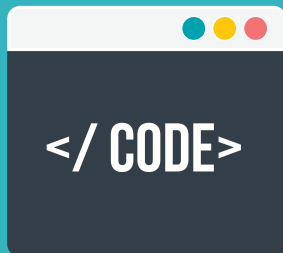




Scotland's Digital Technologies: Summary Report 2019



Contents

Scotland's Digital Technologies: Summary Report was first published in 2017. This 2019 report presents an updated picture of Digital Technologies in Scotland, the skills supply pipeline and employer demand for digital technology skills¹.



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This report has been developed and funded by Scottish Government through the Digital Scotland Business Excellence Partnership whose partners include Skills Development Scotland, ScotlandIS, Scottish Government, Scottish Enterprise, Highlands & Islands Enterprise, Scottish Funding Council, SQA, Education Scotland and Digital Technologies sector representatives.

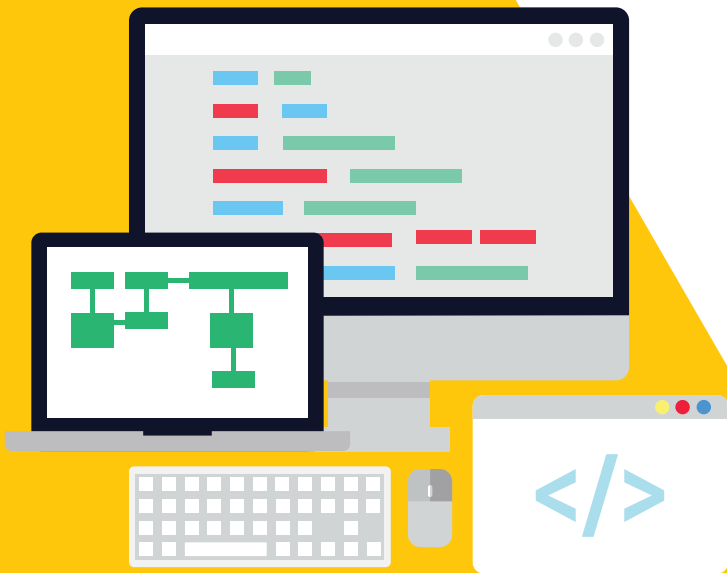
¹ Technology is changing rapidly making comparison challenging. This report compares to the 2017 report where it has been possible to do so.

Introduction

It continues to be a critical time for the digital economy as technology further transforms the way in which we live and work.

This digital revolution is impacting all sectors across Scotland as increasing types of businesses are harnessing the benefits of technology to drive innovation and increase competitiveness. For Scotland this means that the digital technology (tech) sector is growing rapidly and is also a key contributor to economic growth and global competitiveness across every sector in Scotland.

In 2018 the tech sector contributed £4.9bn to the Scottish economy and around 100,000 people were employed as tech professionals across all sectors. Tech in Scotland is not only forecast to continue to grow but is also identified as one of the fastest growing sectors in Scotland. As this digital revolution continues to pick up pace it is creating an unprecedented demand for skills with employers across all sectors.



The Growing Role of Digital Technology Across Sectors

There has been a shift from the traditional role of tech as a business support service to an integral part of business functions, making it an increasingly essential part of day-to-day operations.

However, simply using tech is no longer a means of gaining competitive advantage and industries are innovating, developing and using their own technologies to deliver core business. This is resulting in the transformation of sectors and growth of new sub-sectors. Financial technology (FinTech) has been identified as a critical sector for economic growth in Scotland, alongside the growing cyber security sector, digital health and digital transformation of the public sector.

Traditional sectors are being transformed by tech leading to demand for sector specialist technology skills. For example, in oil, gas and energy, there is a clear requirement for very specialist data skills. Other sectors such as construction and tourism are in the earlier stages of tech innovation and development and will require a greater volume of tech skills as new technologies become adopted more widely.

1

**Digital
Technologies
in Scotland**

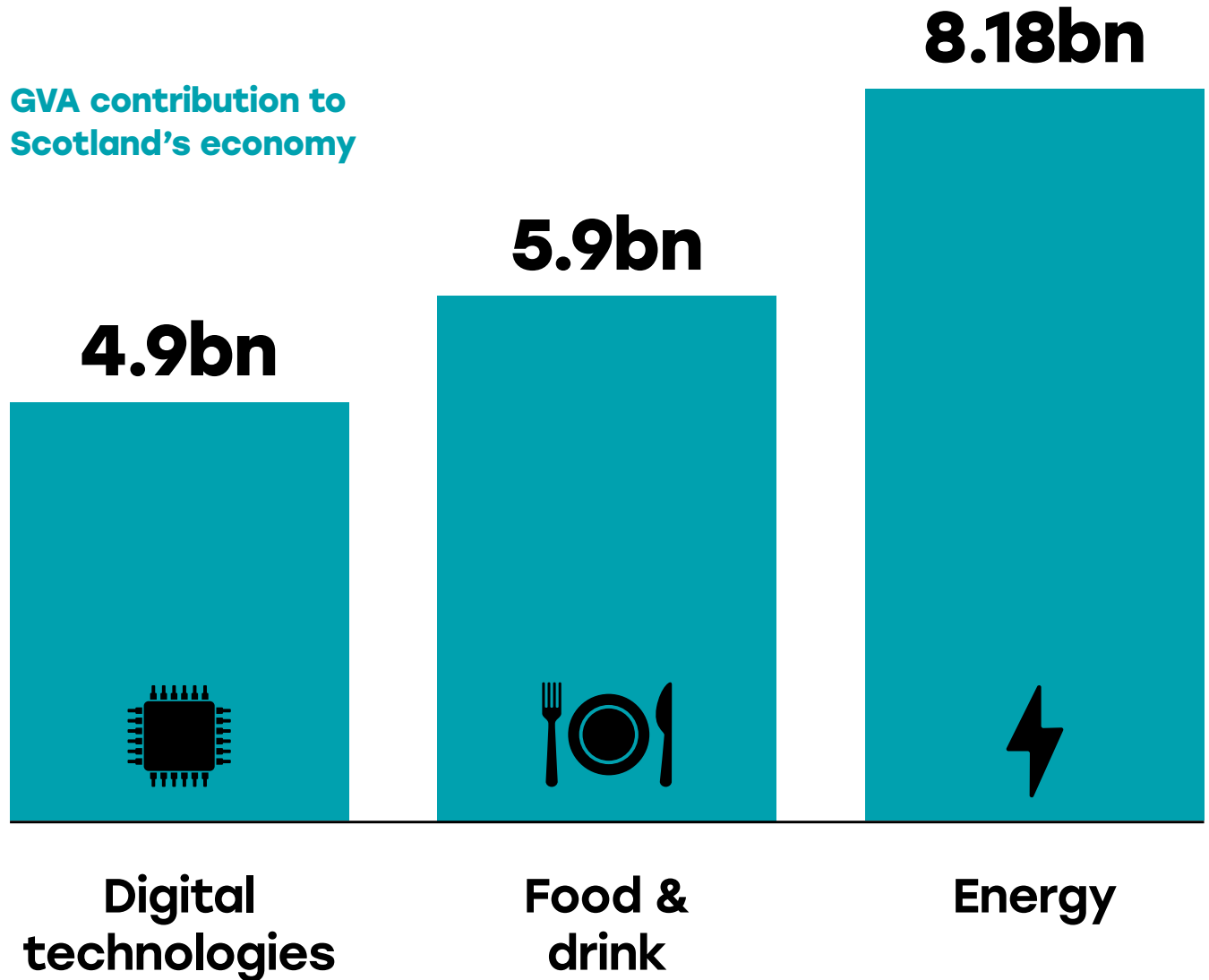
1 Digital Technologies in Scotland

Economic Importance

The tech sector contributed £4.9bn Gross Value Added (GVA) to Scotland's economy in 2019, accounting for 3.5% of total GVA. GVA per head for the tech sector is 40% higher than for the economy as a whole, making it a considerable contributor to Scotland's economy.

The contribution made by the tech sector to GVA is fast approaching that of established key sectors including food & drink (£5.9bn GVA) and energy (£8.18bn GVA).

