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Alexandra L. Gibson
Office for Nuclear Regulation, Alexandra.Gibson@onr.gov.uk

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Issues/ barriers/ problems (and proposed solutions) for equalizing female participation and gender equality in nuclear security

Alexandra Lee Gibson

Office for Nuclear Regulation: Cyber Security Graduate

Abstract
Beginning my cyber security career inside the nuclear sector as a 22-year young female just 6 short months ago and I have already experienced and witnessed the second-class treatment of women, which is remarkably prevalent across the entire sector. This paper will explore some practical measures which are commonly adopted which aim to diminish this very inequality. But it will also discuss the issues, barriers and problems that are encountered when attempting to implement these practical measures, for example affirmation measures. Throughout the discourse I will highlight the importance of female presence in industry and why it is vital they have a voice throughout the nuclear discourse.
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**Introduction**

Throughout the 19th century there was a view that a “woman’s place was in the home”\(^1\) which continued through to the following century. During this time, the discourse surrounding women and their role in society focused widely on their domesticated role in the house and referenced the employment restrictions enforced upon females in society, which limited their work due to ‘lack of skill’\(^2\).

Following the Industrial revolution of the 1800’s the sexual division of labouring became increasingly vast and a heavily controversial issue. It could be argued the laws discussed below deprived women of their dignity and status in society. Mies discussed the several states who prohibited women to work in “mines, smelteries and collieries”\(^3\) states such as: Illinois, Maryland, Missouri and Utah. He further lists the states who prohibited women “in operating and cleaning dangerous machinery” such as New Jersey, Missouri and West Virginia. Finally, Mies discusses those who put restrictions on working “in factories, workshops and mercantile establishments” such as Oregon, Virginia and Michigan. Unless of course this work was voluntary, and then some of these states endorsed unpaid work in the somewhat ‘dangerous for women’ environments whereby they were of no skill to deliver.

**Industry issue? Societal system? Unconscious bias?**

Progress to the 21st century and it’s unsurprising this stagnant and oppressive attitude still drip feeds into some areas of society today. Academics argue the existing gender inequality we see in the workplace today, is merely a product of societal shaping which has been evolving over the decades, reflected in the laws of that time (Risman, B. J. 2004 & Rhode, D. 2007). Of course, over time and throughout the westernisation of states the earlier restrictions and laws have become looser and, in some instances, abolished. But there are still norms prevalent in today’s society, such as gender biases and discriminatory attitudes which often permeate various organisations, industries and entire sectors.

Statistical discrimination coined by Arrow (1973)\(^4\) & Phelps (1972)\(^5\) is a theorized behaviour often used to explain disparities in the treatment of individuals in the workplace. Statistical discrimination uses a characteristic as an indicator of risk, for example; race, gender or age. It is how these characteristics interact with economic agents whom hold inaccurate information about the individuals which results in inequalities. For example, an organisation seeing a young married woman as a risk to

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leaving for maternity leave as she will have a baby in the near future. This is commonly linked to the *glass ceiling* concept and often assumes certain decisions a person or woman will make in their career limiting growth within an organisation. On the back of historical literature which associates women to the home, raising a family and not being as committed to the workplace as their male counterparts, it could be argued there is an inherent bias against women in the workplace that began many centuries ago which feeds into concepts such as this. Many scholars have held a vested interest in how we change gender inequality in the workplace (Benschop et al. 2012; Deutsch 2007; Ely and Meyerson 2000b; Hearn 2000; Liff and Cameron 1997; Nentwich 2006) and this is what the paper will now discuss.

**Why women matter in the Nuclear industry**

When I began my career in Nuclear Security in 2019, I soon realized there was a clear dominance of our male counterparts in the sector. I was the only woman in my team, and as a young woman I began attending meetings, inspections and interventions on behalf of the cyber security team in which I worked. I soon discovered the only woman I would meet, greeted me at the reception desk and asked if I would like tea or coffee.

Moving from an industry where women dominate 58:42 I was genuinely overwhelmed at the lack of women in the Nuclear Security environment, realizing the great loss of potential. Currently there is a small proportion of females in the Nuclear Industry who make up just 22% of the industry as a whole, this means a complete under-representation of women in the nuclear field. After realizing there was a lack of women in the sector, I began investigating my organization. Despite the company actively participating in practices for female equality, their published gender pay gap shocked me. A disparity of 27.00% (2019) meaning a mean average of £10.62 per hour difference in hourly pay rate of men (£39.28) and women (£28.66). I was even more concerned when I learnt this difference was even greater at 35.2% in 2018.

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7 Carnes, W, J. & Radojevich-Kelley, N. (2011). The effects of the glass ceiling on women in the workforce: where are they and where are they going?

