to have to take a backward step and I think at some point, that gets too much for a lot of people*.' – Participant 1

The need to be on call 24/7 and the lifestyle that's associated with cyber security can be a big barrier to women progressing … it's not very family friendly.' – Participant 2

3.1.2 Lack of flexible work practices

Participants detailed the challenges associated with returning to work on a part-time basis following maternity leave both in terms of the perceived burden imposed on colleagues and client preferences for someone in a full-time position.

'*There was flexibility in terms of start and finish time. But when I returned from maternity leave, I was part-time. And there was pressure. It was clear that this made other people's lives hard because a lot of our clients didn't want someone who was part-time*.' – Participant 20

Another participant with caring responsibilities describes that her leaving the office at 5pm would be frowned upon by colleagues and that the organisation she worked for offered a broom closet as a breast milk pumping room. The same participant also recounted that the organisation she worked for did not offer the option of returning to work in a part-time capacity following maternity leave.

'What did they say? "There's no part-time position." So when I went back it had to be full-time. But if I got up from my desk at five o'clock to go and pick my son up from childcare, which closed at six, it would be frowned upon. This company also gave me a closet as a breast milk pumping room.'
– Participant 6

'*When I had my first child, the company that I was working for wouldn't let me go back part-time. So I actually left and ended up working in a different industry. Then maybe about six months later I got a phone call from an ex-client saying, "What are you doing? Come work with me.'"* – Participant 6

Other participants discussed that the lack of organisational support and accommodation to women encountering a career interruption represented a significant barrier to women's career progression opportunities in cyber security. This has implications for the policies and procedures related to caring responsibilities in the cyber security profession, as is evident from Participant 20 who recounted that she had to resort to developing the organisation's maternity leave policy as she was the first staff member to take such leave.

'*And then we have the stereotypical situation where a workplace is not particularly supportive of women who start a family or have other life events in mid-career that cause them to have to take time out of the workplace. It could be because they have to care for a family member, et cetera, et cetera. And this is where we see a really hard barrier around how many women then go on to senior leadership levels.'* – Participant 30

'I was the first woman in the organisation to have ever worked part-time or come back from maternity leave. There's plenty of men with kids, but the only other women there were really young, it just wasn't in their life stage. It was really new having to deal with that. I had to write the maternity leave policy myself and say what I wanted.' – Participant 20

3.1.3 Masculinised culture

According to participants, the male dominated nature of cyber security gives rise to a masculinised culture that is associated with certain behaviours that are exclusionary towards women and undermines their sense of belonging. For instance, Participant 20 referred to a prevailing 'boys' club' and a culture of excessive drinking.

'Some of the security conferences, they're very much a boys club, of wanting to go out and party and drink and, and whatnot.' – Participant 20

'In the past it's been very alcohol fuelled. You know, there's always been a big drinking culture in security… I think it can lead to women feeling a bit less secure in being around that. And it's impossible to keep up with the guys because they buy a round and you can't drink the way they can. So I think that overarching kind of culture doesn't really help things.'– Participant 20

Participant 4 describes a particularly challenging masculinised culture in cyber security sales, where the behaviours are aggressive and extremely competitive, and again are exclusionary towards women.

'It really varies, I think, from company to company. I've heard of environments where women haven't had the easiest time, where it has been a very blokey environment. Especially when you look at the sales environment - that's extremely male dominated and they're very competitive. They're very aggressive and that's just that whole alpha male status. So for women trying to get into a sales cyber security role, that has been quite challenging.' – Participant 4

Participant 28 speaks of an entrenched toxic masculinity within cyber security and the tendency to use male dominated language and images to promote the profession. She also describes the reluctance of women to call out exclusionary behaviours due to 'victim blaming.'

'*It's the men who don't take women seriously in the jobs there. There's also the toxic masculinity. Even the visual imagery when they publish reports, it's always guys that they use, like the image of a generated AI hacker wearing a hood. They could find photos of women working on a computer, androgynous people, or people who are trans or something, you know? So there's that exclusionary behaviour, exclusionary language. And then if you complain or something, you're the one who's to be blamed. There's victim blaming there. So it's really a toxic environment.*' – Participant 28

Participant 30 offered a more benign perspective, in which she had not encountered any challenges stemming from a masculinised culture, but that any obstacles were related to the nature of the work.

'My experience has been quite positive, to be honest with you. And maybe because before I came into cyber security I had another career. I don't know if some of the young ladies who are coming straight from TAFE, or straight from uni, I wonder if they're experiencing different, and I suspect

they might be. But for me, I would say I've found it to be smooth. I've generally found if I've had troubles, it's more been the nature of the work rather than the culture.' – Participant 30

3.1.4 Gender-based microaggressions

Gender-based microaggressions in the workplace represent "subtle and often unintentional slights…that denigrate women" (Kim & Meister, 2023, p. 514) which contribute to women's concerns around self-efficacy, reduce their sense of belonging in the workplace and undermine women's professional identity (Kim & Meister, 2023). Participants spoke about related experiences of microaggressions, including professional disrespect and devaluation of their technical competence. Instances of gender stereotypes were common – in particular that on account of being a woman, a female worker was assumed not to be "technical", even if they had extensive experience in technical arenas.

Participant 6 described a case of her male, non-technical colleague repeatedly being addressed technical questions, despite several attempts to clarify that she herself was the technical expert:

'*In meetings, client's will often talk directly to males in the company about what their business issues are, even if the man is not in a technical role. It's always just the natural assumption is that the man's the technical one and I'm just the person that sets up meetings being the program manager. I have to go into some calls and say, "I'm the program manager, but I'm also technical". I've done that for many years. We're still not there.'* – Participant 6

Another participant described a situation where her expertise and insight were called into question during a meeting, and having her competence being questioned due to her gender.

'I was in a meeting once and one of the presenters, who was a vendor, was talking about a technology solution. The vendor mentioned that they did not know the answer to a question so I just raised my hand and provided the answer. And then the presenter actually went, "Hmm, let me check that". And he came back and said, "Oh, yeah, you're right, you do know your stuff." And I kind of just went, "Hang on, did you double check me because I'm a woman? Or did you just do that because you always do that?". And if I think back to the entire session, when a male colleague would make an assertion, he wouldn't go, "Let me check that" and then go, "Hey, you do know your stuff." So I'm like, "Hang on!" But I genuinely don't think this person did it on purpose. I think it was almost like a muscle reflex.' – Participant 7

Perhaps on account of these stereotypes and biases, participants described various difficulties in being taken seriously. Participants described cases of having their authority challenged, being cut off in meetings, or being subject to disrespect by team members. At times, discrediting or challenging women seemed to serve to bolster or exaggerate a male worker's own credibility. The ubiquity of these behaviours was also seen to be a challenge, with the prevalence of these being so common that moving from one work environment to another would not necessarily address the issue.

'*Depending on what I'm wearing, what my hair's looking like on any given day, all of those usual sort of background factors, I don't get taken seriously. So that's whether that manifests as getting cut off, or if I am given the microphone, or more often not, if I take the microphone, so to speak, or the talking stick. That whoever speaks next will seek to either undermine dispute or discredit what I've said.*' – Participant 30

'A certain demographic of males want to either do one of two things: Humiliate you in front of your peers, or try and demonstrate that you don't know as much as they do.' – Participant 13

Overall, participants described needing to work twice as hard as their male colleagues to be taken seriously. Frequently, women described needing to reaffirm or prove their credentials to appease those who doubted their competence.

'*In the beginning, it was a bit of, "Does she know her stuff?" you know? So you were always constantly going through your credentials or your experience or your capability just to make them feel comfortable.'* – Participant 21

Ultimately, women felt an overwhelming sense of being silenced – feeling that their opinions did not matter to the organisation, and that their presence was not valued or acknowledged during meetings.

