Response to the Scottish Government Consultation on Developing Scotland's Artificial Intelligence (AI) Strategy

March 2020

INTRODUCTION

Close the Gap is Scotland's policy advocacy organisation working on women's labour market participation. We have been working with policymakers, employers and employees since 2001 to influence and enable action that will address the causes of women's labour market inequality.

Artificial intelligence (AI) and data driven technologies undoubtedly create opportunities for the Scottish labour market and society. However, these technologies also present a number of key challenges around women's labour market inequality, built-in discrimination and bias, and future skills challenges. The way in which the Scottish Government responds to these opportunities and challenges will be the determinant as to whether AI will sustain or challenge, women's inequality.

Women are currently under-represented in Scotland's tech sector. Data from ONS highlights that in Scotland women account for just 18% of IT technicians and 16.9% of IT and telecommunications professionals, which includes roles in programming, software development, web design and development, business analysis, and systems design.[1] There are also patterns of occupation segregation within tech sub-sectors with women further under-represented in AI and in its subsets of machine learning and deep learning.[2] This under-representation of women working in AI, and therefore among engineers developing algorithms that determine how a decision is made, coupled with the use of biased training data on which AI decision-making is based have led to many algorithms exhibiting bias and discrimination against women. For example, Amazon abandoned an AI recruiting tool, developed in Edinburgh, when it was revealed to discriminate against women.[3]

Additionally, AI may accelerate digital disruption in the jobs market and pre-existing research and analysis has shown that this disruption is expected to have a gendered

[1] Annual Population Survey (June 18-June 19) *Regional employment by occupation*
[2] Thomson, Clive (2019) *Coders: Who they are, what they think, and how they are changing the word*
[3] Business Insider *Amazon built and AI tool to hire people but had to shut it down because it was discriminating against women* https://www.businessinsider.com/amazon-built-ai-to-hire-people-discriminated-against-women-2018-10?r=US&IR=T

impact.[4] Women workers are concentrated at the extreme ends of the automation spectrum, with women over-represented in jobs that are at the highest risk of automation, such as retail or secretarial roles, and under-represented in the sectors where job growth is likely as a result of automation, such as STEM. Occupations most at risk of automation for men have the lowest earnings, whereas there is considerable risk to 'women's jobs' in better paid occupations, which has the potential to reverse gender equality gains.

In *A Fairer Scotland for Women,* Scotland's first gender pay gap action plan, the Scottish Government have committed to ensuring that addressing the causes of the gender pay gap are central to policies on automation and artificial intelligence.[5] To date, AI strategies, proposals and policy recommendations have not prioritised gender equality. For example, the UK Government's AI Sector Deal makes some vague recommendations with regards to diversity in the AI workforce and in AI development, but has no explicit mention of women, gender equality or wider equality considerations. It is vitally important that Scotland's response to AI is gendered, thus ensuring new technologies do not cement, or indeed, worsen existing gender inequalities. However, it is disappointing that the scoping document for Scotland's AI Strategy and the two published workshop reports contain no mention of gender equality, or women and AI.

As the AI Strategy will be the cornerstone of Scottish Government policy-making on AI, gender equality must be mainstreamed throughout the development of the Strategy. Not only should the objective of the AI Strategy be to ensure that the development and adoption of AI does not cause an increase in social and economic inequality, but it should also harness AI in order to reduce existing inequalities. In this way, the strategy should seek to address gender pay gap and occupational segregation as central aims.

ANSWERS TO CONSULTATION QUESTIONS

As Close the Gap's area of expertise is gender and the labour market, we have not answered all of the questions in the consultation document. Rather, our submission focuses on specific questions within our areas of interest and expertise.

2. Do you agree that the strategy should be people-centred and aligned with Scotland's National Performance Framework?

Aligning the Strategy with the National Performance Framework (NPF)[6] will help to ensure the Strategy promotes both economic and social outcomes. However, this alone will be insufficient to ensure the Strategy furthers gender equality, as the NPF is not well-gendered and contains no metric which specifically relates to gender

[4] World Economic Forum (2018) *The Global Gender Gap Report 2018*
[5] Scottish Government (2019) *A Fairer Scotland for Women: gender pay gap action plan*
[6] Scottish Government. 2019. "National Indicator Performance" available at https://nationalperformance.gov.scot/index.php/measuring-progress/national-indicator-performance.

equality.[7] Only two of the 81 indicators in the NPF relate specifically to women[8], and to view sex-disaggregated data about individual indicators requires a visit to the separate Equality Evidence Finder website.[9] Engender have highlighted concerns that 'it is possible, and indeed likely, that progress will be made towards NPF outcomes in a way that entrenches and deepens women's inequality'.[10]

We are supportive of the intention to make the Strategy people-centred, however, it is essential that the people-centric approach adopted by the Scottish Government must be gender-sensitive and intersectional. Gender-sensitive refers to approaches, policies and practices which have been developed considering gender and thus do not have an unintended negative impact on women or gender equality as a result. An intersectional approach recognises that women are not a homogenous group, but their experiences will vary according to their multiple identities. For example, disabled and Black and minority ethnic women's experiences will be inflected by not only sexism, but also ableism and racism. Only by adopting such approaches will a 'people-centred' strategy benefit women.

