

National Advisory Council on Women and Girls: Quarterly Spotlight

WOMEN AND GIRLS IN DIGITAL TECH

Key Findings

- Girls are underrepresented on subjects related to digital tech in Scottish schools. In the 2018-19 academic year, girls accounted for 17% of entries to Highers Computing Science and 14% of entries to Advanced Highers Computing. The proportion of girls taking these subjects has been largely unchanged since the 2013-14 academic year.
- The attainment of girls taking subjects related to digital tech outperforms boys. In the 2018-19 academic year, 72% of girls achieved grades A-C at Highers Computer Science compared with 63% of boys.
- Women are less likely to take further and higher education courses related to digital tech, and the numbers and proportions of women on these courses have been gradually declining over time.
- A range of factors are likely to contribute to the underrepresentation of women and girls on educational qualifications related to digital tech, including attitudes and gender stereotypes; a lack of careers advice and role models; career aims and priorities; and views on digitalisation and the future of work.
- Women are less likely to work in jobs in the Information and Communications sector in Scotland, with women accounting for 18.8% of employees in 2019/20. The representation of women was even lower among director and managerial roles.
- Although the numbers of women employed in jobs related to digital tech have been gradually increasing since 2004-05, reflecting greater job opportunities in this sector, the representation of women has largely unchanged over time.
- The gender pay gap among employees in the Information and Communications sector in Scotland was 18.0% in 2020, which was substantially higher than the gender pay gap average across all sectors (10.9%).
- The gender pay gap in the Information and Communication sector decreased between 2008-2010 and 2015-2018, but has increased slightly since then.
- Across the UK, women are less likely to perform tasks using digital tech in the workplace, from use of computerised equipment to developing and maintaining IT systems or software.
- The increasing use of digital tech is resulting in wider labour market shifts, which are predicted to give rise to job losses in sectors dominated by women. However, the digitalisation of the workplace also has the potential provide more flexible working opportunities to the benefit of women's labour market participation.
- Internet usage has been steadily increasing for men and women over the past decade, and there are minimal gender differences in internet usage among all adults. However, a gender gap emerges among older adults; in 2019, 57% of women aged 65 and above in Scotland used the internet compared with 64% of men aged 65 years and above.
- Since the first available data in 2009, internet usage has been consistently lower among women living in the most deprived areas than women in the least deprived areas in Scotland.
- There are some gender differences in how the internet is accessed, with women markedly less likely to access the internet on a games console/PS2/xBox (9% compared to 23% of men) and slightly more likely to access the internet on a tablet (55% compared to 51% of men).
- Women are less likely to report undertaking a range of online security measures, including downloading and installing security updates/patches and setting passwords with at least three random words.
- Women are less than men to have digital skills related problem solving and software, and younger women report feeling less confident in installing software and solving problems with digital devices by themselves.

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1. Introduction

This paper offers an overview of current evidence about **women and girls in digital tech**.

It provides a summary overview, and is intended to be accessible for people from all communities across Scotland regardless of whether or not they have existing knowledge about this area. As it is an overview, it cannot examine every issue in depth. For more information about the topics discussed, please follow the references in the endnotes.

2. Defining 'digital tech'

There is no agreed definition of 'digital tech' but the term is commonly used to refer to the use of electronic devices, tools or systems – such as computers and the internet – to create, store, process, analyse or present information.

In recent decades, the emergence and development of digital tech has had a profound effect on the ways in which people in Scotland work, socialise, access goods and services, and obtain information. Digital tech has also opened up new business opportunities and industries.

There are a range of ways in which people engage and experience digital tech, including through:

- obtaining educational qualifications;
- employment in digital tech sectors;
- use of digital tech at home and in the workplace.

In addition, the growing use of digital tech is bringing about wider change in the labour market through increased automation and digitalisation, resulting in the creation of new jobs and the displacement of others.

This paper explores the available evidence on digital tech in Scotland and the UK through a gendered and, where the available data allows, intersectional lens. Where

possible, trends over time are presented to highlight the changing landscape of digital tech and the differential impacts this has had on women and girls.

3. Education

Subjects related to digital tech fall within the umbrella of Science, Technology, Engineering and Mathematics (STEM). Although there is no universally agreed definition of digital tech within STEM, the STEM Strategy for Scotland defined technology as ‘what is produced through the application of scientific knowledge to human activity’.¹

There is a range of evidence showing that there is a lack of women and girls taking STEM subjects in schools, and STEM courses at further and higher education institutions.² This includes subjects related to digital tech, such as Computer Science and Information Technology.

This section of the paper explores the representation and attainment of women and girls on subjects and courses related to digital tech in schools, colleges (further education) and universities (higher education). In addition, evidence related to potential barriers or drivers of the underrepresentation of women and girls on these subjects is discussed.

3.1 National 3 to 5

Since the introduction of National 3 to 5 qualifications, a range of subjects have been available related to digital tech including: Computing; Computing Studies; Computing Science; and Information Science.³

A report by The Royal Society of Edinburgh, published in 2018, highlights a decline in the proportion of girls taking computing-related qualifications at Scottish Credit and Qualifications Framework (SCQF) levels 3 to 5, reflecting National 3 to 5, where the proportion of girls declined from 32% in 2012 to 18% in 2018.⁴ They note, however, that the “nature of computing courses have changed substantially since 2012, with computational thinking and programming featuring much more prominently in the

new Computing Sciences courses. This shift in emphasis may have contributed to fewer females choosing to study the new courses.”

The latest Scottish Qualifications Authority (SQA) data shows that in the 2018-19 academic year:⁵

- 27% of Computing Science pupils at National 3 level were girls.
- 16% of Computing Science pupils at National 4 level were girls.
- 20% Computing Science pupils at National 5 were girls, with 80% achieving grades A to C (compared to 73% among boys).
- 54% of Administration and IT pupils at National 4 level were girls.
- 66% of Administration and IT pupils at National 5 level were girls, with 81% achieving grades A-C (compared to 75% among boys).

Thus, the available evidence suggests both declining representation of girls taking subjects relating to digital tech over time and, within a given academic year, declining representation of girls taking these subjects with increasing qualification level.

3.2 Highers and Advanced Highers

Evidence shows that girls are less likely than boys to take Computer Science at Highers and Advanced Highers levels. In the 2018-19 academic year, girls accounted for 17% of entries to SQA Highers Computing Science and 14% of entries to Advanced Highers Computing.⁶ These courses focus on developing and applying skills related to software programming and/or engineering, databases and web design and development.^{7,8}

The proportion of girls taking Computing Science at Highers level has been consistently lower than most other STEM subjects. For example, among Highers pupils in the 2018-19 academic year, girls accounted for:⁹

- 66% of pupils taking Biology;
- 53% of pupils taking Chemistry;
- 28% of pupils taking Physics;
- 10% of pupils taking Engineering Science.

However, as seen in figures for National 3-5 qualifications, there is some evidence to suggest that subjects related to the application of digital tech have a much higher representation of girls. In the 2018-19 academic year, girls accounted for just under two-thirds (65%) of entries to SQA Highers Administration and IT, a subject which focuses on developing skills in organising and managing information using digital technology in administrative contexts.^{10,11}

As shown in Table 1, the proportion of girls studying SQA Highers Computer Science has remained broadly constant since the 2013-14 academic year. However, the numbers of girls taking Computing Science has decreased from a peak of 894 in 2013-14 to 549 in 2018-19, reflecting a decreasing trend in overall numbers of pupils opting to studying Highers Computing Science over this period.

The proportion of girls taking SQA Highers Administration and IT has remained consistently higher than Computing Science since its introduction in the 2016-17 academic year, although numbers of girls taking Administration and IT have still decreased over time.

Table 1: Numbers and proportions of girls taking subjects related to digital tech at Highers level from the 2013/14 to 2018/19 academic years (SQA statistics).

Academic year	Computing Science		Administration and IT	
	Number of girls	Proportion of girls	Number of girls	Proportion of girls
2013-14	894	20%	-	-
2014-15	572	19%	-	-
2015-16	757	17%	2,734	69%
2016-17	671	15%	2,664	65%
2017-18	656	16%	2,593	64%
2018-19	549	17%	2,451	65%

As shown in Table 2, the proportion of girls studying Computing at SQA Advanced Highers level has remained constant since the 2013-14 academic year. However, there has been a 39% increase in the numbers of girls taking Computing over this period.

