

Closing the Gender Gap in Cybersecurity

By Eleanor Dallaway



Executive Summary

Women working in the cybersecurity industry agree that it is an exciting and rewarding industry, and the fact that they are working in what is traditionally perceived to be a 'man's world' is of no relevance or consequence to them.

At the recent national education and careers fair, The Big Bang, the Digital Defenders stand – a new CREST and UK government-backed initiative to encourage young people into careers in cybersecurity – welcomed just as many schoolgirls to the stand as schoolboys, suggesting no lack of girls' interest in STEM at school age.

Yet, according to (ISC)²'s most recent Global Information Security Workforce Study, women in the information security profession represent 10% of the global workforce, a percentage that remains unchanged from the 2013 study. In comparison, 26% of IT professionals worldwide are women (according to the American Association of University Women) and 9% of engineering professionals in the UK are female, according to the Women's Engineering Society.

There are various existing and ongoing initiatives aiming to improve diversity in the cybersecurity industry, but this report focusses on the gender balance.

With the industry facing a skills shortage, partly born out of the increasing demand for senior management to have excellent business skills as well as technical knowledge, recruiting more people into the cybersecurity sector is increasingly important across the globe.

In February 2016, representatives from CREST member companies and industry assembled at a workshop designed to address diversity – particularly gender diversity – in the cybersecurity industry and discussed ways in which the working group could make a tangible difference through agreed actions.

The group agreed that there is no lack of opportunity for women in cybersecurity, and that the reality of being a woman working in the industry is extremely positive. Despite this, there are very few female applicants to the industry, thus leading workshop attendees to conclude that the marketing and perception of the industry is the main problem.

The workshop was convened by CREST in order to pool intelligence and insight from workshop attendees, who were interviewed ahead of the event by Eleanor Dallaway, editor of Infosecurity Magazine, and facilitator of the workshop.

Attendees were questioned about the importance of diversity in the STEM workforce, and asked to consider who a campaign to increase gender diversity in the workforce should target, what the messaging should look like, and how the success of any such campaign could be measured.

The findings from these interviews were discussed and debated at the workshop, and attendees were able to agree on several actions to be undertaken as a working group.

This discussion paper outlines the details and conclusions from the findings of the February 2016 diversity workshop, but is also intended to stimulate further discussion and action from the cybersecurity industry. CREST and the working group welcome further input from readers of this paper, and looks forward to hearing from anyone who wants to get involved.

The Status Quo

We know that only one tenth of the cybersecurity workforce is female. But why?

Many workshop attendees voiced frustration with the lack of computer science options available in schools. "I was told that there was not enough interest to run such a class at secondary school," revealed a Mathematics graduate who has since taken a pen-testing role in an information security company. "But when you don't know that something is an option, how can you express interest?" she argued, explaining that many of her female friends would have opted to study computer science, had it been advertised as an option.

We're not thinking about the long-term impact of recruiting the same profiles over and over

According to the National Center for Education Statistics, Women earn just 18% of undergraduate degrees awarded for computer science in the UK. Workshop attendees from academia – both lecturers and students – confirmed that this is the result of startlingly low female applicants. They did however add that female computer science students are always as – if not more – successful than male students.

Recruiters confirmed that the level of female applicants for cybersecurity roles is incredibly low. It's not that female applicants are unsuccessful, it's that they are very hard to come by. And this becomes even more true of the more technical roles. "We're not thinking about the long-term impact of recruiting the same profiles over and over," one participant begrudged.

Perhaps the lack of applicants can be attributed to the perception of the cybersecurity industry, which the group unanimously agreed is far removed from the reality.

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*We need more people, so we
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Most participants were eager to point out that despite the perception of the industry being sexist or inhospitable to women, they had never experienced any such issues. The exception to this were a few tales of being given less technical projects or roles because they were automatically delegated to male team members, an assumption that those who experienced this resented.

Workshop attendees recognised and gave credit to the various initiatives and networking groups already in existence supporting women working in cybersecurity, and more widely, technology. However, it was agreed that these initiatives all work in silos, and as such, have had no great impact on the cause.



Why Does Diversity Matter?