GVA contribution to Scotland's economy

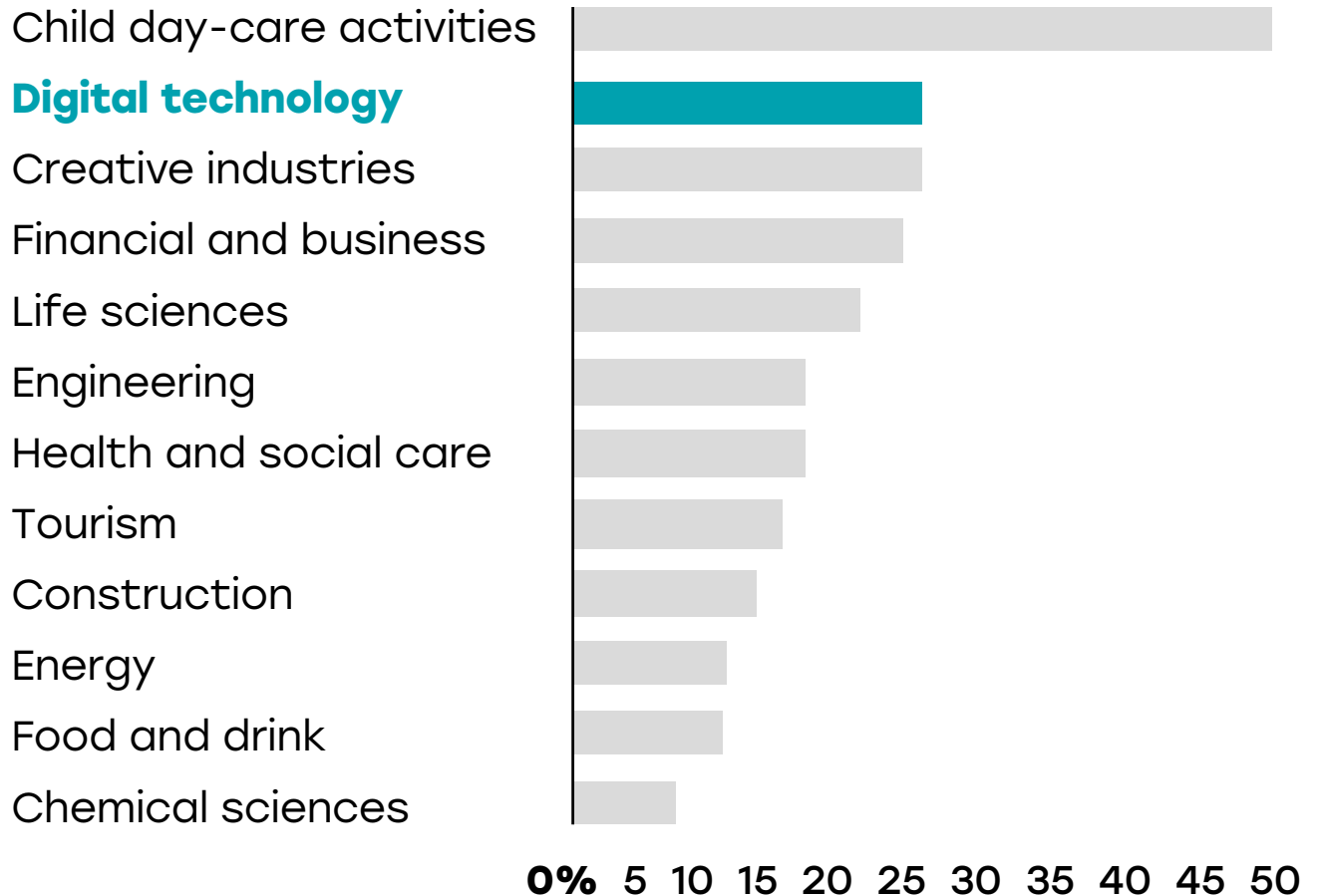


1 Digital Technologies in Scotland

The tech sector is forecast to be one of the **fastest growing sectors in Scotland** to 2029, in terms of GVA (26%) – growing 1.5 times faster than the economy overall (18%)².

² Tech is the second fastest growing sector sitting behind child day-care activities which is expected to see significant growth due to the expansion of free provision, albeit from a comparatively low base.

Forecast percentage GVA growth 2019 - 29

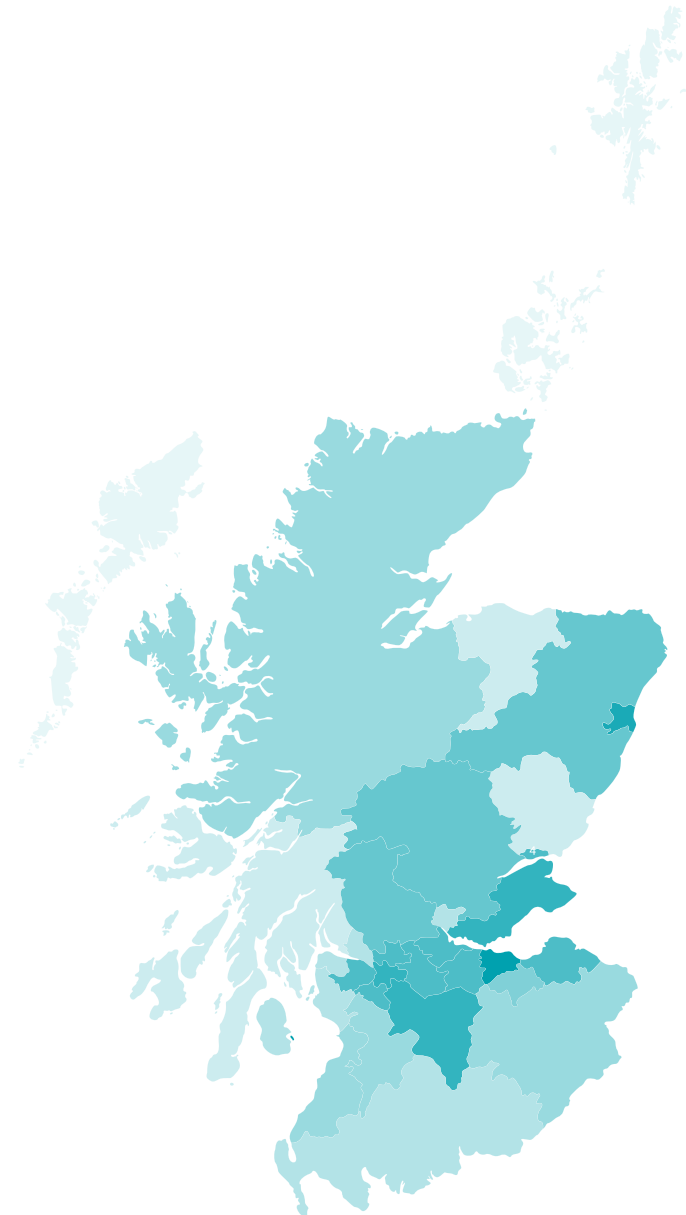
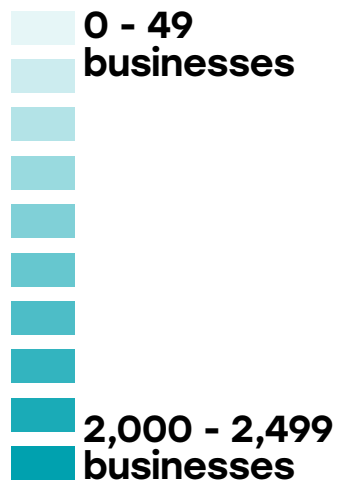


1 Digital Technologies in Scotland

Tech Business Base

There were around 9,500³ tech businesses registered in Scotland in 2018, which is 5.4% of Scotland's total business base. These businesses are located across Scotland with concentrations in Edinburgh (23%), Glasgow (13%), Fife (6%), South Lanarkshire and West Lothian (both 5%).

Tech business count by local authority



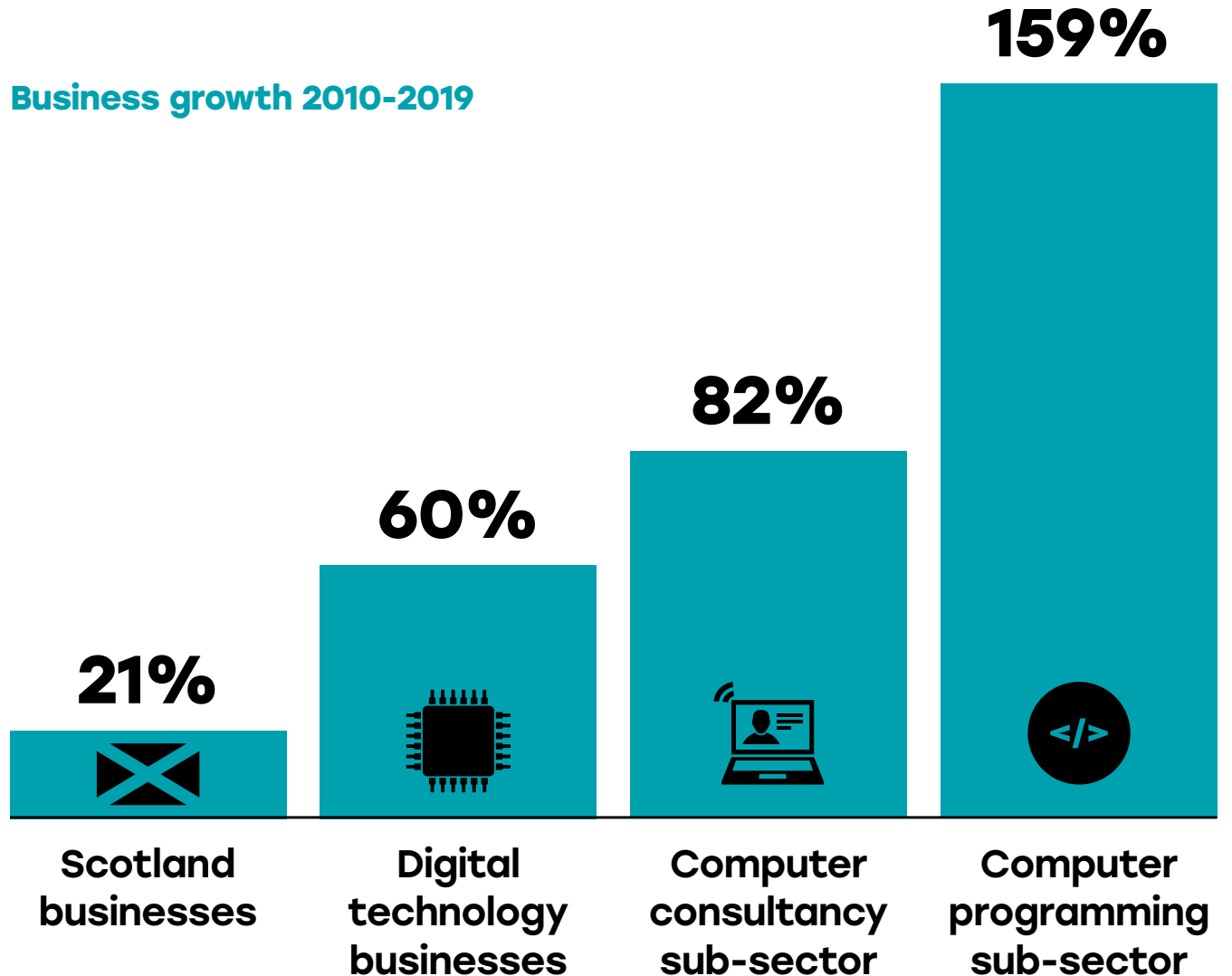
³ Based on all VAT registered businesses including those who may be individuals registered as a company.

1 Digital Technologies in Scotland

95% of the tech sector is made up of micro businesses (1-10 employees) compared to 88% in the economy as a whole. Tech businesses have an average of seven employees per business, compared to 14 for the rest of the economy, reflecting the importance of the start-up community.

The number of tech businesses has grown by 60% since 2010 – almost three times as fast as businesses across Scotland (21%). Sub-sectors such as computer consultancy (82%) and computer programming (159%) have grown exponentially, illustrating the demand for these activities.

