



Report

Exploring the gender gap in cybersecurity

Have we made a difference yet?



Across the Cybersecurity workforce, upto **1 in 4** are now women



Introduction

In 2016, Eleanor Dallaway wrote the report, 'Closing the Gender Gap in Cybersecurity', after conducting a diversity workshop attended by representatives from CREST member companies and industry. Three years on, and two gender diversity workshops later – both run as part of the CREST Access to Cyber Security Day – Eleanor Dallaway seeks to report on any evolutions and progress that has been made, and more importantly, questions what still needs to be done to improve the diversity balance in the cybersecurity industry.

The original 'Closing the Gender Gap in Cybersecurity' report looked at why diversity matters, what was preventing women from pursuing a career in the industry and most importantly it looked at how we, as an industry, can address the gender gap and actually make a difference. The six areas that participants agreed needed to be focussed on back in 2015 were:

- **Education** – getting the right messaging to children at school age
- **Awareness** – how to promote the industry to women and get the messaging right in doing so
- **Perception** – considerations into the way we market our industry
- **Inspiration** – raising the profile of successful women in the industry

- **Support** – the importance of female ambassadors and mentors
- **Removing barriers to entry** – looking at affordable training, conversion courses and flexible return to work policies, etc.

The report considered who the campaign to increase diversity should target. The following groups were listed:

- Primary school
- Secondary school
- Apprentices
- General university students
- Specialist university students
- Conversions from other academic disciplines
- Conversions from other industries
- Career changers/returners
- Retention of existing cybersecurity professionals.

The 2015 research concluded that the most important group to prioritise was secondary school students, followed by university graduates.

That was then, this is now...

Like many things, industry gender representation stats are not an exact science. Multiple sources and research pieces were analysed to get some clarity on what the latest gender diversity statistics are and the results are extremely varied.

The closest to a general consensus that seemingly exists is the belief that the number of women in cybersecurity is rising, with various statistics placing the percentage of women making up the cybersecurity workforce as anywhere between 10 and 25%.

Many people interviewed for this report and attending the workshops countered these numbers, however, stating their belief that female representation in the industry is relatively static.

The brow-furrowing disparity can perhaps be explained by inspecting what job titles are included and how job profiles are being measured. For example, (ISC)2's 2017 report said 11% of the global information security workforce is female, yet its 2019 report says 24%. On the surface, this is immense progress. Further investigating, however, shows that the 2019 report includes women that spend upwards of 25% of their time on cybersecurity, but could be employed in generic IT roles. Whether it's correct to include people who only spend a percentage of their time on cybersecurity is up for debate, but what is certain is that the two datasets are not comparable if the measurements and categorisation has changed. It is thus impossible to detect trends or claim any increase or decrease in statistics.

Despite the discrepancy in the statistics, almost everyone agrees that the numbers, if they are moving at all, are moving in the right direction; however slowly they're moving.



Perception and challenge

The two workshops in July 2019, moderated by Eleanor Dallaway, featured representatives from the Government DCMS Department; ERSOU – Eastern Region Special Operations Unit (police); NCU (National Cybercrime Unit); NCCG National Cyber Crime Group; NCA National Cybercrime Agency (law enforcement agency); CyberSafe; University of Greenwich Cyber Security Lecturer and a DCMS Policy Advisor, among many others, including large representation from the private sector and industry. The workshops were held under Chatham House rules, so all quotes used in this paper are unattributed.

Participants agreed that awareness around gender diversity in cybersecurity has certainly improved. The skills gap faced by the industry requires that the industry look outside of the groups of people that heavily dominate the industry and invest in an effort to encourage more diverse candidates to join the fight to keep data and information secure and the fight against cybercrime.

Awareness however, doesn't always equate to action and change. In fact, when polled¹, 14% of workshop attendees argued that not enough work has been done in this area. Further, 86% believe that whilst progress has been made, it's not nearly enough and not a single person voted for the third option which was 'I'm satisfied with the progress being made'.