It is critical that an equality impact assessment (EqIA) of the AI strategy is developed to identify any unintended impacts on men or women. Under the Scottish specific duties of the public sector equality duty, listed public bodies, including Scottish Government, are required to do EqIAs. EqIA is a mainstreaming tool which provides a mechanism to build equality considerations into policy making, providing a clear and structured way to consider evidence about the needs of protected groups. EqIAs are routinely completed to a poor quality in Scotland's public sector, and are often developed far too late in the policy process. In many cases EqIAs are not completed at all. The efficacy of EqIAs carried out late in policy development is very limited.[11] EqIAs should be undertaken at the very early stages of policy development in order that gender is mainstreamed into the development of policy from the outset, and to avoid restating and entrenching existing 'gender blind' outcomes. The development of the strategy therefore provides a good opportunity for Scottish Government policy on AI to be steered by a high quality EqIA. It is essential therefore that a robust EqIA is developed at the start of the policy process for the AI Strategy.

[7] Long G (2019) *The SDGs and Scotland: a discussion paper and initial analysis*
[8] These are the gender pay gap and the difference between women's and men's labour market participation rates (called 'organisational gender balance').
[9] Scottish Government (2019) "Equality National Performance Framework Dashboard" available at https://scotland.shinyapps.io/sg-equality-evidence-finder/#equality-npf-top.
[10] Engender (2020) *Submission to the Chief Statistician on Sex/gender: Gathering and using data to advance women's equality and rights in Scotland*

3. **How do you think AI could benefit Scotland's people, and how do we ensure that the benefits are shared and no-one is left behind?**

Primarily, as mentioned above, embedding gender considerations as a key aspect of the development and delivery of the Strategy and subsequent policy frameworks will help to ensure the benefits are shared.

Digital disruption in the labour market has the potential to cement the disadvantage faced by certain groups in the labour market, including women. It is therefore vital that the Strategy incorporates proposals to mitigate the impact of potential job losses, and ensures women have access to skills programmes focused on the skills for the future. The impact of the 'fourth industrial revolution' on jobs is contested, and there are no clear conclusions. However, the OECD believe that low qualified workers are likely to bear the brunt of the adjustment costs. As such the challenge is managing rising inequality and ensuring sufficient retraining, especially for low-qualified workers.[12] Training in its current form is not working to offset the potential risks of automation, as participation in training is significantly lower for workers in jobs at high risk of automation than for other workers. [13] Research has found that workers at the highest risk of automation are more than three times less likely to participate in on-the-job training, over a 12-month period, than workers in less-automatable jobs.[14] For example, the retail sector has been characterised by poor development and progression opportunities, and forecasts almost universally identify the sector as being high-risk for job disruption and job losses.[15] This could have profound economic consequences as retail workers display comparatively less resilience in the labour market, with high rates of outflow from the retail sector into unemployment, and particularly long-term unemployment.[16] Women comprise the majority of those employed in retail, and account of the majority of low-paid workers and reskilling and upskilling opportunities for women are therefore critical in ensuring that AI in the labour market does not result in 'winners' and 'losers'.

Importantly, the ONS finds that women account for 70.2% of employees in jobs at high risk of automation, and 42.6% of employees in jobs at low risk of automation. Furthermore, part-time workers, of whom women comprise the majority, make up 69.9% of all employees in jobs at high risk. This compares with only 11% of jobs at low risk of automation being held by part-time positions.[17] A number of barriers

[12] OECD (2016) *The Risk of Automation for Jobs in OECD Countries*
[13] OECD (2018) *Policy Brief on the Future of Work: Putting faces to the jobs at risk of automation* available at https://www.oecd.org/employment/Automation-policy-brief-2018.pdf
[14] Ibid.
[15] RSA (2019) *Retail Therapy: Towards a future of good work in retail*
[16] Ibid.
[17] ONS (2019) 'Which occupations are at high risk of being automated' available at https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/whichoccupationsareathighestriskofbeingautomated/2019-03-25

prevent women from reskilling and moving into higher paid jobs including less access to training overall; under-representation in STEM industries; and caring responsibilities coupled with inflexible workplaces. Skills programmes designed as part of the AI Strategy must therefore address the barriers experienced by women, including low-paid women, in accessing training and reskilling opportunities.