Business growth 2010-2019



1 Digital Technologies in Scotland

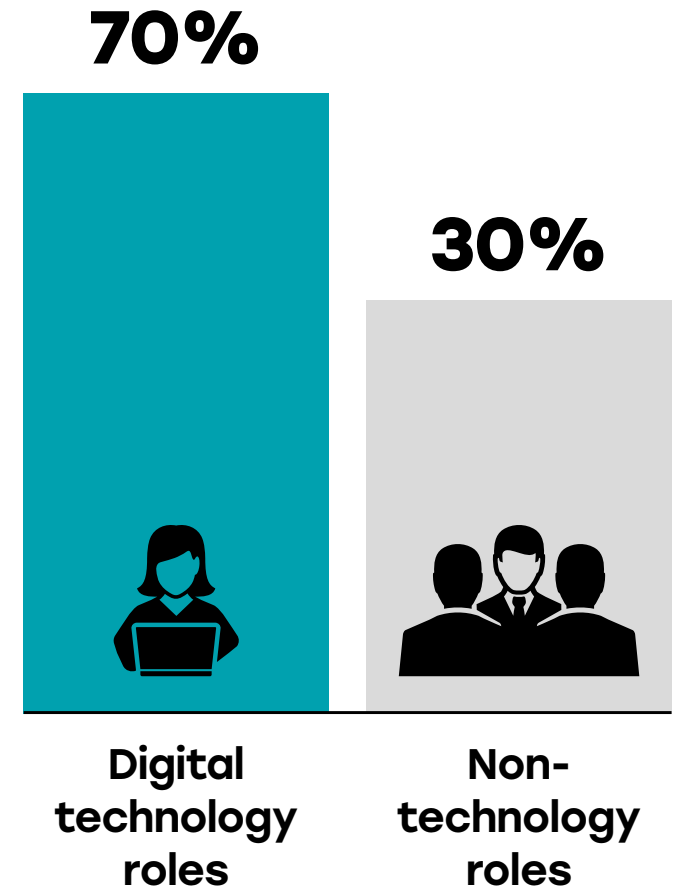
Employment in Technology Businesses

Around **62,500** people are employed in tech businesses (in all job roles) across Scotland; 2.4% of the workforce. Almost 70% of these people are in tech roles with 30% working in other types of jobs. This illustrates the wide range of job opportunities available in tech businesses.

Employment in the tech sector continues to increase, having grown 3% from 2015-2017. This is three times faster than employment growth across Scotland's economy (1%).

The Central Belt accounts for a high proportion of the sector's workforce and the top four employment areas are, City of Edinburgh (25%), Glasgow City (22%), West Lothian (10%) and Fife (6%).

People Employed in Technology Businesses



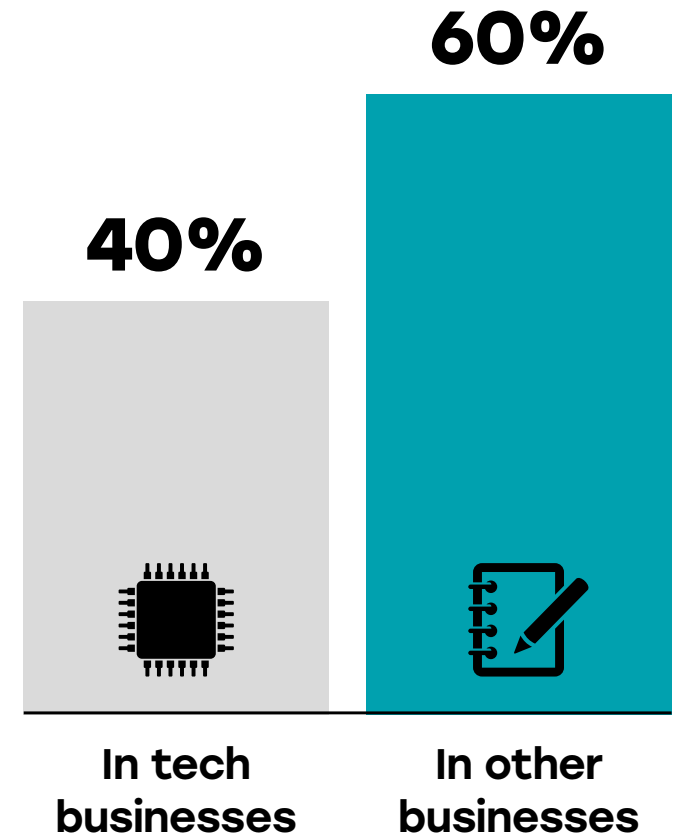
1 Digital Technologies in Scotland

Employment in Technology Roles

Around **100,000** people are employed in tech roles across all sectors in Scotland. This represents 4% of the workforce.

Around 40% of these people are employed in tech businesses with the remaining 60% employed in other sectors such as finance, creative industries, energy, engineering and healthcare. This illustrates the importance of tech professionals across Scotland's whole economy.

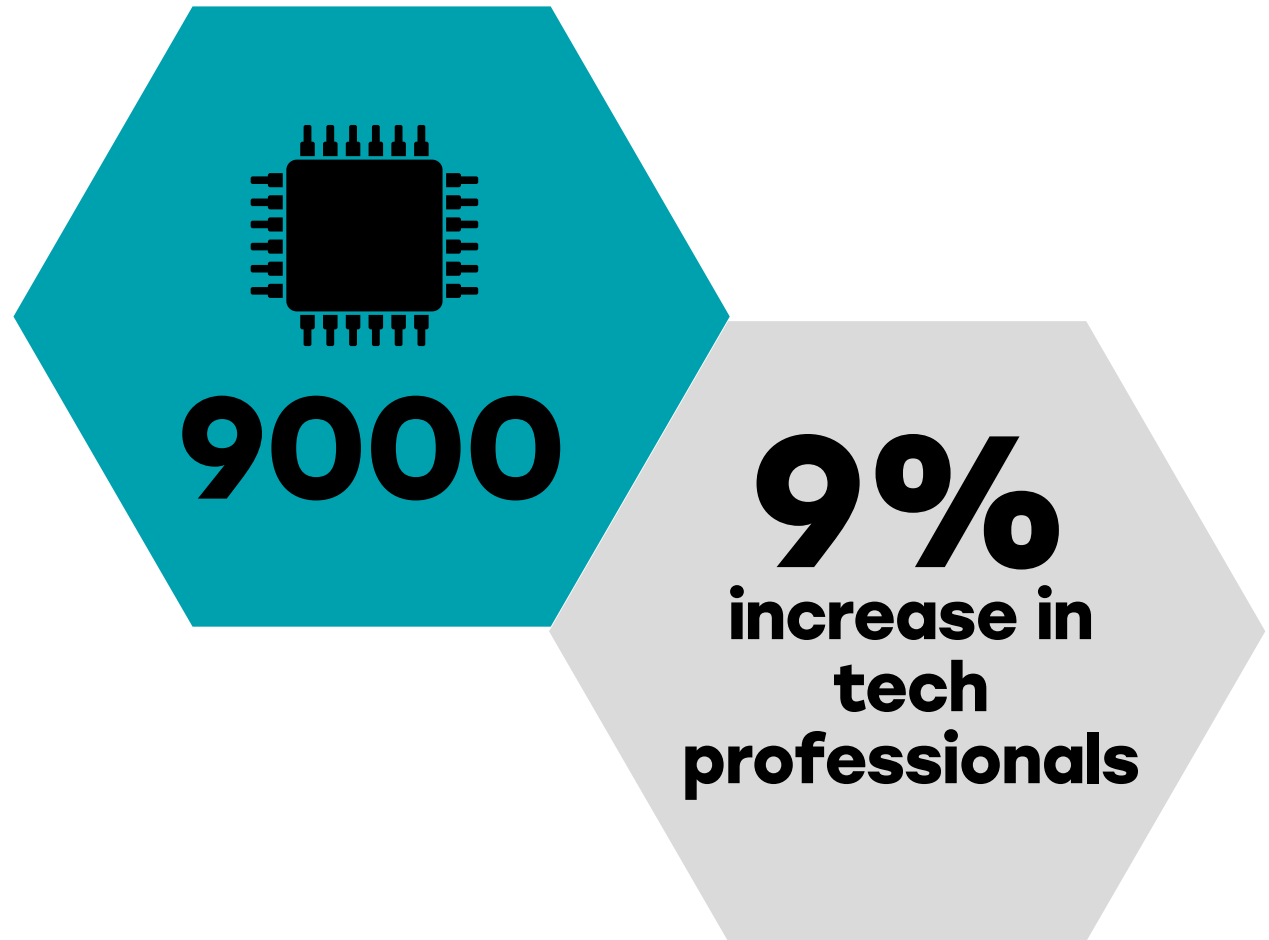
People employed in technology roles



1 Digital Technologies in Scotland

The number of people working in tech professions has grown a further **9%** from 2016-2018, illustrating continued demand for tech skills across all Scotland's industries.

Tech roles are hugely varied and new types of roles are being created all the time. Growth has been particularly strong in web design and development, IT business analysts, architects and systems designers, programmers and software development professionals.



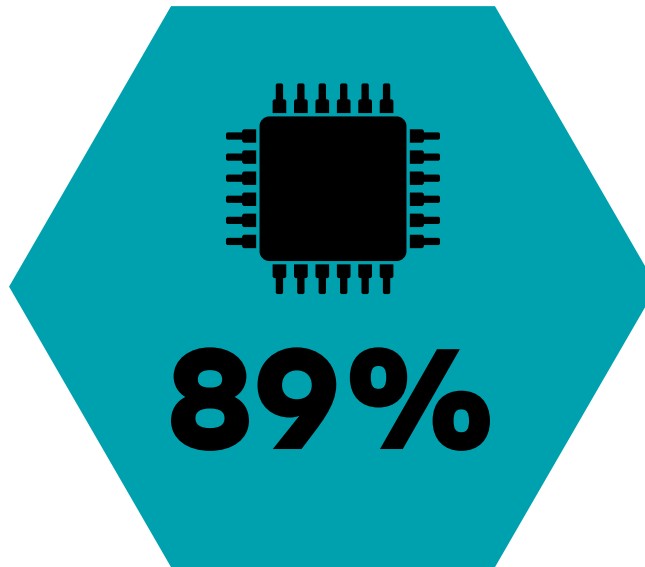
1 Digital Technologies in Scotland

Workforce Demographics

People who work in tech businesses are more likely to be employed on a full-time basis (89%) than those in Scotland's workforce overall (66%).

