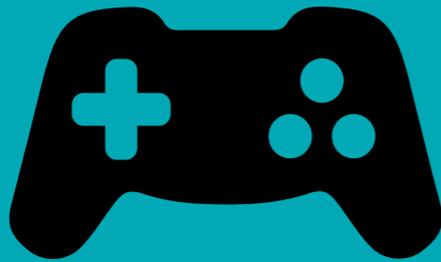




Tackling the Technology Gender Gap Together



Contents



You can return to this page when you see this icon

Developed and funded by the Digital Scotland Business Excellence Partnership whose partners include Scottish Government, Skills Development Scotland, Scottish Enterprise, Highlands and Island Enterprise, Scottish Funding Council, ScotlandIS and digital technology sector industry representatives.

Women in Digital Technology
Page 3

1

The gender imbalance starts early
Page 5

2

Ongoing support and intervention is required
Page 12

3

It is important that we can attract women into tech roles
Page 15

4

Awareness and perceptions of the sector
Page 18

5

The role of employers in addressing the gender imbalance
Page 23

6

Supporting women to stay in the sector
Page 26

Next steps
Page 30

Acknowledgements
Page 32

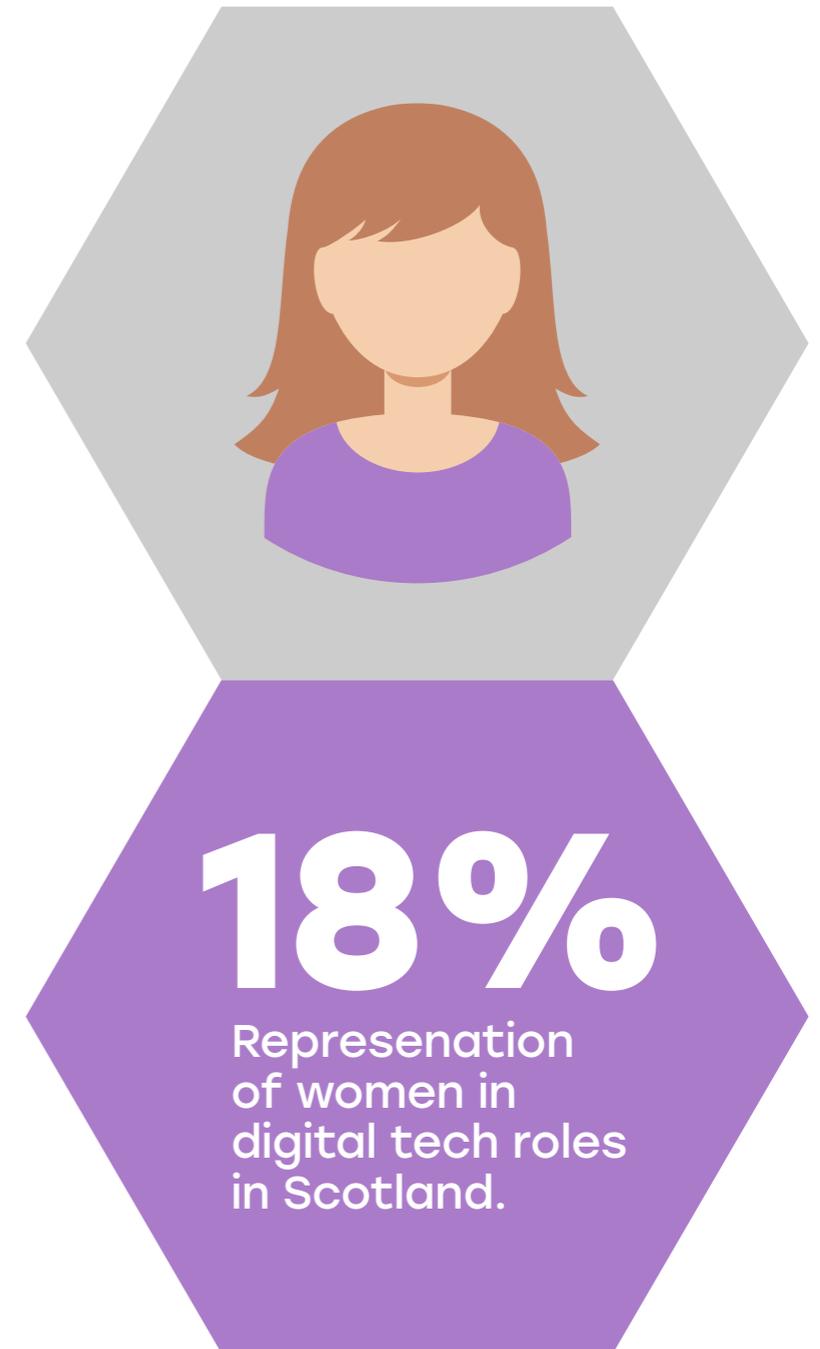
Women in Digital Technology

Tackling the Technology Gender Gap Together



Women are under represented in digital technology occupations across the sector in Scotland, and this represents a potential loss of talent to a sector which is in growth and which has significant numbers of unfilled vacancies.

However with appropriate targeted intervention there exists a prime opportunity to respond to the needs of the digital technology sector by encouraging and supporting greater female participation at all parts of the talent pipeline from school to employment.



Women in Digital Technology

Tackling the Technology
Gender Gap Together



To understand this gender imbalance further and to generate practical solutions to the challenge, the Digital Technology Skills Group and their partners worked with the Employment Research Institute at Edinburgh Napier University to undertake research and produce a gender skills action plan.