Attendees were also asked to vote on how they perceive their own experiences in the industry thus far. Thirty percent had an overwhelmingly positive response, expressing their love for working in this industry.

Fifty-nine percent of participants classified their experience in the industry as mixed, having received support and enjoyed roles but pointing to obstacles and challenges that had to be overcome as a result of being female.

The remaining – and not insignificant 11% – expressed disdain for the industry and their experiences in it, admitting it has been tough.

This data could be analysed in one of two ways, and again points to how subjective statistics and data often is. You could interpret that 90% of those polled were reasonably – and a smaller subset, extremely – happy working in this industry and that perhaps could be marked as a huge success.

Another reading of the data, however, would determine that 70% of women working in cybersecurity have faced challenges, obstructions and/or negative experiences in their cybersecurity careers because of their gender. This reading puts a far more sinister spin on the data collected at the workshop.

Digging deeper into the negative experiences, workshop attendees discussed how they are often faced with assumptions and expectations that their (often more junior) colleagues are more senior, simply because they are men. Further, the groups felt that men are 'heard' more than women, with some attendees believing that it's because men are generally "better at putting themselves out there."

Many attendees admitted that they find networking events intimidating as they are dominated by their male counterparts. It was pointed out that even the timing of networking events accidentally promotes gender bias because evenings and late afternoons are problematic for many working mothers.

¹Data is compiled from the responses of attendees of both gender diversity workshops at the CREST Access to Cyber Day in July 2019, consisting of 32 people.

Road blocks in career paths

The third and final poll question put to workshop attendees asked what the biggest obstacle to increasing the number of women in the cybersecurity industry is. The majority of respondents (57%) believe that gender stereotypes from school age are the biggest barrier to increasing gender diversity. A further 39% believe it's the perception of the industry as a result of how it is marketed, and surprisingly only 4% blame it on a lack of interest from women themselves.

The majority of people that work in the cybersecurity industry come with STEM subjects as the feeder into the industry, and of those, most are from computer science backgrounds. Other potential aptitude indicators are often ignored by recruiters and organisations alike.

Given that the number of girls studying both computer science and other STEM subjects is still lower than boys, this is an early blocker for increasing gender diversity. Initiatives such as Cyber First, which has been working hard to get more girls interested in a career in cyber security, have made some impact but there is still work to be done.

Further, in industry there's a big focus on up-skilling veterans. Again, with the male female ratio in the military heavily weighted towards men, this naturally leads to even more men entering the industry. This however is extremely important work and should continue.

Having more open and undefined career paths should catch people from all disciplines and backgrounds and consequently, will hopefully catch more women. "We need, as an industry, to work out how to help people find a niche and design their own career path," suggested one attendee.

"The rigid career paths that seemingly dominate the industry and leave little room for more diverse recruitment alienates a percentage of the talent pool," observed one participant.



Recruitment challenges

Consensus seems to have shifted in recent years to suggest that a big part of the challenge to increase numbers of women in cybersecurity is that women don't actually want to enter the industry.

This needs to be addressed at an education level, and the responsibility for broadening the horizon for girls in STEM lies with both teachers and parents, and perhaps also the media. Perception and marketing of the industry will be addressed later in this paper.

Of course, there's no harm in continuing to remind organisations how important it is to have gender balance in their teams and the wider business. "We need to be more specific at board-level about why the organisation needs to recruit women – remind the Board that it's not just a box-ticking exercise, it's about improving output and increasing success."

Recruitment can and should be identified as a piece in the puzzle. Workshop participants agreed that there are many issues with current recruitment practice, including the way job descriptions are written, the language used and arguably even candidate requirements.

Employers have the power to change recruiting practice in order to appeal to potential female candidates. And so they should, because as many participants argued: A diverse team is a high-performing team. Success is more likely to occur if diverse minds work together.

"It's time to recruit outside of the 'old-school, boys club' network," said one workshop attendee. One way to do this, participants suggested, is to offer flexible working hours and conditions and cultural benefits.