There is mounting evidence that machine-learning algorithms bear the imprint of their designers and culture.[18] The Apple Card, the credit card created by Apple and developed by Goldman Sachs, has come under scrutiny for alleged gender bias in deciding credit limits after evidence emerged that it appeared to favour male applicants.[19] Automated facial recognition systems have been shown to exhibit gender and racial bias. One study[20] on facial recognition systems found that darker-skinned women were the most misclassified group with an error rate of up to 35%, compared with lighter-skinned men who had a maximum error rate of 0.8%. Similarly, the Scottish Parliament's Justice Sub-Committee on Policing concluded that current facial recognition technology is not fit for use by Police Scotland and that, before introducing the new technology, it needs to demonstrate that the biases in it which discriminate against women and ethnic minorities have been eliminated.[21] Discriminatory AI ultimately embeds gender inequality and inequality more broadly, and it is therefore essential that the AI Strategy disrupts this pattern of discrimination.

4. What do you think of the proposed overarching vision of the strategy, and the two strategic goals that are proposed to underpin this?

The broad strategic goals which underpin the overarching vision are open to interpretation and it is therefore difficult to determine what policy recommendations will stem from these goals or how they will be further theorised. The proposed goals will require significant gender analysis and gender mainstreaming, accompanied by gender-disaggregated data, if they are to benefit women. The goal which stipulates that 'the people of Scotland will flourish' will only be successful if accompanied by an analysis of the differing needs, experiences and barriers faced by women and men. This should mean meeting the different needs of disabled, LB & T, Black and minority ethnic, and older and younger women. A focus on 'the people of Scotland', without any separate goal relating to equality is insufficient to further women's equality,

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[18] Wacjman, Judy (2017) "Automation: Is it really different this time?", *The British Journal of Sociology* http://eprints.lse.ac.uk/69811/1/Wajcman_Automation%20is%20it%20really%20different%20this%20time.pdf

[19] Natarajan, Sridhar and Shahien Nasiripour "Viral tweet about Apple Card leads to Goldman Sachs probe", Bloomberg, 9 November 2019, available at https://www.bloomberg.com/news/articles/2019-11-09/viral-tweet-about-apple-card-leads-to-probe-into-goldman-sachs

[20] Buolamwini, Joy and Timnit Gebry (2018) "Gender Shades: Intersectional accuracy disparities in commercial gender classification", Proceedings of Machine Learning Research, 81:1-15, 2018, Conference on Fairness, Accountability and Transparency, available at: http://proceedings.mlr.press/v81/buolamwini18a/buolamwini18a.pdf

[21] Scottish Parliament's Justice Sub-Committee on Policing (2020) *Facial Recognition: How policing in Scotland makes use of technology*

particularly when coupled with the NPF. We would therefore advocate for an additional strategic goal relating to the promotion of equality and non-discrimination through the adoption of AI. Embracing this additional strategic goal would subsequently ensure that the working groups prioritise equality within their work.

On the goal relating to organisations, this requires consideration of the needs of women-led businesses and explicit objectives relating to addressing women's under-representation in the AI and tech sectors. Indeed, women's inequality in the labour market is a drag on economic growth and productivity, and occupational segregation is correlated with sector skills shortages. Research by Close the Gap has highlighted that closing the gender gap in employment is worth £17 billion to the Scottish economy.[22] Only 21% of SMEs are led by women and if the numbers of women-led businesses increased to equal those of men, it would lead to a 5% increase in GDP, equivalent to £7.6 billion. Venture capital (VC) is an important source of finance in the tech industry, and female-founded companies receive less than 1% of total UK VC, while male-founded companies receive 89%[23], despite the fact that third of entrepreneurs are women.[24] Sectors where women's enterprise is concentrated are not those identified as likely to grow based on current forecasts. For example, in line with women's under-representation in the tech sector as a whole, women account for only 11% of the self-employed in ICT and digital technologies.[25] Addressing women's inequality in enterprise, and the AI Sector, should thus be a central aspect of enabling organisations to flourish.

5. **Do you agree with the representation of Scotland's AI ecosystem outlined in the scoping document? Is it missing anything?**

We are broadly supportive of the AI ecosystem, as outlined in the scoping document. As we have highlighted elsewhere, the development of this ecosystem will of course determine whether it challenges or entrenches gender equality. In particular, we are interested in the 'resources' aspect of the ecosystem which is detailed as relating to skills, data and investment. The development of these resources will require gender analysis, gender mainstreaming, and the use of gender-disaggregated data. It is also vital that gender equality is mainstreamed in the development of any infrastructure, such as Government departments or public bodies, as part of this ecosystem approach.

