

IT, SOFTWARE AND COMPUTER SERVICES



**Creative Industries
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Creative Industries Skills Audits

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IT, SOFTWARE AND COMPUTER SERVICES

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About Work Advance

Work Advance undertakes research, analysis and evaluation to advance understanding of developments in the world of work. We drive practical improvements in policies, programmes and practices that support inclusive and sustainable growth; productive businesses and better management practices; a skilled, agile and healthy workforce; and stronger, more vibrant and cohesive local communities.

Through our networks, we provide research, policy and consultancy services to a range of partners, including businesses large and small, trade unions, professional bodies, policymakers and wider practitioners.

Work Advance adopts an approach that is client-centred. We aim to secure practical solutions through blended research and consultancy services, as well as strong stakeholder engagement and partnership, which brings value through evidence-based and expert insights into what works. We design and support the delivery of tailored programmes and initiatives to test and trial new innovations, including help with monitoring and evaluation to track results and impact.

For further information please visit: www.workadvance.co.uk

About the Creative Industries Policy and Evidence Centre

The Creative Industries Policy and Evidence Centre (Creative PEC) works to support the growth of the creative industries in the UK through the production of independent and authoritative evidence and policy advice.

Led by Newcastle University, with the Royal Society of Arts, and funded by the UKRI via the Arts and Humanities Research Council, Creative PEC comprises a core consortium of Newcastle University, Work Advance, the University of Sussex and the University of Sheffield.

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Executive summary

1 Skills shortages when recruiting: The picture today

The tech sector is vital to the UK economy and the creative industries, but recent years have been marked by considerable volatility. With increased global competition, advances in technological developments, such as the widespread take-up of AI, and growing offshoring, the overall picture shows a slowdown, particularly in entry-level positions in software development and programming.

Just over a third (36%) of tech employers who had hired staff (including freelancers) in the past two years reported recruitment difficulties. These were mostly caused by candidates lacking the skills or experience required for the role. This was still higher than the creative industries average (32%), despite the slowdown.

In tech, skills shortages are most acute among experienced staff (with over two years' experience). Employers struggle to recruit to key creative roles. Despite wider industry trends, recruitment difficulties were evident for software developers (cited by 38% of tech employers with hard-to-fill vacancies), as well as wider technical roles, such as IT user support technicians, UI/UX designers and researchers, and IT network professionals, and business, finance, sales and marketing roles.

Skills shortages are wide-ranging: technical skills (e.g. data analytics, design, networking and cloud computing) and business skills (e.g. sales and marketing and project management) are lacking. Employers also highlighted transversal skills that are hard to find, such as planning and organising, problem-solving and decision-making.

2 Current skills gaps in the existing workforce

Alongside the challenge of skills shortages when recruiting, tech employers also pointed to skills deficiencies among their workforce. In 2025, skills gaps affected three in ten employers in the tech sector.

Many of these are transitory in nature – that is, they exist because individuals are new to their role (cited by 41% of tech employers with skills gaps) or have only partially completed the training required for their position (30%). In addition, skills gaps may be an indicator of the positive ongoing business development and transformation of firms. Examples of this include evidence that employers are introducing new technology and working practices. In a context of change, it is also of interest that nearly one quarter (24%) of tech employers said staff have not received appropriate training.

With industry trends placing increasing demands on experienced tech workers, skills deficiencies amongst the existing workforce are most common amongst workers with 5 to 10 years experience – cited by 42% of employers with skills gaps in the tech sector, compared to 37% across the creative industries.

The types of skills that employers said need improving among their workforce closely mirror those lacking in candidates, capturing a blend of technical digital skills and business and transversal skills. There was also a call for building multidisciplinary teams with a blend of core and digital skills – forming T-shaped professionals and teams with both deep and broad knowledge.

3 Jobs and skills priorities over the next three to five years

Tech employers are relatively ambitious for the future, with half expecting to grow staff numbers over the next three to five years, compared to 46% of employers across the creative industries. Further, the vast majority of employers in the tech sector that expect to expand staff numbers, also anticipate a need to upgrade workforce skills, often due to advances in new technologies and innovations in products and services.

Despite the potential threats of AI, there is an expectation that, in future, there will be a growing demand for many of the roles subject to skills shortages and gaps today: software developers, IT user support technicians, IT consultants, IT product managers, DevOps engineers and data analysts. There is also expected to be an ongoing call for business roles in sales and marketing, business development, finance, people management and project management.

Technical skills will need to keep pace with evolving technologies in areas such as quantum programming and computing, and blockchain technology; AI and machine learning (ML) (i.e. mastery of AI/ML algorithms, neural networks, and deep learning frameworks, AI-assisted development tools using AI coding assistants); data science and analytics (i.e. including data science programming, statistical analysis, data visualisation tools and handling big data); cybersecurity (i.e. malware analysis, security architecture design and secure coding practices); cloud architecture and DevOps; DevSecOps (integrating security skills into DevOps); and wireless communications.

4 Taking action to address skills challenges for the industry

Skills challenges are having a significant impact on the tech sector, with 69% of employers facing skills shortages or skills gaps reporting a business impact. Most commonly these skills challenges were increasing the workload of other staff, presenting difficulties meeting deadlines, increasing operating costs or delaying the development of new products or services.

The majority (78%) of tech employers with skills challenges are taking action in response, and around three quarters had provided training over the past year. While reported rates compare favourably with wider surveys, only a minority provide off-the-job training (6%).

Tech employers reported a range of factors influencing and/or inhibiting training patterns. While the most common reason for employers in the tech sector not offering training is that staff are fully proficient, employers also report being inhibited by a lack of funds and a lack of time for training. There was also concern about the uncertainty created by continual skills-policy changes, which risks greater confusion, instability and reduced employer engagement.

Tech employers called for more financial support and flexible training. This includes steps to enhance collaboration between industry and education providers to improve the relevance of training for the sector (e.g. enhancing HE provision and widening apprenticeship and placements offer), improvements to careers information and campaigning, and the funding of modular training such as through the Growth and Skills Levy and Lifelong Learning Entitlement.

1. Introduction to the Creative Industries Skills Audits

Throughout 2025, the Creative PEC and Work Advance embarked on a series of UK-wide Skills Audits for the creative industries and its sub-sectors. A commitment in the Creative Industries Sector Plan and funded jointly by the Department of Culture, Media and Sport (DCMS) and the Creative Industries Council, the Skills Audits have sought to provide an evidence base to enable the creative industries to speak with a united voice on current and future skill needs, pressing skills shortages and gaps, and wider workforce issues.

The Skills Audits have been delivered in two phases:

Phase 1: Assessed the skills priorities across the creative industries as a whole;

Phase 2: Examined in greater depth the skills priorities of different creative sub-sectors.

This report is part of the suite of sub-sector Skills Audits produced during Phase Two, presenting the skills needs, challenges and priorities of the tech sector.

The research utilises an adapted version of the DCMS definition of the creative industries, which includes the following Standard Industrial Classification codes for the tech sector:

58.29	Other software publishing
62.01/2	Business and domestic software development
62.02	Computer consultancy activities

The wider creative sub-sectors for the Skills Audits of the creative industries cover advertising and marketing; architecture; crafts; design and designer fashion; film, TV, video, radio and photography; IT, software and computer services; computer games; publishing; museums, galleries and libraries; music; and performing and visual arts.

The analysis for the Skills Audits is underpinned by an established labour market framework, covering issues of labour demand, occupational structure, current and future skills needs, and drivers of change (OECD, 2019). The framework provides a structured way of thinking about the different dimensions of the labour market: skills supply and demand, and the way in which they interact with one another.

The research team deployed a rigorous, five-stage approach to developing the Skills Audits, including:

- **Rapid evidence review**, examining evidence on skills issues across the creative industries, in different UK nations and sub-sectors, produced by government, industry stakeholders and the research community;
- **Secondary data analysis** of official, government sources of labour market information (or 'top-down labour market information') to provide a robust, consistent and comparable baseline;

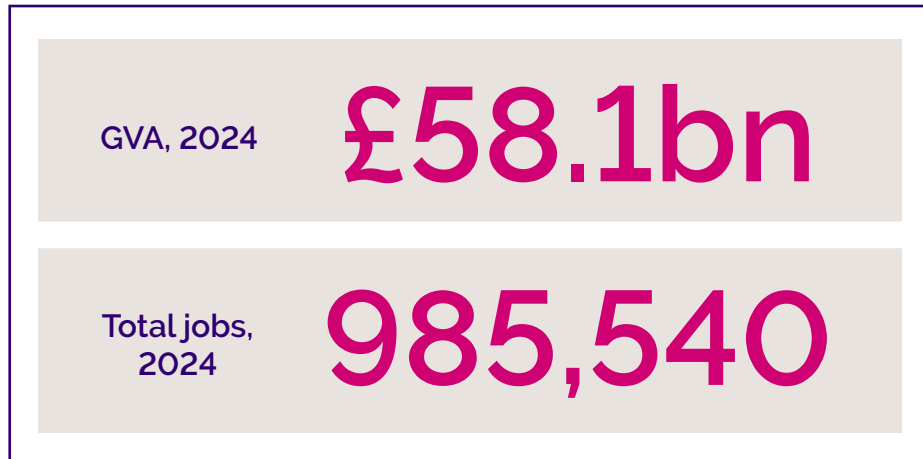
- **New primary research** – the Creative Employer Skills Survey (CESS) – including over 1,300 telephone interviews with employers across the creative industries to explore their perspectives on skills priorities, the talent pipeline, barriers and enablers to skills investment;
- **A series of roundtables** bringing together government, national and subnational creative agencies, trade bodies, unions, creative businesses, major cultural organisations and education providers to promote shared consensus on skills priorities;
- **Reporting and dissemination**, including the production of the Creative Industries Skills Audit and a suite of eleven sub-sector audits.