Table 2: Number and proportion of women and girls taking Computing at Advanced Highers level from the 2013-14 to 2018-19 academic years (SQA statistics).

Academic year	Computing	
	Number of girls	Proportion of girls
2013-14	62	14%
2014-15	66	13%
2015-16	68	14%
2016-17	77	12%
2017-18	89	14%
2018-19	86	14%

Interestingly, although girls are less likely to take Computing Science and Computing subjects, girls consistently outperform boys in their attainment on these courses. For example, in the 2018-19 academic year, 33% of girls achieved a grade A and 72% achieved grades A-C in Highers Computer Science compared with 21% and 63% of boys, respectively.¹² Similarly, 29% of girls achieved a grade A in Advanced Highers Computing compared with 23% of boys.

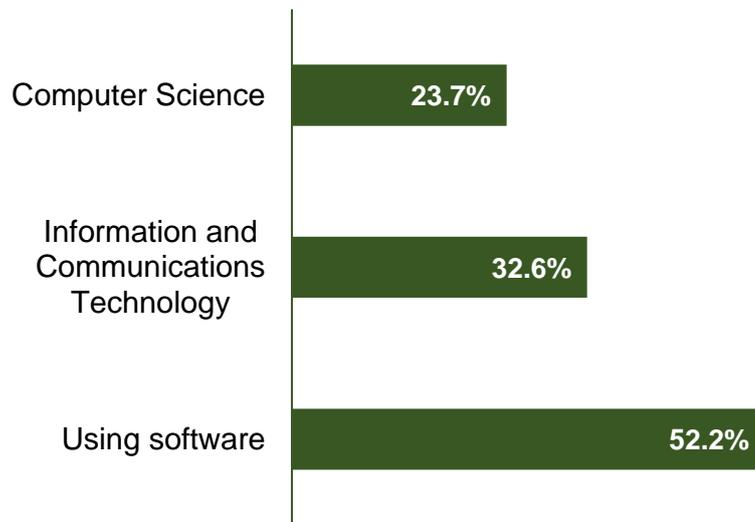
3.3 Further education

Since the first available data in the 1998-99 academic year, there have been a range of courses available at further education institutions across Scotland related to digital tech, including:

- Computer Science.
- Using Software.
- Information and Communication Technology.
- Software for Specific Applications/Industries .
- E-Commerce.

In the 2019-20 academic year, there was a total of 21,103 women taking qualifications related to digital tech, representing 43% of all students on these courses.¹³ However, as shown in Figure 1, the proportion of women varied depending on the course taken. In the 2017-18 to 2019-20 academic years, more than half of all students taking Using Software were women compared with less than a quarter of students taking Computer Science.

Figure 1: The proportions of women on courses related to digital tech in 2017-18 to 2019-20 (SFC Infact Database). Note that three-year averages has been calculated to increase the robustness of this comparison. E-commerce is not presented due to the low numbers of students taking this subject, and Software for Specific Applications/Industries was withdrawn during this period so is also not presented.



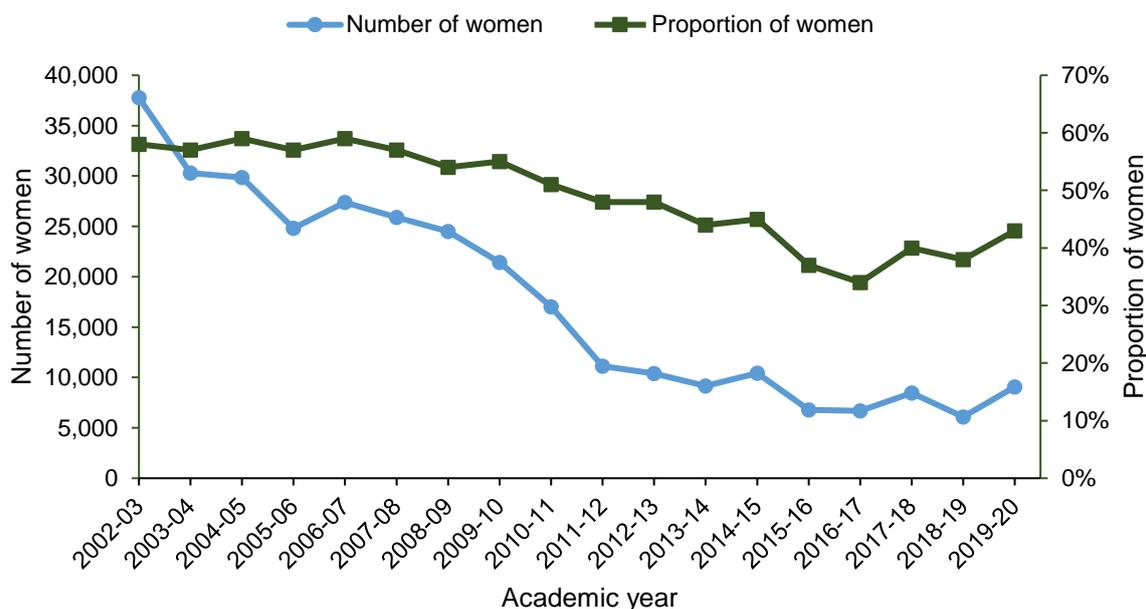
As shown in Figure 2, the number of women taking courses related to digital tech at further education institutions in Scotland have been declining over time, from a peak of 37,766 women in the 2002-03 academic year to a low of 6,094 in the 2018-19 academic year. The 2019-20 academic year saw a slight increase to 9,053 women enrolled on digital tech courses, although further data is required to assess whether this increase reflects a sustained upward trend. Note that the decline in the number of women enrolled on these courses from 2017-18 onwards can be partially explained by the withdrawal of the Software for Specific Applications/Industries course (which accounted for 580 women in the 2016-17 academic year). In addition, it is worth noting that the content of digital tech courses at further education institutions are likely to changed over time and, likewise, other courses are likely to have increased their digital tech content, which could partly account for the declining student numbers on the courses represented in Figure 2.

In addition to decreasing numbers of women taking digital tech courses at further education institutions, Figure 2 also shows that the representation of women on

these courses has also been declining over time. Between the 2002-03 and 2007-08, academic years, women comprised almost 60% of all students on digital tech courses but this had reduced to around 40% from the 2015-16 academic year onwards.

Particular declines in the representation of women have occurred in Computer Science courses, which have decreased from a peak of 53% in the 2005-06 academic year to a low of 23% in the 2016-17 academic year.¹⁴ Recent years have, however, seen an increase in the proportion of women to 35% in the 2019-20 academic year.

Figure 2: The numbers and proportions of women taking courses related to digital tech at further education institutions in Scotland from the 2002-02 to 2019-20 academic years (SFC Infact Database).