This work consisted of:

- Desk-based research to review existing literature on disparities in the sector and the data available on women working in the sector and studying relevant subjects
- Online survey to gauge broad opinions of employers and employees in the sector, college and university staff teaching, and college and university students studying relevant subjects

- Qualitative research including interviews and focus groups with employers, employees and college and university teaching staff to explore issues further. Additional qualitative research was undertaken with recruitment agencies, secondary and primary school teachers and relevant interest groups and bodies.
- Paper-based survey of secondary school pupils to understand the attitudes towards studying computing and working in the sector.
- Action planning workshops with partners to discuss and prioritise key actions to be taken forward.

This report summarises the key findings and provides an outline of the action plan which will be taken forward under the guidance of the Digital Technologies Skills Group and its Gender Work Stream. A key feature of the action plan is that it provides a framework for partners to collaborate and jointly implement actions which will contribute to an increased number of women studying and working in digital technology.

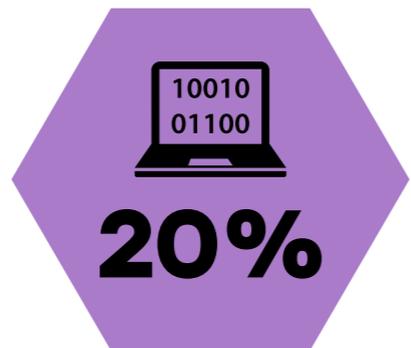


1

The gender imbalance starts early



Women in the Digital Tech Pipeline



Studying National
5 Computing Science
in School



Pursuing
computing degrees
at university

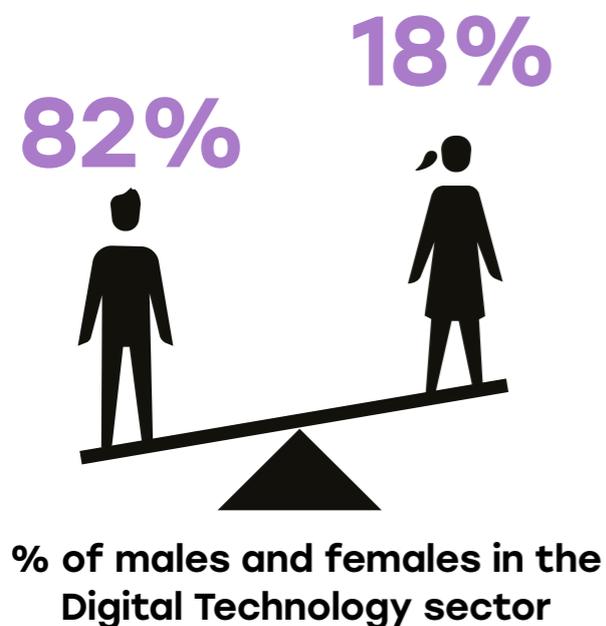


in Digital
Technologies
occupations

1 The gender imbalance starts early



Women's representation in Digital Technology occupations¹ in Scotland (18%) is considerably lower than in other skilled occupations (39%), and the workforce as a whole (48%)².



