Issues in Gender Diversity and Equality in the UK

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ABSTRACT

There has been a significant increase in the number of initiatives to raise awareness of diversity-related challenges in technology worldwide within the past decade. Multiple organizations now emphasize a need for a close to 50%-50% male to female workforce distribution. Example of proposed activities include introducing quotas for women on board positions, promoting equal opportunities for employment in STEM (Science, Technology, Engineering, Mathematics) jobs and creating a woman-friendly work environment. However, despite these efforts, the growth of number of women working in STEM is still slow.

To understand the impact of various initiatives and how they influence the work environment in universities in the UK, we conducted a survey to record responses from multiple women groups, so that we can identify the issues that they have been facing. This paper presents the insights drawn from the survey, along with recommendations for STEM and computing fields in order to increase female numbers in their programs. The survey presents qualitative measures of initiatives addressing the gender gap in the UK. The results show a clear need for prominent role models, mentoring, and promoting engagement of women in STEM subjects from an early age.

KEYWORDS

gender equality, diversity, current trends

1 INTRODUCTION

In recent years, gender diversity and equality have been emphasized as essential to progress in technology [1, 18]. Diverse and inclusive skills have been identified as beneficial for effective problem solving and leadership [12, 18]. In order to reduce stereotyping across technology sectors, traditionally male-dominated industries have been releasing statistical data on their workforce composition. Policies targeting better proportional representation of women, better engagement of employers, and higher commitment to countering discrimination are being introduced. These include for example, board quotas, the UK Equality Act (2010), cultural and diversity initiatives, equal opportunities policies, quotas to encourage hiring of more women in engineering. Steps towards encouraging women into STEM from an early age have also been taken [14]

Historic female role models (for example Ada Lovelace, Marie Sklodowska-Curie) have inspired events, awards, and fellowship schemes (See for example [4, 7]). Contemporary female role models such as the Yahoo's CEO Marissa Meyer and the Facebook's COO Sheryl Sandberg have introduced calls for more women-only awards, events and fellowships to bridge the gender gaps and promote visibility of women in technology. We have witnessed an explosion of focus groups, conferences and workshops providing advice and collaborative platforms for women to learn work-force building skills in order to successfully compete in male-dominated fields.

Figure 1 describes the landscape which is currently influencing career choices and career progression of women in STEM. Attitudes and policies in markets, institutions, and households affect the comparatively low representation of women in STEM. Support groups and tailored economic opportunities and opportunities for engagement have been introduced in order to optimize the involvement of women and improve gender diversity.

Women comprise 40% of the global work force. In the engineering sector, less that 10% of the work force comprises of women and despite the numerous initiatives, the impact on numbers has been low. Addressing the gender gap and ensuring equal participation and representation of women remains challenging in engineering and science. As a means to measure why the gap exists, studies which measure the existence of implicit bias have been conducted. For example, a study examined attitudes across committees hiring for faculty positions [23]. In the study, two candidates (a man and a woman) with identical qualifications were presented to the committees which were then asked whether they would hire the candidate or not. The results showed that there is a clear preference to hiring the male candidate. Further studies investigated how this bias can be countered by looking at how job adverts can be designed to attract the highest-qualified workforce and the best fit for the job specification, regardless of the gender of the applicant [8]. However, such efforts have also met criticism. Studies have identified gender

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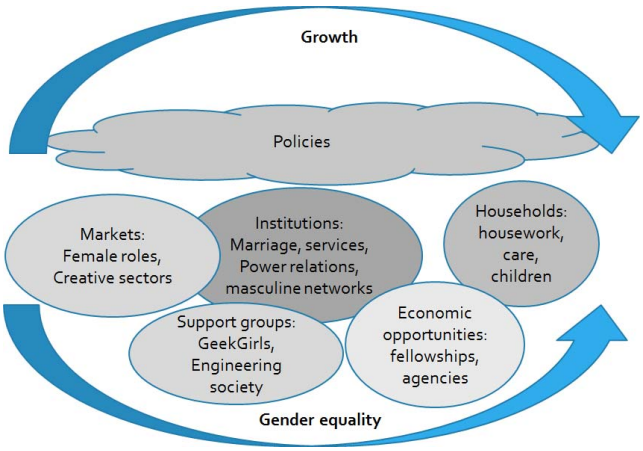

Figure 1: Landscape in STEM

bias as attributed to cultural differences and differences in self-concept, placing an emphasis on the self-awareness and self-image of women as the most decisive factor [2, 6].