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[22] Close the Gap (2016) *Gender Equality Pays: The Economic Case for addressing women's labour market inequality*
[23] British Business Bank (2019) *UK VC and Female Founders* https://www.british-business-bank.co.uk/wp-content/uploads/2019/02/British-Business-Bank-UK-Venture-Capital-and-Female-Founders-Report.pdf
[24] Financial Times (2019) available at 'Why female founders are tapping female investors for cash' https://www.ft.com/content/b0ce52bc-6030-11e9-9300-0becfc937c37
[25] Engender (2019) *Submission of Evidence to the Scottish Parliament Economy, Energy and Fair Work Committee's Call for Evidence on the Scottish National Investment Bank* available in https://www.engender.org.uk/content/publications/Engender-submission-of-evidence-to-the-Scottish-Parliament-Economy-Energy-Jobs-and-Fair-Work-Committee-Call-for-Evidence-on-the-Scottish-National-Investment-Bank-Bill-.pdf

On skills, this should involve ensuring women are given access to reskilling and upskilling opportunities, and that evidence on women's experiences of training skills acquisition is integrated into all programmes and interventions designed to address labour market changes. Growing the AI sector and addressing existing skills gaps requires attracting more women into the sector. Readdressing women's under-representation necessitates consideration of skills and training, but also a consideration of the structure of tech jobs and the prevailing workplace cultures. Ensuring that Scotland can benefit from a strong AI sector as a resource therefore requires action on occupational segregation.

Data is a vital resource for the development and adoption of AI. This must include consideration, and perhaps regulation, relating to the collection, handling and purpose of large datasets to ensure data is not perpetuating gender and racial bias. Discriminatory AI ultimately embeds gender inequality and inequality more broadly, and it is therefore essential that the AI Strategy disrupts this pattern of discrimination when considering access and use of data.

Investment decisions, including those made by the Scottish Government and public bodies, have a key role to play in addressing discriminatory AI, the under-capitalisation of women-led tech businesses and the broader barriers women-led business face in accessing finance. The Strategy and realisation of the AI ecosystem therefore requires consideration of the needs of women-led businesses and explicit objectives relating to addressing women's under-representation in the AI and tech sectors. We provide more detail on the priorities for skills, training, data and investment in our response to question 6 below.

6. **Do you have any comments on the strategic themes that will be explored in detail?**

The broad strategic themes appear to be in line with the strategic goals, and overarching vision for the Strategy. In particular, Close the Gap has a key interest in ethical and regulatory frameworks, and skills and knowledge. Throughout the key questions posed under the themes, there is no mention of gender equality, or equalities more broadly. It appears that equalities considerations reside under the ethics strategic theme, this is potentially problematic as 'ethics' and 'equalities' are not synonymous.

In the following section, we make suggestions about some of the topics the working groups aligned with these strategic themes should prioritise within their workplans.

Ethical and regulatory frameworks

We are supportive of the Scottish Government's focus on ensuring Scotland has a strong regulatory framework to build ethical AI. Self-regulation by companies is

insufficient to ensure that AI is for the common good, and the governance and shaping of AI should be in the public realm.[26] The intention of regulation should not be to stifle innovation, but rather to foster it while also ensuring AI strengthens the values of equality, democracy and human rights.[27] As this theme focuses on ensuring the adoption of AI benefits Scotland's people, one of the core values furthered by this theme should be the promotion of gender equality and non-discrimination.

Algorithms are at the heart of AI and can be useful tools to automate decisions, however, many algorithms exhibit bias and discrimination against women and ethnic minorities. There is mounting evidence that AI models can perpetuate and amplify existing gendered inequalities. This is primarily because the datasets used to train AIs are not representative of diverse groups of women, or people, and the use of this data breeds further bias and discrimination, and women are grossly under-represented among those developing AI. The AI Now Institute at New York University have stipulated that the lack of diversity in the sector, and AI systems reflecting historical patterns of discrimination 'are two manifestations of the same problem, and they must be addressed together'.[28] The AI workforce is largely white, middle class men which means that algorithms are developed by people with a very limited perspective and experience of the world. Research published by Nesta[29] shows that women are chronically under-represented in the industry, making up just 14% of those working in AI research. Women comprise only 15% of AI research staff at Facebook, and 10% at Google.[30]

There is a high and increasing demand for deep learning skills with significant pay attached, and the dearth of women in more lucrative fields such as AI compounds the gender pay gap in tech. The House of Lords Select Committee on Artificial Intelligence recommended that the UK Government encourage greater diversity in the training and recruitment of AI specialists but made very few recommendations in this area.[31] The Scottish Government's strategy should therefore go further than UK-level reports and strategies in making tangible, evidence-based recommendations on addressing women's under-representation in AI and tech. These recommendations should start at the earliest points in the skills pipeline, including tackling gender stereotyping in early learning and childcare and segregation in subject choice.[32]

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[26] Women leading in AI (2019) *10 Principles of Responsible AI*

[27] Ibid.