Like many sectors, tech has an ageing workforce profile. The proportion of younger workers in tech roles is increasing, particularly those aged 16-24, but a large proportion are still aged 45 and above.

Full-time workers



In tech businesses



In Scotland

1 Digital Technologies in Scotland

The proportion of tech roles held by women increased between 2015 and 2017 from 18% to 23%, although this still represents a considerable imbalance.

Growth in female employment across tech roles has been strong in particular occupational roles including web design and development professionals (rising by 344%), IT business analysts, architects and systems designers (197%), IT specialist managers (155%), and IT user support technicians (126%)⁴.

There are a number of factors contributing to the gender imbalance which are summarised in “[Tackling the Technology Gender Gap Together](#)”.



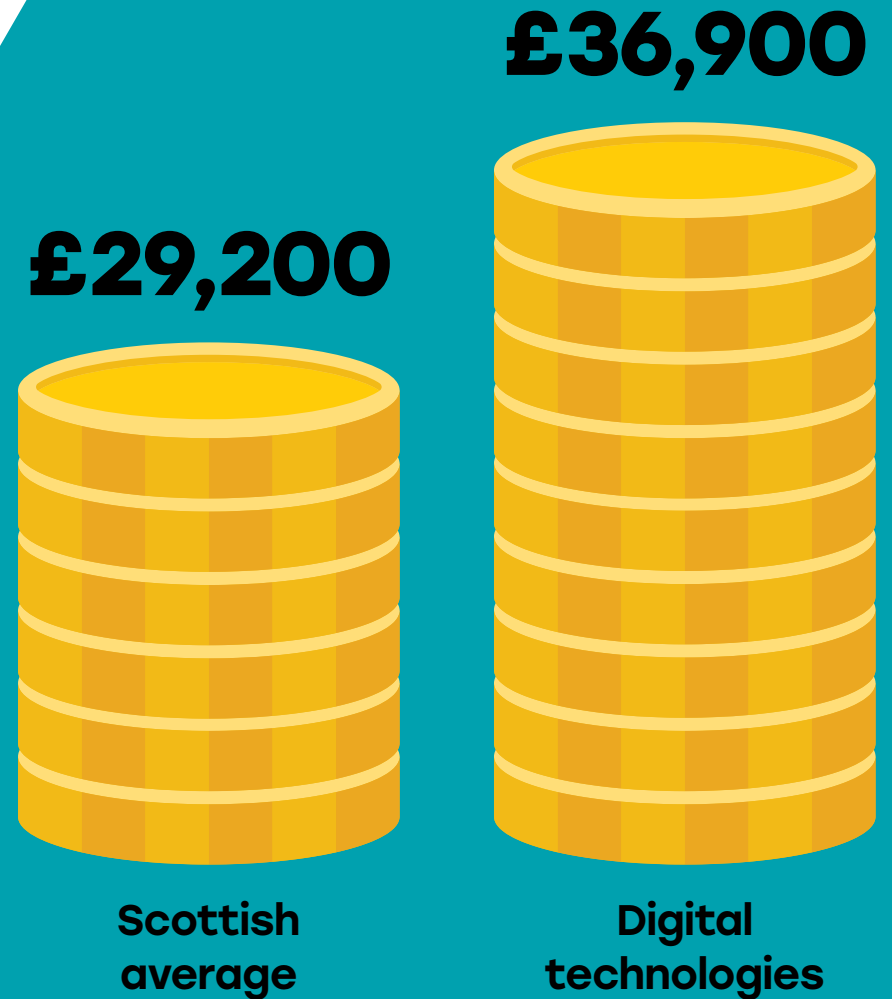
⁴ Women in Technology, Skills Development Scotland (2019)

1 Digital Technologies in Scotland

Salaries for Tech Jobs

The average salary for tech jobs is around £36,900 - 26% higher than the Scottish average of £29,200.

Tech salaries are also growing at a faster rate (15%), than overall salaries across Scotland (11%) (2013-2018).



1 Digital Technologies in Scotland

Forecast Growth in Employment

Demand for tech recruits continues to grow rapidly. It is estimated that Scotland needs around **13,000** new people to work in tech every year. A significant proportion of these jobs will be due to replacement demand and people leaving the workforce.

This is a further increase on the previous demand forecasts from just two years ago and represents a significant opportunity for both young people and other new entrants across a wide range of job roles.



2

**Digital
Technologies
Education Pipeline**

2 Digital Technologies Education Pipeline

Computing Science at School

The number of young people studying computing science SCQF level 3-7 at school decreased from 2016-2018, however this masks a strong proportional increase in entries and passes at Advanced Higher level during this time⁵. The overall pass rate has been largely stable and remains high at 87%⁶.

Level	Entries in 2018	Change 2016-18
SCQF 3-5 (National)	9,622	-15%
SCQF 6 (Higher)	4,099	-8%
SCQF 7 (Advanced Higher)	636	31%
Total	14,357	-12%

⁵ Changes to the school curriculum is a contributing factor to the ability for young people to study computing science at school. Changes to computing science qualifications also mean that the time comparison should be treated with caution.

⁶ Pass rate based on A-D passes

The type of qualifications on offer to school pupils has been widening in recent years and traditional school subjects are no longer the only option. The number of young people studying different types of technology related qualifications in school is rising.

National Progression Awards (NPAs) assess a defined set of skills and knowledge in specialist vocational areas. In 2017/18, over 1,700 students undertook NPAs in computer games development across SCQF Levels 4-6, while there were almost 800 more entries to NPAs in cyber security.

Foundation Apprenticeships (FAs) are offered as a subject choice in some schools. Launched in 2016/17 in software development and hardware & systems support and now also including creative & digital media. Technology FAs are offered at SCQF level 6 and can lead onto a variety of technology pathways including Modern Apprenticeships and university degrees.

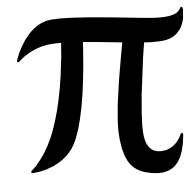
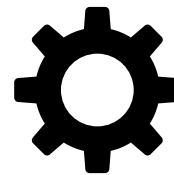
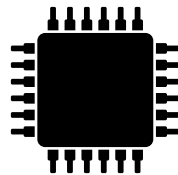
2 Digital Technologies Education Pipeline

Computing science is just one of the learning pathways into tech courses and careers as all STEM disciplines develop transferable skills and knowledge.

Maths is a particularly good pathway into further computing science study; in 2018 there were over 80,000 maths passes.

Some tech courses and careers also place emphasis on arts subjects as an entry route, so the potential talent pool is much wider than just those studying computing science related qualification.

STEAM subjects can lead into tech courses and careers



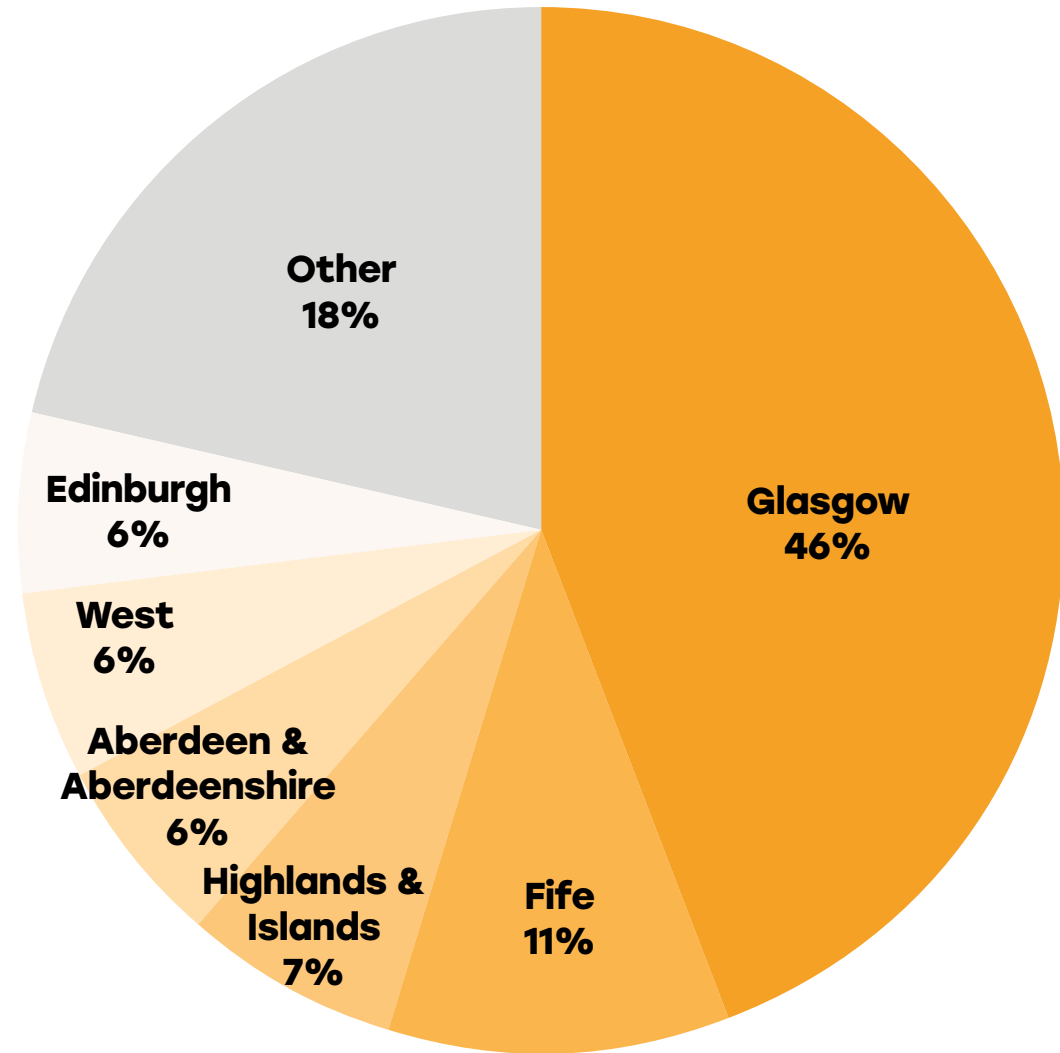
STEAM

2 Digital Technologies Education Pipeline

Computing Science Provision at College

Computing science related courses are delivered by 23 colleges in Scotland across all 13 college regions.