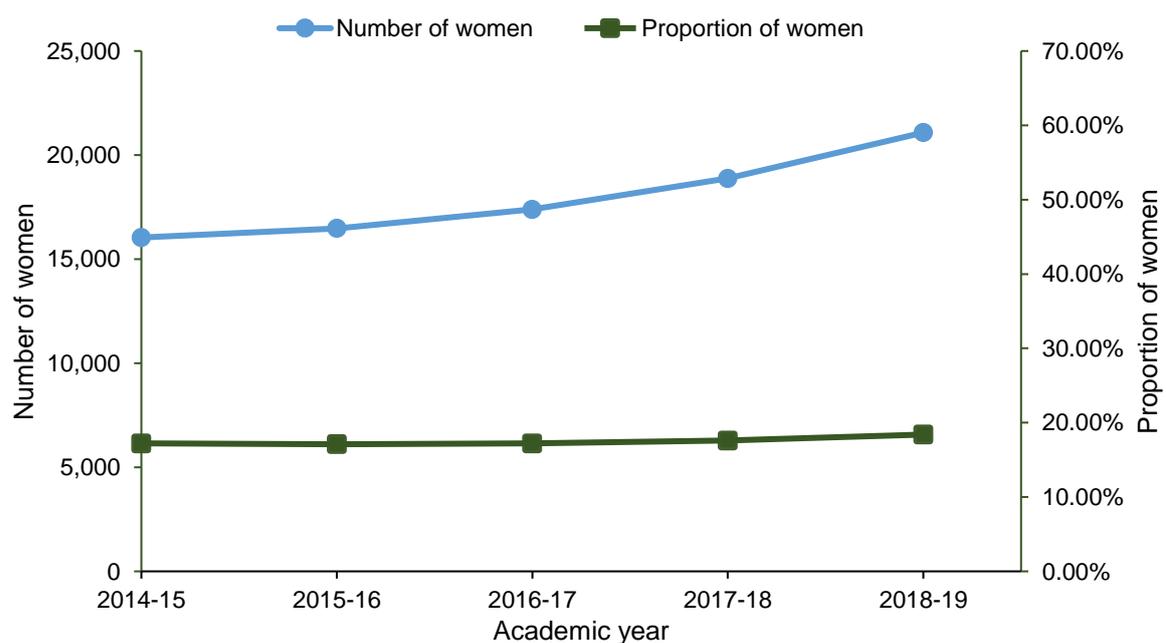
3.4 Higher education

In the 2019-20 academic year, there were 2,405 women enrolled on undergraduate Computing courses at universities in Scotland compared with 9,520 men, meaning that women represented 20% of all students.¹⁵ This is a slightly higher proportion of women enrolled on undergraduate Computing courses than universities across the UK (17%).

There was a markedly higher proportion of women enrolled on postgraduate Computing courses at universities in Scotland than on undergraduate courses. In the 2019-20 academic year, there were 1,065 women enrolled on postgraduate Computing courses in Scotland, representing 43% of all students. This is slightly higher than the proportion of women enrolled on postgraduate Computing courses across the UK (41%).

There is some data available to assess the trend in the proportion of women on Computer Science subjects at universities across the whole of the UK.¹⁶ As shown in Figure 3, there has been a gradual increase in the numbers of women enrolled on Computer science courses at UK universities from 16,040 in the 2014-15 academic year to 21,080 in the 2018-19 academic year. However, during this period, the proportion of women has remained unchanged.

Figure 3: The numbers and proportions of women taking Computer Science courses at higher education institutions in the UK from the 2014-15 to 2018-19 academic years (HESA). Note that data for the 2019-20 academic year is not presented as changes in the way subjects were categorised means that the datasets in 2014-15 to 2018-19 are not directly comparable to 2019-20.



3.5 Barriers facing women and girls obtaining digital tech qualifications

There is some evidence showing that adults in the UK hold stereotypes around the aptitude of women and girls in computing. The 2017 British Social Attitudes Survey showed that 12% of adults viewed boys as naturally better computing compared with 3% who viewed girls as naturally better and 73% than viewed neither as better.¹⁷ This view was more common among some groups than others. For example, men (16%) were more likely than women (9%) to say that boys are naturally better at computing and younger people aged 18-34 years (19%) were more likely than older age groups to take this view. Interestingly, this view was not held for maths: an equal proportion of all adults (8%) viewed girls as naturally better at maths as those who viewed boys as naturally better.

Research - carried out by PwC in 2017 - with 2,176 further and higher education students across the UK revealed that 27% of women said that they would consider a career in technology compared to 62% of men.¹⁸ A number of factors that could contribute to the underrepresentation of women in education and employment related to digital tech were identified, including:

- **A lack of careers advice in schools** – 16% of women reported that they had had a career in technology suggested to them compared with 33% of men. In addition, 21% of women said that having more information would make them more likely to consider a career in technology.
- **A shortage of female role models** – 12% of women reported that there are not enough good role models for them in technology compared with 8% of men. In addition, 66% of students could name a famous man working in technology compared with 22% who could name a famous woman working in technology.
- **Career aims** – 50% of women reported that an important factor in choosing a future career was feeling that the work they do makes the world a better place compared with 31% of men. In addition, women were less likely to cite salary as an important factor (31% compared with 44% of men).
- **Views on technology, automation and the future of work** – 46% of women reported that they expected their future career to be overtaken by automation at some point in the future compared with 55% of men. In addition, women

were slightly less optimistic that new technology would create new types of jobs (54% compared with 62% of men).

A survey of school pupils in Scotland carried out by the Digital Scotland Business Excellence Partnership highlighted ambivalence among girls aged 11-14 years towards computing.¹⁹ The key findings are summarised in Table 3. As shown, girls were less likely to agree with statements that they like computing science and find computing science lessons interesting, and a substantially lower proportion of girls said that they aspire to a technology job. In addition, girls were less likely to agree that people who work with computers have exciting jobs and can make a difference to the world, and were more likely to agree that people that work with computers spend most of the time working by themselves.

Table 3: Summary of key findings from a survey of school pupils undertaken in 2017 (Digital Scotland Business Excellence Partnership).

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

4. Digital Tech Industry

There are a range of job roles in the digital tech sector, including in the fields of programming; cybersecurity; data science; and user experience. This section of the

paper explores the available evidence on gender inequality in the digital tech sector, including the representation of women among employees and the gender pay gap.

4.1 Employment

A range of evidence shows that women are underrepresented in jobs in the digital tech the sector in Scotland. This paper takes the definition of the digital tech sector from a previous report commissioned by the Scottish Government, in which roles in the ‘Digital Technologies’ sector comprised:

- Digital Technologies Directors and Managers;^a
- Digital Technologies Professionals;^b
- Digital Technologies Technicians and Engineers.^c

The latest available data from the Annual Population Survey shows that, between April 2019 and March 2020, there were around 16,000 women employed in the digital tech sector in Scotland.²⁰ These women comprised 19% of all employees in the sector. Table 4 provides a breakdown of the estimated numbers and proportions of women working in each job role category set out in the above bullets.

Table 4: The numbers and proportions of women employed in the digital tech sector in 2019/20 (Annual Population Survey).

Roles	Number of women	Proportion of women
Digital Technologies Directors and Managers	3,800	16.4%
Digital Technologies Professionals	9,100	20.1%
Digital Technologies Technicians	3,000	18.4%
All roles	15,900	18.8%

^a Comprises Information Technology and Telecommunications Directors; IT Specialist Managers; and IT Project and Programme Managers.

^b Comprises IT Business Analysts, Architects and Systems Designers; Programmers and Software Development Professionals; Web Design and Development Professionals; Information Technology and Telecommunications Professionals not elsewhere classified.

^c Comprises IT Operations Technicians; IT User Support Technicians; Telecommunications Engineers; and IT Engineers. Note, however, that due to low sample size data is not available for the number of women employed as Telecommunications Engineers and IT Engineers so these have been excluded from figures presented in this paper.

As shown in Table 5, the number of women employed in the digital tech sector in Scotland has increased in the past decade from a low of 11,000 in 2009/10-2011/12 to a peak of 21,533 in 2016/17-2018/19. However, there has been no significant change in the representation of women since the first data point in 2004/05-2006/07. Across the UK there has likewise been an increase of women working in the digital tech sector over time but no meaningful change in the representation of women. The proportion of women in this sector has been slightly higher in the UK than in Scotland during this period.

Table 5: The numbers and proportions of women employed in the digital tech sector in Scotland and the UK (Annual Population Survey). Data is presented as three-year rolling averages to increase the robustness of the trends.