'I was asked my opinion and then I was just completely ignored. Another senior male at my level just came in and said, "Well, I think we should do this," and presented something completely different. He didn't look at how that might integrate with what I had, didn't look at or even acknowledge me, or what I'd done. It's almost like you don't exist ... There's really strong arrogance across technology in the cyber security teams. It's so male dominated and it's rude and aggressive. And they'll keep trying to take you down'. – Participant 24

'It is sometimes difficult to get your foot in the door and sometimes still difficult to have people listen to what you're trying to say. And voice your opinion, especially if you're in a room full of other highly qualified technical people, sometimes it's really hard to have your voice heard, as a female in the room.' – Participant 1

3.1.5 Bullying, harassment and discrimination

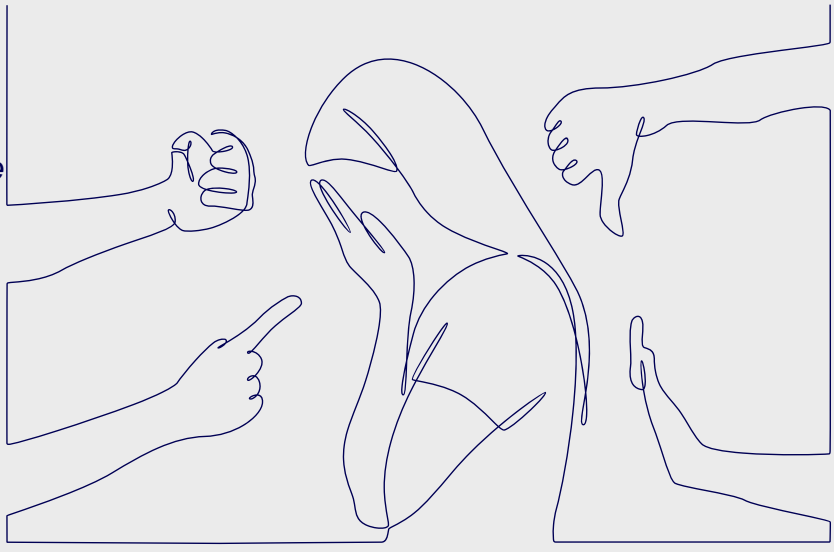
As well as being subject to microaggressions which are often subtle, many women also reported being subject to more overt forms of gender discrimination, including bullying and sexual harassment. Participants described the long-term consequences of being on the receiving end to this type of behaviour, including the development of an "imposter syndrome" – a belief that they are not deserving of their positions or achievements, despite evidence of their competence. Some described taking several years to recover from these experiences, with lasting consequences.

'*That's what fostered the imposter syndrome because I started to believe that when it happened so often, that people would shut down and that people steal your work and say, it's theirs. And it's just too hard to fight all the time to say that it wasn't theirs. "I did that, that was my idea", you know?'* – Participant 3

'I gave no notice. And it was not a pleasant situation. I was ready to walk in front of a bus. It was actually my psychologist that pointed out that I was being gas lit. That's the whole thing of gas lighting, it makes you feel that you're the problem. I openly talk about these things because I think it's important to help people understand that these things happen. That they're not alone when they're going through it themselves. And if we don't talk about this stuff, it gets pushed under the covers.' – Participant 11

The tendency to self-blame for bullying or harassment was also prevalent. In some instances, these behaviours emerged as a reaction to women's self-advocacy, such as a refusal to accept having their work appropriated or asking for a promotion. Several participants emphasised the importance of speaking out and openly discussing these issues, pointing out that the lack of conversation leads to reduced awareness around their prevalence.

'"*You're sounding like a whinger, or an emotional woman," which is what I used to get all the time. Because if anything did go pear shaped, and I would get emotional about it, obviously then I'm an emotional woman. Now, I'm very good at controlling my emotions. But as a younger woman, I found it difficult to, especially when people were bullying me or putting me down. And I'd get upset about it. And then they'd call me emotional. And then that just fostered this idea that, "Well maybe I am, maybe I'm just not good." And I have that impostor syndrome. And that's what fostered it. That toxic environment.'* – Participant 3



‘I was bullied out of my position many, many years ago. And it took me about three years to actually recover from that experience, because the whole time I thought that it was my fault. And that was the experience where I was this close to actually leaving cyber security altogether. I thought, “I'm done with the industry” ... So they'll say things like, “Oh, but you're always on your phone… you're now dating a colleague, so it looks like you're not like paying attention, when you're at work... We want to talk to you about appropriate behaviours in the office.” And I'm like, hang on, “If none of those things were problems before I put my hand up for a promotion, why are they problems now? If you're saying that me cracking a joke in the office is not appropriate, then why doesn’t the same rule apply to the guy who's sitting next to me who's always cracking jokes?”’
– Participant 7

Leaving the organisation was a common response to bullying, discrimination and harassment but exiting from the profession was also considered. One participant believed that these kinds of experiences were a significant contributor to attrition, with organisations simply not providing enough support for women in these positions.

'And it's either because they're harassed - of all the different kinds. They're discriminated against. Or they're just not supported in the way that any human, regardless of gender, should be supported at the early stages of their development in a career - we lose about half who experience that. Unfortunately, the overwhelming majority of women who leave at that point have experienced some form of severe harassment. And I've been one of the few people who have been willing to talk publicly about my own experiences.' – Participant 30

Overall, a lack of accountability by the organisation was noted, with the absence of effective processes being put in place to manage these kinds of behaviours. This lack of accountability – including a stigma associated with being a whistleblower and calling out unacceptable behaviours - was noted not only for women but extended to all victims of bullying in the workplace.

'*We've got a set of laws now that have actually gotten better over time at being able to deal with criminal activity and harassment in the workplace. But we've got very little that deals with the consequences that happen as a result of that. What is the workplace responsible for? And what is an employer accountable for, for not just the direct victims of a situation, but also the indirect victims?'* – Participant 30

'*We need women to feel that they can speak up and not be made to be the whistleblower because I think that is something that's not just present in in our industry... But I think we also need to have those environments of psychological safety and make sure that that there are repercussions when people do the wrong thing, that when there is toxicity, it's called out and stamped out. Most companies have a whistleblower policy that you cannot go after the whistleblower. Because I know so many people that still get harassed and stuff like that for being a whistleblower.'*
- Participant 11

3.2 Gendered professional barriers

Analysis of the interview data revealed four key gendered professional barriers that speak to gendered inequalities across the sector as a whole. These constitute: the under-representation of women, lack of career advancement and leadership opportunities, gender pay gap and gendered stereotypes and biases.

3.2.1 Under-representation of women

Many interview participants noted a lack of female representation in cyber security, expressing the view that gender parity was still a long way away, despite the fact that progress towards gender diversity has improved.

'When I first started, women only made up about 2% of the senior leadership in cyber across any industry. Now it appears it's getting closer to 15%... But that's obviously still very, very low. We're so far away from parity. Now, we know that overall we've increased the number of women and that's been through some very determined pieces of work. So that data is showing that we're somewhere between 28% and 35% of women now as an industry. That growth has happened just in the last seven years. So that's great progress. But of course, we know that we're still far from 50%.' – Participant 30

Some women also discussed the effect of this lack of parity on their sense of belonging. The overall culture created by this over-abundance of men was a concern for some women, with a need to be "one of the boys" being expressed by several participants.

'*I remember the first time I turned up to this meeting, and honestly, I felt like I was surrounded by a bunch of… high schoolers, wearing skateboarding gear and hoodies, and just, the way they talk…. And I get the culture and I've come to love that for what it is, but the first time I turned up at that type of event, I felt so different. I mean, I wasn't dressed like these people. I didn't talk like these people. So you've got the whole technology side of things, which is, you know, very interesting. And that's what I found. I wanted to learn more about that. But I felt a little bit like an outsider*.' – Participant 30

'*When I was at uni, I was one of only three girls in my in the computer science degree back then. And then after the second year, I was one of two. And then the third year, I was the only one left out of everyone. It was not easy to have females to pick for this type of role. Even in cyber and even now with engineering. It's better but it's still not there. I guess I've always been one of the boys, so it makes it a little bit easier because you kind of have to be*.'
– Participant 23

3.2.2 Lack of career advancement and leadership opportunities

As well as an overall lack of women in cyber security positions, participants also noted differences in the types of roles offered to women as opposed to men. Women faced challenges in breaking out of lower-level roles, and being offered more than a fair share of administrative responsibilities. For instance, Participant 21 suggested that women were typically not considered to fill technical roles.

'*I still think women get sidelined into certain roles in cyber security - for example, governance, project management, process type roles. They're still not accepted as much in the more technical roles, like incident response and forensics.'*
– Participant 21

Unconscious biases around women's effectiveness as leaders also made it difficult for women to procure leadership positions or be taken seriously within them. Having women in security leadership positions was seen to be stigmatised due to gender biases. Women were seen to lack leadership capacity, or had their leadership capacities viewed in a negative light. Qualities such as assertiveness for example, were also felt to be framed as aggressiveness, as gender biases filtered perceptions about how these qualities were to be viewed in women. The ubiquity of male leaders within these roles was also noted as a potential issue, with the majority of middle-aged white male leaders considered to prefer potential leaders to be like them.