It was important to establish just why the group felt that gender diversity in STEM is so important, and their arguments can be broken down into three categories:

- **For industry's sake:** Given the huge skills gap in the industry, it makes sense to double the pool of people that industry recruits from. "We need more people, so we need more women," one attendee said simply. Attendees also pointed out that a diverse workforce is more productive and that research shows increased profitability in companies with more women, especially at senior level.
- **Because of what women bring to the party:** It was argued that women bring a different mind-set and set of skills to the workplace, including attention to detail, analytical ability, and problem solving. More controversially, some attendees suggested that women bring "soft skills" to the industry, but others argued that is degrading and insulting to a sex that is equally as capable technologically.
- **For diversity's sake:** Finally, attendees argued that "women can, so they should", and agreed that diversity is important in any industry.

If we keep taking people from the same backgrounds, we'll keep coming up with the same solutions

What's Putting Women Off?

It's important to dissect why there are very few female applicants to the cybersecurity industry in order to try and rectify the situation.

Workshop participants offered several reasons as to why they believe women aren't applying for roles in the industry, and many of those reasons suggest that the perception of the industry is to blame. "We have to correct the perception of the industry for women to want to come into it," one participant said candidly.

This was further explained as misconception of what the industry is, both as a result of the language adopted when talking about the industry – which is considered "too opaque, too intimidating, and full of male connotations" – and a lack of understanding around what the industry is, and what skills are required.

Almost every workshop attendee confessed to "falling into the industry by accident" and having known very little about the industry before they entered. "There is a perception that the industry is boring. It's so exciting and innovative, but no-one hears about the good stuff."

Attendees argued that the industry has changed, but that perception has not evolved at the same rate. "It's crucial that we portray IT as being 'normal', and not geeky and weird," one participant argued. To the contrary, some workshop participants argued that 'geeky' can actually be very appealing, to both men and women, and added the important caveat that 'geeky' shouldn't be viewed as a negative.

This difference of opinion only highlights the importance of marketing all aspects of the industry, both technical and non-technical, and doing so in a pro-active way. "It's time to start selling an industry that women want to be part of."

Several attendees expressed concern that the industry is too quick to broadcast the misconception that you have to be a 'tecchie' to work in the industry, and suggested that the sector puts "technical skills on a pedestal, overlooking the fact that other skills are equally as important."

Most concerning, perhaps, was the comment that "the cybersecurity environment is not poisonous to women, it just looks like that sometimes."

It was suggested that part of the issue can be traced back to how girls are educated in school, not being encouraged to take STEM subjects, and instead falling into the stereotypes portrayed by the media. This, however, is generally considered to be an outdated view, with great leaps having been made in dispelling gender stereotypes in education.

Despite the number of existing initiatives to encourage girls to study STEM, it has been difficult to measure the success as yet, although there is a consensus that in order to be truly successful, these initiatives need to be more collaborative. Workshop attendees agreed that the objective should not be to reinvent the wheel, but to offer support, coherence and additional resource to existing initiatives in order to make the most impact.

Despite there being a number of female scientists, mathematicians and cybersecurity experts portrayed in TV programmes, films, and across the media, the perception is still that there are more men portrayed in these roles.

Lastly, the group agreed that the current gender imbalance serves as a deterrent itself, a self-fulfilling prophecy.

Traditional cybersecurity feeder industries – such as military, law enforcement, intelligence – are also male-dominated, meaning that the gender imbalance remains as such.

We have to sort the problem with the industry for women to want to come into it

How to Make a Difference

Whilst it was important to address the current diversity challenges that the sector faces, the main purpose of the workshop was to discuss and find ways to actually enable change.

The collective ideas can be grouped into the following categories:

- **Educate**

Influencing children early in their education is a key to encouraging more girls into STEM. Many attendees suggested that industry should have stronger connections with schools, running initiatives to engage school children in workshops, classes, and demonstrations to inspire them to strive for cybersecurity careers. While there are many existing and ongoing initiatives, the group acknowledged challenges in this area, namely fighting for time in the curriculum and the vast amount of schools and children that need educating. “We need to target and incentivise head-teachers, they need to lead from the top,” suggested one attendee. More specific ideas for how best to reach and educate school children need to be broken down into primary, secondary, and under-graduates and graduates.