This issue of women's under-representation in the workforce originates well before they reach the labour market itself and reflects fairly closely the number of women qualifying in the relevant technology related subjects. Women make up 18% of those in technology roles, compared with 16% of those pursuing computing degrees at university³. Respondents to the online survey identified this supply of women to the industry from education as a key issue. A lack of women studying the required subjects at university was believed to be a likely barrier by 69% of employers and 71% of employees in the sector, by 65% of those studying in the sector and 93% of those teaching sector related courses.

Respondents also thought the lack of girls studying the relevant subjects at school was an issue, although this was highlighted to a lesser extent, perhaps reflecting the importance of university education in this highly skilled sector. At a school level female participation is echoed with 20% females studying Computing Science at National 5 level, 17% at Higher and 13% at Advanced Higher.

¹ This research takes the same definition of an ICT occupation as the annual 'Women in ICT Scorecard' produced by the Tech Partnership https://www.thetechpartnership.com/globalassets/pdfs/research-2015/womeninit_scorecard_2015.pdf

² Data on women's participation in the sector is taken from the 2014 Annual Population Survey.

³ Source: Data from the Scottish Qualifications Authority (figures for the year 2014/15) and Higher Education Statistics Agency (figures for the year 2013/14).

1 The gender imbalance starts early



The proportion of girls studying these subjects has not increased in recent years and instead has fallen. Thus, although some further ‘leakage’ does occur at the transition from university education to the labour market, the origins of the imbalance are pronounced well before this.

A drop off in interest among girls was perceived by some teacher respondents to happen in early adolescence. The survey of pupils supported this as there was considerable ambivalence towards computing among girls aged 11-14. Whilst it was not perceived explicitly as a subject ‘for boys’ – only 11% (of both sexes) agreed with this statement, there are gender differences in attitudes towards the subject and towards technology careers (Figure 1).

Figure 2
Key findings from a survey of school pupils (aged S1-S4)

	Boys (%)	Girls (%)
Agrees with “I like computing science”	84	56
Agrees with “I am good at computing science”	67	35
Agrees with “My friends enjoy computing science”	61	32
Agrees with “computing science lessons are interesting”	86	59
Agrees with “computing science lessons are important”	85	68
Computing science is mentioned as favourite subject	25	9
Aspires to an technology job	31	6
Agrees that people who work with computers...		
... have exciting jobs	58	41
... can make a difference in the world	69	53
... spend most of the time working by themselves	20	32

1 The gender imbalance starts early



The majority of girls said they like technology lessons and think they are important, however they were less likely to say this than boys. Furthermore, only around a third of girls feel they are good at it, or say their friends enjoy it; for boys, this is closer to two thirds. A stronger orientation towards technology jobs was also found among those whose friends are interested in computers. These findings are important because previous research on girls' attitudes towards STEM careers has demonstrated the importance of feeling confident and identifying with the discipline for fostering positive attitudes.

In general pupils were found to like technology lessons (75%), and to find them interesting (77%) and think they are important (78%).

However, when asked to name their favourite subject other subjects seemed to capture their imagination more, especially creative subjects. Although on the whole attitudes towards careers in technology are not negative, there was a lack of clarity about what technology jobs involved, qualifications they required, and the types of people who do these jobs. In particular, girls were less likely to perceive technology jobs as exciting or able to make a difference, more likely to perceive them as solitary, and attractive to individuals who lacked other interests outside of technology. Even some females who currently work in technology roles reported that they had a negative impression of the sector when they were at school.



The majority of girls say they like technology lessons and think they are important.



Whilst respondents recognised there have been significant improvements to the technology curriculum in schools many felt that there was still more to be done, and schools represented a prime opportunity to inspire young girls about technology careers. In particular blending technology into other subject disciplines was felt to offer the most potential. As women tend to be more drawn to the practical uses of computing rather than intrinsically interested in hardware or coding, it was suggested that as technology is embedded in a range of areas of life such as sport, science, and the arts this approach should be further encouraged in schools by embedding it into other subjects.

It was also felt that if this was executed successfully it would enhance creativity within the technology curriculum. An area that was felt to be lacking, but which was critically important in addressing the gender imbalance. The importance of industry being involved with the delivery of the technology curriculum was also put forward as an important means to ensure that young girls are inspired by a curriculum which is up to date and engaging.

Extracurricular activities such as after school coding clubs were cited as a good opportunity to support young girls to pursue an interest in technology, and could potentially offer a single-sex environment in which girls could feel more equal and comfortable.