The Skills Audits have been overseen by a Project Board comprised of the project funders, Skills England and members of the research consortium. It was also informed by a Steering Group that included representatives of government from each UK nation and every creative industries sub-sector.

Figure 1: Developing the Creative Industries Skills Audits



2. Sector profile and performance



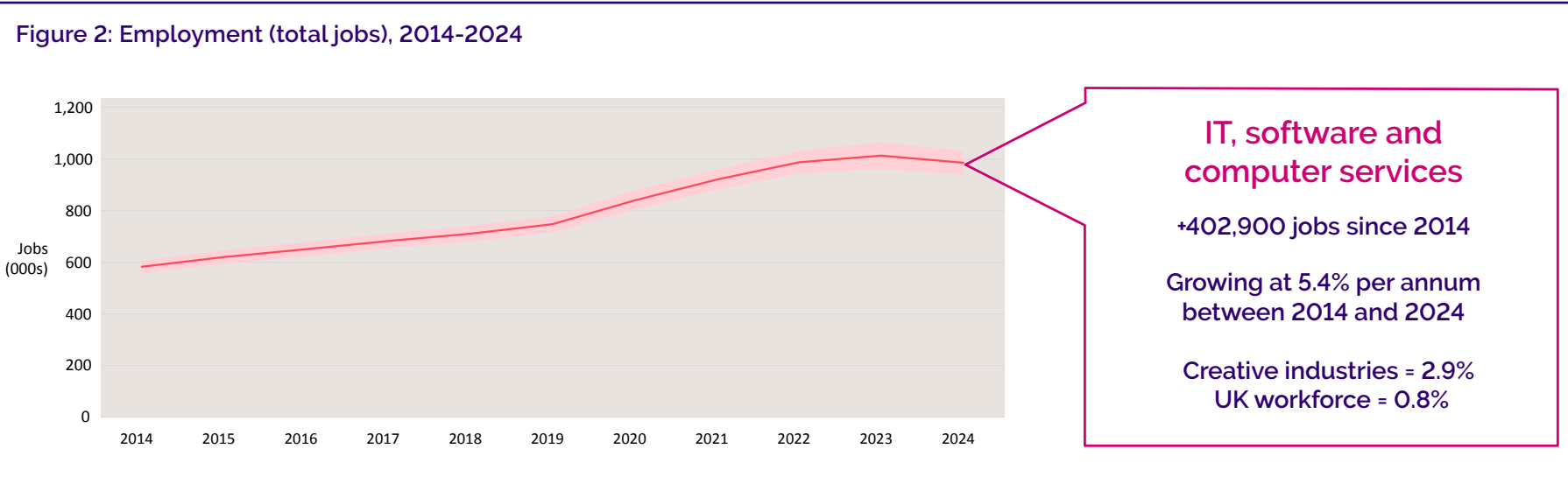
The tech sector is vital to the UK economy and the creative industries. Indeed, with an annual contribution of £58.1bn in gross value added (GVA) and with employment just under one million in 2024, this makes it the largest sub-sector within the creative industries (around 40%).

The sector encompasses a range of digital technology activities such as software development, computer programming and consulting, data services and related IT professional services (with video games excluded for this report's scope). These IT activities underscore its critical function, not only within tech firms but are also across other sectors in the economy.

Over the past decade, the number of jobs in the tech sector has expanded rapidly, with employment growth of 5.4% per annum between 2014 and 2024. This equates to an increase of over 400,000 jobs. This rate of growth is the highest for any sub-sector within the creative industries during this time and exceeds the average for the creative industries and the UK workforce as a whole.

With increasing demand for tech jobs, both within and outside the tech sector, long-term growth has been economy-wide. Yet the distribution of digital talent is uneven across the country. So, while London and the South-East of England have hosted a large share of tech workers, the growth in talent elsewhere has not always kept pace. For instance, Scotland, Wales and Northern Ireland have smaller talent pools, which can be compounded by problems attracting talent to certain, especially remote, locations. In England, London accounts for 59% of the UK tech sector's total value. The East Midlands, Scotland and the North-East of England have been the fastest-growing tech hubs in the UK (Tech Nation, 2025).

That said, despite the longer-term picture, more recently growth in the UK tech sector has slowed (National Foundation for Educational Research, 2025). Pressures on the global economic climate, increased competition and advances in technological developments, such as the widespread take-up of AI, have substantially affected opportunities for tech workers and demand for software development and programming roles. While some technical areas like AI have seen growth, the overall picture shows a slowdown, particularly in entry-level positions, and companies are increasingly offshoring work for cost savings. This was confirmed by employers at the roundtable.



Source: DCMS (2025a, 2025c)

Notes: GVA at current prices. GVA data for 2024 is provisional. Employment is total number of filled jobs, including second jobs and including both employees and self-employed workers in all occupations. The shaded confidence band represents the plausible range around the central estimate (95% confidence interval). It reflects the uncertainty in the data: when the band widens, the estimate is less precise; when it narrows, the estimate is more reliable. Growth rates are compound annual growth rate (CAGR).

3. Jobs and skills

There are some distinct and common features of work in different parts of the creative industries. As much of the work is often cyclical, commission-driven and project-based in the sector as a whole (Carey, Giles and O'Brien, 2023), levels of self-employment are generally high overall and double the UK economy average (28% vs 14%). That said, the position in the tech sector is different and self-employment accounts for only 11% of the tech workforce – so levels are below those of not only the creative workforce but also the UK economy.

In line with the creative industries workforce generally, which is highly skilled, the tech sector is highly qualified. Indeed, 70% of workers have a degree or higher qualification. Technical roles typically require a relevant field such as computer science, software engineering or data science (Skills England, 2025). That said, the occupational profile is quite distinct to meet sub-sectoral skills demands, and the types of role are context specific and largely centred on developing and deploying technology. For example, Skills England categorises tech roles into broad areas:

- Digital production, design and development, covering software engineering, product design and architecture, and building and testing software components;
- Digital support services and operations, covering the design, installation, maintenance and support of IT operations, systems and infrastructure; network/telecoms engineering and the selection and maintenance of devices; cloud storage and management; and cybersecurity; and

- Digital business services, managing digitally enabled solutions to improve business functions, e.g. use of AI/ML, fintech, e-commerce and communications.

Such knowledge-intensive jobs, in high demand, also support higher than average salaries (techUK, 2025).

What distinguishes this sector is the concentration of specialist digital skills at the cutting edge rather than just basic digital literacy (e.g. software engineering and AI). Existing research (techUK, 2021; Hyve 2024) points to crucial technical skills including programming (e.g. proficiency in Java, Python, JavaScript, C#/.NET and SQL), software development methodologies (Agile/Scrum, DevOps practices), data analysis and database management, ML and AI techniques, cybersecurity (network security, ethical hacking and risk management), cloud computing services and architecture, and systems analysis and design. Modern businesses also demand transferable skills: problem-solving, logical reasoning, communication, teamwork, creativity and innovation, continuous learning, and adaptability. With the application of tech to different business contexts, demands are also growing to combine tech know-how with other domain expertise (e.g. creative design, scientific research, business strategy and marketing).

Despite the dynamism in the tech sector, it struggles to advance workforce diversity (Department of Science, Innovation and Technology, 2024). While there has been progress among people from ethnic minority groups, so that there is a higher representation compared to the economy as a whole (23% vs 16%), there is still room for improvement more generally. Indeed, underrepresentation in the tech sector is persistent across various demographics, including gender, disability and socioeconomic background (Department of Science, Innovation and Technology, 2024; Carey, Giles and O'Brien, 2023). Furthermore, there is concern that steps to enhance diversity through recruitment are hard to retain at mid-career and leadership levels, as problems with retention risk perpetuating a persistent 'leaky pipeline'.