[28] West, S.M., Whittaker, M. and Crawford, K. (2019) *Discriminating Systems: Gender, Race and Power in AI*.

[29] Stahoulopoulos, Kosta and Juan Mateos-Garcia (2019) *Gender Diversity in AI Research*, Nesta https://media.nesta.org.uk/documents/Gender_Diversity_in_AI_Research.pdf

[30] West, S.M., Whittaker, M. and Crawford, K. (2019) *Discriminating Systems: Gender, Race and Power in AI*.

[31] House of Lords, Select Committee on Artificial Intelligence (2018) *AI in the UK: Ready, willing and able? (Report of Session 2017-9)*

[32] See Close the Gap (2020) *The Gender Pay Gap Manifesto: Realising fair work for women*

Data is vulnerable to bias where it is based on biased decisions that were made by humans and/or may reflect societal or historical inequalities. Bias can also be found in data because of the method in which it has been gathered and elected, and which groups of people are included in the sample. This is concerning as deep learning AI is increasingly used to make decisions about people lives, for example, in recruitment;[33] monitoring and performance review of the workforce;[34] in justice systems to predict a defendant's likelihood of reoffending;[35] and in credit and insurance decision making in the financial services industry.[36] It should be determined how the collection, handling and purpose of large datasets are perpetuating gender and racial bias with a view to establishing context-specific, gender-specific guidelines for best practice regarding data.[37] The UK Centre for Data Ethics Innovation's interim report into AI in decision-making noted that as the volume and variety of data used to inform decisions increases, and the algorithms used to interpret the data become more complex, concerns are growing that without proper oversight, algorithms risk entrenching and potentially worsening bias. This is particularly true in areas or sectors where there is evidence of historical bias in decision-making.[38]

AI can be a reinforcer of gender norms and stereotypes. Currently, the design of many AI products has served to reinforce harmful gender, and also racial, stereotypes. Humanoid robots are designed in line with gendered hierarchies, and as a result they tend to produce and reinforce gendered bodies and behaviours[39] which ultimately reproduce stereotypical appearances.[40] For example, 'care-bots' have been developed to resemble women, or to have stereotypically female traits, and subservient female virtual assistants are the default interface for consumers' interactions with machines. In its examination of the gendering of AI technology the UNESCO highlighted how increasingly ubiquitous digital voice assistants reflect and reinforce gender bias, and model acceptance and tolerance of sexual harassment and verbal abuse.[41]

It is not inevitable that robots and new technologies will replicate and embed gender bias and Government can intervene to change this trajectory. The Women Leading in

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[33] Centre for Data Ethics and Innovation (2019) *Review into bias in algorithmic decision-making*
[34] Brione, P. (2020) *My Boss the Algorithm: an Ethical Look at Algorithms in the Workplace*
[35] Thompson, Clive (2019) *Coders: Who They Are, What They Think, and How They Are Changing Our World*, London: Picador
[36] Centre for Data Ethics and Innovation (2019) *Review into bias in algorithmic decision-making*
[37] Collet, Clementine and Dillion, Sarah (2019) *AI and Gender: Four Proposals for Future Research*
[38] Centre for Data Ethics and Innovation (2019) *Interim Report: Review into bias in algorithmic decision-making*
[39] Hicks, M. (2015). Using Digital Tools for Classroom Activism: Exploring Gender, Infrastructure, and Technological Discipline through a Public Bathroom Project. Syllabus, 4(2), pp.1-5.
[40] Collet, Clementine and Dillion, Sarah (2019) *AI and Gender: Four Proposals for Future Research*
[41] UNESCO (2019) *I'd Blush if I Could: Closing gender divides in digital skills through education* https://unesdoc.unesco.org/ark:/48223/pf0000367416

AI Network[42] have stated that 'we do not have to be resigned to the negative uses [of AI] that we are seeing, or to the gendering of virtual personal assistants like Alexa, Siri and Cortana or to the discriminatory algorithms'.[43] Government therefore have agency to introduce regulation and guidance to address the gendering of robotics, discriminatory AI and bias datasets.

Skills and knowledge

It is essential that gender equality is mainstreamed in policymaking on training, upskilling, reskilling and growing the AI workforce. Ultimately, whether automation leads to job losses and growth in certain sectors, or changes in job content and tasks, there is a need for upskilling and reskilling initiatives.[44] In future, people will find no market for their skillset at earlier and earlier stages of their careers,[45] leading to a recurring, or perhaps constant, process of upskilling and reskilling. Developing initiatives that support women to upskill, especially women returning from a career break, is one part of the solution. However, it is critical that upskilling and reskilling interventions challenge occupational segregation more broadly, which means targeting women in female-dominated occupations, particularly those which are at high risk of automation.