'*There's still a very borderline toxic sort of attitude towards women in senior leadership positions that work in security, whether that's cyber security or any other form of security, like national security where obviously cyber tends to be nested. You know, we've still got a predominantly middle age to sort of upper age group in the workforce who are men. Now, not all white men, but you know, certainly in some of the circles that I still operate in, they have a tendency to be majority white men. That is changing, but there's still a majority of men who hold preferential attitudes around who should be sitting around the table*.' – Participant 30

'I definitely think there's still a stigma around females being in senior leadership roles for cyber, there's still a stigma around women not being as good managers, as good leaders, as technically capable, not as bullish. There's very definitely a double standard. If a female is driving change throughout her organisation then she's aggressive rather than assertive. There's a double standard in terms of how men and women are perceived. I don't think it's a level playing field right now - especially in leadership roles.' – Participant 15

Women in leadership positions struggled to be taken seriously. Women seemed to be subject to greater criticism and closer surveillance in their leadership compared to men, and often faced hostility from their subordinates or a lack of respect from their equals. In some cases, opportunities to advance, such as attending executive development programs, were withheld from women on account of career interruptions due to pregnancy.

'*I looked after a group of guys, and they didn't like it, they thought, "You're a woman, what would you know?" and they treated me like crap, and they were my own staff.*' – Participant 3

'*I would really like to see something more around women in leadership. And this is not just exclusive to cyber. It's an issue that we have with CEOs and CFOs, with all C level executives. Remember what we saw with Christine Holgate [former Australia Post CEO] and Kelly Bayer Rosmarin from Optus? Women get absolutely crucified if they make a mistake. How do we shift that double standard?*' – Participant 15

'*Something that usually comes up is unconscious bias on what I can do and can't do because I have a family. There was one occasion a few years ago where I wasn't put on an executive training program because I was about to go on maternity leave. They just assumed that I'm probably too busy and might not be in the right headspace at the time, but I was actually really keen on doing the program.*' – Participant 19

3.2.3 Gender pay gap

Another significant gender disparity noted by many women was the gender pay gap. One participant described an instance where a female superior was paid less than her subordinate, despite having a greater workload and higher qualifications. This participant also observed that this pay inequality occurred under the administration of a man who was generally supportive of women and appeared to have a positive attitude towards them, illustrating how even those who seem to champion gender equality can still tolerate or perpetuate sexist conditions. In this instance, the participant, serving as an executive, was able to raise the woman's salary herself, demonstrating the equalising effect of having women in leadership positions.

'I was in charge of everybody's salary, I just went, "Are you kidding me? He's being paid more than her. And she's absolutely superior to him. She does so many more things and is so much more qualified than he is." So the first thing I did was give her more money. She's now the highest paid consultant that I have. And I've just slowly been bringing everybody into line with their qualifications and their experience and how well they're doing with my clients.'
– Participant 3

Many participants had direct, personal experience of being paid less than male colleagues. Others appeared to have insider information on worker salaries, which confirmed the absence of gender equality in pay.

'*Certainly, for my staff, the data obviously says that pay parity is not there for the diversity. So that needs to be addressed. Because nobody wants to feel undervalued.*'
– Participant 8

'*They try and keep it secret what everybody is getting but I found out what the guy before me was getting, and they offered me this position for significantly less, and I just went, "No, I want it for this". And they said, "Oh, you know..." and I said, "Well, I happen to know that he got much more". And they said, "Oh, but he didn't start on that". I said, "Yes, he did." And they went, "Oh", and then they, ummmed, and arrhhed and they came back to me. They said, "Well, you know, that's a lot of money". I said, "I don't care, he was paid that. And that's what I deserve. And if you don't think I deserve that then don't put me in the role."*' – Participant 3

Particularly concerning were organisations' attempts to obfuscate in matters of pay parity. This lack of transparency seems to add an extra layer of complexity in identifying and rectifying parity issues. Many women also noted the effect of being paid less than their male counterparts on women's sense of feeling "undervalued". It also appeared to push some women away from taking on further responsibilities, as compensation for these extra responsibilities was not offered.

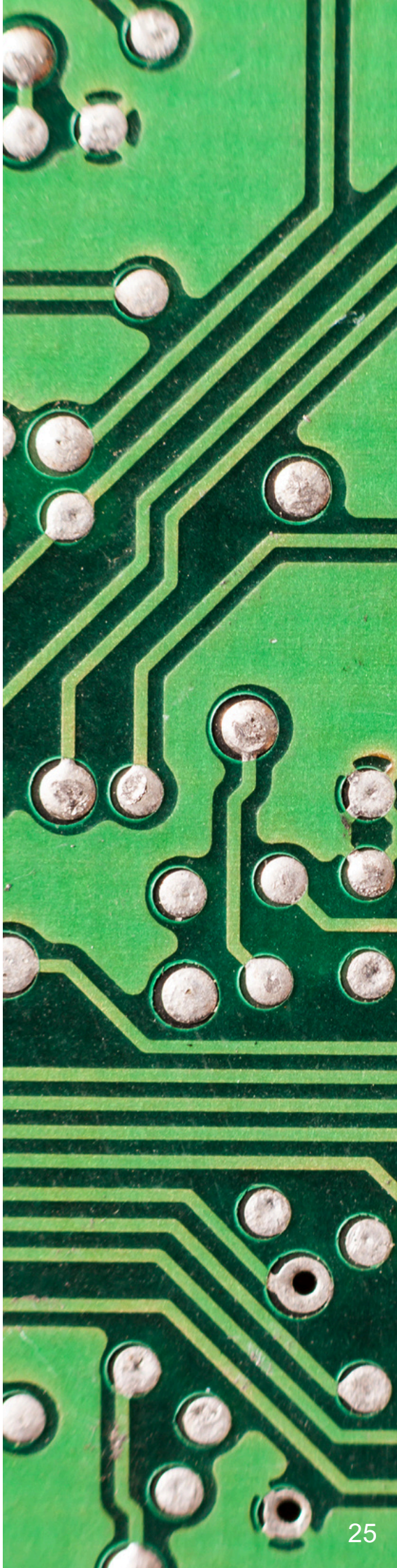
‘*It sometimes tends to demotivate team personnel, you're not performing at 100% because your mind is constantly thinking, “Oh, my God, I'm being disadvantaged. I'm not being given equal opportunities. I've seen women being impacted by it and demoralised and demotivated because of those reasons and then it tends to lead to them leaving and it's leakage of skill set. So, it's hard to get women into cyber and then if such things happen, it is going to demotivate that person even further.’* – Participant 14

‘*They're really good at championing me and my knowledge and my experience by asking that I speak at events, but then they didn't want to pay me. So I think it's because of the gender pay gap that women go, “Why would I bother?*”’ – Participant 3

Lastly, this sense of injustice and feelings of being undervalued by the organisation lead some women to exit from the organisation, leaving a skills shortage. The organisation's failure to take pre-emptive action was noted, with efforts to address or acknowledge the problem occurring only when it was too late, resulting in a significant loss of talent for the organisation.

‘She can do the job of probably four or five people because she's that intelligent and she loves to work. But they've lost her now because they couldn't keep her. They haven't been able to find anyone to replace her that was able to do everything that she was she was doing. Now they see the pay difference.’ – Participant 23

In conclusion, the gender pay gap was a significant gendered barrier noted by many participants. It was seen not only as a financial injustice but also as a reflection of the lack of value attached by the organisation to their women workers. It was seen to have a demotivating effect on women, and in several cases caused some women to leave their workplace entirely. Lack of transparency around pay scales was also identified as exacerbating this issue.



3.2.4 Gendered stereotypes and biases

Several participants attributed the lack of female representation in cyber security to gendered stereotypes and societal expectations, and suggested that these commence at an early age.

'I'll give you an analogy, girls used to play with Barbie dolls, boys used to play with guns, which is very similar in this industry. The percentage of women in cyber is quite low globally. And in executive roles, or C suite, it is even lower. Things are changing, but there is still that unconscious bias of "She's a lady, she doesn't have an official qualification in technology, she doesn't understand the landscape," and things like that.'
– Participant 14

Participant 6 suggests that the lack of interest in cyber security among girls is evident at primary education levels and proposed that educational programs could help to promote more interest in cyber security among primary school age girls.

'I've seen them coming through primary school, from like nine or 10 years old. There really is not that much interest compared to boys at that age. So you can see the differences. Maybe that means we need better educational programs for parents at that younger age.'
– Participant 6

Participant 24 explained that part of the problem lies in the IT curriculum in the senior years of high school, which she believes is not particularly creative or suited to promoting interest among girls.

'Look, I think I'm really concerned about the pipeline of women. I've had two girls myself, who studied IT at school. And were really good at it and got A's and then dropped out of it in year 11 and 12.'
– Participant 24

Research highlights that gender stereotypes contribute to women's concerns around self-efficacy and associated lower career aspirations and adversely influence women's career progression (Hartman & Barber, 2020). Several participants discussed concerns around self-efficacy and self-confidence more broadly, which they believed impeded their career progression, particularly in the early stages of their career.