Others believed there is an even quicker win: to remove any unconscious bias by taking away any gender-specific language or any male connotations from job adverts. "The vocabulary chosen by employers can prevent a candidate from even submitting an application," said one workshop attendee. "Language can be intimidating, subconsciously geared towards men and can completely alienate half of the potential workforce."

Workshop participants agreed that the need to appeal to both genders goes beyond just the wording of job profiles in the recruitment stage. Handling the interview stage correctly and without bias will also have a big impact. "Employers should consider having a female interviewer as part of the interview panel," suggested one attendee. "It's less intimidating, she would often add more empathy and it gives off the right messaging about women in the company."

The female representatives at the workshop agreed that the inclusion of training options on the job advert would encourage female applicants, as would good maternity policies and back to work support.

Desired, not required

Workshop attendees had a shared disdain for long lists of technical skill requirements on job advertisements. It's commonly understood that men are way more likely to apply for a job if they only meet 60% of the requirements, whereas most women feel they need to meet all 100% in order to apply. "Men are so much better at putting themselves out there," said one participant. "Confidence issues – and more specifically, incidents of imposter syndrome – are far more common in women." The suggestion therefore is to reduce the list of technical skills required to apply, or at least change the wording from 'required' to 'desired'.

So that's what participants agreed they don't want to see on job profiles. But what do they want to see? "We want to see evidence of a female mentor network, we want to learn about flexibility and working from home possibilities." Another attendee said they wanted to see success stories highlighted and shared and when discussing a potential role with a recruiter, they want to feel confident that the recruiter understands the company culture and can match candidates to companies.

Representatives from the Civil Service that were in attendance confirmed that it is committed to flexible working and senior role job shares. "The Civil Service is responsible for representing the people and its focus is on diversity and equality."

The National Crime Agency, which is a branch of the Civil Service, has a Director General who is a woman, plus lots of women at senior levels. There is also a commitment to flexible working which is important to the work/life balance that women raising families need and many strive for simply for personal reasons.

Employment that fits around family life was mentioned several times as a way of giving equal opportunities to both men and women. This was expanded on in relation to return to work policies for women once they have had children. "If the industry doesn't play this right, it will lose good, skilled, trained women. Retention of good talent is more than worth the trade-off to offer flexibility whenever possible."



Technical roles need technical women



There is still a perception from outside the industry that more often than not men fill the more ‘techy’ roles and women are hired into less technical functions including marketing and PR, compliance and admin. But is this the reality?

One participant actually believed the number of women in deep technical roles to be declining. For the first time in five years, the technical ‘Ninja Course’ his organisation runs had zero female candidates, a situation that had not previously occurred.

“More women choose the managerial side of the industry because it offers a better work/life balance,” said one attendee. “The tech side requires a lot of keeping up with industry advances and changes, and more unsociable, less family-friendly hours.”

The availability of shadowing opportunities for those either inside or outside the industry to shadow technical roles may encourage more women into deep technical roles. Similarly, one participant suggested open days in tech organisations to showcase good examples of senior women in technical roles. “Advertise the company as a female-friendly place to work, where women aren’t pigeon-holed and are promoted.

Priorities for change

Both workshops had the primary focus and objective of inspiring change. Participants were asked to highlight some of their own 'priorities for change' in the quest to make cybersecurity a more gender diverse industry.

The list of the suggested 'priorities for change' in its entirety, as determined by workshop participants, is listed on page 17.

Many common themes kept emerging, with frequent requests for female mentoring programmes, encouraging girls at a school age and changing the external perception of the industry were amongst some of the more popular wishes.

Terminology was raised, with the focus on adapting it to make the industry more accessible and appear more welcoming. "The language in recruitment, in particular, needs considering. Job descriptions should demand less and gender-neutral language is an absolute must," said one participant.

Many participants raised the importance of role models to inspire new talent into the industry. If those role models are women, it gives girls something to aspire to and demonstrates success.