Taking coding out of the classroom was identified as an important means of inspiring young girls about technology jobs because they can make a link from something they enjoy and is important to them, to a future career path. However for activities outside of school the challenge is to find what might attract girls to join a club, without going down a stereotypical route such as making it about fashion or beauty. A good example of an initiative that engages girls because it gives them a chance to see how technology could be used to make a difference and solve a problem is Apps for Good.

1 The gender imbalance starts early



Extracurricular coding initiatives

There are several UK initiatives that are either aimed specifically at girls, or have success in involving them.

TechFuture Girls⁴ is an after school club for girls aged 9-14. Skills such as coding, cyber security, data management and video editing are taught through activities themed around music, sport, charity work and dance. The initiative is free of charge for schools as it receives corporate sponsorship, and has reached 150,000 girls in 4,500 schools in the last decade. 84% of girls involved stated they were more likely to consider further education or a career in technology as a result.

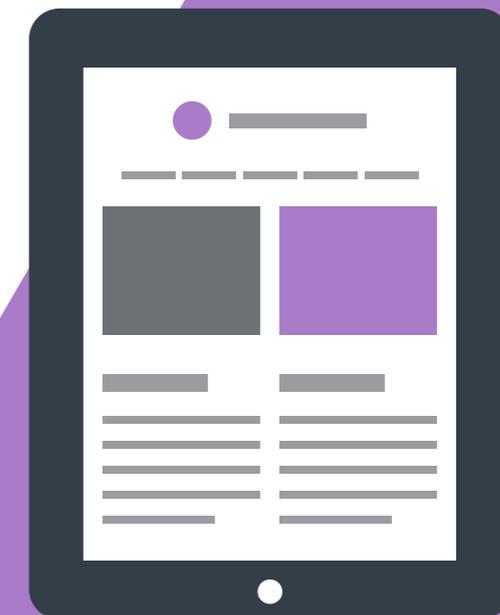
4 www.techfuturegirls.com

5 www.appsforgood.org

6 www.ladygeek.com/portfolio/little-miss-geek

Apps for Good⁵ partners with schools to deliver courses in the skills to make mobile, web and social apps. The organisation worked with 23,000 pupils in 470 schools in 2014/15. 48% of participants are girls. Role models are considered important; a quarter of volunteers are female, and a third of expert sessions are delivered by women. After taking part, 15% of female students said they were more likely to choose GCSE computing, and 29% were more interested in technology.

Little Miss Geek⁶ runs tech clubs in inner city state schools. Over 5000 students have taken part, and one girls' school in London saw a 52% increase in girls taking Computer Science.





2

**Ongoing support
and intervention
is required**

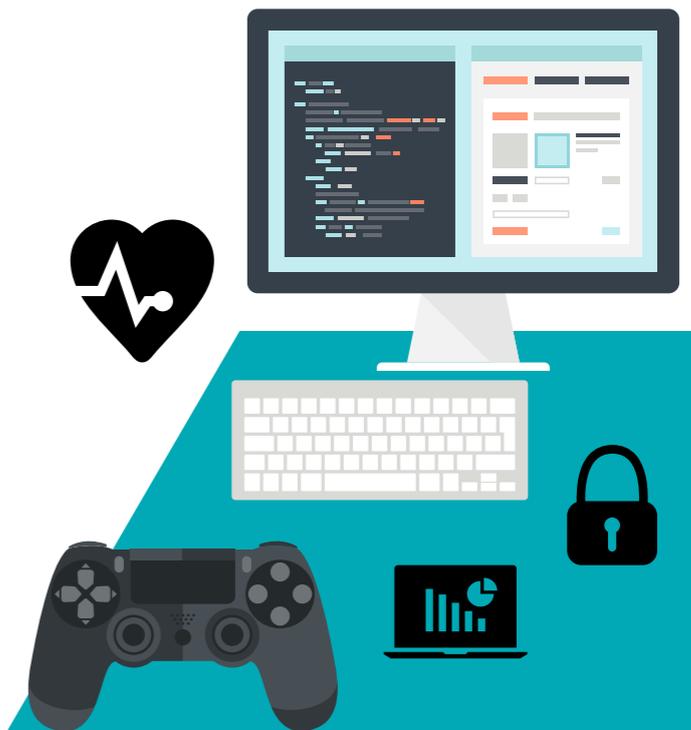
2 Ongoing support and intervention is required



There is also a substantial gender disparity at university level, although this varies depending on the course which suggests that some universities or courses are better at engaging women than others. Research respondents suggested that women tend not to apply for computing related degrees because they feel it is not for them, do not identify with the image of a person who studies computing, or perceive that it is necessary to have been programming computers for many years. Women who do enrol on computing courses are also more likely than males to become discouraged if they feel they do not fit in with their co-students, may feel isolated, or lack confidence, especially if they are surrounded by apparently skilled and confident male counterparts.