'I'm not as technical as the guys. I wouldn't ask for what I needed. And I had the mindset that I wasn't as good as the boys which really hindered my career development for a very, very, very long time. I would wait for permission for one of the guys to see my value. What I've noticed between women and men is that guys will unashamedly and unapologetically ask for what they want. If they want to create, if they want a pay rise, if they want a promotion, they will just hound you until they get it.' – Participant 15

‘*Guys are going for these jobs, but the women have a mindset issue around, “Can I do this?” There's a self-confidence issue. There's an impostor syndrome issue. I don't see much investment happening in that space. And so we really need to get that happening first before we're gonna see a significant shift.*’ – Participant 15

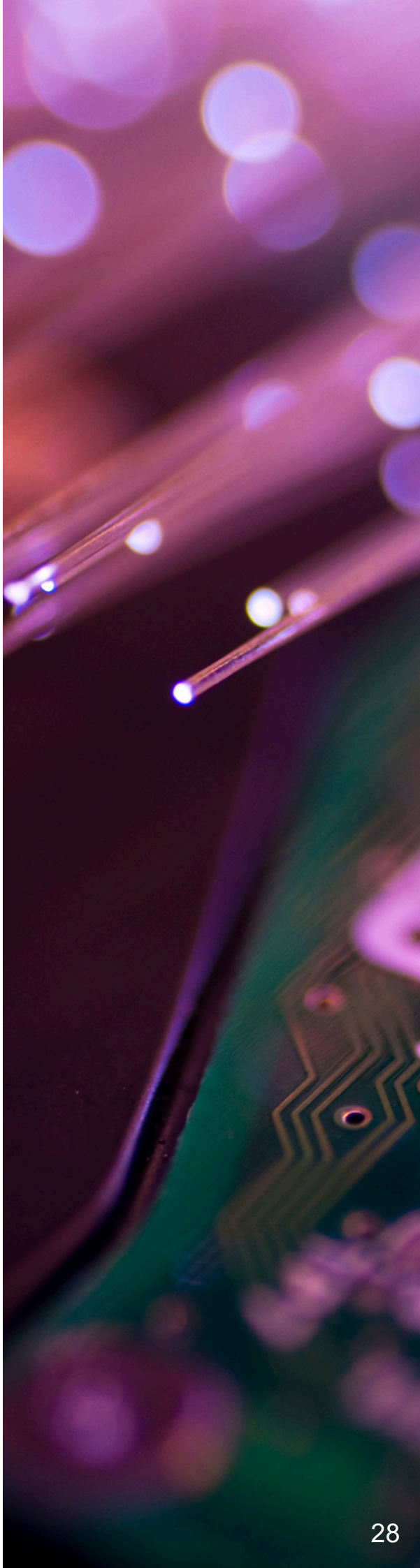
3.3 Summary of gendered barriers in cyber security

Overall, a significant and ongoing struggle for gender parity within the cyber security profession was noted by interview participants, consistent with evidence documented for both Australia and overseas. The impact of this disparity was experienced as gendered barriers that operate in the workplace and across the industry more broadly. Gendered barriers in the workplace comprised: poor work life balance; lack of flexible work practices; masculinised culture; gender-based microaggressions; and bullying, harassment and discrimination. Gendered professional barriers across the sector included: the under-representation of women, lack of career advancement and leadership opportunities, gender pay gap and gender stereotypes and biases.

Participants noted how job design and the demanding and often inflexible work commitments of many cyber security roles in Australia – exacerbated by its 24/7 culture - made it difficult for women with domestic and/or child rearing responsibilities to achieve work-life balance. These challenges appeared to extend to limited organisational support being offered to women returning from maternity leave. This is consistent with the operation of a ‘flexibility stigma’ (Padavic et al., 2020) in cyber security and a prevailing mindset that career interruptions associated with maternity/parental leave are detrimental to one’s career development (Professionals Australia, 2017). This has important consequences, with evidence highlighting that a lack of flexible work arrangements in STEM and ICT fields in Australia is a key reason why women leave their careers (Foley et al., 2017).

It is evident that a masculinised culture remains entrenched across Australia's cyber security workplaces, which gives rise to behaviours that are exclusionary towards women and undermines their sense of belonging. Participants communicated about their own or other female colleagues' experiences of being subjected to harassment or bullying, but more commonly reported were instances of microaggressions. Participants cited examples of professional disrespect and a related devaluation of their technical competence which reduced their professional identity and undermined their emotional safety in the workplace. This is consistent with literature that documents a common pattern of gender based microaggressions in cyber security and STEM fields (Jordan, 2022; Reed et al., 2017) and work conditions that can be inhospitable towards women both in Australia and internationally (Aljuaid, 2022; Bongiovanni & Gale 2023). This highlights the imperative need for a more inclusive and supportive atmosphere for women in cyber security.

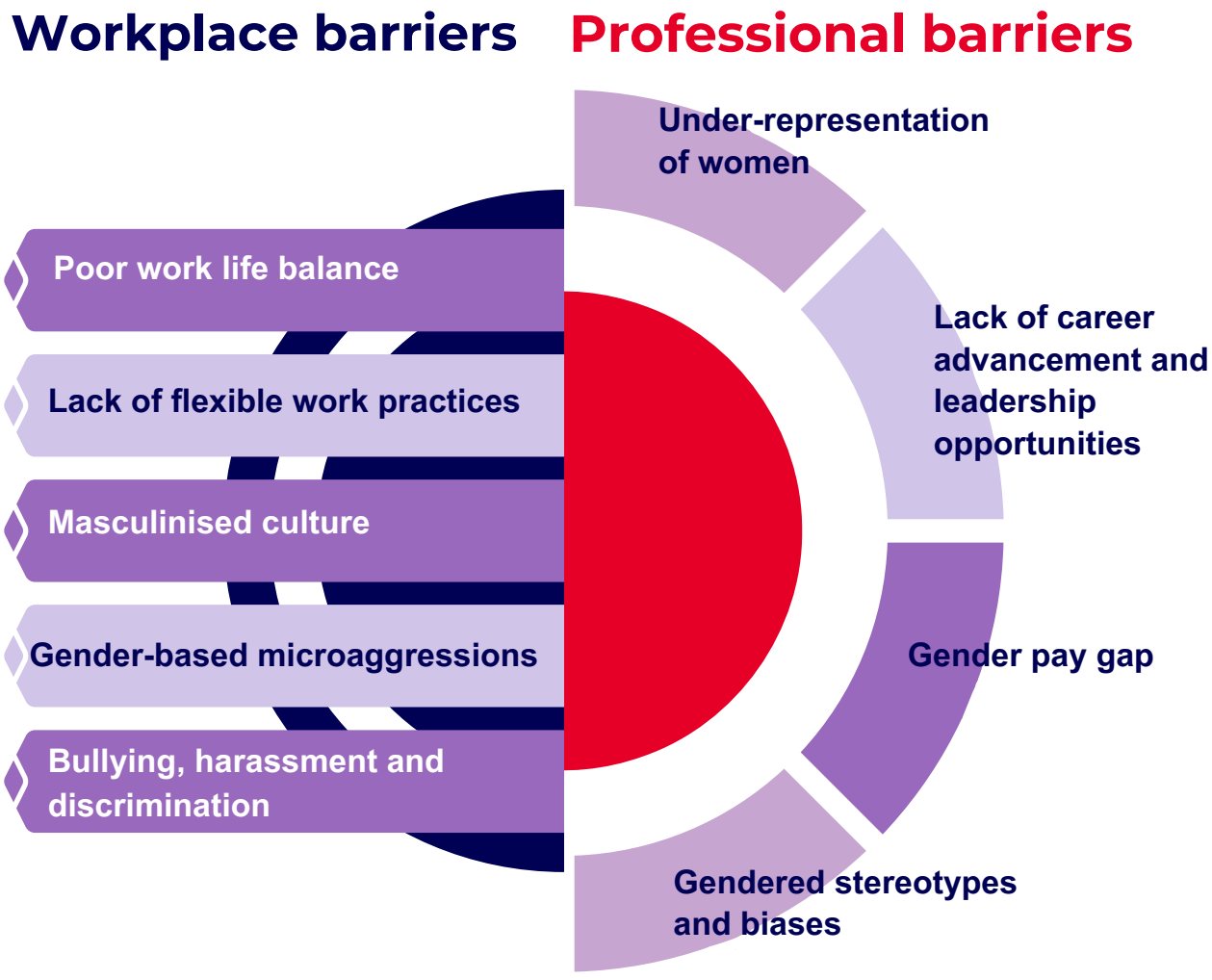
Observations by participants of poor representation of women across the sector is consistent with evidence which confirms the under representation of women in Australia's cyber security profession in Australia (Risse et al., 2023) and internationally (ISC2, 2024). Some participants also expressed concerns about being paid less than their male colleagues for similar roles and this is persistent, with evidence documenting a pervasive gender gap for cyber security and STEM disciplines in Australia and internationally, as noted in the Literature Review Report. At the same time, many participants attributed their decision to remain within the cyber security profession to generous pay and conditions. Participants also highlighted limited career opportunities, especially for progression to leadership positions. This is consistent with evidence on vertical segregation across the cyber security sector in Australia (Risse et al., 2023) and internationally (Coutinho et al., 2023).