	Scotland		UK	
Year	Number of women	Proportion of women	Number of women	Proportion of women
2004/05 - 2006/07	13,167	20.8%	225,233	24.5%
2005/06 - 2007/08	13,300	20.5%	231,000	24.6%
2006/07 - 2008/09	13,500	20.4%	234,200	24.3%
2007/08 - 2009/10	13,100	20.8%	231,900	24.0%
2008/09 - 2010/11	12,400	20.4%	231,500	23.5%
2009/10 - 2011/12	11,000	19.0%	235,500	23.7%
2010/11 - 2012/13	11,633	18.8%	241,300	23.5%
2011/12 - 2013/14	12,967	19.7%	249,100	23.5%
2012/13 - 2014/15	13,700	19.3%	263,000	23.8%
2013/14 - 2015/16	14,633	19.4%	288,367	24.9%
2014/15 - 2016/17	17,200	20.5%	322,100	26.7%
2015/16 - 2017/18	21,200	22.8%	342,800	27.5%
2016/17 - 2018/19	21,533	23.0%	347,167	27.1%
2017/18 - 2019/20	19,533	21.3%	360,867	26.9%

The latest available data on the numbers of employees working in the digital tech sector across the UK, covering the period April to June 2018, shows that a markedly

higher proportion of women working as Information Technology Professionals^d were in part-time roles (12%) than men (2%) and all employees (4%).²¹ In addition, 19% of women working as Information Technology Technicians^e were working in part-time roles, compared with 8% of all employees (note that a figure is not disclosed for men due to the low numbers of men working part-time in these roles). The proportions of women working in part-time roles in the digital tech sector is lower than proportion of women employed in part-time roles than for all occupations (40%).

Available data on the numbers of employees by subject area in UK universities shows only a small increase in the numbers of women working in 'electrical, electronic & computing engineering' and 'IT, systems sciences & computer software engineering' since the 2014-15 academic year but minimal change in the proportion of women working in these subject areas (see Table 6).²² There are no available breakdowns for numbers of women working in these subject areas at Scottish universities, although it is expected that the trends are comparable to those shown in Table 6.

^d Comprises IT Specialist Managers; IT Project and Programme Managers; IT Business Analysts, Architects and Systems Designers; Programmers and Software Development Professionals; Web Design and Development Professionals; Information Technology and Telecommunications Professionals not elsewhere classified. Data is not available for Information and Telecommunications Directors due to low numbers of women working part-time in this role.

^e Comprises IT Operations Technicians; IT User Support Technicians.

Table 6. The numbers and proportions of women working in subject areas related to digital technology at universities across the UK from the 2014-15 to 2019-20 academic years (HESA).

Academic year	Electrical, electronic & computer engineering		IT, systems sciences & computer software engineering	
	Number of women	Proportion of women	Number of women	Proportion of women
2014-15	620	14.3%	1,480	22.2%
2015-16	670	15.1%	1,460	21.8%
2016-17	640	14.6%	1,530	22.3%
2017-18	695	15.2%	1,675	22.3%
2018-19	750	15.9%	1,800	22.6%
2019-20	820	16.7%	1,885	23.1%

4.2 Gender pay gap

In 2020, the median gender pay gap (the gender difference in median hourly earnings for all employee jobs) was 18.0% among all employees in the ‘Information Communication’ industry in Scotland, reducing to 15.9% among full-time employees.²³ This is markedly higher than the median gender pay gap for all industries in Scotland, which was 10.9% for all employees and 3.0% for full-time employees in 2020.

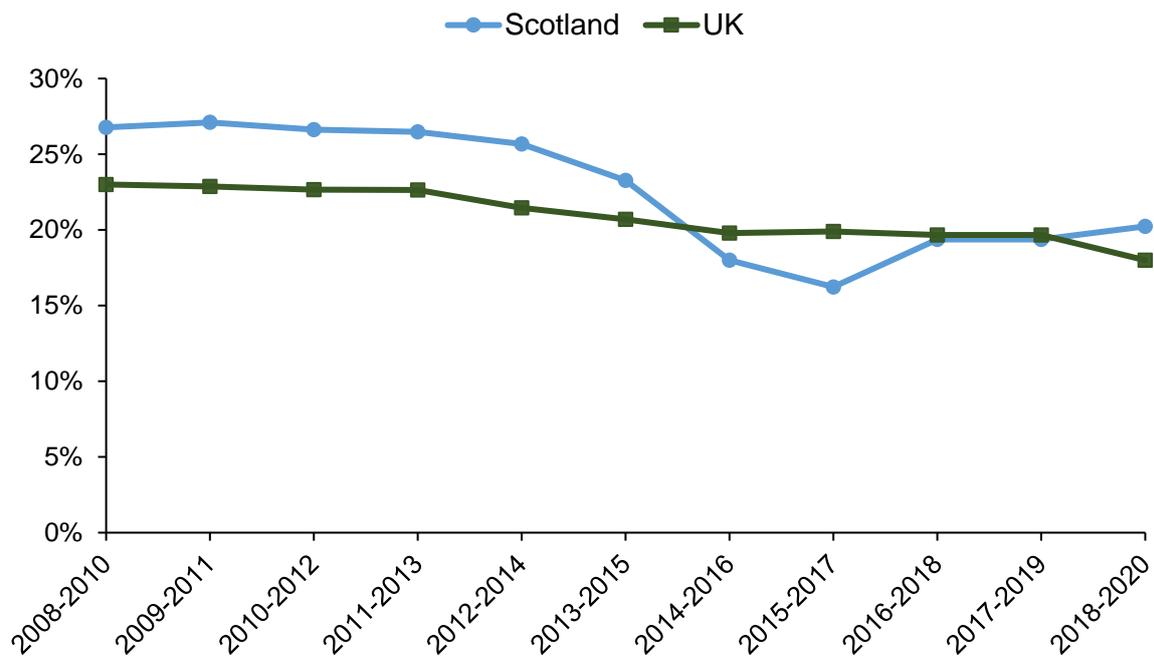
Figure 4 presents the median gender pay gap for all employees in the Information and Communication industry as three-year rolling averages since 2008-2010. This shows that the gender pay gap for all employees in the industry reduced from 26.8% in 2008-2010 to 16.2% in 2015-2017, but slightly increased in 2016-2018 and has remained at the same level since then.

The gender pay gap for all employees in the Information and Communication industry across the UK was initially smaller than in Scotland, but has been comparable to the gender pay gap seen in Scotland since 2016-2018 (see Figure 4).

It should be noted that annual estimates of the gender pay gap in this sector in Scotland should be interpreted with caution due to lower sample size than the

estimates for the UK, and for this reason three-year rolling averages are presented in Figure 4 to increase the robustness of the trends.

Figure 4: The gender pay gap for all employees in the Information and Communication industry in the UK and in Scotland from 2008-2010 to 2018-2020 (Annual Survey of Hours and Earnings).



Evidence suggests that the gender pay gap for all employees in the Information and Communication industry in the UK increases with age. As shown in Table 7, in 2020, the gender pay gap was 27.4% among employees aged 60 years and above and 16% among employees aged 40-59 years compared with just 1.4% among employees aged 18-21 years. Although the gender pay gap across all industries is larger among older employees, the increase with age in the Information and Communication industry is especially pronounced.

Table 7: The gender pay gap by age in 2020 for Information and Communication employees and all employees in the UK (Annual Survey of Hours and Earnings).

Industry	18-21 years	22-29 years	30-39 years	40-49 years	50-59 years	60+ years
Information and Communication industry	1.4%	9.3%	8.0%	16.0%	15.8%	27.4%
All industries	-0.8%	1.1%	-1.1%	2.4%	6.7%	9.2%

There is some evidence to suggest that Computer Science graduate salaries among women are lower than men. Data from 2015/16 suggests that five years after graduation from Scottish universities, women have lower median earnings than men following qualifications in the vast majority of STEM subjects, including Computer Science.²⁴ The median annualised earnings of Computer Science graduates were £25,000 among women and £27,300 among men (9.2% higher).

4.3 Barriers to increased representation of women in the digital tech industry

A survey by the Digital Scotland Business Excellence Partnership identified the lack of supply of women to the digital tech sector from education as a key issue.²⁵ The lack of women studying the required subjects was believed to be a likely barrier by 69% of employers and 71% of employees in the digital tech sector, 65% of those studying sector-related courses and 93% of those teaching sector-related courses. Respondents felt that the lack of girls studying relevant subjects in schools was an issue but this was highlighted to a lesser extent than the underrepresentation of women taking university-level subjects related to digital tech. In addition, a lack of awareness of the opportunities available in the digital tech industry was highlighted as a contributory issue by 44% of employees and 52% of employers in the digital tech sector, and by 42% and 47% of those studying and teaching on sector-relevant courses. Misunderstandings about the nature of the work were identified, especially in the media, which was felt to particularly misrepresent the digital tech sector. There was also some concern raised among those teaching on sector-relevant courses that technology is seen as a low status career path with unclear career progression.