International studies indicate the need of promoting change of attitudes from an early age for both boys and girls [15, 22]. In the UK, for example, only 20% of the total number of students who study computer science at GCSE level are girls. The number drops to 16% at a degree level and beyond.

Studies have shown that a significant number of women leaves engineering due to family issues, related to child-care or caring responsibilities [13, 16, 17]. We argue that policies introduced at the government level, should help support family, hard work and ambition for nurturing young female talents in STEM. The drive for women to push forward in STEM careers works two ways both from employers and the employee's perspective and will take time.

Awards and fellowships, exclusively for women can be perceived negatively, creating the impression that they are easier to obtain, based on gender and not on merit. In reality, for successful STEM careers, women need family support, hard work and ambition and they need to be recognized based on merit and not on gender.

1.1 Contributions and structure of the paper

In this paper, we, the ACM-women UK Chapter, present the synthesis of a survey which aimed to identify significant factors that affect the gender distribution in STEM.

We make the following contributions:

- We identify attitudes that need to change and propose recommendations for ensuring diversity across the tech industry and academia.
- We review the impact of selected women-promoting initiatives, which have been designed to encourage optimal gender representation in STEM in the UK.
- We present statistics on perception of the importance of diversity for the success of the organization (in both academia and industry).
- We analyze attitudes of men and women towards equality, diversity, skill sets, and mentoring.
- We identify areas of improvement and propose targeted solutions, based on the aggregated responses of our survey.

The paper is organized as follows. The methodology is presented in Section 2. In Section 3, we identify significant issues affecting women in STEM. We also discuss related work on supporting women in STEM careers and discuss the importance of equality, diversity, skill sets, and mentoring. We present our recommendations and most significant findings in Section 4. Our goal was to determine the extent of familiarity with gender awareness initiatives in STEM and to compare the attitudes of women in STEM to the attitudes reported by alternative surveys for STEM [10, 18, 21].

2 METHODOLOGY

We distributed the survey electronically to organizations engaged in STEM. The survey consisted of twenty questions addressing issues for women in STEM, among the most significant of which are diversity, role models and gender stereotypes. The age-range of the survey respondents was 20-50 years; 62% of the respondents were female. Participants were predominantly from the UK (80%), the remaining 20 % were UK citizens, currently residing in Europe and USA. The participants had occupations in diverse fields, represented as follows: Education 66%, Medicine 2%, IT and Computer Science 35%, comprising of undergraduate, postgraduate, PhD, research associates, and researchers, lecturers and senior lecturers. The proportion of distribution among the STEM fields was as follows: Science 42%, Technology 57% and Engineering 38%. The total number of respondents to the survey was 87.

3 ISSUES FOR WOMEN IN STEM

Diversity in STEM subjects and the importance of mentoring and strong role models are recognized as integral to attracting more women [10, 18, 19]. In this section, we assess the attitudes of our survey respondents to diversity, role models, and gender stereotypes.

3.1 Diversity

Gender-diverse teams perform better financially, particularly when women occupy a significant proportion of top management positions [11]. The team dynamics and collegial relationships and productivity are enhanced [10]. The need for diversity was strongly represented in our survey responses. 87% of the respondents agreed that diversity is important for a successful organization, 6% were neutral, and 7% identified diversity as unimportant.