Gender stereotypes were noted by participants as having consequences for the career experiences and recruitment of women into the industry. Some participants observed the impacts of this on their self-efficacy, while there was broad agreement that gender stereotypes impacted girls and young women in ways that fostered a notable lack of interest in cyber security as a profession. This accords with evidence that observes more males than females are exposed to cyber security as a career (Raytheon, 2017) and limited understanding of cyber security amongst school aged girls can affect subsequent career choices (Lihammer & Hagman, 2021). Moreover, the evidence suggests that in the Australian context, job advertisements in cyber security contain more stereotypically masculine language than other technically oriented professions, which potentially deter women from applying for these roles (Commonwealth of Australia, 2023).

Overall, while some participants did note some improvement in gender equality and inclusion in cyber security, the pace of change was characterised as unsatisfactory overall, with true equality yet to be achieved. The workplace and industry-wide gendered barriers highlighted herein point to significant challenges that must be addressed for gender equality to progress in cyber security in Australia. Gendered workplace and professional barriers as described in **Section 3** is depicted in Figure 1.

Figure 1. Gendered workplace and professional barriers



4. ENABLERS TO ENHANCE GENDER EQUALITY IN CYBER SECURITY IN AUSTRALIA

There is a growing awareness of the need to improve gender and diversity of the cyber security profession to lift recruitment and retention of women, thus alleviating skills shortages. Our interview analysis revealed various initiatives and practices designed to improve gender diversity and inclusion, which include enablers for retaining women within workplace (4.1) as well as enablers that could be implemented across the profession (4.2).

4.1 Workplace enablers for retaining women

Our analysis highlights three key workplace enablers that can promote the retention of women working in cyber security, including flexible work arrangements and changes to job design, mentoring programs, and professional development, including for leadership roles.

4.1.1 Flexible work arrangements and job design

Participants generally viewed the flexibility to work from home favourably, a development that some acknowledged had been precipitated by the working from home restrictions enforced during the global pandemic. Participant 4 suggested that flexible workplace arrangements represented an important factor facilitating work-life balance and supporting retention in cyber security.

'I think work flexibility is always a great thing. Remote work has been fantastic. And I think that's applicable for anyone but definitely for women because they typically still do a lot of the childcare, so that that support is absolutely key. With our company at the moment, we're very flexible so people can just have their lives and have a career at the same time. I think that definitely makes a difference in terms of whether someone leaves or stays.' – Participant 4

Participant 1 suggested that women – particularly those with domestic and caring responsibilities – valued workplace flexibility, but that this was limited for women working in operational roles.

'I think as bad as COVID was, being able to work remotely and flexibly has definitely made work a little bit easier. Especially for women who have home and care requirements. I'm still seeing a lot of women, especially in those more operational roles, who are a bit overwhelmed and just can't quite make the role fit in in with the life that they want to live and then they get a bit lost.' – Participant 1

Participant 19 indicated that managers in cyber security could be more open-minded about hiring women seeking part-time roles. She referred to her experience of changing job design and supporting greater workplace flexibility to accommodate women who wish to work in a part-time capacity.

'*I think a challenge in consulting is a lot women wanting to work part-time. And I've seen lots of people say, "Well, part-time is not possible, we need you full-time." And I'm always saying, "You know, let me know what you need. And I'll just change my projects to accommodate you. If you're doing two days, and then I need to find someone else that does three days, or uplift another role to something else, I'll just shape the work." So I can support part-time women. That's why in my team, I've had a really good balance, but others just say, "No, no this is a full-time role. So sorry." Whereas it's about shaping the roles sometimes. So it fits the person and the person can do it*.' – Participant 19

4.1.2 Mentoring programs

Several participants noted that they had benefited from mentoring during their careers, including career guidance from male mentors/sponsors. Participant 30 spoke of the signal that male sponsors can send within an organisation around the culture of improving workplace gender diversity and inclusion.

'*I've been really lucky to have a lot of male champions in my career. But I think that's also because I'm delivering to those people at a level that they find valuable. So it's not just all these guys who've helped me with my career. It's also because I'm delivering value into them.*' – Participant 15

‘*My male mentors have really helped me. Another great initiative that needs to ramp up is a buddy system. Everyone should have a buddy*.’
– Participant 16

‘*I think male sponsorship is important. Because that's actually setting an example in the organisation, to all your colleagues who are men, so that they look and see someone doing that as well.*’
– Participant 30

Participant 3 spoke of the value that women obtain from being paired up with mentors at an early stage in their careers and that mentoring can help to build self-efficacy and self-confidence more broadly.

‘*I've started organising mentoring programs, and I've reached out to a lot of the universities and specifically smart women in the industry that I can bring on and have as graduates and running a good graduate program, making sure they have good mentors within the organisation to make sure they thrive. And so that's what I've been doing with all my staff, male or female. Mentoring is absolutely key, especially for women, to make them feel like they're confident enough to do good work in cyber*.’ – Participant 3

4.1.3 Professional development including developing leadership skills

Participants highlighted professional development as helpful, as it supports women's career advancement directly as well as helps them build self-efficacy. Participants explained that they had benefited from undertaking and pursuing professional development and training, including in relation to developing leadership and management skills. Participant 1 discussed that she valued the ability to pursue discounted professional development opportunities through the AWSN.

'*I'm a member of the Australian Women in Security Network. And I find those networking events and some of the training opportunities that you can get through that network are really beneficial. They also offer discounted training to women, and cyber security training can be quite expensive. I've definitely found that helpful in growing in my career and also being able to meet with people who are in similar situations. I think when you know you're one of many, it's a little bit easier to continue to keep pushing and fighting. It's much harder when you feel like you're out on a limb and all by yourself*.' – Participant 1

Similarly, Participant 4 spoke of the value she gained from pursuing an MBA to enhance her managerial skills and knowledge, an opportunity which her organisation agreed to partly fund.

'*When I was a bit younger, I thought, "I want to do my Executive MBA because maybe that will help me become more of a leader, and will round up my management skills." So I sought that out myself, and then I was supported by my boss at that time. He said, "You know, we're happy to partially fund some of that extra education." I think it's very much up to the individual, but I'm also seeing a lot more female led groups that are helping women to learn more around cyber security.'* – Participant 4

Another participant shared that targeted development to build skills in areas she felt less capable or confident with has been highly valuable for her career progression.

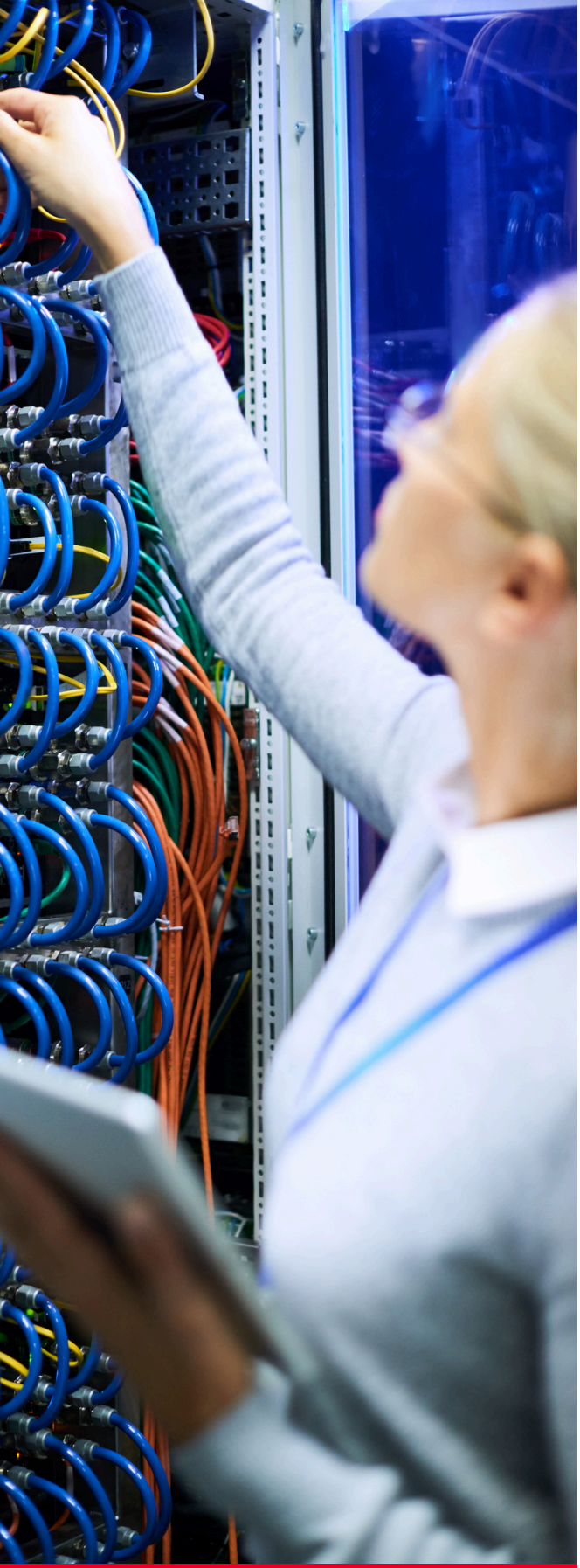
‘*One of the things I think I struggled with quite early on was the public speaking aspect of the world. I still don't consider myself a great public speaker. But I’ve definitely made significant improvements from where I was. I think most IT people tend to be quite introverted. And I'm definitely on the introverted side of that spectrum. And so, I have spent a lot of time working on that and I've done some training through AWSN, and that has really helped push me and be able to explain quite technical concepts to a crowd of people who may not necessarily be technical in nature.*’ – Participant 1