Figure 3: Employment status of the workforce, 2022-2024

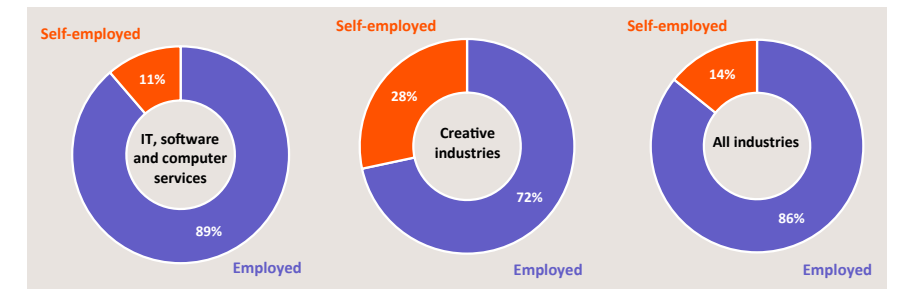


Figure 4: Workforce qualifications (% degree-qualified), 2022-2024

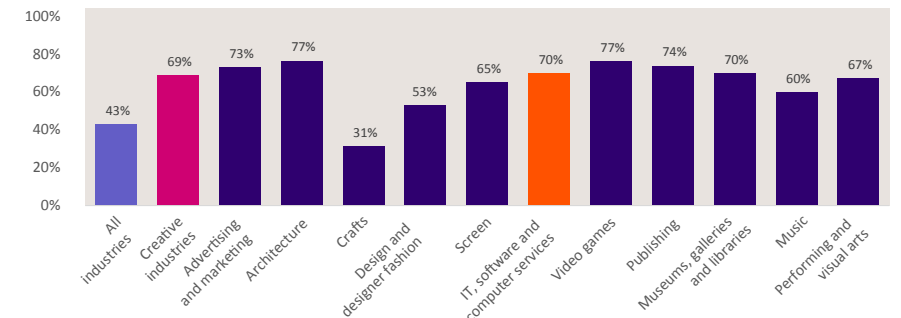
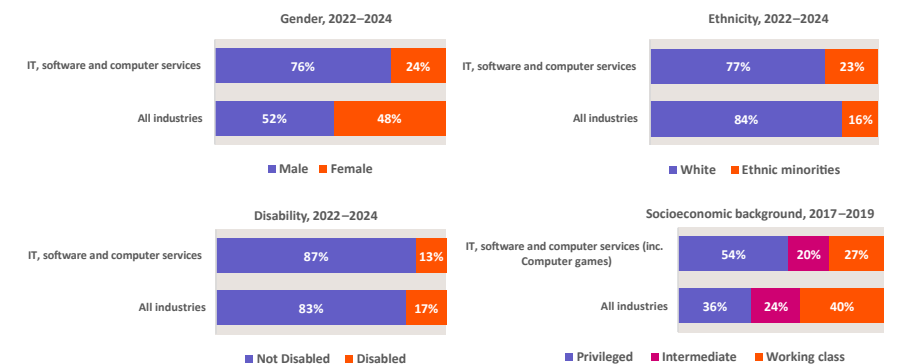


Figure 5: Workforce diversity



Source: DCMS (2025a); Carey, Giles and O'Brien (2023)

Notes: Data based on a three-year pooled sample from the ONS Annual Population Survey. Data for socioeconomic background is from the Creative PEC Good Work Review – see Carey, Giles and O'Brien (2023) for further information on the definitions used.

4. Recruitment difficulties

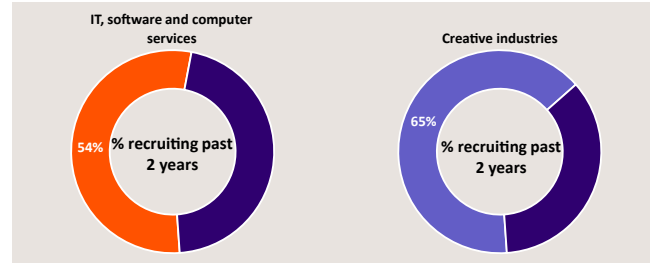
CESS 2025 enables the examination of skills mismatches, where employers' skills demands cannot be met. This starts with recruitment difficulties and skills shortages when employers are looking for talent in the external labour market. We found that, in line with broader evidence (DCMS 2024), over the last two years, recruitment has been less buoyant, with only around half of employers in the tech sector (54%) recruiting. This includes agency staff and freelancers. This is lower than levels across the creative industries overall (65%).

Furthermore, CESS 2025 identified parallels in the mechanisms for recruitment between the tech sector and the creative industries as a whole, with the most popular methods involving the use of online job platforms and word of mouth. In contrast, more tech employers also deployed recruitment consultants compared to the sector as a whole.

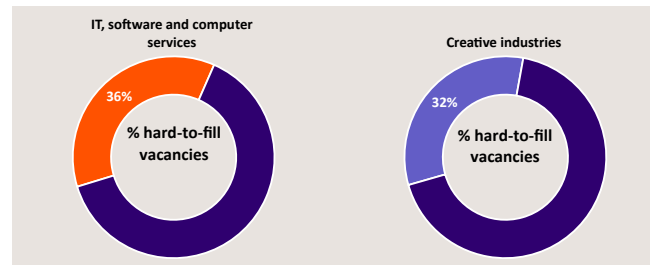
Around a third of recruiting tech employers (36%) had hard-to-fill vacancies, which is higher than the average across all creative industries employers (32%). Recruitment difficulties in the tech sector were more likely to be due to a lack of required skills (75%) and, to a lesser extent, work experience (44%) and required qualifications (19%). This was broadly similar to the picture for the creative industries. That said, slightly fewer tech employers reported that work experience was an issue compared to the creative industries overall. Furthermore, a lack of required attitude or motivation was less of an issue for tech employers, as were poor terms and conditions. In contrast, slightly more tech employers highlighted issues with competition from other employers.

Figure 6: Hiring and recruitment difficulties, 2025

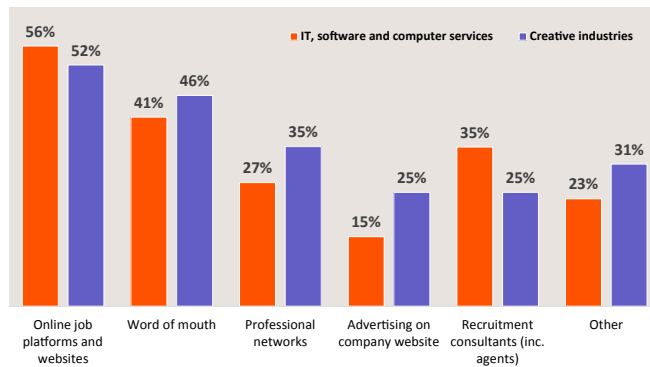
Q: Has this site recruited anyone, including any paid employees, agency staff, and self-employed or freelance workers, in the past two years?
Base = all establishments [n = 252]



Q: Did any of the vacancies you had at this site in the past two years prove hard to fill?
Base = establishments that have recruited in the past two years [n = 161]



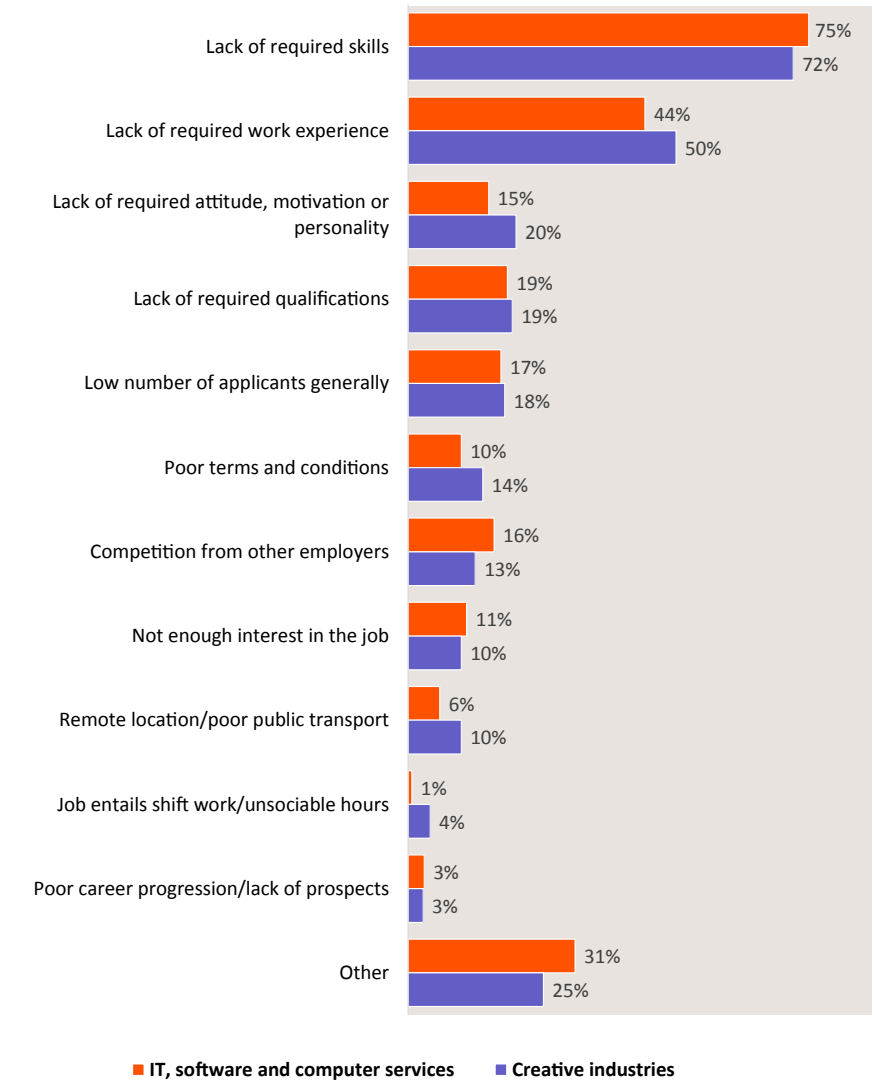
Q: What recruitment methods do you use to fill vacancies at this site?
Base = establishments that have recruited in the past two years [n = 161]



Source: CESS 2025

Figure 7: Main causes of recruitment difficulties, 2025

Q: What were the main causes of your vacancies for [occupation] being hard to fill?
Base = establishments with hard-to-fill vacancies [n = 62]



Source: CESS, 2025

5. Skills shortages

Taking the skills responses together, CESS 2025 shows that skills shortages are the main cause of hard-to-fill vacancies. Indeed, 75% of tech employers reported that their vacancies were hard to fill due to candidates lacking the required skills, qualifications or experience. This was slightly lower than levels for the creative industries (79%).