The additional barriers women face in accessing training have been well-evidenced, yet these considerations do not appear to form a central pillar of policies around lifelong learning and skills programmes more broadly. Women are less likely to receive employer training than men, and there are also gender differences in the types of training accessed. Women are more likely to receive generic training such as equality and diversity and health and safety, while men are more likely to be given supervisory and management training.[46] Low paid, part-time women workers are the least likely to receive any type of training,[47] which is particularly concerning given the forecasts mentioned above.

Women are also more likely than men to have contributed towards the cost of their training, and full-time workers are more likely than part-time workers to have had the total costs of their learning paid for by their employer.[48] Female part-time workers' challenges in accessing training are compounded by the tendency for part-

[42] The Women Leading in AI Network, whose members include leading AI scientists, algorithm coders, privacy experts, charity sector leaders and academics, have produced reports and recommendations focused on ensuring AI promotes equality rather than amplifying embedded stereotypes that hold back both society and the economy.
[43] Women leading in AI (2019) *10 Principles of Responsible AI*
[44] OECD (2018) *Policy brief on the future of work: Putting faces to the jobs at risk of automation*
[45] SCDI, BT, ScotlandIS and RSE (2018) Automatic… For the People? How Scotland can harness the technologies of the Fourth Industrial Revolution to increase economic and social prosperity
[46] Aldrige, Fiona and Corin Egglestone, (2015) *Learning, Skills and Progression at Work: Analysis from the 2015 adult participation in learning survey*, UK Commission for Employment and Skills
[47] House of Commons Women and Equalities Committee (2016) *Inquiry into the gender pay gap*
[48] Aldrige, Fiona and Corin Egglestone, (2015) *Learning, Skills and Progression at Work: Analysis from the 2015 adult participation in learning survey*, UK Commission for Employment and Skills

time work to be low-paid, thereby presenting a financial barrier. Furthermore, the primary reason for most women working part-time is their caring roles; time spent doing this unpaid work extends into all aspects of women's lives making it more difficult to undertake training or education outwith working hours.

This experience of training, coupled with the expected gendered impact of digital disruption on employment, means that women may be disproportionately impacted by changes in the labour market. This evidence on women and training should be integrated into all programmes and interventions designed to address labour market changes. Currently, interventions such as the Flexible Workforce Development Fund have not taken a gendered approach to design, delivery or evaluation. There is no information on whether capacity was built in college staff to support them to engage with employers on gender, skills and training. The range of information published in the evaluation suggests that data collected during the employer application process nor monitoring data gathered by colleges is disaggregated by gender. The evaluation of the Fund does not mention gender, and the only reference to women is in describing that both women and men have participated in training.[49]

The development of AI also relies on a supply of skilled experts. Shortage of talent is a challenge for most high technology fields, but is especially acute in AI because 'it is a specialised subfield at the junction of two already supply-constrained fields' of software engineering/computer science and mathematics/ statistics/ data science.[50] Across the economy, there is a correlation between women's under-representation and sector skills gaps. If Scotland is to have the skills to be a world leader in automation and AI, it is therefore necessary to address women's under representation in the sector. The attrition rate of women working on tech, and in STEM more broadly is high; 70% of women with STEM graduate qualifications are not working in the industry.[51] This represents a gross loss of female talent to Scotland's economy.

It is likely that existing inequalities will only be aggravated and enlarged by an expansion in the AI workforce as the AI labour market fails to reflect a diverse population.[52] Readdressing women's under-representation necessitates consideration of skills and training, but also a consideration of the structure of tech jobs and the prevailing workplace cultures. Recent research by Close the Gap has highlighted that often women's under-representation in the tech sector can be entrenched by structural issues, such as the design of jobs and the type of

[49] Ibid.
[50] Professor Dame Wendy Hall and Jerome Pesenti (2017) *Growing the Artificial Intelligence Industry in the UK*
[51] Royal Society of Edinburgh (2018) *Tapping All Our Talents: A progress review of science, engineering, technology and mathematics in Scotland*
[52] Collet, Clementine and Dillion, Sarah (2019) *AI and Gender: Four Proposals for Future Research*

employment contract.[53] Research has identified inflexible workplace practice including a lack of part-time work and a culture of long hours which makes it difficult for women with caring roles to manage work-life balance. Only 4% of workers in tech are in part-time roles[54] and 6% of information technology roles are advertised on a flexible basis.[55] Childcare provision and flexible working opportunities should also be key considerations in addressing women's under-representation. Certainly, focusing on the skills pipeline alone, while ignoring issues with workplace cultures, harassment and recruitment discrimination, will be insufficient to address the lack of diversity in the tech sector.[56]

