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Gender, Workforce and Artificial Intelligence

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Abstract
Our aim is to explore the role Artificial Intelligence has on widening the gender inequality gap that currently exists in the field of Information Technology. This study builds on the 'Advancement of Women in Technology (AWT) framework and 'The implicit bias theory to explore women's ability and willingness to enter and remain in an AI related career. By conducting semi-structured interviews of 4 users of AI as a pilot study, data gathered enables us to draw a parallel to fully understand the existing gender gap in AI and the general invisibility which women as contributors to the industry experience and make recommendations for industry practise.

Keywords: Artificial Intelligence (AI), Gender Gap, AI Principles, AI Ethics, Impact of AI bias, Benefits and dangers of AI technologies.

I. INTRODUCTION

According to a UNESCO assessment, the Information and Communication Technologies (hereafter ICT) field is characterised by a low presence of female students and professionals, with only 3% of female students selecting ICT studies in higher education. With the present rate at which science and technology are progressing, the demand for AI expertise and skillsets are continually increasing with AI being amongst the top 10 careers of choice by progressive ICT Professionals [1]. Out of the growing population of people embracing AI as a career in the ICT sector which is predominantly a male dominated sector, only 22% are women according to [2]. Most companies estimate that less than 1% of their job applicants are women, and the WEF estimated that it would take 108 years to close the global gender gap [2] In fact, a [2] study on LinkedIn, the largest database of skillsets, found a significant gender gap in the representation of AI professionals. The study also found no evidence that this gap has been closing over the past few years, despite the fact that both men and women have been adding AI skills to their profiles at a similar rate. As a result, women are neither catching up to men nor falling further behind. This research seeks to identify patterns in the AI landscape where there is a widening gender gap both in developed and developing countries alike. It seeks to understand and document the perceptions of women in AI and its potential to widen the gender gap in the workforce. Therefore, this research seeks to answer the following research questions.

1. Will Artificial Intelligence widen the existing gender gap in the workforce?
2. What are the implications of knowing how women learn and implication for artificial intelligence in the workforce?

This study makes recommendations on ways to close the gender gap and mitigating the current trajectories at this early stage of the fourth industrial revolution.

II. LITERATURE REVIEW

Until now, the technology developed still allowed humans to be in control, guiding the machines and getting them to perform as desired. This was the motivation for the increasing focus on STEM education for women and girls that enabled them to access tech jobs especially in areas that required human intelligence to control the machines [3]. However, the present wave of advancements into 'Big Data, Analytics, Robotics and Artificial Intelligence opens up the possibility of more sophisticated automation that requires large scale reduction of human involvement while creating options for substantial augmentation of human capabilities. This has huge implications for women and heightens the challenges of educating and supporting women in the tech domains. What does this then mean for the female gender?

The causes of this low figures are multiple. [4] have argued that the lack of female references is one of the causes of the deficit of women in AI and that providing female role models for primary and secondary school students would inspire more girls to enrol in STEM related fields. [5] examined the reduced job opportunities in the tech labour market, and related it to how this brings negative consequences for both the society and women, thereby questioning "what it really means to be included? [6] presents their reasoning from an education perspective, that the last 20 years has shown a decline in the number of females enrolled in science, technology, engineering and mathematics (STEM) related courses and also the

workforce has recorded an unacceptable high number of resignations from women in information technological related job positions. This they say stems from gender stereotypes created by our societies. While from the social context, [7] highlight the influence that family-related challenges have on STEM academic and non-academic careers. This is as a result of the lower perceived self-efficacy in girls as gender is continually framed mainly in relations to the biological sex differences or an economic moderator of an outcome. They argue that this narrowed perspective of gender overlooks cultural and social science underpinnings. This study specifically adds to a growing body of research [8] that examines the social and political effects of data collection for various groups in society, emphasising the crucial role played by curators of machine learning algorithms in producing fair data that avoids gender discrimination in AI. [5] also emphasises the "democratisation of data" by incorporating all viewpoints, particularly those from the group most at risk of discrimination (women), into the development of technology.