There are clear concentrations in some areas with the highest proportion of enrolments in Glasgow 46%, Fife 11%, Highlands & Islands 7%, Aberdeen & Aberdeenshire 6%, West and Edinburgh – each 6%.



Computing science enrolments by college region

2 Digital Technologies Education Pipeline

Computing courses make up a significant proportion of college enrolments in Scotland. In 2017/18, 8% of all enrolments were in computing related courses, equating to over 25,600 enrolments.

Although the majority of enrolments is in lower level qualifications, the number of people studying computing science in college at further and higher education levels (SCQF levels 7-12) has been increasing⁷.

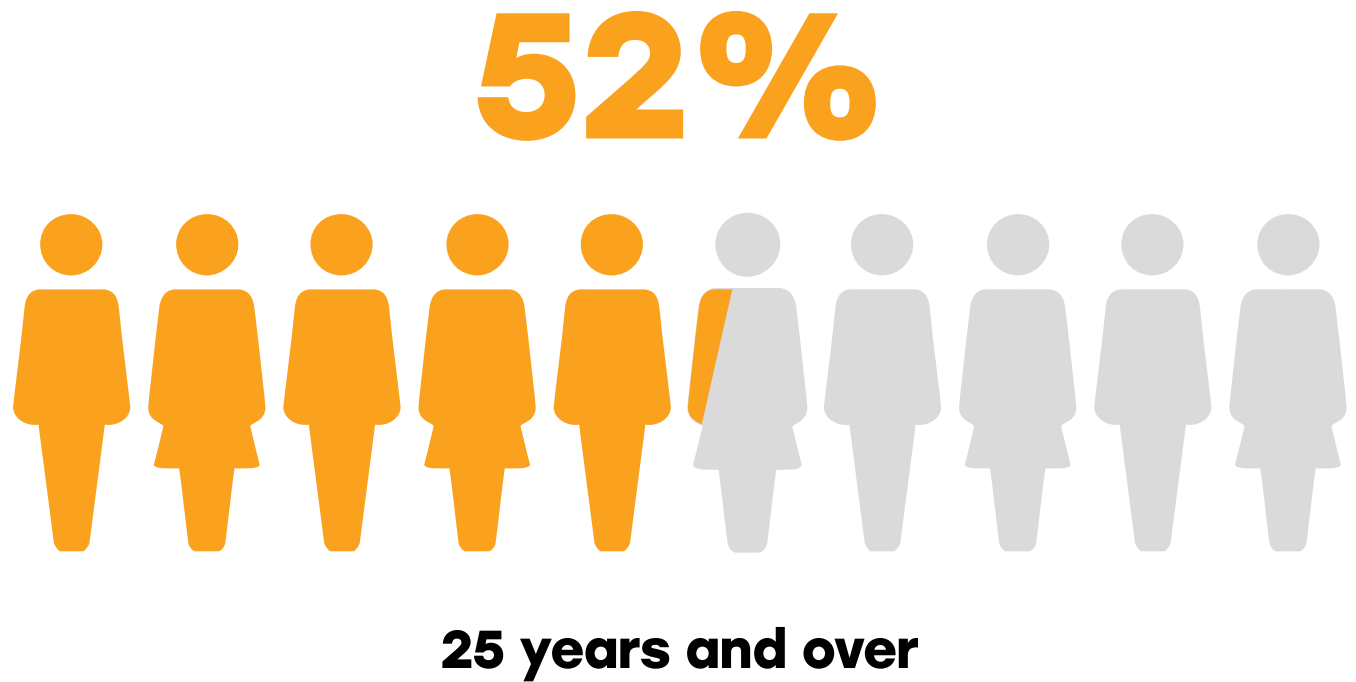
Framework Level	Enrolments 2017/18	Change 2014/15 – 2017/18
SCQF 1-6	2,244	1%
SCQF 7-12	4,320	14%

⁷ Supergroups containing technology related courses have changed since 2017 making time comparison difficult. This change has mainly affected courses offering lower level qualifications and hence we show comparison for SCQF 1-12 only.

2 Digital Technologies Education Pipeline

Computing Science College Student Demographics

The age profile of the computing student cohort is older than the overall college student cohort in Scotland in 2017/18. Over half (52%) of those enrolled on computing related courses were aged 25 or over.

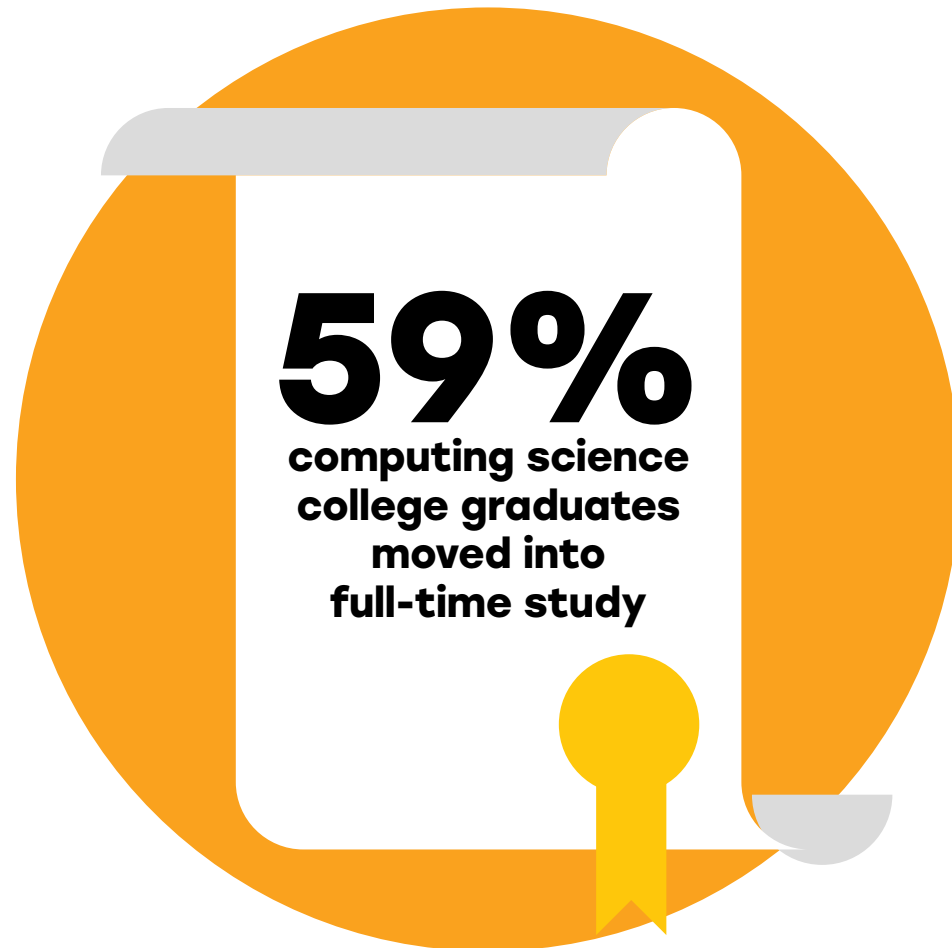


2 Digital Technologies Education Pipeline

Computing Science College Leaver Destinations

In 2016/17, 59% of computing science college leavers entered further full-time study, compared with 41% across all college disciplines.

29% of computing science leavers directly entered employment, compared with an average of 47% across all college disciplines. This supports the view that employers are looking for people with higher level qualifications.



2 Digital Technologies Education Pipeline

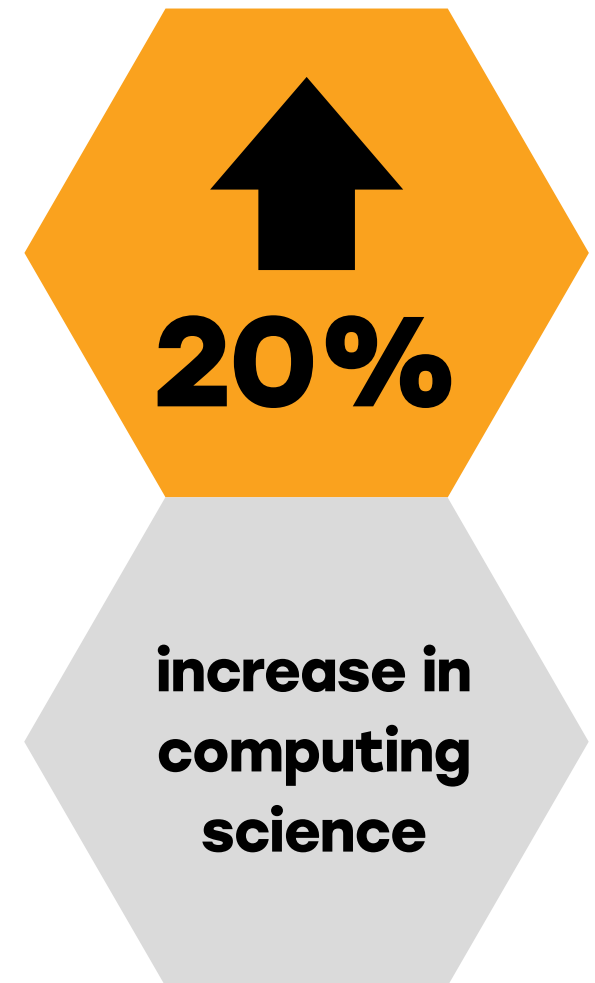
Computing Science Provision at University

15 Scottish universities deliver undergraduate computing science degrees, and 14 deliver postgraduate qualifications.

The total number of students studying computing science continues to increase and has grown by 20% since 2014/15 to over 17,000.

Computing science accounted for approximately 7% of all university provision in 2017/18.

The majority of provision (80% of students) is at undergraduate degree level, however the proportion of postgraduates is increasing slowly. This is indicative of the demand for higher levels tech skill for example in big data and analytics.