Not all the computing students who responded to the online survey aspired to work in the sector, although most did, including the female students. However, female students displayed less confidence that they would be able to move into their preferred technology related role, reinforcing their lack of confidence compared to males. This is demonstrated in the graduate destinations data which shows disparity in the proportion of male and female computing graduates who move on to technology roles after graduation; 73% of male graduates from computing subjects are in a technology role 6 months after graduation, compared with 58% of female graduates⁷.

⁷ Source: Destinations of Leavers from Higher Education survey 2013/14, conducted by the Higher Education Statistics Agency



The majority of female computing students do aspire to work in the tech sector.



Interestingly, female graduates who move into technology roles are more likely to have done so from a non-computing background than male graduates; just under half have a computing background, compared with around three quarters of male graduates. The remainder of female graduates entering these roles come from a wide range of backgrounds, including the creative arts, business studies, and the natural and social sciences. Consequently introducing female students who are studying non-computing science courses, to technology careers and disciplines was recognised as a prime area of opportunity.

The issue of female technology graduates not entering relevant employment is not unique to the technology sector, as research into other male dominated sectors has suggested that women may be put off entering other STEM sectors due to factors surrounding the recruitment stage. This presents opportunity for employers themselves to influence the numbers of women working in the technology sector.



Over half female graduates in sector come from non-tech backgrounds such as creative arts, business studies and natural/ social sciences.



3

**It is important that
we can attract women
into tech roles**

3 It is important that we can attract women into tech roles



In the workforce the gender imbalance is a significant loss of talent to employers. The Department for Business Innovation and Skills evidence has illustrated that where diversity is sufficiently well-embedded employers reap significant business benefits from equality and diversity, such as increased staff engagement and retention, more creativity and better problem solving due to a wider range of perspectives. Encouraging a diverse workforce also widens the talent pool from which to recruit, and employers may be better able to adapt to increasing consumer diversity when this diversity is also reflected in its workforce.

Addressing diversity in the workplace is an international challenge and despite numerous initiatives to increase female representation in the sector no country is approaching gender parity. Comparatively speaking the UK sits somewhere around the middle, having neither the highest nor the lowest level of female participation. Studies have shown that there are some relatively simple actions which employers can take to encourage greater diversity such as reviewing their recruitment practices. Job adverts for male dominated occupations tend to use more masculine wording, which can make women perceive the job as less appealing or make them less inclined to apply. Reviewing where jobs are advertised may also offer a means to reach more women applicants.

3 It is important that we can attract women into tech roles



In addition to the low female participation in the technology workforce there is also a considerable degree of vertical and horizontal occupational segregation by gender within the sector. Men and women are equally likely to be in professional occupations, but men are more likely to hold managerial or skilled trade roles. Women are more likely to be in project management, web design or technician roles, with men more likely to be programmers and IT engineers.

This is likely to be a contributing factor to the gender pay gap which is evident in the sector as median hourly pay of £17.68 for men and £14.89 for women.

Previous research on gendered occupational segregation in the technology industry also suggested that the phenomena of segregation and pay gaps may be linked, as women are more likely to be in roles with 'soft' skills which are often less well remunerated. Women may also end up pushed into or trapped in these roles because these skills are assumed to be inherently female.

Women are more likely to be in roles with 'soft' skills.





4 Awareness and perceptions of the sector

4 Awareness and perceptions of the sector



Two key issues that emerged as potential barriers to women's participation in technology were:

a lack of awareness of the opportunities available in the industry...

and the potential effect of negative stereotypes.

Although lack of awareness was not felt to be a barrier to women's participation by a majority of the online survey participants, a substantial number of respondents did feel this was likely to be a contributory issue; 44% of employees and 52% of employers in the sector, 42% of those studying towards and 47% of those teaching on the relevant courses. It was not necessarily felt that a lack of awareness of the sector *per se* was the issue, but it is more down to misunderstanding about the nature of the work itself. Women working in the sector identified there were aspects of their technology jobs that should be appealing to women, but they did not think were widely acknowledged. In particular they cited that the technology sector requires individuals who are creative, problem solvers, good team workers, and who are interested in making a difference.