After all priorities for change were discussed and recorded, moderator Eleanor Dallaway asked each attendee to vote for the two 'priorities for change' that they considered to be most crucial. The votes were then tallied and the results were revealed. The most voted for 'priorities for change' across the two workshops were:

- 1. School-level encouragement for girls to study computer science**
- 2. Improve visibility of female role models, including more female-specific awards and events**
- 3. Challenge the perception of industry and perceived gender-specific roles**
- 4. Industry-wide female mentoring and coaching**

The workshop participants were then separated into groups to tackle one of these priorities each and come up with an action plan, considering potential barriers to achievability, actions and timeframes. This report will now present the findings and presentations from each group and its plan to action change.

Action 1: School-level interference to encourage more girls to study STEM, and in particular, computer science

Earlier in this report, it was revealed that 57% of workshop attendees believe that the primary reason for the under-representation of women in the cybersecurity industry is down to a lack of interest in the subject from school age and beyond.

This priority for change seemed to have more barriers and challenges than the others as its success relies on many different groups of people and influencers working together to make meaningful and sustainable change.

Teachers, for example, are just one piece of the puzzle. Parents and families need to be involved, the curriculum needs to be consulted, careers advisors need to be on board and role models and people from industry will likely also need to play a part.

One idea that was touted was to introduce cyber champions into school with the objective of promoting online safety to school children. It was hoped that this awareness of the dangers in cyberspace will lead to an interest in cybersecurity as an industry and career. Even if it failed in the latter objective, promoting online safety to students would not be a wasted mission.

Offering coding clubs and extracurricular STEM clubs marketed to appeal to both girls and boys is another way of inspiring interest.

Participants believed that teachers can support this mission by ensuring the way they talk about computer science and related disciplines is void of gender stereotypes. "They should use female examples when talking about historical role models and they could invite women from the cybersecurity industry into school to talk about their career path into cybersecurity," suggested the group. They believe that industry leaders – including directors, CEOs and accreditation bodies – could and should be responsible for approaching schools with an offer to go into the school and educate and encourage students. It was acknowledged that teachers are often very busy and often don't have time to consider or action anything beyond the mandatory curriculum.

It was suggested that schools could run a girls STEM day, led by industry and drawing on successful Hollywood movies like 'Hidden Figures' that promote the important and impressive impact women have had on computing history. Bletchley Park could also play a part in telling the stories of how women have shaped history through computing.

The group proposed using ex-students to visit the school and share their success stories in STEM careers to existing students, which they believed would be popular with both staff and students.

Six months ago, CyberFirst ran an online Girls Competition, with the aim of encouraging and inspiring the next generation of young women to consider computer science as an option with a view to a future career in cybersecurity. Schools have a duty to adequately promote initiatives like this.

CREST are looking to have a positive impact on encouraging girls into cyber from a young age. To do this, they have three primary objectives:

1. Break down gender stereotypes
2. Cross-skilling at a primary age and offering modules at degree level
3. Educate teachers so their cyber skills are relevant for coding clubs, using free/external resources

The group acknowledged that any impact school initiatives may have will be long-term, given the length of time it takes for children to reach working age. There's no overnight solution and whilst ideas can be actioned immediately, the impact will take many years longer.

Action 2: Improve visibility of female role models, including more female-specific awards and events

The second priority for change should, if successful, aid the first, since it was agreed that schoolgirls should be encouraged by giving them visibility of female role models and success stories.

The group discussed the many different ways to give successful women in the industry a platform on which to inspire others. This can be as industry-specific as featuring more in industry publications, creating a female 'hack the box' competition channel on YouTube and speaking at more industry events. Or it could be as wide-reaching as targeting young girls to make cybersecurity a career option through apps, fashion and female-centric gaming.

Female-centric awards have both negative and positive connotations. Whilst they have been judged as "insulting, because women are more than capable of competing in non-gender specific awards", others conclude that they create a safe, non-intimidating environment and give tech companies a good opportunity to support and promote female talent. The ceremonies and celebrations give women in the industry an opportunity to meet each other, network and hopefully feel a sense of belonging.