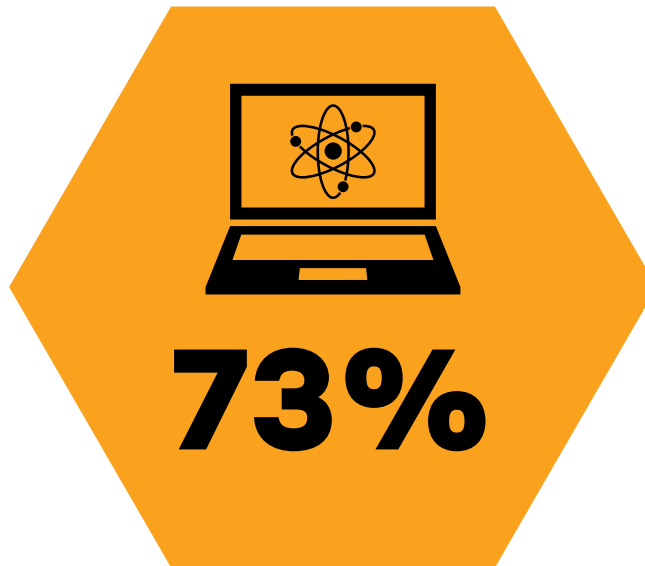


2 Digital Technologies Education Pipeline

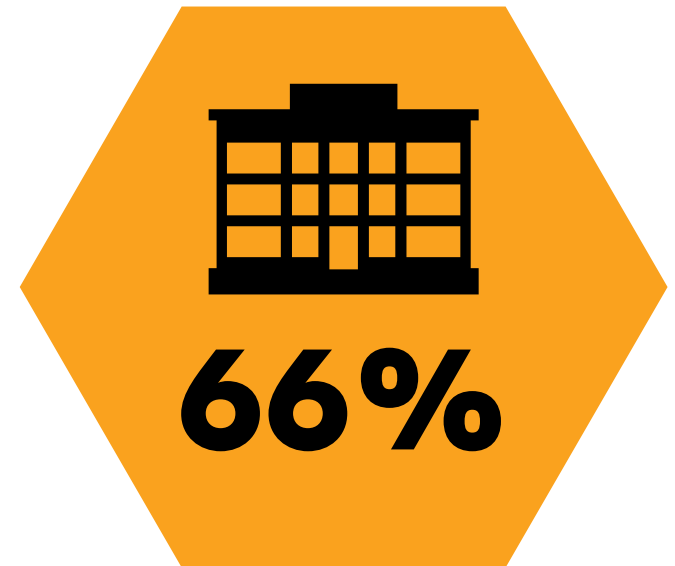
University Student Demographics

The computing science cohort at university is younger than the overall student profile; 73% were 24 years and under compared to 66% for all university enrolments.

All age cohorts have increased year upon year since 2014/15, with the greatest increase being in the 20-24 age group at 24% across the four years.



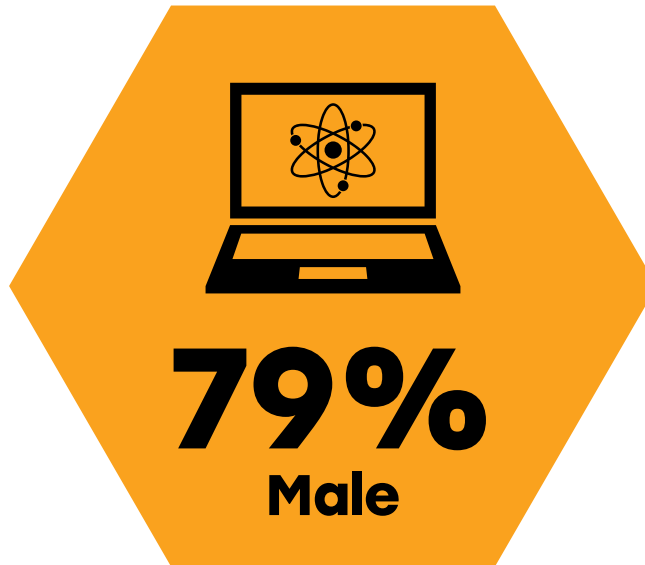
**Computing science
students 24 years
and under**



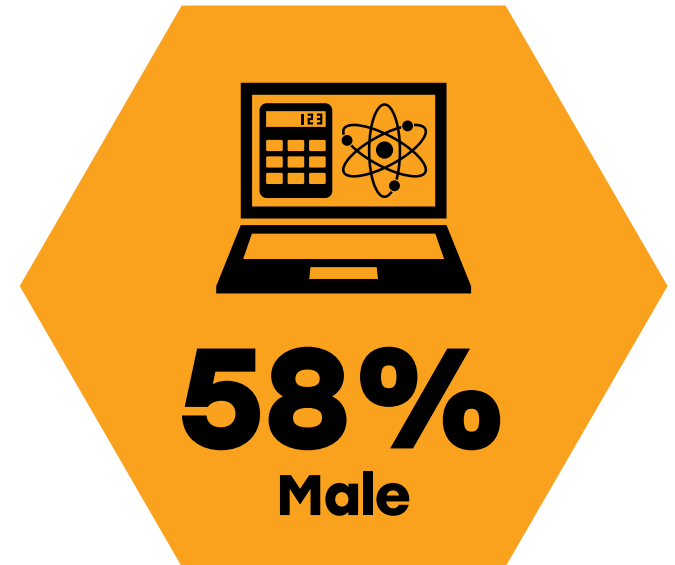
**All university
enrolments 24 years
and under**

2 Digital Technologies Education Pipeline

Computing science courses are male dominated (79%), while there is a more equal gender split on mathematical and computing science courses (58% male). This suggests that males tend to opt for pure computer science degrees.



Computing science



Mathematical and computing science

2 Digital Technologies Education Pipeline

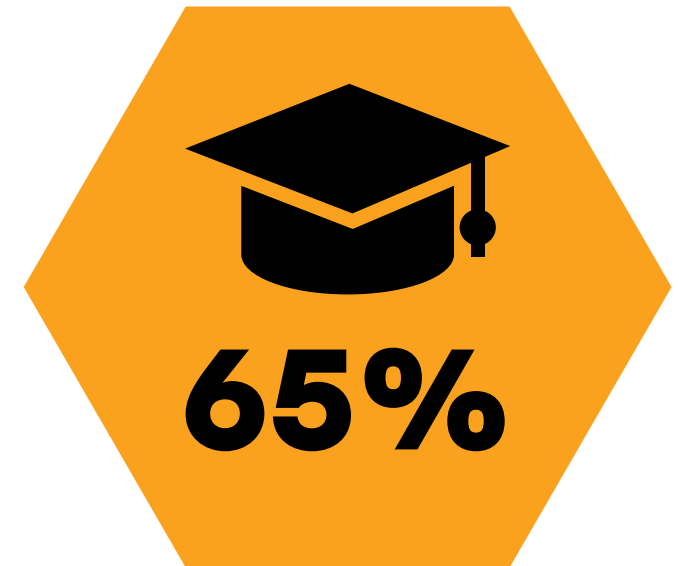
Computing Science Graduates

The number of computing science graduates is growing.

There were around 5,200 computing science graduates in 2017/18. This is a 15% increase over three years since 2014/15. Substantially more than the previous increase of 5% in the two years from 2012/13.

Around two-thirds of these graduates moved into employment after graduation (65%). 9% of graduates were unemployed six months after, compared with only 5% of all university graduates. The proportion of graduates going onto further full-time study has increased slightly from 16% to 19%.

Those who enter full-time employment move into a variety of sectors. This indicates the wide spread demand for computing science graduates across sectors.



**University graduates
moved into employment**

2 Digital Technologies Education Pipeline

Digital Technology Apprenticeships

Modern Apprenticeships (MAs) help employers to develop their workforce by training new staff and up-skilling existing employees. Digital technology MAs are currently offered in five frameworks, covering a variety of disciplines and jobs roles related to hardware, networking, software development, cyber security, applications and data analytics.

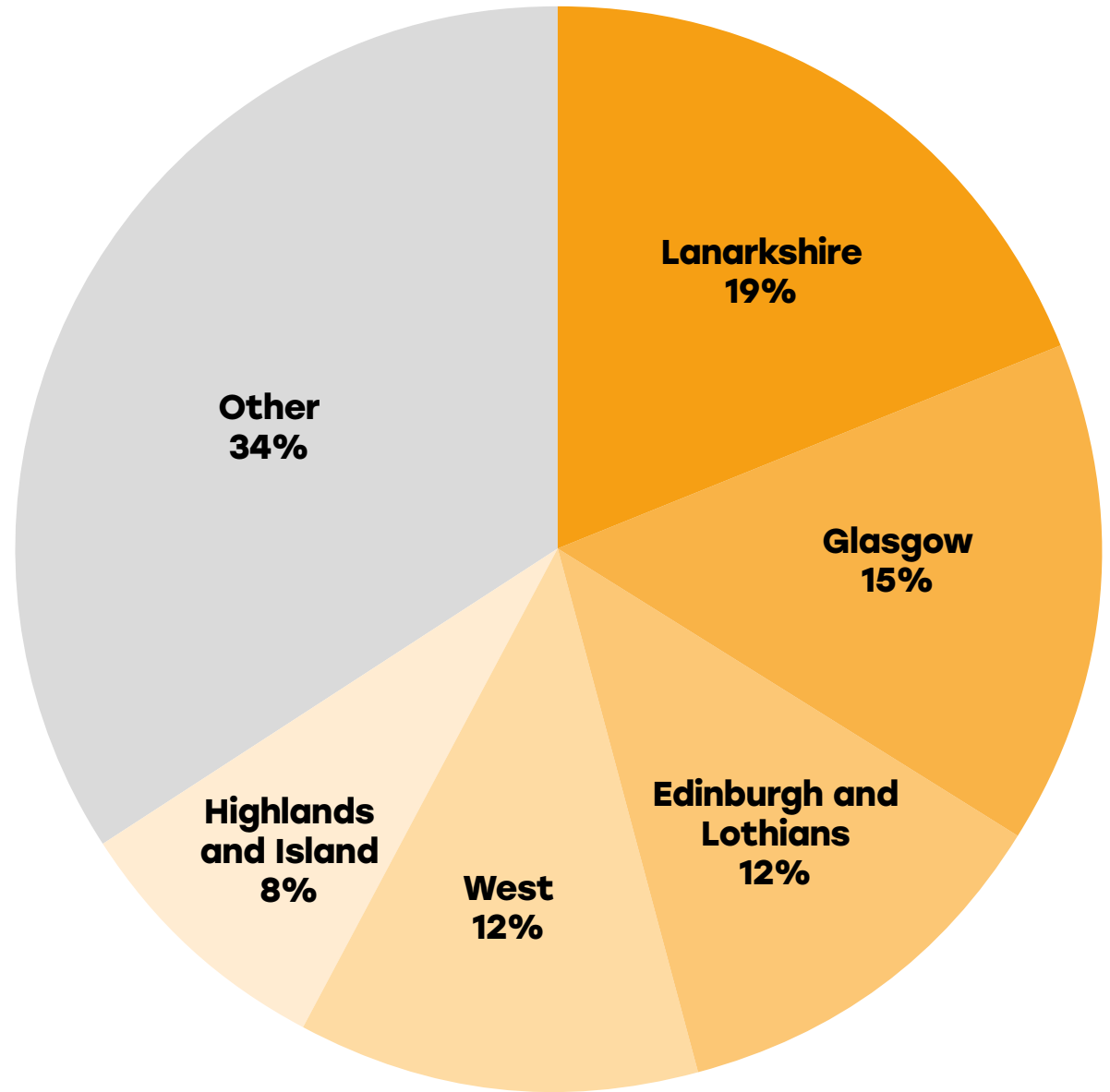
The number of digital technology MA starts has almost doubled in the last two years to over 1,800 starts in 2017/18. This has been fuelled in part by the addition of a new framework for digital applications which has proved to be popular. The achievement rate has also grown to 78% from 73% in 2015/16.