The media was considered as a key contributor to this issue due to how they depict technology jobs in films and on TV. Representations of the sector in popular culture were felt to be not very positive or accurate and, felt to be particularly problematic when combined with general lack of knowledge about the sector to counteract these.

“Shows like the IT crowd haven't done us any good.”

Employee



There was some concern, particularly among educators, that technology is seen as a lower status career path with unclear career progression, and it is not currently a mainstream aspiration for young people. They felt that it was necessary to raise the profile of the sector in order to attract more young girls. A key element of this has to be educating parents that technology is a quality career choice and is on a par with other more traditional careers which parents may be more familiar with. The pupil survey echoed the importance of their family on their future career aspirations, and young people who were encouraged to use computers at home were more likely to say they aspired to a technology career.

“I don’t think there is enough knowledge as to what these roles actually involve. I think there is still the stereotype of, you know, the kind of geeky programmer sitting in his anorak in front of his computer for 12 hours a day. And there isn’t maybe enough clarity as to the breadth of the types of roles that exist in that industry.”

Employer

Solutions to this issue were felt to involve creating better links between education and industry to ensure that those working in the sector have the opportunity to promote the wide range of rewarding job opportunities to young girls, parents and their teachers. Employers expressed an interest in doing this but did not necessarily know how to do this effectively. They also identified that as employers they can lack the knowledge and resources to understand how to effectively communicate the sector to young people, and to explain what these job roles and opportunities are in a simple and engaging way.



This evidence supports the approach which Digital World⁸ is taking to present technology as a career of choice. It also suggests that work is required to engage more employers in careers awareness activities and to develop resources to support them in conveying effective and consistent messaging about the sector.

Moving beyond general awareness raising activity it was also felt by the majority of respondents that more female role models would help encourage more women into the sector. Role models were considered to be important in helping young girls to envisage themselves in the sector, however it is critical that role model are inspirational, credible and young girls can relate to them to prevent doing more harm than good.

⁸ Digital World is a marketing initiative promoting careers in digital technology. Introduced in July 2015 and developed by Scotland's digital technologies sector and Skills Development Scotland.

“Unless you can see somebody that has [made it], you don’t think it’s possible, and that starts from a really early age. If all you’re looking at when you’re choosing your Standard Grades is a bunch of guys in caps, you might be a girly girl and want to be a developer, but where do you see that? You can’t see that anywhere, you can’t see it on TV.”

Employee



Whilst it is important to address this awareness issue early in schools, there is also opportunity to counter negative perceptions of the technology sector amongst females at a later stage as several women now working in technology had initially pursued alternative career paths. Their routes into the sector varied as some had been offered training by their employer, others self-taught or attended intensive 'boot camp' style training courses. It is therefore important that careers awareness activities' can reach young people, women returners and career changers who will bring to employers important transferable skills and experiences.

“As long as they look cool. I think image is a big thing, so if you had a female role model going into a school and she looked quite geeky, the kids are going to go ‘ha ha geeky IT person’, so I think it’s important to get the right type of role model.”

Employee





5

The role of employers in addressing the gender imbalance

5 The role of employers in addressing the gender imbalance



Women working in the sector were generally very positive about their jobs, however they identified that there was scope for employers to review and promote better working environments to encourage more women to enter the sector, and to be retained in the sector. Areas for improvement included the long hours demanded by some jobs, and the low prevalence of part time working which is relatively rare at 16% compared with 33% for other skilled jobs⁹.

Despite the technology sector appearing particularly well suited to flexible working practices it was felt that employers had failed to fully embrace this opportunity which offered the potential to attract female applicants. Some employers still preferred traditional working practices and looked unfavourably on requests for flexible working. It was also felt that the gendered nature of the workforce could lead to decisions about working practices and culture being made by men, for a predominantly male workforce.



Women working in the sector were generally very positive about their jobs.

⁹ Source: Annual Population Survey 2014

5 The role of employers in addressing the gender imbalance



However it is important to note that the need for flexible working conditions is no longer an issue unique to women, therefore in addressing this employers may generally increase the attractiveness of their industry and their company.