Untransparent and biased recruitment practice, a lack of access to informal networks, particularly those which are based on stereotypically male activities, prevent women from entering and progressing in the industry. Research published by ScotlandIS, the trade body for the digital technologies industry, identified evidence of sexist workplace cultures in which women report feeling undervalued, being excluded from discussions and discouraged from pursuing more technical projects, being talked over at meetings, and being asked to do lower status admin tasks that are not related to their role. Half (49%) of women responding said they believed they had been discriminated against at some time in their careers, and 42% of women reported that they are expected to put up with sexually explicit "banter" in the workplace.[57] These negative male-oriented environments in tech workplaces hinder their progression and in some cases force women to leave the industry altogether.[58] Uber, Google, Apple, Microsoft and other tech companies have been plagued by allegations of sexual harassment, while there is also evidence of a widespread culture of sexism, sexual harassment and discrimination in "brotopia" of Silicon Valley.[59] It is therefore not only an issue of ensuring more women have STEM-related qualifications, but also of workplace cultures and the structure of jobs in AI, and tech.

Joining the dots theme

On the joining the dots theme, it is vital that the AI Strategy is builds upon A Fairer Scotland for Women to ensure that the Plan furthers the Scottish Government's

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[53] Close the Gap (2020) 'Close the Gap research finds that fixed term contracts are amplifying the inequalities and disadvantage that women face in the tech industry' available at https://www.closethegap.org.uk/news/blog/close-the-gap-research-finds-that-fixed-term-contracts-are-amplifying-the-inequalities-and/

[54] IPPR (2019) *Future is Ours: Women, Automation and Equality in the Digital Age*

[55] Royal Society of Edinburgh (2018) *Tapping All Our Talents Review 2018: Women in STEM*

[56] West, S.M., Whittaker, M. and Crawford, K. (2019) *Discriminating Systems: Gender, Race and Power in AI*.

[57] Be It (2017) Sexism in the IT Industry: Survey results available at https://www.scotlandis.com/news/2017/december/sexism-in-it-in-scotland-the-report/

[58] Financial Times (2018) 'Macho 'brogrammer' culture still nudging women out of tech' available at https://www.ft.com/content/5dd12c50-dd41-11e8-b173-ebef6ab1374a

[59] Chang, Emily (2019) *Brotopia: Breaking up the boys' club of Silicon Valley*

ambition to tackle the causes of Scotland's gender pay gap, including occupational segregation. It is also important that the AI Strategy ensures policy coherence with the policy recommendations and objectives of A Fairer Scotland for Women.

While the AI Strategy will further develop the Scottish Government's policy framework, established by the Labour Market Strategy, the Fair Work Action Plan, the work of the Enterprise and Skills Strategic Board and the Future Skills Action Plan. However, the Scottish Government should be conscious of the fact that these policy documents lack gender analysis and do not outline how these proposals will enable the development and utilisation of women's skills. This is important because evidence shows that unless action plans and strategies actively consider women throughout the policymaking process, and utilise gender disaggregated data in design, delivery and evaluation, these plans will not deliver for women. The AI Strategy should therefore build on this policy framework by including gender equality considerations, rather than merely replicating the pre-existing recommendations which do not contain sufficient focus on the specific barriers women face in the labour market.

7. How can confidence in AI as a trusted, responsible and ethical tool be built?

It is vital that appropriate safeguards are in place to ensure fairness, transparency and the ability to challenge a machine decision.[60] Transparency and 'explainability' are important for public trust and ethics. Currently, the laws and policies surrounding AI are at the embryonic stage of development.[61] Existing legislation surrounding data, such as GDPR, protect people's rights to some extent, there is a need for further analysis and, subsequently, further protections.[62] GDPR does not represent a one-size-fits-all solution to these emerging issues.[63]

Women Leading in AI's report concludes that the greatest challenge in appropriately regulating AI is not technical, but rather rests on establishing the social and political will for assigning and maintaining accountability.[64] This has been echoed by Clementine Collett and Sarah Dillon who have noted that 'there is a risk that economic prosperity and political power will play an underlying role in shaping laws and policies concerning AI, as the expense of other more socially equalising motivations'.[65] Certainly, across the UK, there has been much discussion about

[60] Women leading in AI (2019) *10 Principles of Responsible AI*
[61] Collet, Clementine and Dillion, Sarah (2019) *AI and Gender: Four Proposals for Future Research*
[62] Collet, Clementine and Dillion, Sarah (2019) *AI and Gender: Four Proposals for Future Research*
[63] See Tzanou, M. (forthcoming, 2020) 'Addressing big data challenges: a taxonomy and why the GDPR cannot provide a one-size-fits-all solution'. In M. Tzanou (ed.), *Big Health Data and the GDPR: Data Protection, Privacy and the Law* and Allen, R. (2020) *Artificial Intelligence, Machine Learning, algorithms and discrimination law: the new frontier*
[64] Women leading in AI (2019) *10 Principles of Responsible AI*
[65] Collet, Clementine and Dillion, Sarah (2019) *AI and Gender: Four Proposals for Future Research*

ethical AI and the introduction of ethics codes, but very little work to translate these into practice or embed ethical AI into policy and legislation.[66]