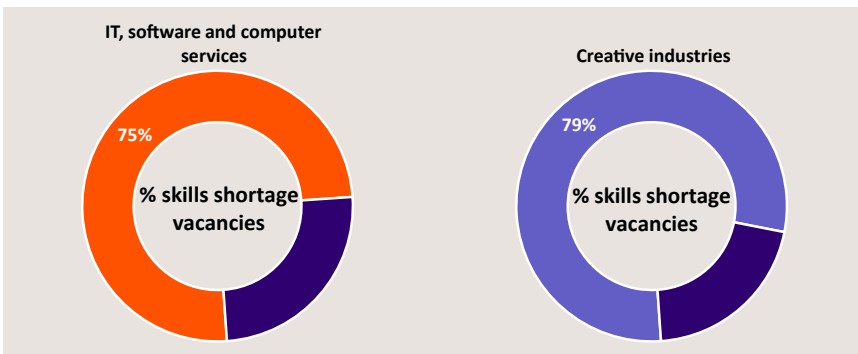
The highest share of recruiting employers in the tech sector who were experiencing skills shortages were seeking candidates with more expertise: particularly with five to ten years' experience (37%). This aligns with the findings of wider research that shows mid-level and senior positions are more in demand than entry-level roles as technology and markets change, and, as such, are especially hard to fill.

In contrast, only a quarter of tech employers found problems at entry level.

Tech employers outlined a wide range of occupations that were proving hard to fill. The most common were specialist digital roles. Despite wider industry trends, recruitment difficulties were evident for software developers (cited by 38% of employers with hard-to-fill vacancies), as well as wider technical roles, such as IT user support technicians, UI/UX designers and researchers, and IT network professionals. In terms of the broad picture of demand, this aligns with existing research (techUK, 2024) pointing to a need for data analysts, cybersecurity professionals, web developers, IT managers and DevOps engineers, combining software development and operations. Other generic roles were also identified, including business and sales executives, customer service occupations and administrative roles.

Figure 8: Hard-to-fill vacancies caused by skills shortages, 2025

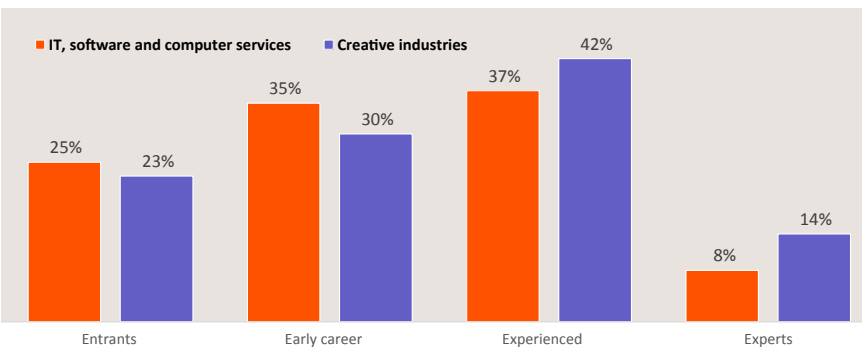
Q: What were the main causes of your vacancies for [occupation] being hard to fill? = Lack of applicants with required skills, qualifications or experience
Base = establishments with hard-to-fill vacancies (n = 62)



Source: CESS, 2025

Figure 9: Seniority of roles with skills shortages, 2025

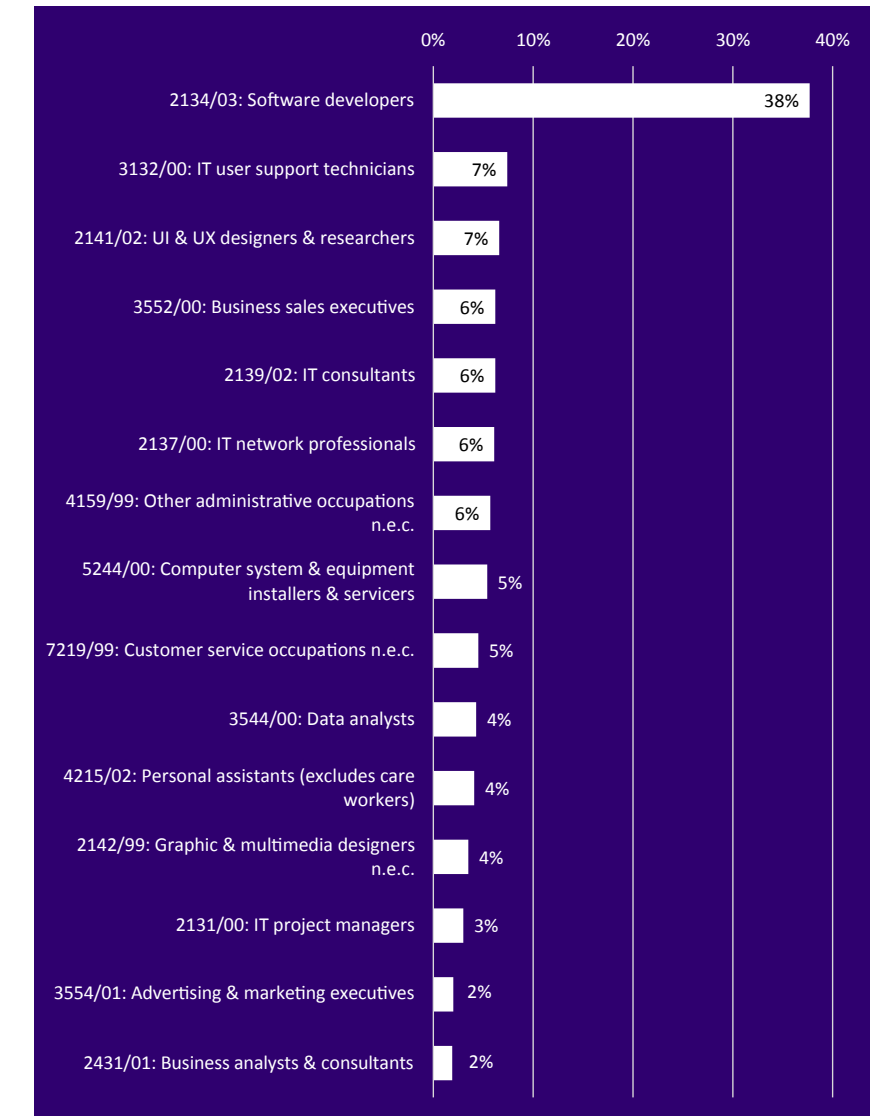
Q: How would you describe the level of experience or seniority of the candidates sought for [skills shortage occupation] vacancies?
Base = establishments with skills shortage vacancies (n = 48)



Source: CESS, 2025

Figure 10: Hard-to-fill occupations (six-digit Standard Occupational Classification [SOC]), 2025

Q: For which specific occupations did vacancies at this site prove hard to fill?
Top fifteen occupations cited. Base = establishments with hard-to-fill vacancies (n = 62)



Source: CESS, 2025

5. Skills shortages (continued)

CESS 2025 identifies the main specialist skills lacking among applicants in the tech sector for those employers with skills shortages. This points to challenges finding expertise in advanced programming, development and software architecture; experience with digital frameworks and tools (e.g. cloud platforms and AI-development/ML skills); cybersecurity expertise; data engineering and big data analytics skills (e.g. database management and data visualisation skills); and UI/UX design skills. Wider business skills shortages included sales, marketing and project management.

CESS 2025 asked explicitly about IT skills and found that 66% of employers with skills shortages identified areas where digital skills are currently lacking. Unsurprisingly, this highlighted more problems obtaining many digital skills within the tech sector than the creative industries as a whole. For example, a higher share of employers reported difficulties finding skills in specialist software and hardware, building and maintaining IT systems/networks, and web development. When asked for further details on the digital skills lacking, responses covered a number of areas, including programming and coding (e.g. proficiency in Java, Python, JavaScript, C#/.NET and SQL), software development methodologies (Agile/Scrum and Spring Boot), data and business analysis (e.g. data visualisation tools such as Amazon QuickSight, and Microsoft Azure and Power BI), cybersecurity (network security, ethical hacking and risk management), cloud computing services, ML/AI techniques, and systems analysis and design. Employers' insights at the roundtable stressed the need for IT and business architects, combining tech know-how with other domain expertise (e.g. creative design, scientific research, business and marketing) to develop bespoke solutions.

Figure 11: Specialist skills shortages, 2025

Q: Have you found any specialist skills or knowledge needed to perform the role difficult to obtain from applicants for [skills shortage occupation] vacancies? If so, what specific specialist skills or knowledge have been lacking?