Several participants spoke to the benefits they had accrued from professional development including the development of managerial and leadership skills, which among other things had expanded career progression opportunities and in some instances, increased the participants’ self-confidence.

‘*There's been advocacy from my manager, there's been investment into training, formal training, leadership training. There's been exposure to more opportunities than I've ever been given in my career*.’
- Participant 15

'*I think throughout the years, there have been some successful women's leadership programs that I've been on... and they give you some tools and skills to build self-confidence and reassurance*.’ - Participant 8

‘There's a diversity group and they are very inclusive of women. They're putting all the women through women in leadership coaching sessions right now and I'm part of the pilot group. So they're just a very supportive company for females.'
- Participant 18



While it was understood that leadership training fostered career progression opportunities, Participant 21 noted that that not all women necessarily aspire to be managers or leaders and questioned whether career advancement would be limited for such women.

'I think really sitting down with individuals and working out what their career aspirations are is important. Not necessarily all women want to go into leadership positions. So what opportunities are there to advance their career without taking on a managerial or leadership role? Managing a team of quite technical people can be really hard work.' - Participant 21

4.2 Professional enablers for recruiting women

Our analysis highlights three key professional enablers that can promote the recruitment of women into cyber security in Australia, namely: promoting the benefits of working in cyber security, addressing gender biases in hiring and fostering a positive mindset towards cyber security in girls.

4.2.1 Promoting the benefits of working in cyber security

Many participants had varied educational and industry backgrounds, although some had been interested in or studied computer science and/or information systems at the tertiary level before entering the profession. In terms of what motivated them to pursue a career in cyber security, many participants indicated that they followed an indirect path into the profession. Participants 15, 4 and 8 attributed this to the fact that cyber threats were not widespread two decades ago and that cyber security was only in its nascent stage of its professionalisation when they were in their early career stages.

‘*I joined cyber security 20 years ago and back then it certainly wasn't an industry like it is now. I didn't even know about cyber security. I didn't make a conscious decision to join the industry. I fell into it like a lot of people who started 20 years ago because it wasn't the way it is now.There were no industry degrees on cyber security or anything like that. And so I was an IT graduate that happened to be put into a security program. And I fell into security that way*.’ – Participant 15

‘*It wasn't a choice. It was that I fell into it. It was an interesting industry to be part of, especially, you know, almost two decades ago, cyber threats and that whole concept around even the internet and what was happening there was still relatively nascent so even the threats back then were nowhere near as sophisticated as they are now.*’ – Participant 4

‘I fell into cyber security, it's not something that I studied for. My career began in telecommunications which was a nice lead into it. But it was it was totally a new field. So it wasn't a planned decision.’ – Participant 8

Participants cited several reasons for why they choose to remain in the cyber security workforce, with the most popular being the positive social impact their work has on protecting the community from cyber-crime.

‘*I really liked the problem-solving aspect... trying to understand how something happened. After uni, I pursued a job in the police force working in what was known as the computer crime squad because I wanted a position or a workplace where a) I could learn but, b) I could also contribute back into the community*.’ – Participant 7

‘*As it evolved, I became naturally interested in the privacy and the confidentiality aspect. And as social media came into play, the issues and problems that were coming in terms of those platforms. So what got me in there was a drive for knowledge, understanding legislation, rules, keeping people safe. And what kept me there is interest in the ability to make a difference*.’ – Participant 2

Other commonly cited reasons for remaining in the cyber security workforce included the value attached to working in a team (Participant 27), an intellectual engagement with problem solving (Participant 30) and attractive pay and conditions (Participants 10 and 15).

‘*I'm absolutely a people person. And I love working in collaborative relationships with others to achieve better outcomes. I love leading a team of people to be better and to do better and to get the support they need to grow in their careers. It’s extremely rewarding knowing you're protecting your organisation and making improvements*.’ – Participant 27

'I think it is about tackling the really hard, complex problems. So those things don't necessarily deliver reward in the day-to-day. It's more about being able to look forwards around how the things that I've done in the past are able to influence the future. But I guess very tightly related to that is actually working with people who value what I can bring to the table. I take a lot of satisfaction around what I learned from others as well. So I'm really collaborative in the way that I prefer to work.'
– Participant 30

'*I get paid well. I do love what I do. But I have bills to pay. If no one was paying me, I probably wouldn't do it*.'
– Participant 10

'*You need to have a very broad breadth of knowledge in cyber. At times that has been overwhelming, but I stay in it because of job security and mobility. Financial stability has been really big in terms of remuneration.*' – Participant 15

4.2.2 Addressing gender biases in hiring

Many participants were opposed to various forms of positive discrimination as a recruitment enabler for women, such as gender targets or quotas. Participants' aversion typically related to the concerns that colleagues – particularly male colleagues – would question the competence of women if they had been hired to meet the goal of achieving a gender quota. Observations from Participants 22, 16 and 6 reflect the underlying aversion to gender quotas and the strong preference for a meritocratic recruitment process.

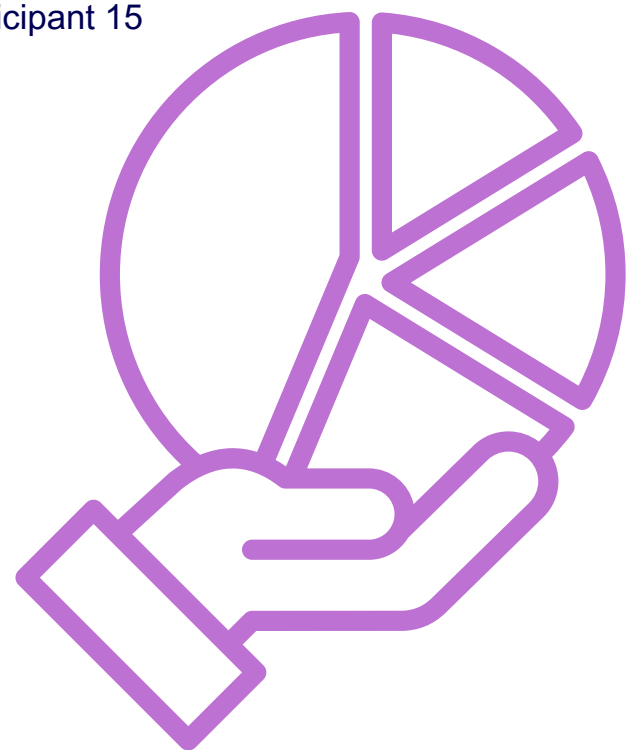
'I have seen positive discrimination initiatives. But I don't know how successful they are. And also they can backfire because a woman who's hired could then think, "I'm hired because I tick a box," rather than, "I'm hired because I'm the best for the job."' – Participant 22

'*I don't want to just fill a quota. If I get a job, it's going to be because I'm the best person for the job. And bringing in quotas just means that I got it because I'm female. That's rubbish.'*
– Participant 16

'*I don't like quotas, I think they tend to do far more harm than good. A lot of males are kicking back against that. I think everyone should just be on an even playing field*.' – Participant 6

Participant 15 suggested that gender quotas also risk undermining the perceived credibility and competence of women who were not hired to meet a gender target. Participant 15 also proposed anonymising applicants' CVs with respect to names and gender to overcome any gender biases that might be present in hiring practices, as an alternative to gender quotas.