Women Leading in AI propose a global framework accompanied by Algorithm Impact Assessment (AIA) to be initiated at the commencement of any project to guide ethical development, procurement, utilisation and evaluation. AIAs have been adopted elsewhere, including by the Canadian Government.[67] The group have also made a number of important recommendations around ethical AI which will encourage public trust including:

- Introduce a regulatory approach governing the deployment of AI;
- Introduce a mandatory requirement for public sector organisations using AI for particular purposes to inform citizens that decisions are made by machines, explain how the decision is reached and what would need to change for individuals to get a different outcome; and
- Introduce a new 'Certificate of Fairness for AI systems' alongside a kitemark type scheme to display it.

In the workplace, the importance of retraining workers and 'bringing your workforce with you' are clear. So far, the introduction of technology in the workplace has not always been accompanied by training for the workforce. Deloitte's 2019 Global Human Capital Trends report find only 22% of British workers were satisfied with their employers' use of technology, while 82% found there was a lack of leadership planning and engagement with workers.[68] A survey by the STUC found that while 76% of workers could identify automation in their workplace, automation was often seen as being introduced poorly and without proper training and support for workers.[69] Consequently, 65% of respondents felt that there were training needs in their workplace as a result of automation or digitisation and only 23% felt that training needs were being met in full.[70] There are also concerns that 'algorithmic management' will bring increased management control, without corresponding consent from the workforce, particularly in areas of surveillance and performance monitoring.[71] Not involving staff in changes breeds disempowerment and distrust around AI and it is essential that workplaces embed learning about new technologies and new ways of working when adopting AI in the workplace.

CONCLUSION

If the current trajectory continues, the development and adoption of AIs is likely to reinforce women's labour market and economic inequality as a result of the

[66] Collet, Clementine and Dillion, Sarah (2019) *AI and Gender: Four Proposals for Future Research*
[67] Women leading in AI (2019) *10 Principles of Responsible AI*
[68] Deloitte (2019) *Global Human Capital Trends 2019*
[69] Scottish Government and STUC (2018) *Technological Change and the Scottish Labour Market*
[70] Ibid.
[71] Brione, P. (2020) *My Boss the Algorithm: An Ethical Look at Algorithms in the Workplace*

development of gender-blind technology, the replication of bias in recruitment decision-making and the potential job losses from automation. This has the potential to undermine the Scottish Government's ambitions around the gender pay gap, and women's equality more broadly. It is therefore essential that the AI Strategy challenges women's inequality. This can be achieved by mainstreaming gender equality, building recommendations informed by a gendered analysis of women and men's differing experiences of the labour market, training and the impacts of discriminatory AI. We recommend that an additional strategic goal relating to the promotion of equality and non-discrimination through the adoption of AI is added to the scoping document and strategy. This will ensure that equality considerations are prioritised throughout the strategy, as it is clear that a focus on ethics alone will be insufficient to promote women's equality.

Moving forward, it is vital that all of the strategic working groups have gender competence,[72] and that each group considers gender equality within the context of their particular remit. Equalities considerations should not be siloed into specific working groups or aspects of the final strategy, but rather mainstreamed throughout the development, delivery and evaluation of the strategy. Only gender mainstreaming, which Scottish Government is obliged to do under the public sector equality duty, will ensure that Scotland's response to AI is gendered. 'Ethical AI' must be understood as AI which promotes gender equality.

Ultimately, the ambition of the strategy should be not only ensuring that AI does not result in increasing social and economic inequality, but also harnessing the power of AI to reduce pre-existing inequalities. The proposals and priorities outlined in this submission will ensure that all of Scotland's people and organisations are able to benefit from ethical AI, and that women are not left behind. Only substantive action to prioritise gender equality within the strategy will ensure that new technologies do not cement, or indeed, worsen existing gender inequalities. This ultimately requires social and political will, which has so far been lacking.

Ensuring that AI furthers gender equality will have clear economic benefits for Scotland, as research by Close the Gap has highlighted that closing the gender gap in employment is worth £17 billion to the Scottish economy.[73] Addressing women's labour market inequality will also benefit employers, particularly tech and AI employers, as they will be able to recruit from a wider talent pool, address skills gaps, and see their businesses become more productive, more innovative, and more profitable.

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[72] Gender competence – refers to the skills, knowledge and analytical capability to develop policy that is well-gendered; that takes account of the socially constructed difference between men's and women's lives and experiences. 'Intersectional' gender competence is that which understands that women are not a homogenous group, but the disabled and Black and minority ethnic women's experiences will be inflected by ableism and racism.

[73] Close the Gap (2016) *Gender Equality Pays: The Economic Case for addressing women's labour market inequality*