Base = establishments with skills shortage vacancies [n = 48]

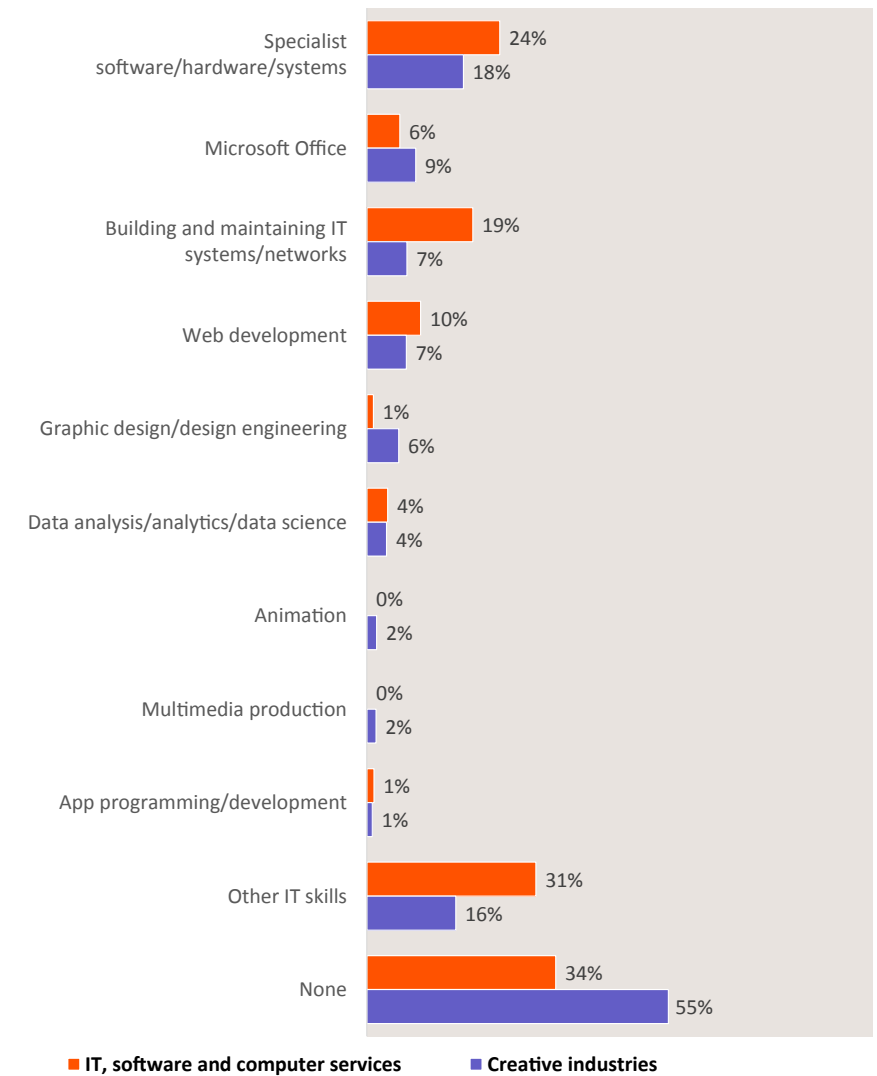


Source: CESS 2025

Figure 12: Digital skills shortages, 2025

Q: Have you found any basic or advanced IT skills difficult to obtain from applicants for [SS Occupation] vacancies. If so, what specific IT skills have been lacking?

Base = establishments with skills shortage vacancies [n = 48]



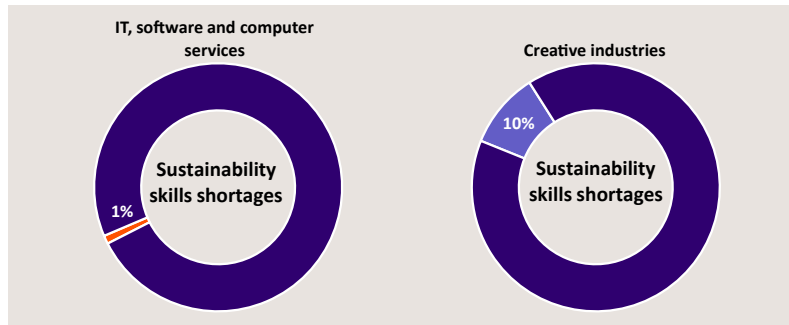
Source: CESS, 2025

5. Skills shortages (continued)

Figure 13: Sustainability skills shortages, 2025

Q: Were any of the skills you have found difficult to obtain from applicants for [SS Occupation] vacancies related to wanting to be more sustainable or carbon-neutral? If so, what specific sustainability or 'green' skills have been lacking?

Base = establishments with skills shortage vacancies (n = 48)



In an increasingly automated modern economy characterised by constant disruption, transversal skills are key.

CESS 2025 suggests that, in line with previous research (Giles, Carey and O'Brien, 2025), the core skills tech employers reported were the most difficult to find are those such as planning and organising, working with others, speaking and adapting.

While this picture broadly mirrors the creative industries, it appears a higher share of tech employers point to difficulties with planning and organising skills and problem-solving and decision-making skills relative to the sector as a whole.

Wider research reinforces the need to combine technical and transversal skills (Skills England, 2025) such as numerical and data capability,

practical problem-solving, communication (written and spoken including presentation and storytelling skills), teamwork and business skills (e.g. consulting, data analysis, finance and stakeholder management).

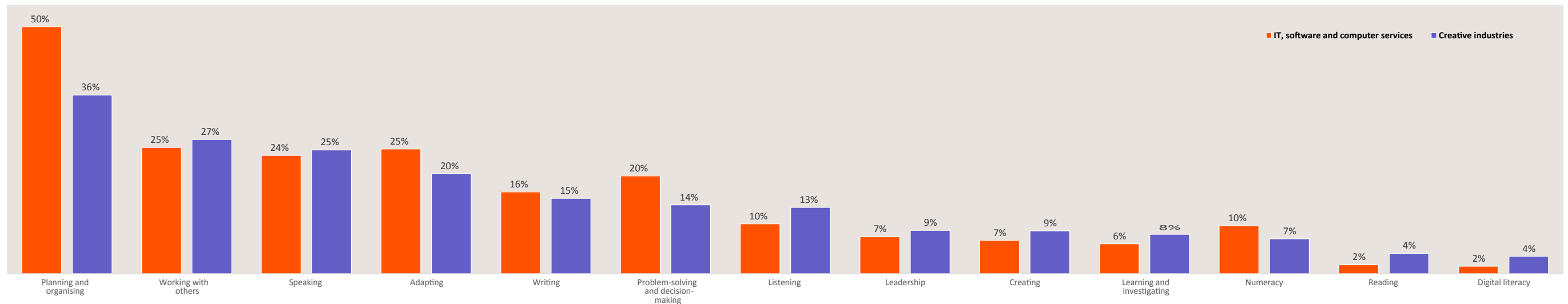
It also references the need for continual upskilling and to keep skills accredited and updated (e.g. up-to-date certification for cloud computing and security).

CESS 2025 also provides up-to-date information about difficulties finding applicants with sustainability or carbon-neutral skills. It appears that this was less of an issue overall for either the tech sector or the creative industries. Indeed, only 1% of the tech employers with skills shortages reported candidates were lacking skills associated with organisational sustainability goals, compared to 10% for creative industries employers overall.

Figure 14: Core skills shortages, 2025

Q: Have you found any core or 'transversal' skills difficult to obtain from applicants for skills shortage occupation vacancies? If so, what specific core or transversal skills have been lacking?

Base = establishments with skills shortage vacancies (n = 48)



6. Skills gaps

When considering skills deficiencies among their current workforce, just under a third of all employers (30%) within the tech sector reported skills gaps. This is similar to the picture for the creative industries overall.

While levels of skills gaps appear higher than those seen in the Employer Skills Survey 2022 – at 11% of employers (Giles, Carey and O'Brien, 2025) – in part, this potentially reflects the broader assessment of the workforce. Indeed, CESS captures agency staff and self-employed and freelance workers, in addition to employees, in reviewing the existence of skills gaps. There are a variety of factors contributing to skills gaps. According to CESS

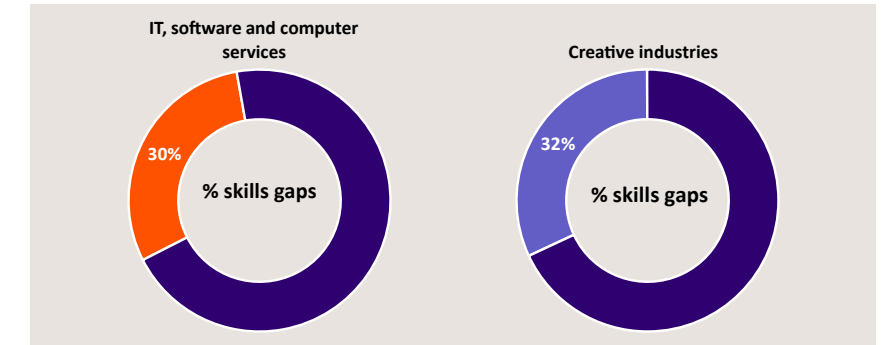
2025, the most common causes are transitory, as with wider research (Giles, Carey and O'Brien, 2025). That is, they exist because individuals are new to their role (cited by 41% of tech employers with skills gaps) or have only partially completed the training required for their position (30%).

In addition, skills gaps may be an indicator of the positive ongoing business development and transformation of firms. Examples of this include evidence that employers are introducing new technology and working practices. In a context of change, it is also of interest that a significant share of tech employers reported that staff have not received appropriate levels of training (cited by 24% of tech employers with skills gaps).

Figure 15: Skills gaps, 2025

Q: Thinking about your current workforce (including employees, agency staff, self-employed or freelance workers), approximately what percentage would you regard as fully proficient at their job? <100%.