Increase in digital technology MA stats

2 Digital Technologies Education Pipeline

Digital technology apprenticeships are offered across Scotland with a high proportion of MAs in Lanarkshire (19%), Glasgow (15%), Edinburgh & Lothians (12%), West (12%) and Highlands & Islands (8%).



**Digital technology
MA starts by region**

2 Digital Technologies Education Pipeline

Building on the strength of Modern Apprenticeships, and tech employer's appetite for degree level qualifications, Scottish Apprenticeships now also includes **Graduate Apprenticeships** (GAs) which are offered in the workplace.

Tech GAs have grown rapidly from their initial pilot of five starts in 2017/18 to almost 300 starts in 2018/19.

Tech GAs are currently offered in software, IT management for business, cyber and data science.

Tech apprenticeships are viewed positively by employers and there is an increasing appetite for tech apprentices across sectors. Around a third of employers currently use Foundation, Modern or Graduate Apprenticeships.



3

Employer Demand for Digital Technology Skills⁸

3 Employer Demand for Digital Technology Skills

Current Demand for Skills

Over half of employers (58%) recruited tech skills in the last 12 months.

Of those who had recently recruited tech skills, over 51% had recruited development and implementation skills, whilst delivery & operation (30%) and relationships & engagement (26%) had also been high in demand.

Of those who had recruited development and implementation skills the highest demand had been for experienced and technical level roles and most commonly for systems development.

Skills recruited 2018/2019

Development and implementation

51%

Delivery and operation

30%

Relationships and engagement

26%

Strategy and architecture

15%

Change and transformation

15%

Skill/people management and quality

11%

3 Employer Demand for Digital Technology Skills

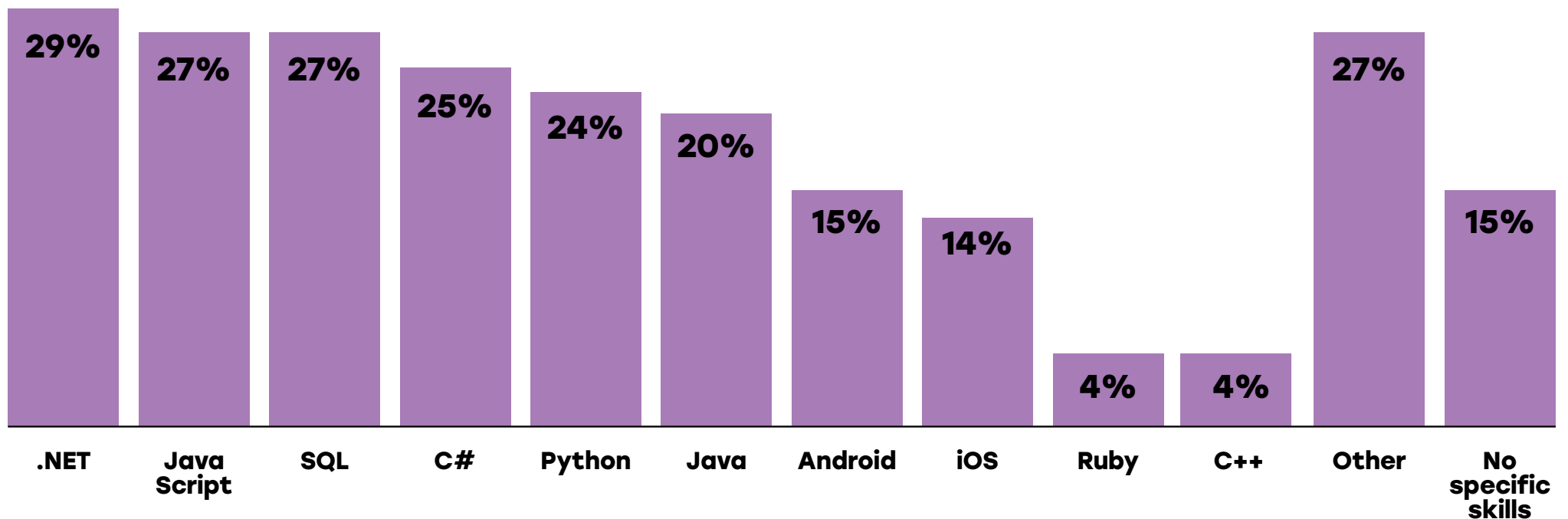
Language Skills Required

Employers require a wide range of language skills.

However, 15% of employers said they did not require specific language skills, but instead the

ability to learn different languages is important.

Language skills required by employers



3 Employer Demand for Digital Technology Skills

New Technology Skills

Tech employers require a wide range of specialist skills, particularly around data, cyber security and artificial intelligence.

The majority of employers had skills gaps in these areas with only one-third of employers who required these skills having all the skills they need.

Employer demand for new technology skills:

- 82% require cyber security skills
- 81% require information security skills
- 73% require data analytics skills
- 55% require artificial intelligence skills

3 Employer Demand for Digital Technology Skills

Current Workforce Skills Issues

Recruiting a workforce with the right technical skills or experience is the biggest challenge for employers currently. 75% reported this as being an issue with 28% stating it as a significant one.

A significant proportion (58%) also reported skills issues in terms of the necessary employability or work readiness skills, which is an issue increasingly affecting other parts of the economy.

Almost half (48%) of business respondents reported currently having digital technologies skills shortages or gaps in their workforce. Of this group, 64% had issues in development and implementation, with delivery and operation (29%) and relationships and engagement (27%) also notable.



3 Employer Demand for Digital Technology Skills

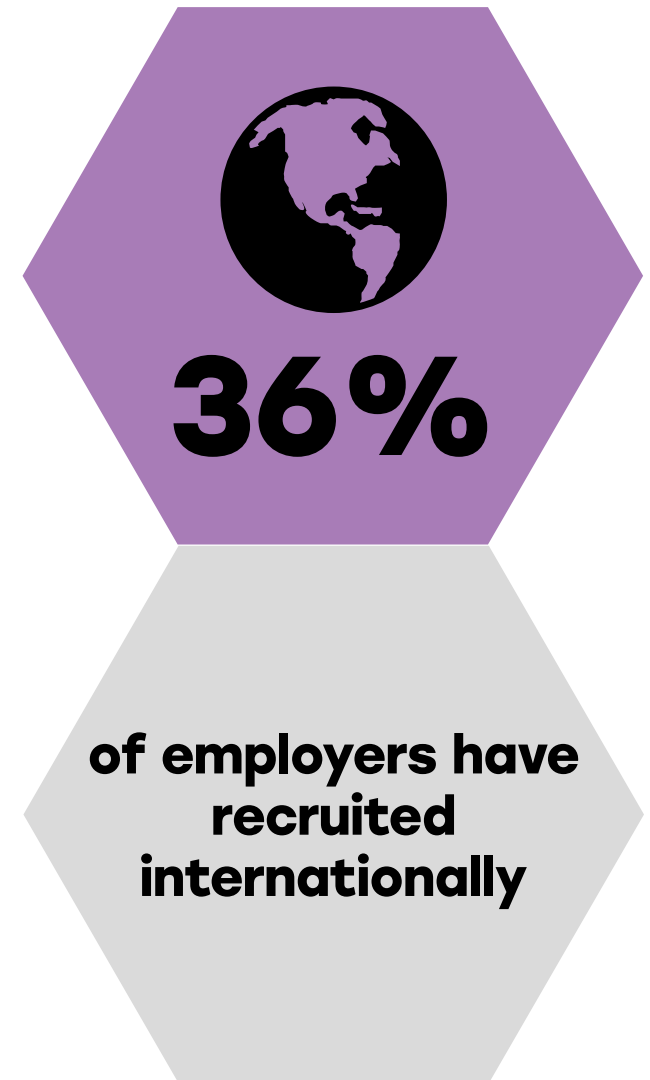
Recruitment Gaps

Almost half of employers (48%) currently have vacancies in digital technology roles. For many employers, there are challenges to filling these vacancies. Employers felt the reasons for these skills shortages and gaps were mainly due to there being a lack of required skills in Scotland and too much competition for these skills.

Employers use a variety of solutions to meet their recruitment needs and challenges including apprenticeships, internships, college and university graduates.

This illustrates employer's appetite to invest in younger and less experienced talent, however there remains more of a focus on university graduates as employers perceive them to be better equipped with technical skills and work readiness skills at this stage.

International recruitment is also being used to help fill gaps. 36% of employers have recruited tech skills internationally. The main drivers for this are a lack of UK applicants and the requirement for specialist skills and experience.



3 Employer Demand for Digital Technology Skills

Future Skills Issues

The majority of businesses (53%) expect that there will be an increase in the number of digital technologies vacancies they offer over the next 12 months.

Employers also anticipate the most significant issue in the future to be their ability to recruit people with the right technical skills or experience – 76% expect this to be an issue for them with 22% anticipating it as a significant issue. In addition, 70% of employers feel that not having the correct technical skills within the organisation will be an issue over the next three to five years.