Global diversity awareness surveys report similarly high percentage of the need for gathering, analysing, and sharing data in order to remove bias and increase opportunity [3, 20]. Inclusion has been identified as a top priority.

3.2 Role models

An absence of positive female role models and mentors is identified as the likely reason for women feeling uneasy in male dominated technology sectors [21]. Visible and effective role models are needed to support women so that they can thrive and are retained in STEM careers.

In our survey, we did not target gender similarity. We asked respondents to assess their need for a mentor or role model, not taking the gender of the mentor or role model into account. 53% of our respondents stated that positive role models already play an important role in their career, 47% of the respondents were positive that suitably-selected influential role models have the capacity to change their perceptions towards a career in a STEM field. 29% of the respondents strongly agreed when asked whether they would like to have a mentor, 32% agreed, and 18% indicated that they are uncertain whether having a mentor will be beneficial. This clearly shows that there is a need for a strong mentoring program and for the presence of role models. Only a very small percentage of the respondents indicated that they have already been allocated a mentor at their place of employment. 18 % were unsure whether the professional relationship that they have established with a senior colleague is identifiable as a mentor-mentee relationship and 61% of the respondents indicated that they would have wanted to have a mentor at the beginning of their STEM career. A mentor was not perceived as necessary by 13% of the surveyed professionals.

In addition to the absence of suitable role models, the assumed lack of comparable skills is another likely reason for women "feeling uneasy" in a male dominate fields. A worrying 19% of our survey respondents indicated that according to their own perception there is a difference in the skill sets that a male and a female employee will bring to technology fields with equal education (the conviction being that the male candidate will have better skills), and 39% were unsure.

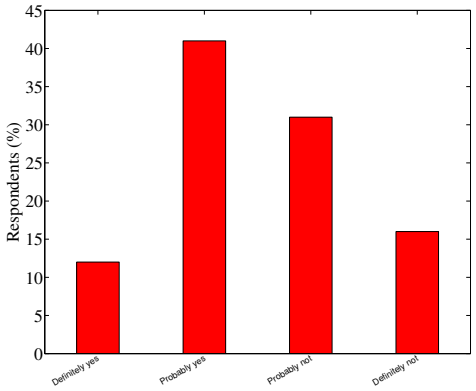

Figure 2: "As a woman, do you feel uneasy in a male-dominated technology sector?"

3.3 Gender stereotypes

It is assumed that women who have chosen to study and subsequently engaged in a career in STEM subjects are more resistant to gender stereotypes as they have overcome barriers in formal educational environment and at home [5]. Nevertheless, women in STEM are acutely aware of the gender stereotypes from an early age. The development of the academic self-concept begins in infancy and unfolds its most significant impact(s) after primary school. Expectations based on gender and subsequent attributions of skills and abilities do not use objective criteria. Frequently, stereotypical evaluations both at home and at school do not correspond to actual achievements but rather rely on limiting beliefs, gender bias and stereotypes (for example, the belief that girls are weaker in mathematics) [5].

87% of our survey respondents agree that gender stereotypes, including beliefs about the affinity of women to study, apply themselves to and subsequently excel in STEM subjects do exist in our society. The respondents indicated that they needed to resist these stereotypes and not let them affect their career progression and their career choice.

Limiting beliefs about the difference in technology-related skill sets, persist. 63% of the respondents to our survey replied that they do not think that men and women bring the same skill set to an organization after identical education and training. 77% of respondents agreed that they feel uncomfortable if either males or females exclusively dominate a workspace. This is an interesting result, indicating the need for diversity at top level management positions. Attitudes to diversity will need to change. Our survey indicated that the introduction of quotas is not a way forward. When asked whether there is a need for gender-based quota 65% of the respondents disagreed. 82% agreed that there is need for promoting STEM and diversity in education.