5. The digitalisation of work

5.1 Use of digital technologies in the workplace

There is little available evidence on gender differences in the use of digital tech in the workplace and no available data for Scotland only. However, this issue was explored by the European Institute for Gender Equality (EIGE) in their 2020 thematic focus on 'digitalisation in the world of work'. Table 8 presents figures collated by the EIGE on the proportion of employees who performed Information Computer Technology (ICT) related activities at work in each of the 28 EU member states (EU-28).²⁶ This shows that women in the UK were less likely than men to perform ICT-related tasks in the workplace, such as using computerised equipment; creating or editing electronic documents; and using applications to receive tasks or instructions. The gender differences observed in the UK were consistent with those seen across the 28 EU member states, although women in the UK were generally more likely to perform ICT-related tasks at work than the EU-28 average.

Table 8: Percentage of employed people aged 16-74 years who performed ICT activities at work by gender and type of activity in 2018 (EIGE).

Work and activities performed	UK		EU-28	
	Women	Men	Women	Men
Used other computerised equipment	10%	15%	8%	13%
Exchanged emails	40%	44%	32%	36%
Created or edited electronic documents	34%	39%	24%	28%
Used social media	12%	16%	9%	11%
Used applications to receive tasks or instructions	17%	25%	10%	14%
Used occupational specific software	25%	29%	19%	24%
Developed or maintained IT systems or software	5%	11%	3%	7%

5.2 Labour market shift

The emergence and increasing use of digital tech is expected to have a significant impact on the labour market, and the future of gender equality within it. There is little available evidence on the impacts of digitalisation on the labour market in Scotland,

so available evidence for the UK as a whole is summarised in this section. It is anticipated that the issues for women across the UK will similarly apply to women in Scotland.

The World Economy Forum's (WEF) 'Future of Jobs' 2020 report estimated that, by 2025, 85 million jobs may be displaced globally by a shift in the division of labour between humans and machines, while 97 million new roles may emerge that are more adapted to the new division of labour between humans, machines and algorithms.²⁷ New data from the WEF's Future of Jobs Survey showed that, as a result of the COVID-19 pandemic, 94.3% of UK companies plan to accelerate the digitalisation of work processes (e.g. use of digital tools) and 57.1% plan to accelerate the automation of tasks.²⁸

All jobs identified in the WEF's report as being in increasing demand across the UK centred around the digital tech sector, including Data Analysts and Scientists; AI and Machine Learning Specialists; and Big Data Specialists. These are jobs that are currently dominated by men. In contrast, the increasingly redundant jobs identified, including Data Entry Clerks; Bookkeeping and Payroll Clerks; and Administrative and Executive Secretaries, are roles primarily occupied by women.

Despite increasing automation in the labour market, the COVID-19 pandemic has had global effects on employment rates across a range of sectors. LinkedIn data published in the WEF's 2020 report shows a reduction in year-on-year hiring rates in the UK Software and IT sector throughout April to September 2020. In addition, analysis of five-year hiring trends across the LinkedIn platform identified eight clusters of professions^f with increasing employment prospects across 20 leading economies. Among the eight clusters, only two had greater employment of women as compared to men – 'People and Culture' and 'Content Production'. Women comprised just 9% of workers in 'Cloud Computing' and 22% in 'Data and AI'. The

^f The eight clusters span People and Culture, Content Production, Marketing, Sales, Product Development, Data and AI, Engineering as well as Cloud Computing.

representation of women in these sectors in the UK was lower than the average across all 19 countries⁹ considered.

The EIGE's 2020 thematic focus on 'digitalisation in the world of work' similarly highlighted that the digital transformation of the labour market brings with it several important challenges for gender equality. Most notably that women are at a slightly higher risk than men of being replaced in their jobs (e.g. in clerical support work) by digitally-enabled machines; and newly emerging jobs (e.g. ICT professionals) are often concentrated in the in male-dominated STEM sectors.²⁹

Whilst the increasing emergence and adoption of digital tech have the potential to negatively impact on sectors with a high representation of women, digital technologies also have the potential to increase the flexibility of work and generate new job opportunities.³⁰ This could have the potential to reduce gender gaps in labour force participation, and increase women's income. 'Platform work' is an example of a new sector that has emerged as a result of advances in digital tech, which refers to an employment form in which "organisations or individuals use an online platform to access other organisations or individuals to solve problems or provide specific services in exchange for payment".³¹ Some forms of platform work are highly flexible and provide important opportunities to combine paid work with unpaid caring responsibilities. However, it is not always the case that the availability of new, digital-technology enabled, sectors will address the gender gap.

EIGE's 2020 report highlights that most platform workers are self-employed or independent contractors, meaning that there is limited access to social and work protection measures including those essential for achieving gender equality (such as maternity, paternity and sick pay/leave).³² In addition, the report highlights that women are more likely to take on platform work as they need to work from home due to caring responsibilities whereas men are likely to do so to top-up income from other employment. Thus, platform work is unlikely to substantially change the unequal division of unpaid care and pay between women and men.

⁹ Countries considered: Argentina; Australia; Brazil; Canada; France; Germany; India; Ireland; Italy; Mexico; Netherlands; New Zealand; Saudi Arabia; Singapore; South Africa; Spain; Sweden; United Arab Emirates; United Kingdom; United States.

6. The digital divide

It is widely recognised that being online has many advantages, including increased educational attainment; access to public services; access to affordable goods; greater convenience; enhanced access to information and knowledge; and reduced loneliness and social isolation. Although access to the internet and digital skills have increased markedly in the past two decades, there remains a 'digital divide' in access and usage of digital technologies. A recent report by the Cumberland Lodge sets out two components of 'digital divide':³³

- **First-level digital divide:** whether people have access to a computer or the internet.
- **Second-level digital divide:** the various reasons why and how people access and use digital tech differently.

The Cumberland Lodge report also sets out that the digital divide is multifaceted and changeable, such that as one gap closes another may emerge. For example, a reduction in the digital access gap may give rise to a widening divide in digital skills.

This section of the paper explores the available evidence related to gender differences in internet access and usage, use of technologies, digital skills and barriers in usage of digital technologies.