Employer future skills issues:

- **Difficulty recruiting people with right technical skills or experience 75%**
- **Not having the correct technical skills within the organisation 70%**

3 Employer Demand for Digital Technology Skills

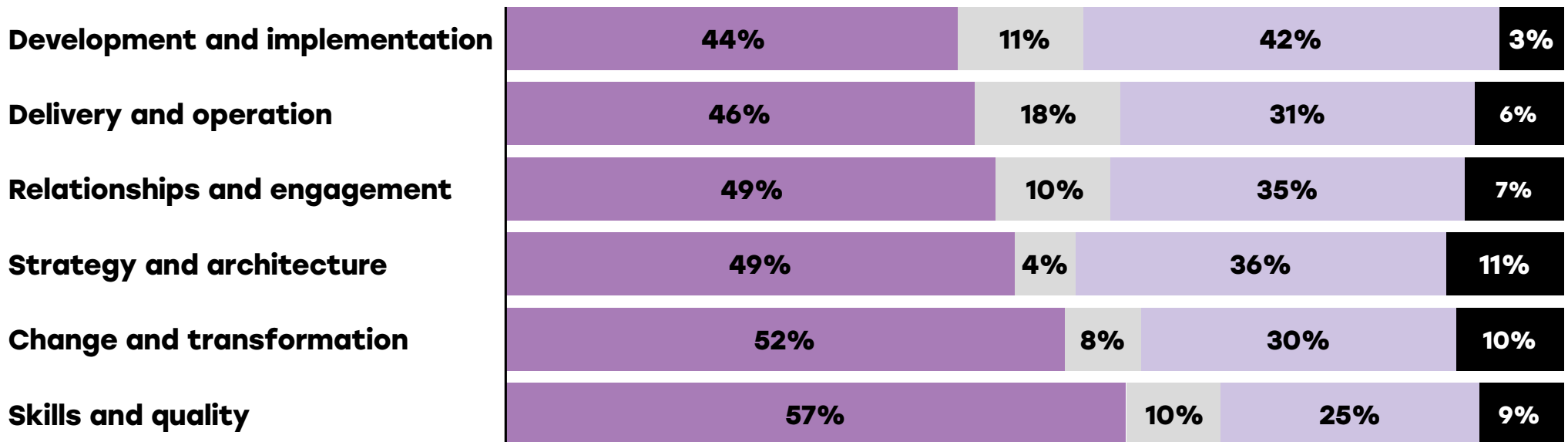
Over half employers expect to have skills issues in development and implementation,

delivery and operation, relationships and engagement, and strategy and architecture.

Most employers require these at the experienced, technical and operational level.

Anticipated skills issues over next 3-5 years

■ No skills issues ■ Entry, basic, apprentice ■ Experienced, technical, operational ■ Manager or director



3 Employer Demand for Digital Technology Skills

Demand for Emerging Technology Skills Needs

Emerging technologies are bringing with them a high requirement for new skills.

Employers expect big data and analytics to be the most urgent emerging technology skills need in the future, highlighted by over half of employers (56%). Just under half (48%) expect to need artificial intelligence and machine learning skills.

Emerging technology skills needs anticipated in future

Big data and data analytics

Artificial intelligence and machine learning

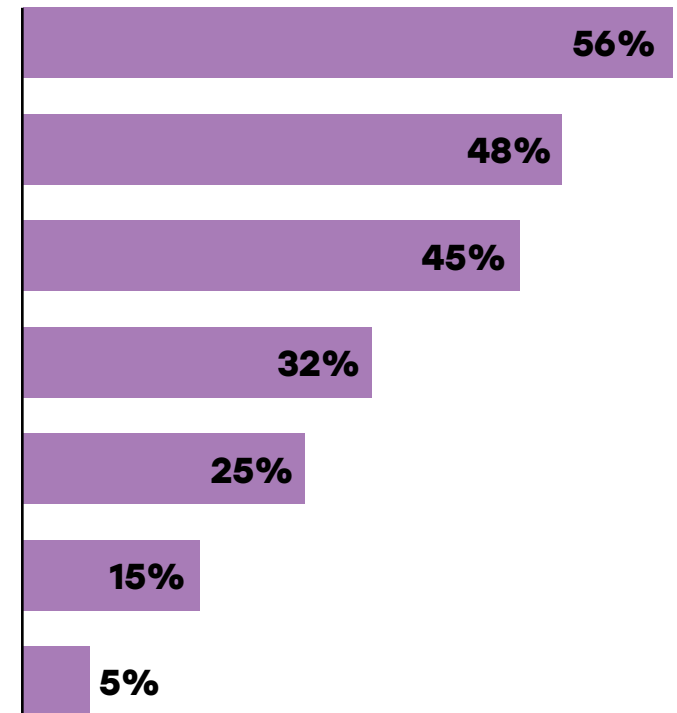
Internet of things

Virtual and augmented reality

Smart Cities and smart infrastructure

None

Other



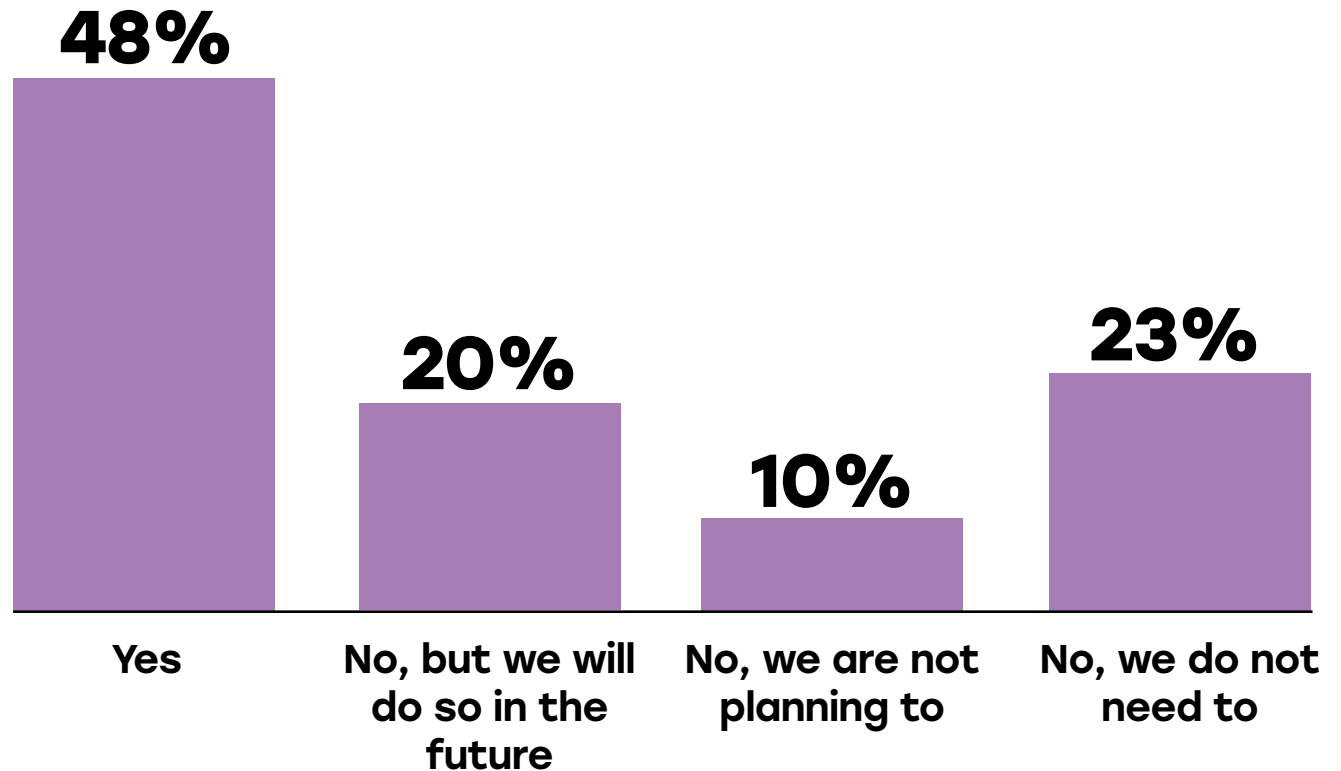
3 Employer Demand for Digital Technology Skills

Upskilling and Reskilling

Over half of employers want to provide more tech skills training to their staff.

48% of businesses are currently developing or planning to develop approaches to upskills or reskill their existing non-tech staff to support growth in tech roles, with a further 20% expecting to do so in future.

Employers currently developing or planning to develop upskilling/reskilling



Summary

- The tech sector continues to grow much faster than the overall economy.
- Employment in tech businesses and tech occupations continues to grow alongside expanding demand for tech professionals from across Scotland's sectors.
- The tech supply pipeline is expanding both in terms of the type of qualifications offered and increased range of tech related subjects.
- The number of people studying tech related qualifications at school has been fairly constant, whilst the number studying at college, university and apprenticeships is increasing.
- Employer demand for tech skills is high and expected to rise, particularly in key areas such as development and implementation, delivery and operation, and relationships and engagement.
- Emerging technologies like artificial intelligence and data are further driving demand for more specialist technology skills.

Acknowledgments

This summary report is based on “Scotland’s Digital Technologies Sector Analysis 2019” – a research study undertaken by Ekosgen on behalf of the Digital Technologies Skills Group and their partners. This study primarily involved a comprehensive desk-based analysis of the Scottish technology sector. This covered employment and enterprise data from a variety of statistical and employer sources to provide detail on the size and scale of the sector.

It also utilised occupation and industry data to build a picture of the cross-sector composition of the Scottish digital economy. In addition an in-depth review of education and training provision and qualifications was undertaken for subjects related to the digital technologies jobs. This secondary research was complemented by an online survey and consultation programme with digital technologies employers.

Further information on this research and methodology can be provided by contacting ketty.lawrence@sds.co.uk

This report has been developed and funded by Scottish Government through the Digital Scotland Business Excellence Partnership whose partners include Skills Development Scotland, ScotlandIS, Scottish Government, Scottish Enterprise, Highlands & Islands Enterprise, Scottish Funding Council, SQA, Education Scotland and Digital Technologies sector representatives.

As lead partner for the Digital Technologies Skills Investment Plan, Skills Development Scotland would like to thank Ekosgen for undertaking the research and 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.