- **Raise Awareness**

Raising awareness of the sector – and portraying it in an accurate, positive way – is paramount to increasing the number of women in cybersecurity. Overtly promoting cybersecurity careers and opportunities available to women – and telling them it is a career that they can enjoy – is an essential first step. A register of initiatives and a supply of engaging materials would be helpful in improving awareness of the industry.

Including female profiles in school and university career guides was also put forward as an idea for improving awareness about the cybersecurity opportunities available to women.

- **Change Industry Perception**

There is a consensus that the perception of the industry is a huge contributing factor to the lack of women in the sector. Participants were keen to clarify that the industry itself is not the problem, but the perception of the industry is. The marketing of the cybersecurity industry needs a lot of further consideration, particularly relating to ensuring its messaging is gender-neutral and thus attracting both sexes.

- **Offer Support**

The group agreed that whilst it is imperative to recruit new women into the industry, it is also important to support and retain the women currently in the profession. Mentoring schemes and improved networking opportunities were popular ideas for improving the support network for women in the cybersecurity industry.

Offering support to women either returning to the sector or converting from elsewhere was also seen as incredibly important, be it financially, or emotionally.

- **Inspire (Promote Role Models and Ambassadors)**

It was unanimously agreed that raising the profile of successful females in cybersecurity would be really encouraging for women considering entering the industry. The group established that there is a lack of female role models in the industry, and that appointing ambassadors and promoting women would inspire the younger generation. It was suggested that having more female speakers at conferences and more women writing articles in the trade press would be a great start.

- **Removing Barriers for Entry**

The cost of training can often act as a barrier to entry for people wanting to start or return to careers in cybersecurity, so supporting women financially, through the availability of under-written loans, could act as a solution.

The idea to create conversion courses with marketing aimed at women was also bought forward.



Industry must come together to pool its resources and money to collaborate on a shared objective



Who Should the Campaign Target?

A portion of the workshop was dedicated to agreeing who the campaign to increase gender diversity should target. Very quickly a number of target groups emerged.

- **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**

When polled about the order of priority, attendees agreed that secondary school children were probably the most important group to target, followed by graduates. However, focussing on these groups alone will not solve the short-term problem. If the campaign was to only focus on schools, it would be eight years before any tangible changes became visible.

At primary school level, the group agreed that both parents and teachers should be responsible for promoting technology and online safety. "Girls should be encouraged to attend STEM workshops, after-school computer clubs, and play with robots," said one attendee. Whatever the format of these clubs or workshops, it is essential that they are fun, the group agreed.



*We need to make it cool to be a girl
into computers*



At secondary school, children choose which subjects to study at GCSE level, which ultimately shapes their career path. Reaching them before they make decisions about what to study, and thus what industry to join, is crucial.

Several workshop attendees believe that teachers should be incentivised to encourage girls to join STEM clubs, and others suggested that women from the cybersecurity industry should mentor secondary school children, holding workshops and cybersecurity challenges to engage girls. As a relatively small industry, it makes sense to collaborate with wider STEM initiatives, and utilise existing coding clubs and girls' computer clubs in order to reach as many girls as possible. It's important to note that whilst girls are the target of this report, it is also important for the industry to reach and engage school boys too, as the awareness issue applies to both sexes.

Graduates – and under-graduates – are prime targets for recruiting into the cybersecurity industry. The group suggested re-assessing the marketing for attracting secondary school children to study computer science at university to ensure the messaging is gender neutral.

The graduate campaign needs to look beyond computer science students, however, the group agreed. There are many other excellent feeder subjects to cybersecurity, notably maths, science, and even business disciplines. The biggest concern is that cybersecurity just isn't on the radar of most graduates. "If no-one knows it's an option, how can we increase numbers?" one attendee asked.

It is therefore very important to ensure that cybersecurity is on the radar of career advisors, and that good materials are readily available in careers services in both secondary schools and universities.

Finally, the returners and career migrators group was discussed. This is perhaps the most over-looked group, but certainly the category with the potential for the most quick-wins. This group already have the skills, but just need support, guidance and training tools to move into, or be welcomed back into, cybersecurity.