Base = all establishments (n = 252)

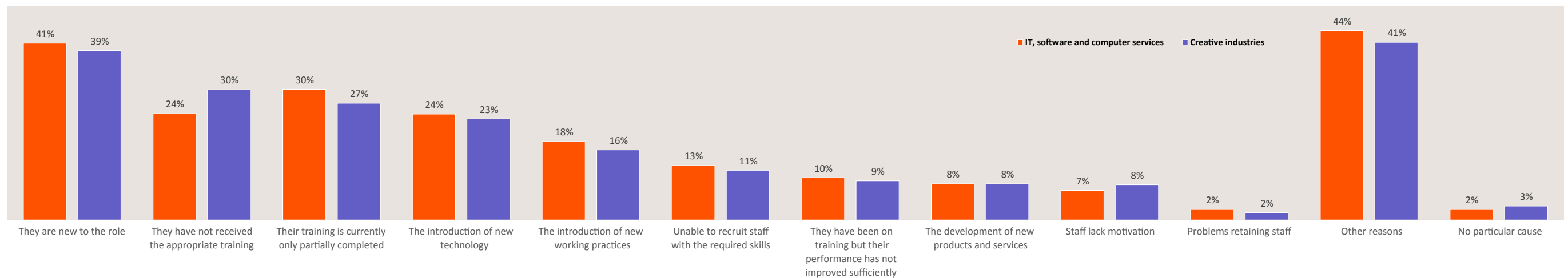


Source: CESS 2025

Figure 16: Main causes of skills gaps, 2025

Q: What are the main causes of staff in [skills gap occupation] not being fully proficient at their job?

Base = establishments with skills gaps (n = 83)



Source: CESS, 2025.

6. Skills gaps (continued)

In line with industry trends that are reported to be placing increasing demands on experienced tech workers (highlighted earlier), CESS 2025 found that the majority of tech employers are seeing skills gaps among more experienced, existing workers.

Indeed, 42% of tech employers reporting skills gaps suggest these affect experienced staff with five to ten years of experience – a higher share than for the creative industries as a whole (37%). In contrast, only a fifth of employers in tech firms saw skills gaps among entrants with less than two years' experience.

CESS 2025 also provides an indication of the nature of roles where there are skills gaps. The most common roles with gaps were technical and specialist digital roles. Again, as with skills shortages, the biggest area of concern was for software developers (cited by 24% of tech employers with skills gaps). Wider roles were also mentioned, including IT user support technicians (10%) and computer analysts and scientists (7%). However, technical roles were not the only ones with skills issues, and wider more generic roles

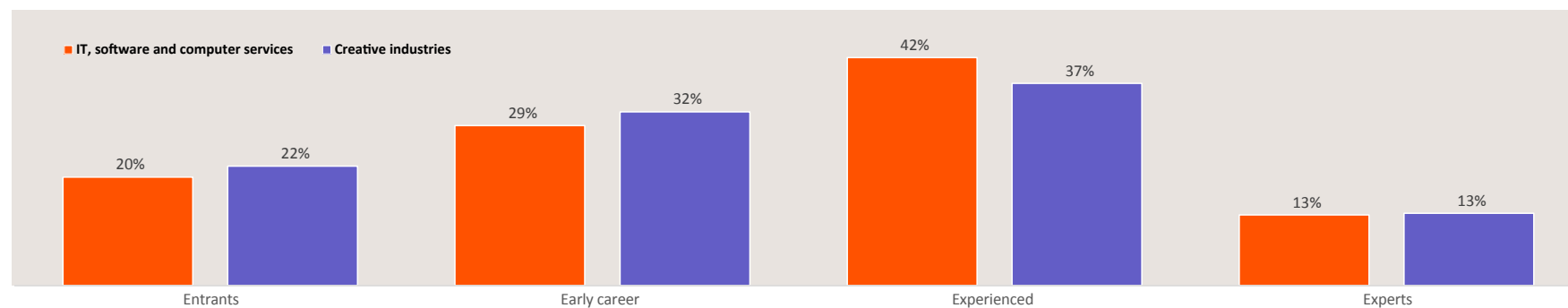
were identified in business, finance, and sales and marketing, including business sales executives (7%), accounting clerks and bookkeepers (6%) and marketing associate professionals (3%).

These occupations facing skills gaps align to those identified by wider research (techUK, 2025). Indeed, existing evidence suggests that due to the breakneck speed of tech innovation and the continual need for upskilling amid intense labour market competition for highly experienced staff, there are problems maintaining proficiency in key specialist areas as technologies, languages and tools evolve.

These occupations include software developers (i.e. full-stack and specialised developers working on a whole, or part of an application), cybersecurity specialists, data engineers and analysts, cloud and DevOps engineers maintaining cloud-based IT environments, network and telecoms engineers working with advanced connectivity technologies (ACTs, e.g. 5G/6G) and AI specialists. At the same time, advanced digital skills (e.g. AI, cybersecurity, cloud computing and digital leadership) are being sought in a range of wider business roles, especially among managers.

Figure 17: Seniority of staff with skills deficiencies, 2025

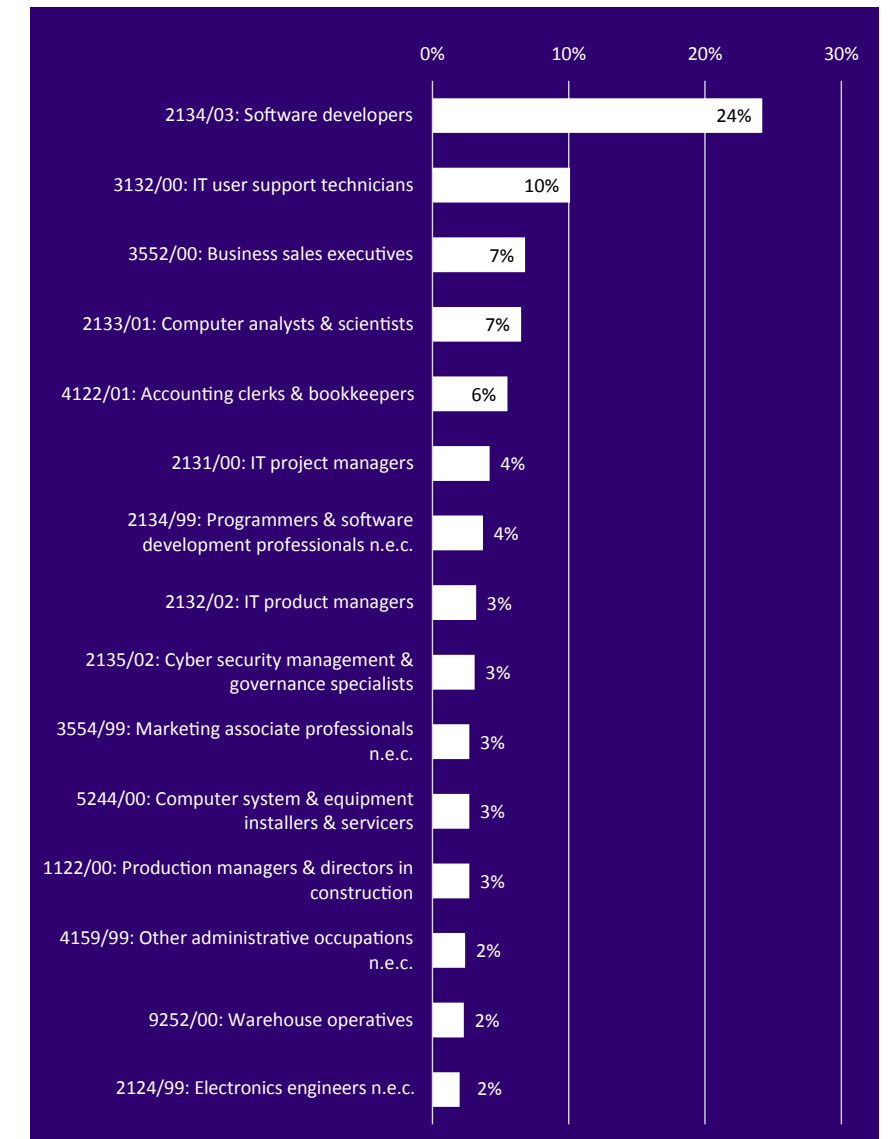
Q: How would you describe the level of experience or seniority of the staff working as [skills gap occupation]?
Base = establishments with skills gaps (n = 83)



Source: CESS 2025

Figure 18: Skills gap occupations, 2025

Q: In which specific occupations are staff not fully proficient at their role?
Top fifteen occupations cited. Base = establishments with skills gaps (n = 83)



Source: CESS, 2025

6. Skills gaps (continued)

CESS 2025 identifies the main specialist skills lacking in the tech sector workforce where tech employers reported a lack of full proficiency. These include modern software engineering practices and advanced programming keeping up to date with and deploying evolving languages and IT tools/frameworks (e.g. Agile methods, Spring Boot, AI and ML), networking and cloud solutions expertise, cybersecurity expertise, data engineering and big data analytics skills, UI/UX design skills, and continuous learning capability to adopt new technologies like AI, quantum computing, blockchain technology and ACTs.

The tech employers also reported skills gaps among broader business areas, including finance, people management, sales, marketing and project management.

CESS 2025 found that when tech employers were asked explicitly about IT skills gaps, around one third (34%) reported them as an area of concern. Specific skills lacking covered basic and more advanced IT skills, ranging from Microsoft Office skills to more specialist software/hardware/systems, data analysis and web development skills.

When asked for further details on exactly which digital skills were lacking, employers highlighted a wide range of skills, confirming that digital skills increasingly apply in non-digital roles. Indeed, this included basic digital skills, data literacy and data analysis to enable all staff to effectively use IT tools such as ML and AI. But advanced digital skills were also reported to be missing. These shortages and gaps (e.g. in digital leadership and strategic tech understanding) were identified among both technical staff and managers.

Figure 19: Specialist skills gaps, 2025

Q: Do any of your staff working as [skills gap occupation] lack full proficiency in terms of specialist skills or knowledge needed to perform the role? If so, what specific specialist skills or knowledge are they lacking full proficiency in?