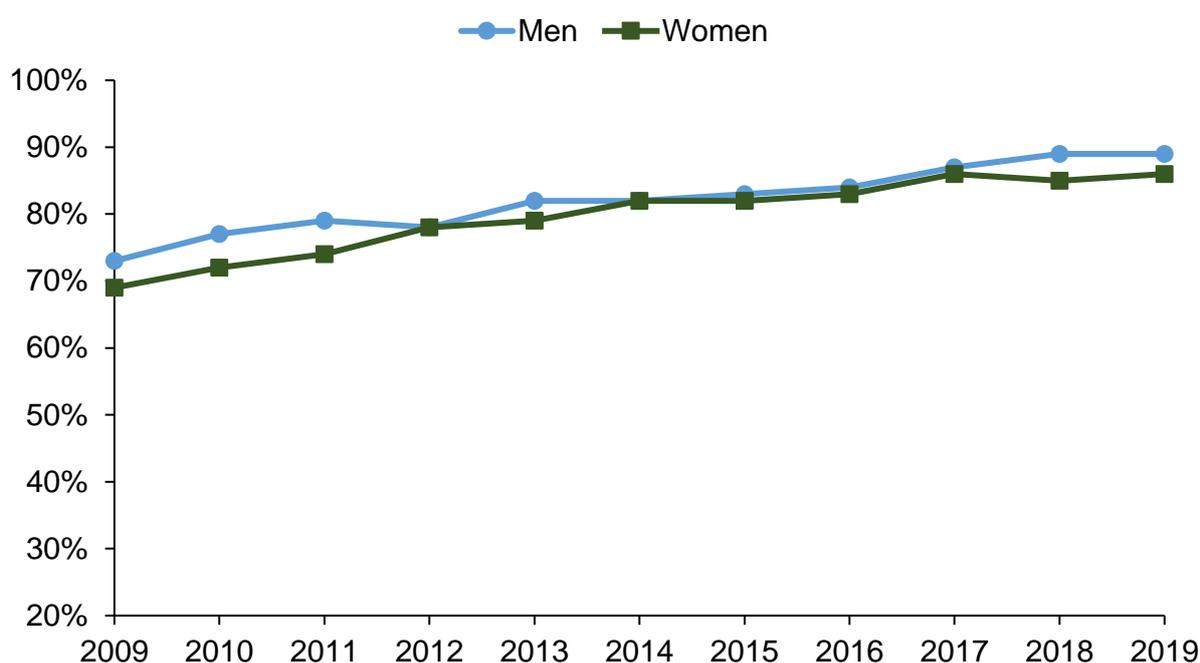
6.1 Internet access and usage

ONS figures show that the proportion of internet non-users – people who have never used the internet or last used it more than three months ago – across the UK has declined over time, from 20.3% (10.2 million adults) in 2011 to 10.0% (5.3 million adults) in 2018.³⁴ There is some evidence to suggest that internet access has further increased during the COVID-19 pandemic.³⁵ However, of the remaining internet non-users, 58% were women.³⁶ Women have consistently comprised just over half of all internet non-users across the UK since 2011.

The latest data from the Scottish Household Survey (SHS) similarly showed that the proportion of households in Scotland with internet access was at a record high of

88% in 2019, which is similar to the previous year (87%).³⁷ In addition, 88% of adults in Scotland were using the internet in 2019, an increase from 71% in 2009. As shown in Figure 5, internet usage in Scotland has been increasing for both women and men since 2009, with women slightly less likely to be using the internet than men although overall differences are very small.

Figure 5: The proportion of internet users in Scotland by gender from 2009 to 2019 (Scottish Household Survey).



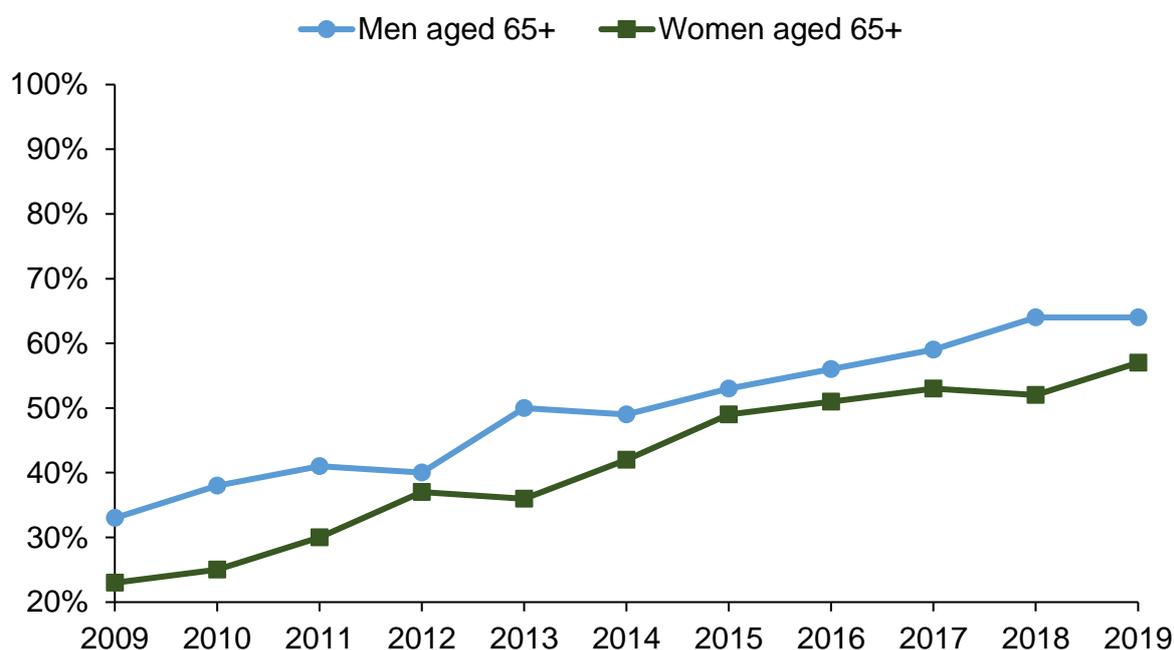
However, there is a key interaction between gender and age in internet usage. There remains a generational divide in internet usage.³⁸ Since 2011, older adults aged over 65 years have consistently comprised the largest proportion of adult internet non-users, although the proportion of older adults accessing the internet is steadily increasing over time.

As shown in Table 9, similar proportion women and men under the age of 65 years in Scotland were using the internet in 2019. However, a gender difference emerges in adults aged 65 years and above, in which 57% of women were internet users compared with 64% of men. The gender gap in older adults has remained broadly constant since 2009 (as shown in Figure 6). These trends are consistent with ONS figures for the UK as a whole.³⁹

Table 9. Internet usage by age and gender in 2019 (Scottish Household Survey).

	16-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65+ years
Women	99%	98%	99%	95%	91%	57%
Men	100%	98%	97%	95%	89%	64%

Figure 6: The proportion of internet users among adults aged 65+ by gender from 2009 to 2019 (Scottish Household Survey).

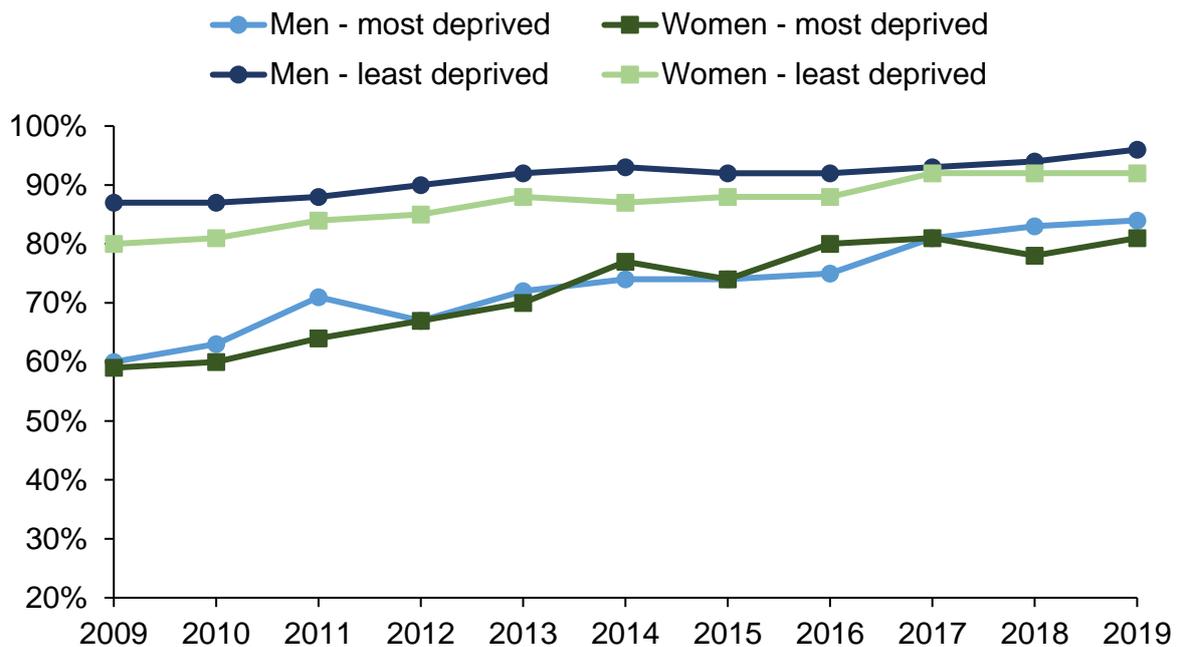


Another key driver of internet usage is socio-economic factors, with reduced internet access and usage among those with lower household incomes and among those living in more deprived areas.⁴⁰ To investigate whether gender differences in internet usage are moderated by socio-economic factors, a breakdown by the Scottish Index of Multiple Deprivation (SIMD) and gender was produced based on the available SHS data. The SIMD is a tool for identifying places in Scotland where people are experiencing disadvantage across different aspects of their lives, including income, employment, education, health, access to services, crime and housing.⁴¹

As shown in Figure 7, since 2009, women living in the most deprived areas (20% most deprived) were less likely to use the internet than women living in the least deprived areas (20% least deprived). However, this difference has been narrowing

over time, driven by a sharper increase in internet usage among those in the most deprived areas than those in the least deprived areas. There is a similar gender difference among women and men living in the most and least deprived areas.