An additional challenge for those in technology jobs is that the dynamic and evolving nature of the sector means there is a constant need for learning to be accommodated. This was considered a particular challenge for those who had to take career breaks as on returning to work the digital world may have moved on significantly. It was generally felt that re-skilling was entirely possible for individuals who already had the required generic competencies but that it may be difficult for them to find the time, therefore training needed to be made widely available.

“I find it difficult to imagine competing with people who play games and programme in their spare time... who spend all day at work and then more time at work, and that’s them happy with that, and that’s fine, but with all the other things I would like from my life, I’m not going to be able to compete with that type of person, with that kind of enthusiasm and intensity. So maybe I’ll have to settle for being middling in this career.”

Employee

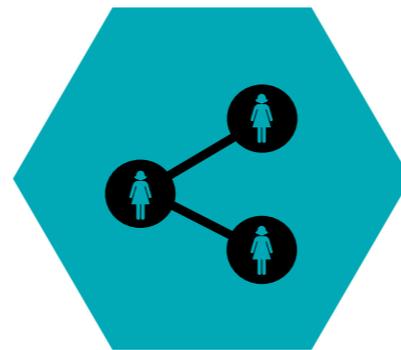


6

Supporting women to stay in the sector



**Build
Confidence**



**Develop
Networks**



**Facilitate
Career
Progression**

6 Supporting women to stay in the sector



Attracting more women to enter the sector is only part of the solution, and it is important that women are encouraged to remain in the sector and to develop into interesting, rewarding and senior roles. Previous research has noted the role of gendered informal networks in giving men an advantage in competitive workplace environments, and compounding the issue of women feeling that they do not fit in.

“It emphasises that feeling of maybe nobody really understands me here.”

Employee

The need for similar female networks to help women build confidence and feel more a part of the sector received mixed responses as some respondents expressed ambivalence about this approach.

However those with direct experience of existing female’s technology networks identified the importance of meeting like-minded women, and felt that it was good for confidence and morale. Mentoring was also cited as an important means of boosting women’s confidence in working in a male dominated environment, and facilitating career progression.



In achieving these career aspirations discrimination was not perceived as the most important barrier to entry, but something that could present negative experiences. The research suggested that discrimination does exist in the sector, sometimes blatantly, but more often in more subtle forms and was considered a likely barrier by 57% of female employees, but only 42% of male employees and 40% of employers.

This disparity is revealing, and is related to the way in which bias against women in a male dominated sector may be present, but not necessarily acknowledged or conscious. More commonly female employees cited they did not feel discriminated against as such but more out of place, and subject to unconscious bias in things like workplace decision making.

“I don’t have a problem with it because I got used to it, but I certainly don’t like it, I’d love to see more women involved in technical roles, because I think there’s a massive problem in how we approach the workforce from a society point of view.”

Employee

Next steps



With 18% of the digital technology workforce being women, the research has clearly identified that there is a gender imbalance in the sector.