Often, the cost of the training or qualifications needed to enter the cybersecurity industry acts as a deterrent or indeed barrier for career migrators or returners, an issue particularly prevalent for those returning from maternity leave. Under-written loans for conversion courses and industry training would be a possible solution to break down this barrier to entry.

This final group can be influenced by recruiters, HR departments and professional bodies, the latter of which participants agreed should be leading a media campaign.

How to Get the Message Out There

The group spent some time discussing what messaging should be used to effectively target women. One thing that was unanimous was that any messaging must validate a young girl's interest in STEM.

One attendee suggested that the media must play a significant role. "We need more female coders and cybersecurity experts in TV shows and movies – younger girls need to feel validated." This is poignant, because the message absolutely needs to reach girls that this career is for them. It was acknowledged by many that great strides have been made in media representation of women in technical roles, but the consensus was that this could be taken further.



We need more female coders and cybersecurity experts in TV shows and movies – younger girls need to feel validated.



Recruiting celebrity ambassadors to engage girls – particularly at the secondary school and graduate level – could have great impact, the group suggested.

TV and radio campaigns, print advertising, social media campaigns, and online adverts were all ideas put forward in order to reach the masses. Others suggested that direct marketing and more intimate networking events would have a greater impact on a smaller group, and many suggested that the message should be infiltrated through education. "Having an actual conversation with someone is far more likely to make an impact than an impersonal campaign," one attendee argued, highlighting the importance of face-time.

Graduate fayres are an obvious target – for all STEM graduates, not just computer science – and many suggested running programmes in schools. These programmes could be road-shows in all-girls schools, IT clubs exclusive to girls, practical challenges and workshops, or industry observation days where students are taken into real working environments and given the opportunity to shadow cybersecurity professionals. Regardless of the type of school programme, the consensus was that to make a significant impact, the activity should be continual, or periodical, as opposed to a one-off event. The challenge, of course, is the size of the audience and the capacity for reach.

Schools have limited time and the competition for air-time is enormous. It is therefore imperative to collaborate with existing initiatives in order to make the biggest possible impact.

Regardless of the media used to distribute the messaging, the group agreed that momentum and positivity are absolutely key to a

successful campaign. "Let's forget the statistics, forget the negatives, and stop getting hung up on how few women there are and what the challenges may be. Instead, let's focus on the success stories and talk about why it's awesome to be in cybersecurity" put forward one workshop attendee. Re-enforcing the idea that women in cybersecurity is abnormal only continues to put women off, resulting in a self-fulfilling prophecy.

"We need to tell girls what they can bring to the party and contextualise why this industry is so suited to women," said one attendee, who argued that this comes down to the language we use. "The key is telling girls they can do whatever they want to do."

Attendees continually referenced the importance of marketing the non-technical side of the industry too, promoting the message that there is 'something for everyone'. Of course, many girls are attracted to the industry purely because of the technical side, so it must not be downplayed or hidden. The key is to promoting all sides of the industry – technical and non-technical.

Selling the purpose of the industry is also important, attendees agreed. "It's about fighting cybercrime, it's innovative, it's interesting, and let's not forget to point out that it's well paid, and a career for life."

How Overt Should the Messaging Be?

There were many conflicting opinions around the tone that marketing messaging for this campaign should adopt. The group debated whether marketing messages should overtly and explicitly target women, or whether they should be more subtle.

Those that argued for the former suggested that messaging needs to be overt in order to acknowledge the issues, bust myths and be disruptive. They argued that positive discrimination is required in order to make a tangible difference, and that it is important to "openly promote cybersecurity as a legitimate career choice for women."

Those that campaigned for a more subtle delivery argued that unless messaging is subtle, it can come across as patronising and insulting. "I'm cynical about leaflets covered in pink stuff," one attendee confessed. It was suggested that the key to success was not to tell women that you are targeting them, but instead use female case studies and role models, along with gender neutral marketing, in order to catch their attention.

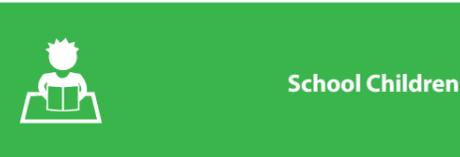


Subtle isn't working. Let's make some noise!