'*More recently, a lot of guys have been like, "Oh, she just got the job because she's a woman." Because there's a diversity quota, and that is really damaging… somebody actually said that to me. And I was like, "I could run rings around you in terms of the way I execute my role." So it's challenging that there's still a lot of stigma around women in security, particularly in leadership roles but yeah, we're doing our best*.' – Participant 15



'We don't want quotas. But they actively get you to think about where you're sourcing your candidates from so you're not just looking at male candidates. I think looking at CVs without names so you can review the person's skill set instead of bringing in any biases into could be really helpful.' – Participant 15

Participants' concerns around the stigma associated with gender quotas might in part reflect the fact that many of the women interviewed have at least five years' of experience and were likely hired into the profession at a time when few organisations prioritised gender diversity.

4.2.3 Developing a positive mindset towards cyber security in girls

Several participants generally agreed that the gendered stereotypes that emerge around cyber security need to be addressed through educational programs at schools. Participant 16 suggests that this should start as early as primary school aged children and proposed that the relevance of cyber security to social media could be used to promote interest among this cohort.

‘*When I was going to school I had to learn knitting and all sorts of things while the boys got to learn much more exciting stuff. I think cyber security needs to be promoted and a diversity of what you can do in cyber security needs to be moulded from much early on in primary school and then leading into secondary school. So then kids at that age already have a view that this could be a really good career opportunity. And then take the VCE or university subjects based on potentially what they want to achieve later on in life.*’
– Participant 19

‘*I get a real buzz these days from when I get approached to come and talk about what I do. And I spend a lot of time actually going around schools, (unfortunately, only high schools, I'd really love to do primary schools because I think getting them younger would be better) but going around a lot of high schools talking to them about how to protect themselves on social media. And when you get those kind of 15/16 year olds coming up to you after a session, and just going, “Oh, wow, I never thought of it like that.” And you've got graduate teachers about to embark on a career that never, it never occurred to them that what's on social media could be blackmail material for future students.*’ – Participant 16

4.3 Summary of enablers to enhance gender equity in cyber security

Participants spoke about several practices and programs that have helped their career development and motivated them to stay in the sector. Within organisations, practices including flexible work arrangements, mentoring, sponsorship and professional development have been cited as beneficial. Participants also shared views on activities and initiatives that could change the deeply ingrained gender stereotypes about cyber security roles, for instance, promoting the social impact and collegial element as associated with cyber security roles, and promoting interest in cyber security among school aged girls. Participants however were not in favour of gender quota practices, especially when they are implemented in isolation.

Participants view flexible work arrangements favourably as they support work-life balance, especially for those with caring responsibilities, and it has been noted that the global pandemic has accelerated a positive shift to more open attitudes towards flexible work. At the same time, participants commented on the limited opportunities to have such arrangements for those in operational roles, and one participant suggesting that managers could be more open minded and flexible with job design to accommodate experienced women seeking to work part-time in cyber security. These findings speak well to existing literature, reinforcing the importance of flexible work practice in attracting and retaining women especially with caring responsibilities (Aljuaid, 2022; Bagchi-Sen et al., 2010; Poster, 2018), and highlight that organisations can more purposefully review and improve this practice as an effective way to attract and retain women.

Participants explained that they had benefited from mentoring and sponsorship including those provided by their male colleagues, and that male sponsors send a strong signal within the organisation that helps to improve organisational culture. They also highlighted that mentoring has helped them to build self-efficacy and confidence. These findings speak to the importance of having allyship programs in place so that more men can actively advocate for and support women (Bilal et al., 2021; Moser & Branscombe, 2022). In addition to this, professional development opportunities, including those provided by AWSN and through MBA studies, have been cited as helpful for participants to develop the knowledge and skills needed to expand career progression opportunities. These findings are in line with existing literature, which points to the importance of offering training and development for women working in STEM settings (Chasserio & Bacha, 2024; Chuang, 2019), emphasising the positive role that can be played by governments, industry associations as well as by individual organisations in ensuring these opportunities are provided.

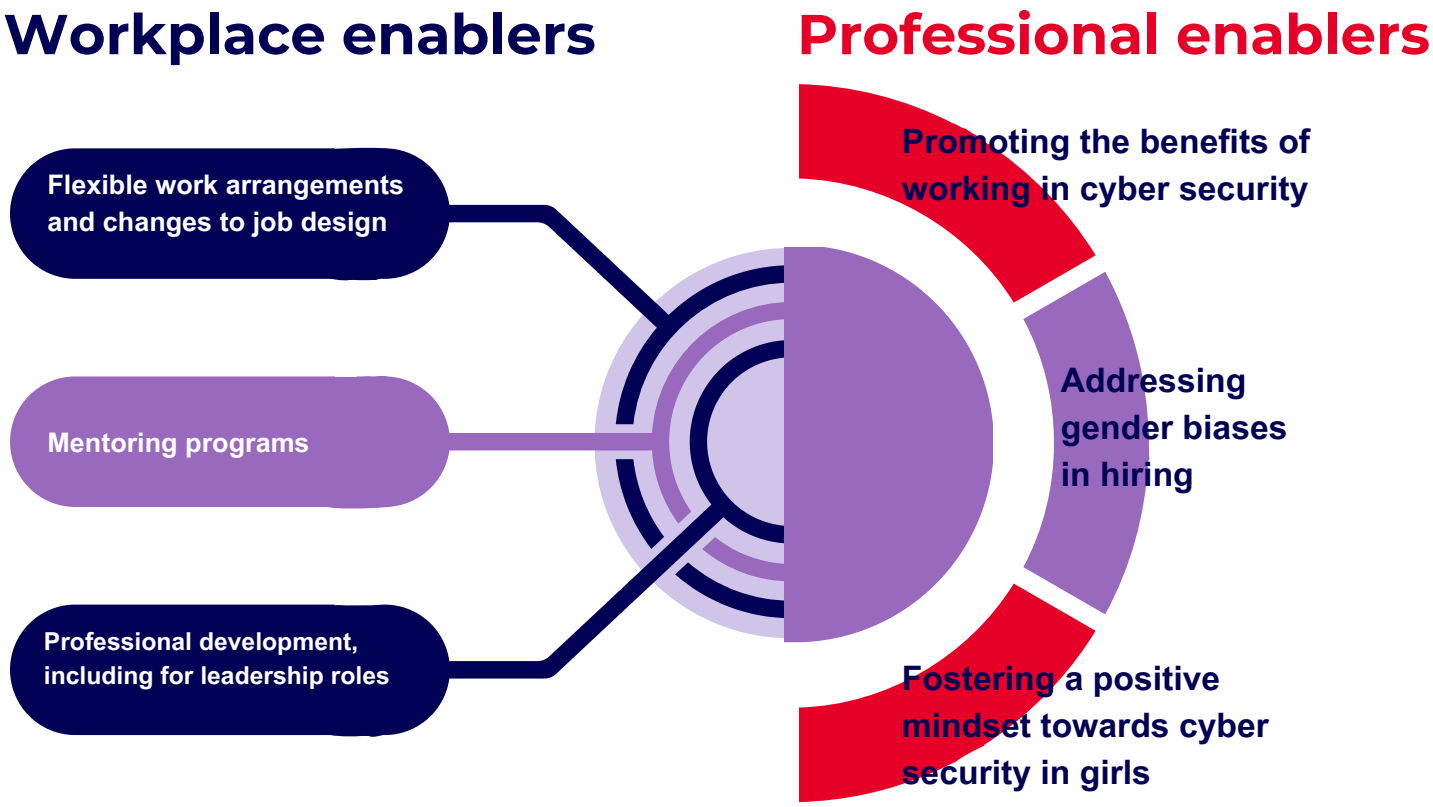
In terms of changing societal attitudes broadly, participants stressed the need to better promote the benefits of working in the sector, such as highlighting the social impacts of cyber security work and collaborative approaches to problem solving. This is consistent with our Phase I finding (Risse et al., 2023) as well as the broader literature (DeCrosta, 2021; Kam et al., 2022; Kshetri & Chhetri, 2022; Withanaarachchi & Vithana, 2022). At the same time, participants were generally averse to the implementation of gender quotas due to concerns that their own competence, as well as that of the women hired to fulfil a gender quota, would be questioned. This finding is consistent with the 'competence stigma' reported in the literature (Leibbrandt et al., 2018), and highlights that it is important to complement gender quotas with other initiatives to foster workplace inclusion, such as mandatory unconscious bias training and allyship programs, that can change men's attitudes.