Figure 7: The proportion of internet users by gender and SIMD between 2009 and 2019 (Scottish Household Survey).



Citizens Advice Scotland carried out a survey on digital access among people who sought advice from their Bureaux during June 2017.⁴² Among the 1,200 people that took part, 18% reported difficulty using a computer and 16% reported not being able to use a computer at all. With respect to gender differences, a slightly higher proportion of women reported being able to use a computer very well (36% compared to 34% of men) and a slightly lower proportion of women reported not being able to use a computer at all (15% compared with 16% of men), although differences were very small. The survey also revealed some gender differences in internet usage; 52% of women reported using the internet often compared with 43% of men. Similarly, only 14% of women had never used the internet compared with 20% of men.

Data from a range of sources shows that disabled people are less likely to be internet users than non-disabled people. For example, the SHS shows that, in 2019, 90% of disabled people were internet users compared with 94% of non-disabled people.⁴³ Likewise, data from the Scottish Health Survey showed that, in 2018, a greater proportion of adults with a physical or mental health condition do not use the internet (27%) compared with adults with no physical or mental health condition (8%).⁴⁴ Across the UK, a lower proportion of disabled adults in Great Britain use the internet for shopping (73%) compared to non-disabled adults (85%).⁴⁵ However, the gendered aspect of this difference is not clear; women in Scotland are more likely to be disabled than men⁴⁶, but there is no available evidence that has explored this interaction. Additionally, evidence shows that minority ethnic groups (not white Scottish, British or Irish) are more likely than average to use the internet (97% of compared with 87% overall) but, again, evidence on the intersection with gender is not available.⁴⁷

6.2 Where and how users access the internet

The use of digital tech includes where and how users access the internet, and the online safety measures taken by internet users.

Current evidence indicates that there are minimal gender differences in where digital technology is used. Data from the SHS shows that, in 2019, the locations in which women and men access the internet were broadly comparable (Table 10).

Table 10: Where users access the internet by gender in 2019 (Scottish Household Survey).

Where users access the internet	Women	Men	All
At home	98%	96%	97%
At another person's home	11%	9%	10%
At work	24%	29%	27%
School, college, university, other educational institution	6%	6%	6%
A government/council office	1%	1%	1%
Community or voluntary centre/organisation	1%	0%	1%
On the move via a mobile phone/smartphone/tablet	59%	58%	58%
Public library	4%	2%	3%
Somewhere else	2%	3%	2%

Although the locations of internet access are similar between women and men, the SHS does reveal some gender differences in the devices used to access the internet. As shown in Table 11, in 2019, women were markedly less likely to access the internet on a games console/PS2/xBox (9% compared with 23% of men). In addition, women were slightly less likely to access the internet on a personal computer or laptop (70% compared to 74% of men) and slightly more likely to access the internet on a tablet (55% compared to 51% of men).

Table 11: How users access the internet by gender in 2019 (Scottish Household Survey).

How users access the internet	Women	Men	All
A personal computer or laptop	70%	74%	72%
Digital, cable or satellite television	21%	25%	23%
Mobile phone/iPhone/Smartphone	86%	86%	86%
A games console/PS2/xBox	9%	23%	16%
A tablet - iPad/Playbook or similar	55%	51%	53%
Another way	0%	1%	1%
Other than a personal computer or laptop	94%	92%	93%

A recent report by Ofcom, published in April 2021, showed that women were less likely to have used the internet for entertainment (88%) and information (92%) than men (93% and 96%, respectively).⁴⁸ Although there was no gender difference in the incidence of gaming, the devices used for gaming did differ between women and men. Women were more likely than men to play games on a smartphone (43% compared with 35% of men) and less likely to use games consoles (21% compared with 32% of men) or computers (21% compared with 29% of men). Perhaps linked to device preference and the types of games being played, women were also less likely than men to play games online with or against others (27% compared with 37% of men). In addition, the report showed a gender difference in social media use; a slightly higher proportion of women reported having a social media profile or account (84%) than men (80%), and women were more likely to report that they share, post or comment on social media sites or apps (61% compared with 55% of men).

There is some evidence to suggest that there may be differences in the purpose of internet usage between young women and men. Data published by the EIGE showed that, in 2017, younger women aged 16-19 years in the UK were significantly less likely to use the internet for civic or political participation (13%) compared with men of the same age (35%).⁴⁹ This was the largest gender gap of all 28 EU member states, with 16% of younger women and 20% of younger men using the internet for civic or political participation across EU-28.

A report by The Princes Trust, published in 2016, highlighted significant differences in the demographic characteristics of young people in the devices they had access to and their usage patterns based on evidence gathered through focus groups and a national survey of young people aged 16 to 24 years.⁵⁰ With respect to gender differences, the research showed that that young women were more likely to have access to smartphones (91% compared with 88% of men) and were less likely to have access to non-smartphones (26% compared with 33% of men). Additionally, women were less likely to have access to a games console (49% compared with 69% of men), and more likely to have access to a tablet or e-reader (61% compared with 55% of men). In general, younger women used digital devices less than younger men but were more likely to report relying on their smartphones (14% of women compared with 5% of men).

Online safety is a key component of internet usage. The latest SHS data showed that, in 2019, women were less likely than men to engage in a number of online safety measures. As shown in Table 12, women are less likely to:

- download and install software updates/patches when prompted;
- set passwords that include three random words;
- change passwords for online accounts regularly;
- make sure their mobile phone has up-to-date anti-virus software.

Table 12: Online safety measures by gender in 2019 (Scottish Household Survey).

Online safety measures taken by internet users	Women	Men	All
Download and install software updates/patches when prompted	55%	59%	57%
Avoid opening emails or attachments from unknown people	69%	70%	70%
Use different passwords for different accounts	60%	63%	62%
Set passwords that include three random words	28%	33%	31%
Change passwords for online accounts regularly	33%	37%	35%
Avoid giving personal information online	68%	69%	68%
Make sure my computer has up-to-date anti-virus software	60%	61%	61%
Make sure my mobile phone has up-to-date anti-virus software	46%	50%	48%
Make sure my home wi-fi is protected with a username and password	62%	64%	63%
Back-up important information	49%	52%	51%
None of these	10%	9%	9%

The aforementioned Ofcom report similarly showed that women were less likely than men to report that they, or someone in their household, engage in a range of internet safety measures at home (88% compared with 93% men), including downloading the latest software updates when prompted and using a firewall.⁵¹ In addition, women were more likely to agree that internet users must be protected from seeing inappropriate or offensive content (65% compared with 57% of men), and that people should have the right to hide their identity online in order to express their views anonymously (35% compared with 41% of men). Women were also more

likely than men to disagree that people can say what they want online even if it is controversial or hurtful to others (53% compared with 42% of men).

EIGE research into the opportunities and risks of digitalisation for young people highlighted that, in 2013, young women in the UK aged 15-24 years were more likely to have been the victim of any kind of online harassment than young men and, in 2016, young women of the same age were more hesitant to engage in social media debates due to having heard, read, seen or experienced cases of abuse, hate speech or threats than young men.⁵² The latter was one of the largest gender differences of all EU member states. In addition, based on data from 2013/14, the EIGE estimated that 19% of girls aged 15 years in Scotland had been cyberbullied by messages and 15% by pictures at least once (compared with 12% and 8% of boys, respectively).

6.3 Digital skills, knowledge and motivation

Whilst having access to the internet and devices are critical components of the digital divide, having the skills, knowledge and motivation to use digital tech remains a key driver.