Base = establishments with skills gaps (n = 83)

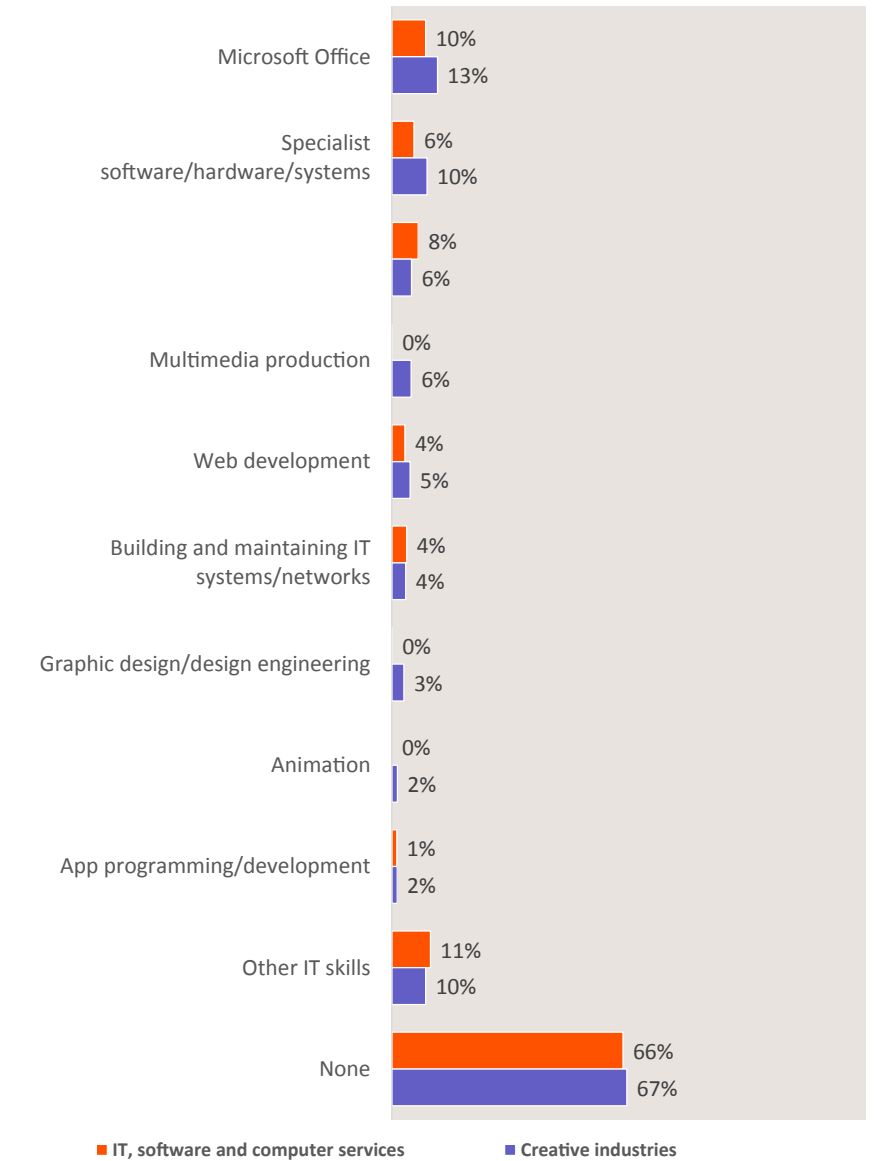


Source: CESS 2025

Figure 20: Digital skills gaps, 2025

Q: Do any of your staff working as [skills gap occupation] lack full proficiency in terms of basic or advanced IT skills? If so, what specific IT skills do you feel need improving?

Base = establishments with skills gaps (n = 83)



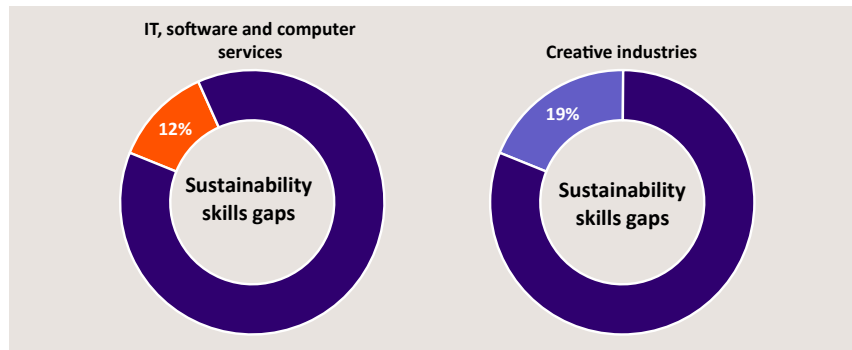
Source: CESS, 2025

6. Skills gaps (continued)

Figure 21: Sustainability skills gaps, 2025

Q: Were any of the skills you mentioned needing improving among staff working as [skills gap occupation] related to wanting to be more sustainable or carbon-neutral? If so, what specific sustainability or 'green' skills are they lacking full proficiency in?

Base = establishments with skills gaps (n = 83)



The existing research highlights the challenges of building the right mix of generic skills, alongside growing digital capabilities, among the existing workforce (Skills England, 2025). This is confirmed by CESS 2025, which found that core transferable skills were reported to be deficient among the workforce by some tech employers, as well as amongst candidates when recruiting (seen earlier).

The most common skills gaps identified were planning and organising skills (25%), working with others (24%), adapting (17%), speaking (17%) and problem-solving (16%).

Employers' insights from the roundtable, combined with existing research, underlined a range of generic skills that are required in tech businesses. These include numerical and data capabilities, practical problem-solving,

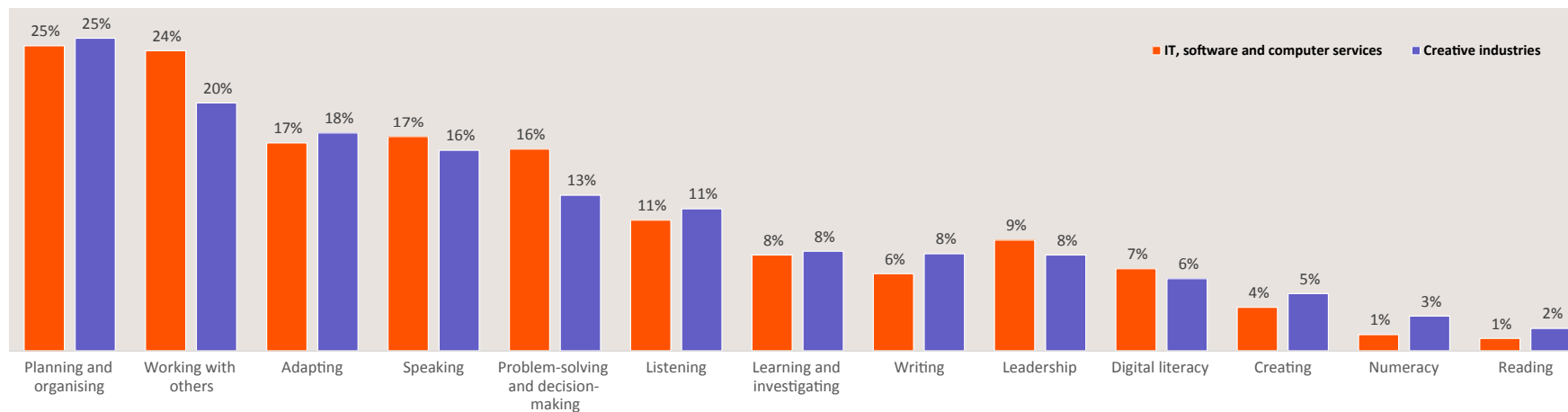
communication (written and spoken, including presentation and storytelling skills), teamwork and business skills (e.g. consulting, data analysis, finance and stakeholder management). This also references the need for continual upskilling and to keep skills accredited and updated (e.g. up-to-date certification for cloud computing and security).

Employers' insights from the roundtable confirmed that, as the take-up of digital skills and knowledge across firms becomes more pervasive, this increases demand for building multidisciplinary teams with a blend of core and digital skills – forming T-shaped professionals and teams with deep and broad knowledge. This confirms the value of team working, problem-solving and communication, for example. In such a context, firms no longer wish to rely on making use of existing off-the-shelf IT tools and applications, offered, for example, by core IT providers such as Microsoft, Amazon and Google. A key focus is to find ways to enable more responsive digital services, so that IT experts and specialists can work across business domains to design more user-centred and bespoke IT solutions.

Figure 22: Core skills gaps, 2025

Q: Do any of your staff working as [skills gap occupation] lack full proficiency in terms of core or 'transversal' skills? If so, what specific core or transversal skills do you feel need improving?

Base = establishments with skills gaps (n = 83)

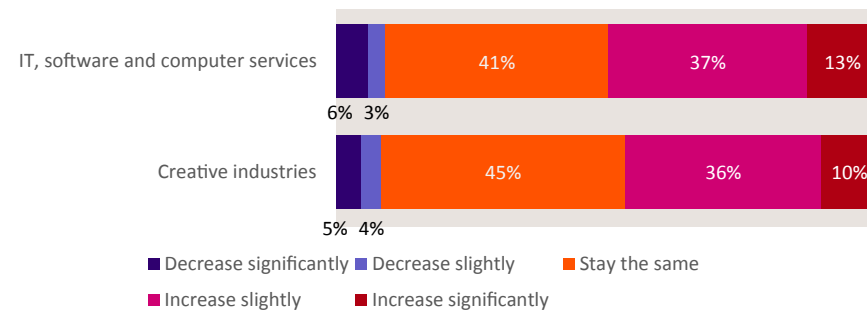


With a growing awareness of environmental issues for businesses, CESS 2025 also reviewed the emphasis on sustainable or carbon-neutral skills among the existing workforce. This highlights that employers are more concerned about skills gaps in this area among existing workers than skills shortages among potential recruits. Indeed, a higher share of tech employers with skills gaps reported staff lacked sustainability or green skills (12%), albeit at lower levels than creative industries employers overall (19%).