Participants agreed that promoting interest in cyber security among school aged girls was necessary to challenge gendered stereotypes that arise at an early age. Increasing the visibility of female role models, such as having more female teachers and speakers in STEM, would help and some participants have personally acted in this capacity and have seen the positive impacts of doing so. The broader literature also highlights the need to promote girls' and women's interest in cyber security to combat gender-based stereotypes around cyber security in society (Kshetri & Chhetri, 2022; Withanaarachchi & Vithana, 2022).

Overall, the findings are largely consistent with prior literature, which reinforces the various enabling factors that could be undertaken through creating more inclusive work arrangements, strengthening professional development and improving recruitment strategies to make a career in cybersecurity more appealing to women – while cautioning the use of gender quotas and the need to change the mindsets and attitudes among school-aged girls towards the profession.

Gendered workplace and professional enablers as described in Section 4 is depicted in Figure 2.

Figure 2. Gendered workplace and professional enablers



5. CONCLUDING REMARKS AND RECOMMENDATIONS

The qualitative research paints a picture of women who typically followed an indirect path into a career in cyber security, and are motivated to remain working in the profession by a range of factors, including good pay and conditions and the positive social impact their work offers by helping to protect the community. Many participants have encountered cultural problems around working in a 'boy's club' where overt forms of gender discrimination such as harassment and bullying towards women as well as microaggressions are still all too common.

Participants have benefited from greater workplace flexibility and mentorship programs which is consistent with the literature on flexible work arrangements (Goldin, 2014) and mentoring support (Moser & Branscombe, 2022). Despite the persistence of gendered barriers particularly around culture and job design, and evidence that some workplaces remain inhospitable towards women, there was a general view that progress had been made on achieving better outcomes for women in the cyber security workforce. But given the still male dominated nature of the profession and attendant masculinised culture which undermines women's sense of belonging, participants were of the view that that there is scope for further improvement.

A holistic approach that involves all key stakeholders – employers, governments and professional industry associations – is necessary to foster gender diversity and inclusion in cyber security.

Table 2 identifies recommendations to support recruitment of women into cyber security, including the implementation of gender quotas, educational programs designed to combat gender-based stereotypes around cyber security among school aged children and promoting the positive social impacts that a career in cyber security can have.

Table 2. Recommendations to support recruitment of women into cyber security

For employers	• Investment in mandatory gender inclusive training that highlights the gendered barriers that women face in cyber security, which could contribute to a culture of acceptance around the rationale for, and implementation of gender quotas. • Creation of part-time or other flexible roles that offer genuine career advancement opportunities. • Address the stereotypically masculine language common to cyber security job advertisements that potentially deter women from applying for roles in the profession. • Further, job advertisements can be more gender balanced by focusing on potential in addition to technical skills and experience. • Inclusive messaging featuring images and profiles of women in internal and external communications.
For governments	• Educational programs designed to promote interest among girls in cyber security, which should start as early as primary school. • Fund longitudinal data collection on attitudes towards cyber security and gender to measure if these are shifting and if interventions have an effect.
For professional industry associations	• Industry peak bodies should consider promoting the positive social impact of a cyber security career such as protecting the community as a key motivator to attract women. • Other key motivators such as competitive remuneration benefits and working in a team should also be promoted. • Industry bodies can highlight transferrable skills that are essential for cyber security roles, such as curiosity, critical thinking and teamwork so that these are given higher value in recruiting processes.

Table 3 (on the following page) identifies recommended workplace practices and conditions to improve retention of women. These include mandatory training to foster a more gender inclusive work culture and raise women's sense of belonging, a re-thinking of job design to change the 24/7 work culture that is common in the profession, and government sponsorship of professional development opportunities for women in cyber security.

Table 3. Recommendations to improve retention of women in cyber security

For employers	• Mandatory gender inclusive and/or unconscious bias training could be considered as a way to foster a more inclusive culture and address the exclusionary behaviours that impact women's sense of belonging in cyber security. • Ensuring flexible job arrangement is offered to better support and accommodate women – particularly those with caring responsibilities and/or those wishing to work part-time. A tailored and creative approach to change job design in this regard would also be welcome. • Encouraging the uptake of parental leave and flexible job arrangements for men, as a positive way to change the male-dominated culture. • Ensuring anti-bullying and anti-harassment policies are in place, that there are clear and easy reporting strategies and that incidents reported are properly addressed, including provisions to protect whistleblowers. • Providing mandatory training on such policies to all employees, especially those in leadership positions. • Conducting gender pay equity audits and developing transparent compensation policies; identifying cases where inequity exists and developing action plans to address this inequity over time. • Offering professional development opportunities that focus on leadership and managerial skills tailored to women, including public speaking, as well as structured career advancement opportunities for women not willing or able to pursue leadership roles. • Providing staff with social connection opportunities that do not rely on the consumption of alcohol.
For governments	• Ensuring gender equity in cyber security remains an important agenda to address, committing funding and resources for programs and initiatives to support the professional development of women in the sector, and to address gender stereotyping of the profession.
For professional industry associations	• Continue offering mentoring, training and other support for women. Such mentoring and training programs designed specifically for women could be implemented at the organisational level and/or by industry peak bodies in cyber security • Continue advocating for gender equity agendas with the government to ensure funding, resources and initiatives are put into place to build the momentum towards gender equity. • Utilise professional networks to connect with women who have left cyber security roles and provide support to enable them to re-enter the cyber security industry. • Raise awareness of the Panel Pledge, a joint initiative of the Champions of Change Coalition, Chief Executive Women and Women's Leadership Institute Australia, which aims to improve gender representation in public and professional forums.

Overall, the analysis from interviews with 30 women cyber security professionals – which highlight persistent gender disparities, limited leadership opportunities and cultural problems around gender inclusion – is broadly consistent with the Australian and international evidence presented in the Literature Review Report. Australia represents an interesting setting because like other developed countries whose cyber security workforces have been the subject of much research – particularly the United States and United Kingdom – it is a developed country where female labour force participation is high by global standards and organisations in recent years have focused on raising gender diversity and improving gender inclusion in the workplace.

The gendered barriers in cyber security appear to exhibit strong inertia pointing to powerful structural and institutional dimensions common to other male dominated professions and industries (Ridgeway, 2011). There appears to be a growing consensus as documented in the Literature Review Report (see for instance ISC2, 2024), that the efficacy of initiatives designed to boost the recruitment and retention of women in cyber security both in Australia and internationally will be shaped in part by their ability to increase women's sense of belonging in what remains a male dominated sector.

Against the backdrop of still low representation of women in Australia's cyber security workforce, this report offers a comprehensive and unique insight into women's lived experiences in Australia's cyber security profession, illuminating the factors that both support and hinder their career progression. A key challenge for the profession lies in recognising and addressing resistance to cultural change, particularly concerning gender equity initiatives. This report equips the profession with valuable insights to navigate these gendered barriers effectively to improve recruitment of, and retention of women. The journey towards gender equity begins with a willingness to learn and adapt. If Australia's cyber security profession can cultivate a genuine commitment to enhanced gender equity, diversity, and inclusion, it will be well-positioned to meet Australia's growing demand for cyber security services.

The recommendations underscore the critical need to remove gender biases in workplace cultures and implement evidence-based strategies to foster inclusivity and diversity. Effecting change is a complex process that must be supported by all key stakeholders, and our analysis suggests that co-ordinated actions are likely to be more effective in improving gender diversity and inclusion in Australia's cyber security workforce:

- **Leaders of employers** can set the tone from the top by championing diversity and inclusion, embed gender equity goals in executive KPIs and demonstrate personal commitment to learning and change.

- **Employers** can establish diversity targets and implement robust policies, create an authentically inclusive work culture through mandatory training programs and safe reporting mechanisms around harassment and bullying for instance, and proactively address resistance to gender equality initiatives.

- **Professional industry associations** have a uniquely important role to drive meaningful change because many members of the cyber security workforce are employed across disparate industries. They can develop programs supporting women in cyber security, encourage equal representation in leadership and at events, amplify women's voices and visibility in the profession, and lobby governments to collect data designed to increase transparency of the gender composition and pay in the profession.

- **Educational institutions** can address gender stereotypes around cyber security that are evident at a young age, by designing inclusive curricula free from gender bias, fostering networking opportunities for students and families and encouraging school aged girls and women to pursue cyber security careers.

- **Governments** have a role to implement gender aware policies, fund initiatives promoting gender equality in cyber security, including in the collection and provision of longitudinal data on girls' and women's attitudes towards cyber security, and integrating gender considerations into policy and budget decisions.

- **The wider community** can help to challenge gender stereotypes of cyber security in the media and popular culture, and promote diverse images of the cyber security profession.

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