The Lloyds Bank UK Consumer Digital Index uses the transactional and behavioural data of over 1 million consumers across the UK to give a current view of digital skills. In 2018, the Lloyds Bank Consumer Digital Index estimated that 4.3 million adults in the UK (8%) had no basic digital skills. Of these, almost two-thirds were women (61%).⁵³

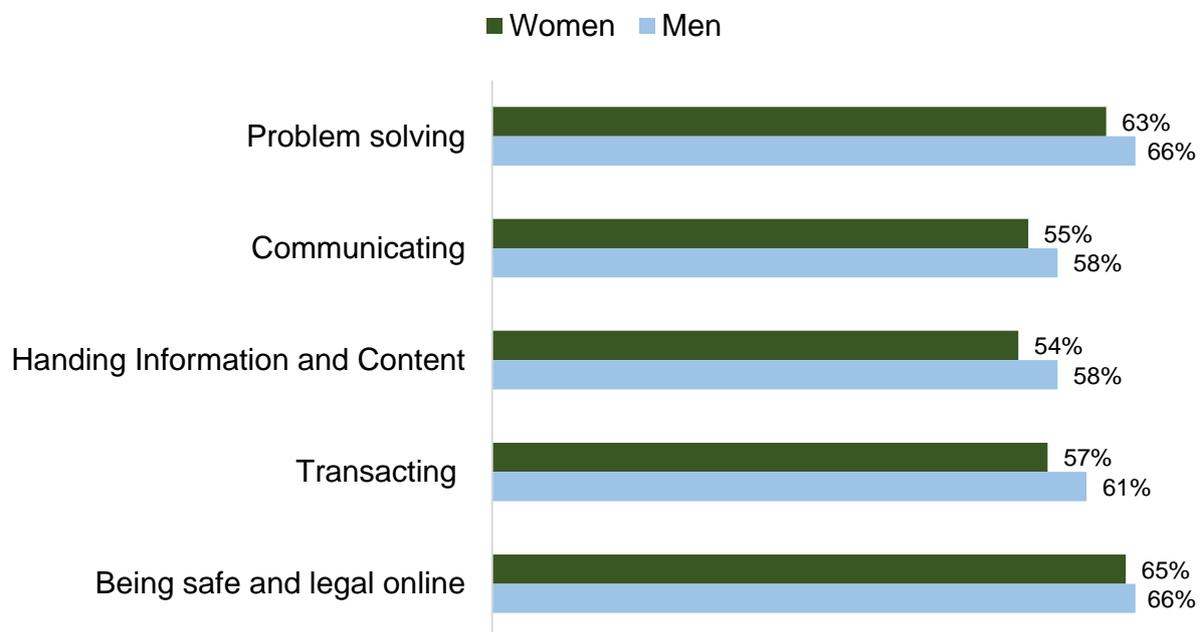
In 2018, Lloyds Bank developed a measure of 'digital skills for work' in collaboration with the UK Government Department for Education and Department for Digital, Culture, Media & Sport. The measure comprises an assessment of the following skills:⁵⁴

1. **Problem solving:** Finding solutions to problems using digital skills and online services.
2. **Communicating:** Communicating, collaborating and sharing online.

3. **Handling information & content:** Finding, managing and storing digital information and content securely.
4. **Transacting:** Applying for services, buying and selling, and managing transactions online.
5. **Being safe and legal online.**

Based on data from just over 2,000 adults across the UK, the Lloyds Bank Consumer Digital Index 2019 revealed a digital skills gap between women and men in employment; 43% of women had the full digital skills for work compared with 50% of men. This difference was attributed to fewer women working in the technology and digital industries and a higher proportion of women working in part-time roles (adults in part-time roles were also found to be less likely to have the digital skills for work). A breakdown of the gender differences for each of the digital skills for work is presented in Figure 8.

Figure 8: The proportion of adults in the UK with each digital skill for work by gender in 2019 (Lloyds Bank Consumer Digital Index 2019).



Data from the Lloyds Bank Consumer Digital Index 2020 showed that – based on data from over 4,000 adults in the UK - women were less likely to have foundation digital skills, such as being able to use the internet and their devices by themselves

(81% women compared to 86% men).⁵⁵ The difference is particularly driven by older adults, with women and men aged 64 and under achieving parity in the foundational skills (93% for both women and men). In contrast, among adults aged 65 and above, men were 19 percentage points above women (43% of women compared with 62% of men). Interestingly, however, the research also showed that women were overall less likely to experience motivational barriers to getting online than men (29% compared with 42% of men).⁵⁶

The EIGE recently published figures for each EU member state showing the gender difference in a range of digital skills (Table 13).⁵⁷ Overall, this showed that a greater proportion of women and men in the UK have above-basic digital skills compared to the average across all 28 EU member states (EU-28). However, there were some gender differences within individual digital skills. Similar to the pattern of gender differences seen across EU-28, women in the UK were less likely to have above-basic problem solving and software skills than men.

Table 13: The percentage of people aged 16-74 years with above-basic digital skills in 2019 by gender in the UK vs. EU-28 (EIGE).

	UK		EU-28	
	Women	Men	Women	Men
Above-basic digital skills				
Information skills	82%	82%	71%	71%
Communication skills	81%	78%	67%	66%
Problem solving skills	72%	80%	56%	63%
Software skills	53%	60%	39%	44%

The aforementioned EIGE research into the opportunities and risks of digitalisation for young people showed that while digital skills and access to digital tech is becoming less of an issue for young people in all EU member states, data gathered in 2015 indicates that boys express higher self-confidence across a range of skills in relation to the use of digital tech.⁵⁸ The data from young people in the UK showed that, when compared to boys the same age, girls aged 15-16 years were less likely to:

- Feel confident enough to install software on digital technologies (79% compared with 79% of boys).
- Feel confident to start solving a problem with digital devices by themselves (74% compared with 86% of boys).
- Feel comfortable using digital devices that they are less familiar with (75% compared with 81% of boys).

These gender differences were slightly smaller than the average of all EU member states. However, the UK had the largest gender difference in overall digital skills of all EU member states, driven largely by greater proportions of young men in the UK having software and information skills.

Similarly, the aforementioned report by the Prince's Trust also showed some gender differences in digital skills among the young people aged 16-26 years that took part in their research.⁵⁹ Specifically, the research showed that young women were considerably less likely to have high-level content creation skills, but had stronger social skills (e.g. knowing who to communicate with, about what, on which platforms).

7. Conclusions

In summary, the available data shows that there are multiple gender inequalities present with respect to digital tech, including:

- The underrepresentation of women and girls taking subjects related to digital tech in schools, colleges and universities. Further, the representation of women and girls taking digital tech subjects has decreased over time. Despite this, girls consistently outperform boys in their attainment on digital tech qualifications.
- The underrepresentation of women and girls in all roles in the digital tech sector, particularly among directors and managers. In addition, there has been little change in the representation of women in the digital tech sector over the past two decades.
- The significant gender pay gap in the digital tech sector, which is almost double the gender pay gap seen across all sectors. Women are also more

likely to be working in part-time roles within the digital tech sector, which is likely impact on pay and progression.

- There are a number of barriers to the representation of women and girls in digital tech education and employment, including perceived gender differences in computing abilities; perceptions of the nature of work in the digital tech industry; and a lack of role models and careers advice for women.
- Women are less likely to perform tasks using digital tech in the workplace, from use of computerised equipment to developing and maintaining IT systems or software.
- Women are at increased risk job losses arising from the increasing use of digital tech to automate work. Digitalisation of the workplace could offer women more flexible working opportunities in new sectors, although this is unlikely to address existing gender inequality at home and in the labour market.
- Internet usage is at record high levels, and there are minimal gender differences among all women and men. However, a gender difference remains among older people, with older women less likely to be internet users than older men.
- Women are less likely to engage in a range of online safety measures, including updating software and setting strong passwords. This puts women at greater risk of internet usage.
- Women are more likely to agree that people should be protected from offensive content online, and younger women are more likely than younger men to have experienced online harassment and cyberbullying.
- Women are less than men to have digital skills related problem solving and software, and younger women report feeling less confident in installing software and solving problems with digital devices by themselves. Although gender differences in digital skills are most pronounced among older people, there is evidence to suggest the gender gap in digital skills among younger people remains.

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