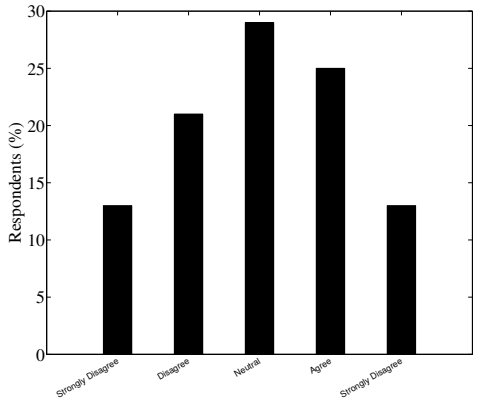

Figure 3: "Do stereotypes deter you from establishing a career in STEM?"

3.4 Awareness of women-promoting initiatives in the UK

Various support groups promoting women in science exist in the UK, e.g. Women in STEM, Girl Geeks, BCS-Women [9, 14, 24], see also

Figure 4. They all encourage more innovation, entrepreneurship and entrepreneurship. Our survey aimed to identify how well-known each of these initiatives is.

Since we distributed the survey with an explanatory note, ACM-Women and its activities were identified as known to 80% of the respondents. This was closely followed by Athena Swan and Grace Hopper, BCS-Women and Women who code.

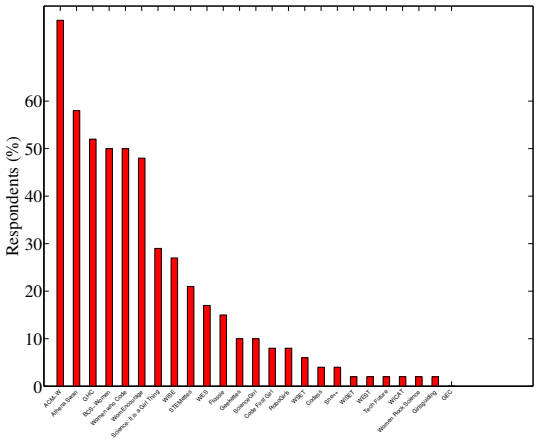

Figure 4: Initiative Awareness in the UK

There was some support for the introduction of new laws by the government to promote the number of females (See Figure 5).

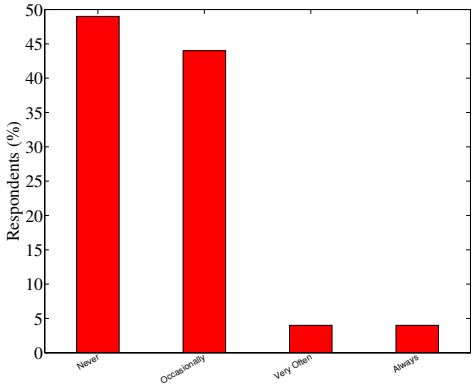

Figure 5: "Should there be new laws introduced by the government to promote the number of females?"

4 RECOMMENDATIONS

STEM provides numerous opportunities for career engagement, development and progress for women. Based on the identified issues, our survey results support the following recommendations:

(1) Create programs to encourage more girls to study engineering from an early age.
(2) Develop mentoring programs for school students such as having engineers to come into primary schools and do talks, so that positive role model and mentors are introduced early on.
(3) Promote visibility of women as role models through diverse social media channels such as Facebook, Twitter, technology-related forums, Youtube in a positive manner. Promote visibility of women at science festivals and organized events for school-age children.
(4) Build strong peer-support network for participants of events and initiatives. Engage the participants in follow-up activities.
(5) Address barriers of isolation via mentoring in STEM. Promote successful women role models at the graduate level to ensure that more women are retained in a career in STEM.
(6) New policies are needed to facilitate and allow women to earn the respect of their peers and families and to encourage the development of a positive self-concept of the woman scientist.

With these recommendations in mind, our ACM-W professional chapter (https://acmukwomen.acm.org) was established in 2014 to support women in pursuing computing related careers, finding like-minded colleagues, and learning new skills in the UK. We hope that others will join us in this endeavor.

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