Further, the lists of women shortlisted is a brilliant way to showcase female talent in the industry and hopefully inspire women in the industry and those looking to enter it.

Female-specific industry events are very popular. Infosecurity Magazine runs a 'Women in Cybersecurity' networking event at Infosecurity Europe each year, and the event which accommodates 200 people, is always at full capacity with RSVP's five times over the allocated tickets. Workshop attendees however suggested that organisers of industry events must consider geography and timing of these events, in order to attract as many women as possible.

Many women with families struggle to travel to London, where the vast majority of industry events are held, and networking events are often scheduled for late afternoons and evenings which parents who work part-time or school hours struggle to attend.

Participants agreed that using historical role models to promote women in the industry was the way forward, suggesting that media companies like the BBC, or independent film producers, should be encouraged to create documentaries and productions around historic role models like Hedy Lamarr and Ada Lovelace.

With backing and funding from the industry, this could be commissioned. Ian Glover expressed an interest in CREST supporting this effort and representatives from the National Cybercrime Group and NCA also suggested they would be keen to get involved.

Action 3: Challenge the perception of industry and perceived gender-specific roles

This priority for change should, in theory, encapsulate the first two actions. Promoting female role models should contribute to challenging and changing the perception of the industry. If achieved, action three would lend itself to helping with the first action, encouraging more schoolgirls into the industry.

Workshop participants suggested that subtle and consistent 'normalisation' of women in the tech sector would make a huge difference to industry perception. "If various media channels consistently showed women in cyber roles, if they depicted success and somehow portrayed it as the norm, that message should start to filter through."

The group conceded that cultural change is a difficult and long-term process. However, they focussed on the short-term actions that could work towards achieving an evolution in culture and industry perception. "We're competing with the wider technology industry trying to make the same changes and attract the same candidates." The group also considered how people are often, by default, resistant to change.

Actions that could help to change perception include:

- Presenting real world stories of women in cybersecurity on posters and in leaflets
- More polling on female roles in academia and industry
- Promote – and give a platform to – female industry leaders
- Celebrate female success in the industry visibly and audibly

"It's really important that we raise awareness that the industry is inclusive and does not discriminate," said one participant. "To do this, we need the backing of female leaders and senior males. We need to be pushing out the right messaging from the right people."

Workshop attendees suggested that women in technology groups could take responsibility for leading the charge on changing perception. With buy-in from the government and leadership from senior industry representatives and organisations like CREST, these perception-changing initiatives could be actioned. Ladies of London Hacking Society and British Computer Society (BCS) were suggested as organisations to involve.

It's important to consider what voices will resonate to achieve the maximum impact with the target audience. However perfect the messaging, if it's not coming from the right people, it will not achieve its objective.

Beyond the media, it's important to ensure that the careers materials given out in schools contain the right messaging in the right tone. To make sure it's hitting the mark, those in charge of producing this material should talk to school girls to learn and understand what will resonate. Perhaps materials could use female celebrities who have an interest in - or expertise - in technology, for example.

In order to change industry perception, it is imperative that we celebrate and promote successes. If a girl wins the Cybersecurity Challenge, the industry should scream it from the rooftop. Positive messaging and real-life success stories need to be displayed at careers fayres, talked about by teachers and displayed on posters positioned around schools.

Action 4: Industry-wide female mentoring and coaching schemes

The fourth and final action to offer an industry-wide female mentoring and coaching scheme was received with huge enthusiasm by everyone in the group.

The objective is simple: to create a stronger, closer female community whilst enabling women to grow and develop in their careers.

“Do not underestimate the importance of women encouraging women,” said one attendee. “These schemes can give women a sense of belonging and help them to be the best version of themselves.”

The working group suggested that a database of industry-wide mentors and coaches is created, with agreed guidelines in place. It was recommended that accredited organisations could take ownership of this initiative and be responsible for running and coordinating the database.

“The scheme would need to gain buy-in from industry partners to supply mentors and coaches, perhaps in exchange for CPD,” the group suggested. In order to make it work, there would need to be agreed guidelines and a training programme for mentors and coaches to ‘train the trainers’.