8 [www.pwc.co.uk/services/human-resource-services/gender-pay/](http://www.pwc.co.uk/services/human-resource-services/gender-pay/)

Nuclear Security emerged from the backlash of World War II were the field was already inclined toward a military-style approach, combined with policymaking which women were mostly omitted from and were the nuclear weaponry zone wasn’t viewed as feminine, this combination created the illusion that women do not have a place in Nuclear Security.

But today we understand what an illusion this was. We currently sit in an industry full of powerful women; the CEO to my place of work the ONR is Adrienne Kelbie, Rhonda Evans is head of the WINS academy, Linda Keen the President of Canada’s Nuclear Safety Commission and of course Marie Curie, researcher of radioactivity and radium. The list could go on. Fellow females in the industry agree there is great challenge in making voices, experiences and tenacities heard, but there is still a clear gender parity and imbalance across Nuclear Security, a sector were women play a vital role.

**Why we need women in the Nuclear Security domain**

Rhonda Evans, director of WINS debates “international research into gender equality and women in the workforce has consistently shown that a diverse and inclusive workforce is better for everyone: shareholders, stakeholders and society in general”. According to research conducted by Duckworth & Seligman (2006), female presence within a team boosts productivity levels and that in a wide range of settings, girls are more self-disciplined than boys. In general, this characteristic is correlated with success in the workplace. This is supported by a New American Security report in 2017 where it was reported that military units with greater gender diversity perform better on the battlefield, more creative approaches are adopted and problem solving is more diverse, which supports the idea that diversity breeds creativity and a broader range of ideas which lead to better solutions. Which is essential in any industry, but especially important in a dynamic and fast evolving industry such as Cyber Security were alternative thinking is essential for success.

Parcheta, N. & Kaifi, A. B. & Khanfar, M, N. (2013) say women bring ‘more creativity’ and their presence creates ‘stronger teams’ due to their associated behaviours such as being natural mediators and having an abundance of patience. The academics go on to say “women are also more concerned with the wellbeing of others compared to men” which reinforces the nurturing behaviours women tend to display, which makes for a more understanding and productive team. Research would suggest that both sexes are vital to a team and both offer different valuable skills which equate to optimal working. Ironically, Flournoy argued that "women are socialized to sort of think outside the box to solve problems, and to make connections, and to work horizontally ... and that just was not welcomed very much in the nuclear conversation", so despite the benefits in the

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16 https://www.nytimes.com/2019/05/15/opinion/women-national-security.html
alternative thinking from women it perhaps overlooked due to the old fashioned view of the sector.

Solutions to date
In Britain we have witnessed a steady rise in female participation, from the Second World War to now, moving toward a workforce that comprises of different groups; from traditionalists, Baby Boomers to Generation X and Generation Y. There is such importance in adopting a diverse and multi-sex workforce. Aside from the commonsensical quota rules that automatically boost female representation in the workplace, there are several other areas that can be improved to achieve equality in the workplace.

There is value in mentorship programmes for women, especially within their early careers as this can provide opportunity for growth which is agreed by many academics. Mentor programmes enable senior members of organisations, often men, to see the potential and academia within their mentored. This is a great way to attempt lift the gender bias and judge a candidate on their real capabilities. However, in some instances, mentorships replicate many of the field’s more problematic dynamics for women and men which refers to the common sexualisation of women in the workplace as a subordinate gender to men. This is confirmed from research by RAND Corporation who reported in 2014 that 26 percent of active-duty women, compared to 7 percent of active-duty men, experienced sexual harassment or gender discrimination.

Initiatives like those driven by the International Gender Champions Movement who recognized there was 2x more men than women speaking about Security, Law, Science, Tech & IT at high level panel sessions. Understanding this difference, they started the Panel Parity Pledge, which is a 3-prong process for conference organisers and panellists to consider. Firstly; are there equal numbers of men: women speaking on the panel, secondly; what is the organiser doing to ensure gender balance at their event and thirdly; will the organizers commit to striving for gender balance on the panel and beyond the event.

There is a drive for both men and women to join groups such as Women in Nuclear and Women in International Security. These groups highlight the need for women in the industry and show a joint stance on the matter. Organisations such as CRDF continue to promote females in security fields by hosting events such as Breaking Barriers: Women in Nuclear Security. These events highlight the contributions women have made in industry (Rally to Ban the Bomb) and allow for positive female role models for other

20 National Defense Research Institute, Sexual Assault and Sexual Harassment in the U.S. Military: Top-Line Estimates for Active-Duty Service Members from the 2014 RAND Military Workplace Study (Santa Monica, CA: RAND Corporation, 2014)
21 www.genderchampions.com/panel-parity
women to look to in the sector. People recognising the gender imbalance struggle within nuclear security on a worldwide level and so organisations such as the OECD has created an extensive programme to encourage STEM for girls23, the NCSC has created female-only programmes and competitions24. WINS have created a Gender Champions Programme25 to leverage the increase of women in the nuclear security sector. This can also include organisational quotas to heighten females in the workplace.