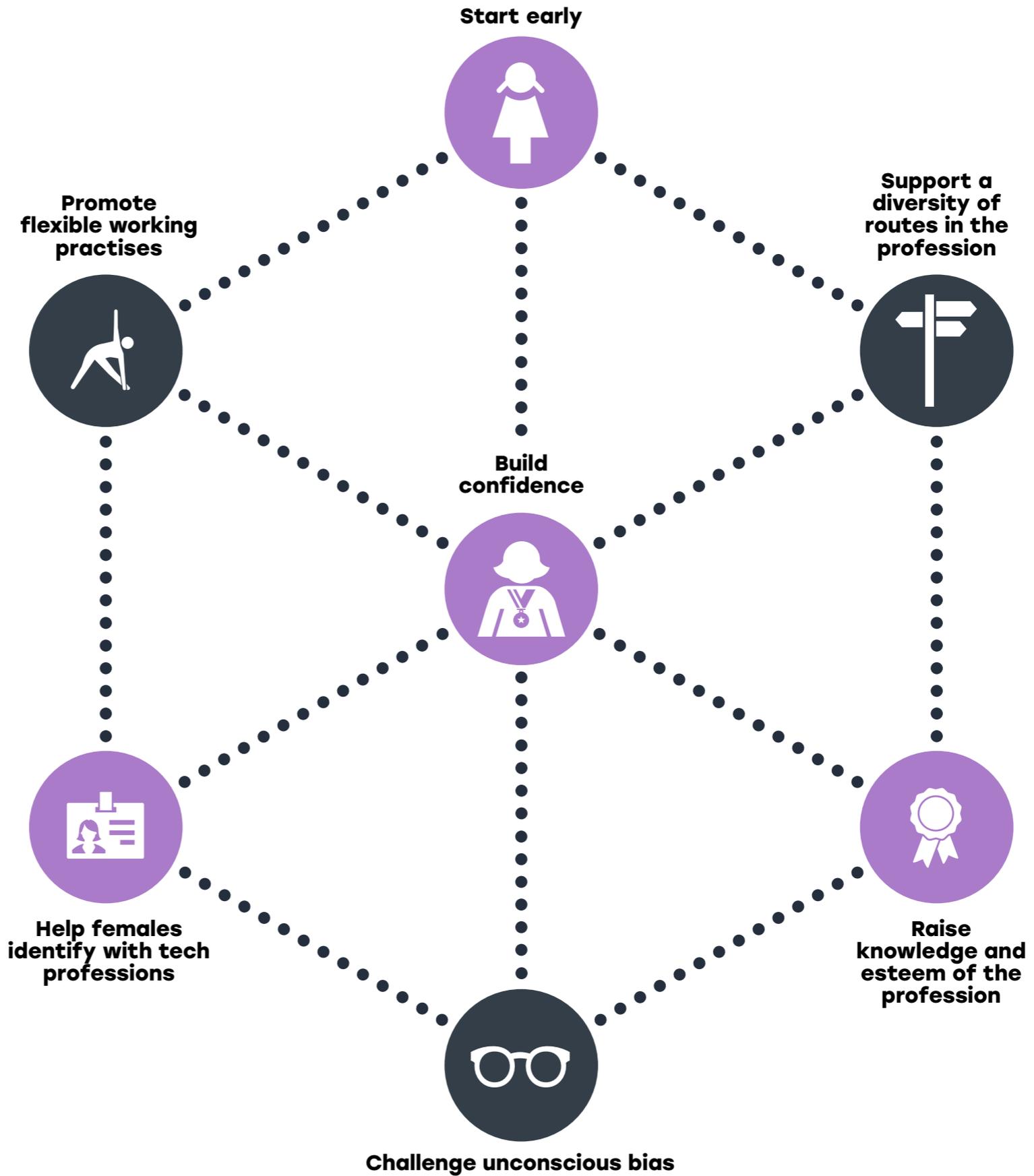
If tackled effectively this could contribute to the unmet demand employers have for highly skilled technology professionals. The origins of the imbalance begins early with the relatively low uptake of computing subjects at all stages of education, so it is important that solutions are developed which help tackle this issue at school. Young girls at school are not overwhelmingly negative towards digital technology subjects and careers which suggest that through appropriate awareness raising and inspiration, there is significant opportunity to attract them into technology careers.

It is important that solutions continue to be developed for all stages of the talent pipeline as women who have studied technology subjects at college and university are less likely than men to move into a technology role after graduation. Women do however enter the sector from other disciplines – something which we should support further as well as helping them to realise their fit for the sector sooner. The research has also indicated that a number of features related to working in the sector may dissuade women from entering technology employment, or from being retained. This creates an opportunity for employers to review their practices and contribute to solutions.

Undertaking this research has been an important piece of work as it has provided the necessary evidence base and framework for action planning, and has supported partners to work together to jointly develop a portfolio of solutions. It is however recognised that addressing the gender imbalance will not be a short term issue and significant work will be required by a range of stakeholders including education, industry and public agencies.

Next steps

Key principles in a strategy to increase participation of women in digital technology:



Acknowledgements



As lead partner for the Digital Technologies Skills Investment Plan, Skills Development Scotland would like to thank all individuals, businesses and partner organisations who took the time to support the development of this project by taking part in research, focus groups, consultations and workshops.

We would specifically like to thank the Employment Research Institute at Edinburgh Napier University for undertaking the research and organisations involved in the gender digital technology skills action plan including ScotlandIS, Scottish Funding Council, Highlands & Island Enterprise, Education Scotland, Scottish Government and Digital Technology sector industry representatives.

This report is based on research undertaken by Graham, H., Fuertes, V., Egdell, V. and Raeside, R. (2016). **Women in ICT and Digital Technologies: An investigation of the barriers to women entering, staying, and progressing in the sector, and actions to ameliorate this - Executive Summary.** Please contact Employment Research Institute, Edinburgh Napier University for further information.

Skills
Development
Scotland