Consideration needs to be given to the difficulties around mentoring those at competitor organisations. The database would need to contain enough data so that potential conflicts of interest could be avoided. Further consideration would need to be given to GDPR and ownership of data.

The group suggested that the database should track progression and record milestones, changes and progress.

Whilst the female-centric mentoring scheme would be developed with the objective of supporting women, the programme would welcome male mentors and mentees that wanted to actively engage.

The success of this scheme relies heavily on finding an organisation to take ownership of the programme. It would also require supportive industry partners to contribute to the maintenance of the scheme and invest time and people into making it a success. Workshop participants suggested that CREST could work with industry to form a working group in order to get this initiative up and running.

The group suggested that once the mentoring programme was off the ground and producing results, it would be beneficial to produce mentor stories and case-studies to promote the scheme and to raise the profile of successful women and their career journeys.

Conclusion

Three years on from the first gender diversity workshop organised by CREST, it is clear to see where progress has been made and where it has not. Awareness, without doubt, has improved. So too has appetite to make a difference. The skills gap in the industry generally has acted as a catalyst for getting organisations to step up the effort to recruit more women. It's not just about the different skills and outlook a female worker would bring, it's now also about recruiting more people generally.

Despite this evolution in attitude, the numbers and statistics aren't reflecting the progress. More needs to be done and the two workshop groups made comprehensive and thoughtful lists of the tangible things they'd like to see actioned in order to make real change.

Together, the groups voted for the actions they considered to be of highest importance and the four most popular actions were chosen to study and consider in further detail.

The four separate actions that were prioritised are all somehow linked. If we improve the visibility of female role models, this allows us to challenge the perception of the cybersecurity industry. Both of these two initiatives help with school-level encouragement for encouraging girls into the industry. Finally, the mentor scheme gives a platform on which role models can help to coach and guide others, which in turn will help to challenge the perception of gender as it relates to the industry.

It's more than a starter for ten. The actions are well-thought through, they are doable, they just need the support of industry and in most cases, need a driving force.



Complete list of priorities for change:

Priorities for change as compiled by the attendees of the workshops:

- Consider the language used in recruitment
- Job descriptions need to demand less
- Adapt terminology used in the industry to make it more accessible
- Have female interviewers present during the interview process
- Organise open days in tech organisations portraying good examples of senior women and advertising the company as a female-friendly place to work
- Be more specific at board-level about why the company needs to recruit women
- Focus on an industry feed from STEM, not just computer science
- Demonstrate a positive bias to female interns
- Improved role model visibility to inspire new talent
- Share success stories for increasing gender diversity
- School-level encouragement for girls to study computer science
- Make industry and industry events and networking less intimidating
 - More family-friendly networking event hours
- Industry-wide mentoring and coaching
- Challenge and change recruitment methods
- More female-focussed initiatives including open days, competitions, taster sessions
- Create a stronger, closer female community
- Share success stories from other schemes and initiatives
- Having more open, undefined career paths which catch people from all disciplines and backgrounds
- Change the perception of cyber as being exclusively technical
- Find ways to attract and nurture career changers and mid-career candidates, including veterans
- Tackle/change recruitment process to make it more diversity friendly
- Find ways to attract and inspire young girls into the industry
- Improve visibility of female role models, including more female-specific awards and events
- Improve working flexibility to support work/life balance and make it easier for working parents, carers, single parents.
- Improve apprentice options and availability for diverse candidates
- Change how cybersecurity is depicted in the media
- Focus on retention of women once they've had children
- More nation-wide events for women that have families and find it difficult to travel to London

Call for action points

- A small working group be established with volunteer CREST members to contribute and oversee the work in this area.
- Small piece of research to identify good practice and other guidance that can be referenced to CREST member companies.
- Film more day in the life videos to help change the perception of cyber security careers and increase the visibility of female role models
- Promote the existing good day in the life videos
- Consider holding more regional events

For further information contact CREST at www.crest-approved.org

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