The gender pay disparity must definitely be reduced, but ideally removed, and to achieve this organisations must be transparent about its presence. It is vital policies are established that ensure men and women are compensated equally for performing the same work. But beyond the argument for equal pay the policy should also ensure that both genders are treated equally in recruitment, training, hiring and promotion. Establish a policy that allows both men and women to balance their work lives with their personal lives. This guideline would ensure that management supports employees' pursuit of further education to advance their careers, as well as family counseling, family time or other related efforts that assist employees in maintaining healthy and positive family relationships.

There is one theory which could be considered for a more long-term response as a solution to the gender prejudice in the workplace. Small-wins theory based on work by Karl Weick (1984)26 is a change model to achieve gender equality, it works using a ripple effect. Often criticized for their lack of impact, small changes can often lead to other changes and have the potential to spiral into larger changes. Some argue that despite being small, the changes are of such a nature they can be implemented into people's every day, so they aren't overwhelming and don't run risk of causing resistance or stigma27. To support this, Meyerson and Fletcher (2000)28 argue everyday life is unfortunately characterized by deeply embedded inequalities so changing the processes, obvious discriminatory practices is a lot more difficult than implement minor tweaks which will began to address the deep-rooted issues and the concept of the glass ceiling. This leads on to the next section, issues with affirmative policies.

The issues/ barriers/ problems encountered from solutions

Quotas and affirmative action policies which aim to address the under-representation of negatively stereotyped minority groups in the workplace (females, ethnic minorities, homosexuals etc.) show considerable evidence to suggest there are benefits to enforcing these policies. But there is also significant evidence which demonstrates the effectiveness of quota initiatives and such like is far more complex. Studies show that the success of quotas depends on a number of factors. For example, quotas are much less effective when they aren't enforced by sanctions, Storvik and Teigen (2010)29 argue the serious sanctions associated with the Norwegian quota law were responsible for its

24 https://www.ncsc.gov.uk/cyberfirst/girls-competition
success. This is because radical interventions are powerful as they forego weakening compromises and focus on results only. But due to the enforcing nature of sanctions, they also cause much tension between groups and consequently are highly contested and openly resisted. Often when a measure is enforced by ‘sanction’ it can cause resistance and stigma, mostly against the group it is hoping to protect. Benschop & van den Brink (2014) explain a theory for why this happens, they argue “gender equality strategies involve changing processes of power and therefore invoke resistance”. If you are attempting to shift power from one place to another this can be difficult for others to get on board with, especially if they have to conform. This tends to be especially difficult in a workforce with older generations or were employees have been in the organisation for a significant period, there will be a culture that is solidified and one that they are used to, as this tension progresses it enters into occupational segregation, were you will begin to see a divide in the workplace.

Even when measures are adopted to achieve gender equality, we often see other issues that interfere. The inherent discrimination from dominant groups in society and the feeling of having to ‘fight’ the stereotypes that are solidified in our society, consequently, leading to the prejudice about women’s merits, abilities and skills at work that impede their career and access to power. As a result of this, even when women are; doing well, feeling progression and being offered promotions they fear ‘Imposter Syndrome’ coined by Clance & Imes (1970). Which is when a highly skilled and talented individual is beset with feelings of self-doubt or incompetence which can limit the acceleration of women at high-level or decision-making jobs, so they either don’t take the promotion or don’t apply in the first place.

Additionally, in a study by New America several female professionals working in the industry found the gender bias that draining and restricting they opted to change career in order to access the progression that is typically easy to access in other sectors. This claim is supported by the CNAS study of the national security workforce which found “while women’s representation throughout the General Schedule workforce has increased, they are either leaving government service than their male counterparts, or not being promoted at the same rates”. This comes back to the glass ceiling concept and the automatic restriction on a woman ultimately because of her gender, but also feeds into the grave inequalities between men and women in industry.


34 Carnes, W. J. & Radiojevich-Kelley, N. (2011). The effects of the glass ceiling on women in the workforce: where are they and where are they going?
**Conclusion**
To those who think gender is now miraculously balanced in the workplace because you are starting to see it level it, you are far from wrong.

To those who assume I attend the meeting to make your coffee, write up the minutes, fetch your documents and make myself scarce when you start discussing ‘academic’ content, I’m not. And just because my gender is different to yours, it does not hinder my capabilities.

To me; know your capabilities, realise your drive and recognise your place within the Nuclear Security industry.

To my Women in Nuclear family, the women who inspire me daily; thank you for making this possible.

“People often assume that, because I’m a woman, I don’t have enough knowledge to be in the field,”
- Nirasha Rathnaweera (2020)35