III. METHODOLOGY

This study will build on the 'Advancement of Women in Technology (AWT) framework and 'The implicit bias theory [9] to explore women's ability and willingness to enter and remain in an AI related career. The authors of the implicit bias theory, argue that an unintentional, unplanned bias exists which influences the way in which members of our society makes any decision. We use this concept to draw a parallel to fully understand the existing gender gap in AI and the general invisibility which women as contributors to the industry experience. Could this be as a result of an implicit bias? We also adopt the principles of the AWT framework to understand women's 'ways for learning' and 'self-efficacy' to promote more women in emerging and advanced technologies [10].

Using an adapted Grounded Theory Analysis [11] we develop a robust understanding of the gap and impact of AI on gender in the workforce. To do this, we will begin by analysing the data from organisations such as UNESCO and WEF) to identify the gaps and impact of AI technology on women in the workforce. This process will allow us to focus on an expert-based 'best-evidence synthesis' of key literature rather than capture all literature on the presentation and adoption of women into the ICT sector specifically AI [7]. Preliminary data for this study was collected from semi-structured interviews involving 4 women working in AI-related fields. The data was analysed using a Grounded Theory Analysis which has both inductive and intuitive benefits [12] and the results are presented in the next section.

IV. RESULTS AND FINDINGS

Table I. OVERVIEW OF PARTICIPANTS

Participants	**Sector**	**AI Skills**
Participant 1	Performance Management	Talent Analytics
Participant 2	Financial Services	Analytics
Participant 3	Advertising	Devops and Cloud Computing
Participant 4	Government	Security and inter-relationship skills

This study answers the research questions based on the preliminary findings and is presented below with direct quotes form the participants to support findings:

1.What are the implications of knowing how women learn and implication for artificial intelligence in the workforce?

This study argues that women learn differently in line with the AWT framework and evidenced by direct quotes from our participants. They suggest the unique ways in which they learn;

P4…Interacting or engaging with individuals with the skills either in a way of hands on training or table top exercises

P1…Hands on learning helps me better

This shows the preferred mode of learning for women is through practise, and this links to opportunity creation which the society does not provide equally to both males and females see [7].

2.Will Artificial Intelligence widen the existing gender gap in the workforce?

This study therefore agrees from this pilot study that AI will likely widen the gender gap in the workforce because women are not likely to have the skills

needed to explore the AI filed to its fullest. Additionally, the field is already overly represented by males, making females lack role models to attract them to come into and remain in the field.

When asked about gender representation at their organizations, their responses can be summarised below:

P1 says: We see more of white male represented
P2 says: Men are much more represented
P3 says: Males
P4: 50/50 representation

This confirms that the field is predominantly male dominated with just one participant documenting a 50-50 gender representation. This study also sought to find out the ease of being recruited into the ICT sector, most of the respondents articulate that it was a bit challenging (P1) and passion has remained the driving force (P4).

Therefore, in conclusion, this study is in alignment with previous studies that suggest that AI will widen the gender gap in the ICT sector but goes beyond that to make recommendations for this lingering problem backed up theoretical frameworks and evidenced by data.

V. CONTRIBUTION OF STUDY

This study adds to the continuing conversation about gender equality and AI principles. Women with AI abilities are generally more likely to work in fields involving the use and application of AI as seen in this pilot study, with common jobs in data analytics, research, and education. According to a LinkedIn report, men are arguably more likely to work in the technology's development, which is mirrored in the talents they list as having, like deep learning and neutral networks. This current study is novel in that it looks at how to solve gender equality issues in AI and suggest that it is first best to understand how women learn and then begin to promote the use of AI in that manner.

VI. IMPLICATIONS FOR PRACTICE

The study of women's involvement in AI has both academic and political appeal. This study focused on the gap and impact evaluation of artificial intelligence on women in the workforce. This has implications for praxis as the findings of this study will reiterate the importance of ensuring that more women engage in not just the use of AI but the creation of AI systems. Furthermore, the issue of cultural diversity infused into AI to make AI more human-centric has been of great concern among researchers, industry decision makers and government for some time now. The study also has implications for policymakers as the AI policy landscape is brimming with opportunities for educational research. Policy implementation concerns, as well as the role and responsibility of industry players, are new frontiers to be explored by policymakers. The ability to address these concerns will contribute to the policy foundations and recommendations made by UNESCO on how to address gender equality considerations in AI.

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