Time for Action

Derived from the outcomes of the workshop, the following action plan has been put together with the objective of closing the gender gap in the cybersecurity industry.

	Educate	Change Industry Perception	Raise Awareness	Inspire	Offer Support
 School Children	Schools careers guide with female profiles	School pathway descriptions linked to primary subjects	Ambassador attendance at academic events. Create and maintain register of initiatives, challenges and materials	Female cybersecurity YouTube channel for promotion of female industry speakers with emphasis on careers	FAQ's and profile descriptions
 Apprentices	Apprenticeship careers guide with female profiles	Create an industry film and increase the number of female 'Day in Life' films at junior levels	Ambassador attendance at academic events. Create and maintain register of initiatives, challenges and materials	Female cybersecurity YouTube channel for promotion of female industry speakers with emphasis on careers	FAQ's and profile descriptions
 General University Students	University careers guide with female profiles	Create an industry film and increase the number of female 'Day in Life' films at junior levels	Ambassador targeted 'milk round' attendance. Ambassador attendance at academic events. Create and maintain register of initiatives, challenges and materials.	Female Cyber Security YouTube channel for promotion of female industry speakers	FAQ's and profile descriptions
 Specialist University Students	University careers guide with female profiles	Create an industry film and increase the number of female 'Day in Life' films at junior levels	Ambassador targeted 'milk round' attendance and career social media channels	Female cybersecurity YouTube channel for promotion of female industry speakers with emphasis on careers	One to Many Mentoring
 Conversion From Other Academic Disciplines	University careers guide with female profiles. Create conversion courses and loans for training and certification with marketing aimed at women	Create an Industry film and increase the number of female 'Day in Life' films at mid and senior levels	Ambassador targeted 'milk round' attendance and career social media channels. Create and maintain register of initiatives, challenges and materials	Female cybersecurity YouTube channel for promotion of female industry speakers with emphasis on careers	One to Many Mentoring
 Conversion from Other Industries	Active participation in existing social networks and expand to other areas. Create conversion courses and provision for loans for training and certification with marketing aimed at women	Create an Industry film and increase the number of female 'Day in Life' films at mid and senior levels	Create job board profiles, develop and maintain register of initiatives, challenges and materials	Female cybersecurity YouTube channel for promotion of female industry speakers with emphasis on careers	One to Many Mentoring
 Career Changers / Returners	Active participation in existing social networks and expand to other areas. Create conversion courses and provision for loans for training and certification with marketing aimed at women	Create an Industry Film and increase the number of female Day in Life Films at mid and senior levels	Create job board profiles, develop and maintain register of initiatives, challenges and materials	Female cybersecurity YouTube channel for promotion of female industry speakers with emphasis on careers	One to Many Mentoring
 Retention Of Existing	Maintain this newly-formed network and commit to these actions as a group and extend membership. Create Conversion Courses and provision for loans for training and certification with marketing aimed at women	Create an Industry film and increase the number of female 'Day in Life' films at mid and senior levels	Active participation in existing social networks and expand register of initiatives, challenges and materials	Female cybersecurity YouTube channel for promotion of female industry speakers with emphasis on careers	Active participation in existing social networks and expand to other related areas

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We need to work out what we can do as a group that can benefit the whole industry... What can each individual deliver, and what could that look like en-masse?
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You Can Get Involved Too

CREST, its member representatives and other workshop attendees are beginning work on these campaigns and actions. In order to continue momentum, additional support and input from the industry is required.

The group would like to encourage anyone interested in contributing to this cause to get in touch with thoughts and ideas, and welcomes anyone to join the discussion around the following questions:

- **Who should we be targeting with the campaign to get more women into cybersecurity?**
- **What networks or current initiatives address the diversity issue?**
- **What should the messaging look like?**
- **What is the most suitable media for delivery of the messages and how can we get the material to the recipient?**
- **What metrics can we put on success?**

If you would like to share your views, please contact allie@crest-approved.org.

CREST would like to thank the workshop participants and supporters for their time, contributions, and commitment.





For further information contact CREST at
<http://www.crest-approved.org>

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