7. Future jobs and skills needs

Figure 23: Employer expectations for employment in the next three to five years, 2025

Q: Over the next three to five years, how do you expect the number of staff (including employees, agency staff, self-employed or freelance workers) at this site to change?
Base = all establishments (n = 252)



Source: CESS 2025

CESS 2025 provides an indication of employers' expectations for the future and whether they anticipate the need to increase levels of employment and upskill their workforce in the next three to five years. This points to a fairly high degree of ambition, especially in the tech sector.

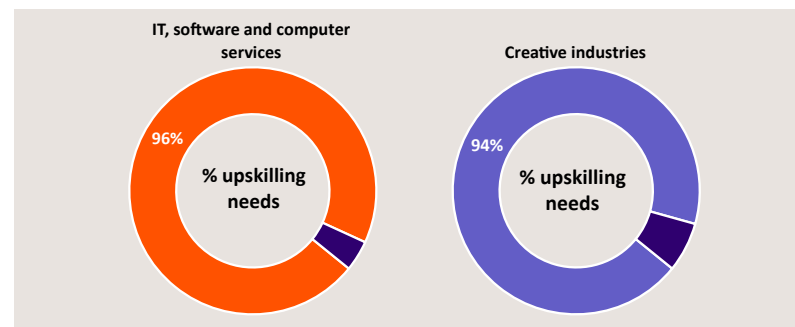
Indeed, half of tech employers expect to be increasing the number of staff they employ over this period (vs 46% of creative industries employers). Further, the vast majority (96%) of tech employers that expect to grow staff numbers also anticipate a need to upgrade the skills of their workforce over the next three to five years (compared to 94% in the creative industries).

A closer examination of the reasons behind business requirements to acquire new skills among the workforce shows that a considerably high share of employers reported technological advancement and innovation as key drivers.

This is seen, for example, through the introduction of new technologies or equipment (cited by 80% of tech employers with upskilling needs), the development of new products and services (84%), and the introduction of new working practices (56%). That said, new legislative requirements are also a fairly significant factor (69%) and at higher levels than in the creative industries as a whole (63%)

Figure 24: Employer expectations for upskilling in next three to five years, 2025

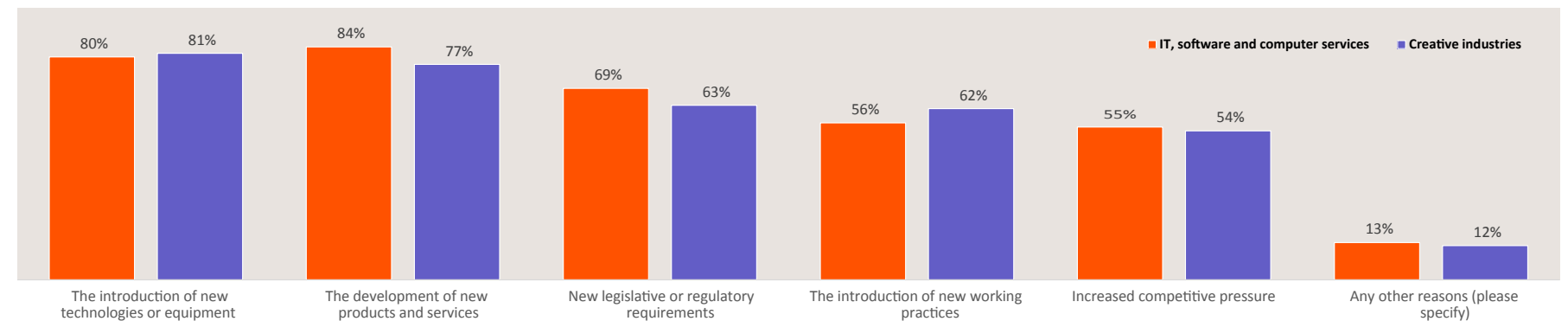
Q: Over the next three to five years, do you expect that any staff at this site will need to acquire new skills or knowledge? ≠ 'None'
Base = establishments expecting to increase staff numbers in future (n = 140)



Source: CESS 2025

Figure 25: Main drivers of upskilling needs, 2025

Q: Over the next three to five years, do you expect that any staff at this site will need to acquire new skills or knowledge as a result of the following factors?
Base = establishments expecting to increase staff numbers in future (n = 140)



Source: CESS 2025

7. Future jobs and skills needs (continued)

CESS 2025 also takes a detailed look at the occupations where employers anticipate a need to expand staff numbers and upgrade the skills of the workforce in the next three to five years.

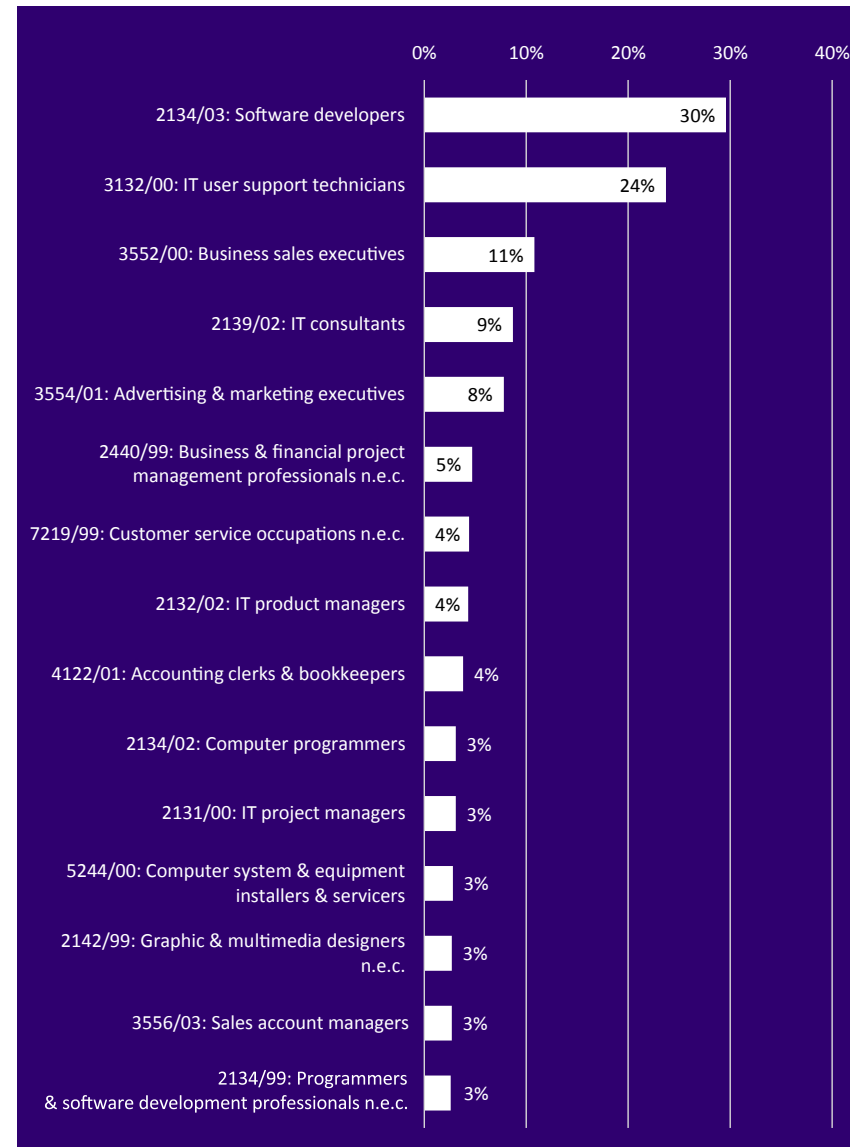
First, those roles expected to grow in future include specialist digital roles, such as: software developers (cited by 30% of tech employers that expect to grow staff numbers), IT user support technicians (24%), IT consultants (9%) and IT product managers (4%). Furthermore, wider, more generic roles were identified, including business sales executives (11%), advertising and marketing executives (8%), accounting clerks and bookkeepers (4%), customer service occupations (4%) and business and financial project management professionals (5%).

In addition, CESS 2025 reviews the roles in which staff are considered to have the greatest need to acquire new skills in future. Again, this covers a mix of technical digital and broader roles. Starting with the digital roles, we found the most common occupations include software developers (30%), IT user support technicians (12%), IT product managers (5%), computer system and equipment installers (3%), DevOps engineers (3%), IT service delivery managers (3%) and data analysts (3%). However, in this context, fewer wider, more generic roles were reported – that is, only business sales executives (2%) and business analysts and consultants (2%). There is strong alignment between many of the identified roles in CESS 2025 and wider research (Skills England 2025). Taken together, the evidence points to several critical occupations for the future, either because they are already in demand or are expected to grow.

Figure 26: Occupations in demand in future, 2025

Q: In which specific occupations do you expect the number of staff to increase over the next three to five years?

Top fifteen occupations cited. Base = establishments that expect staff numbers to increase (n = 140)

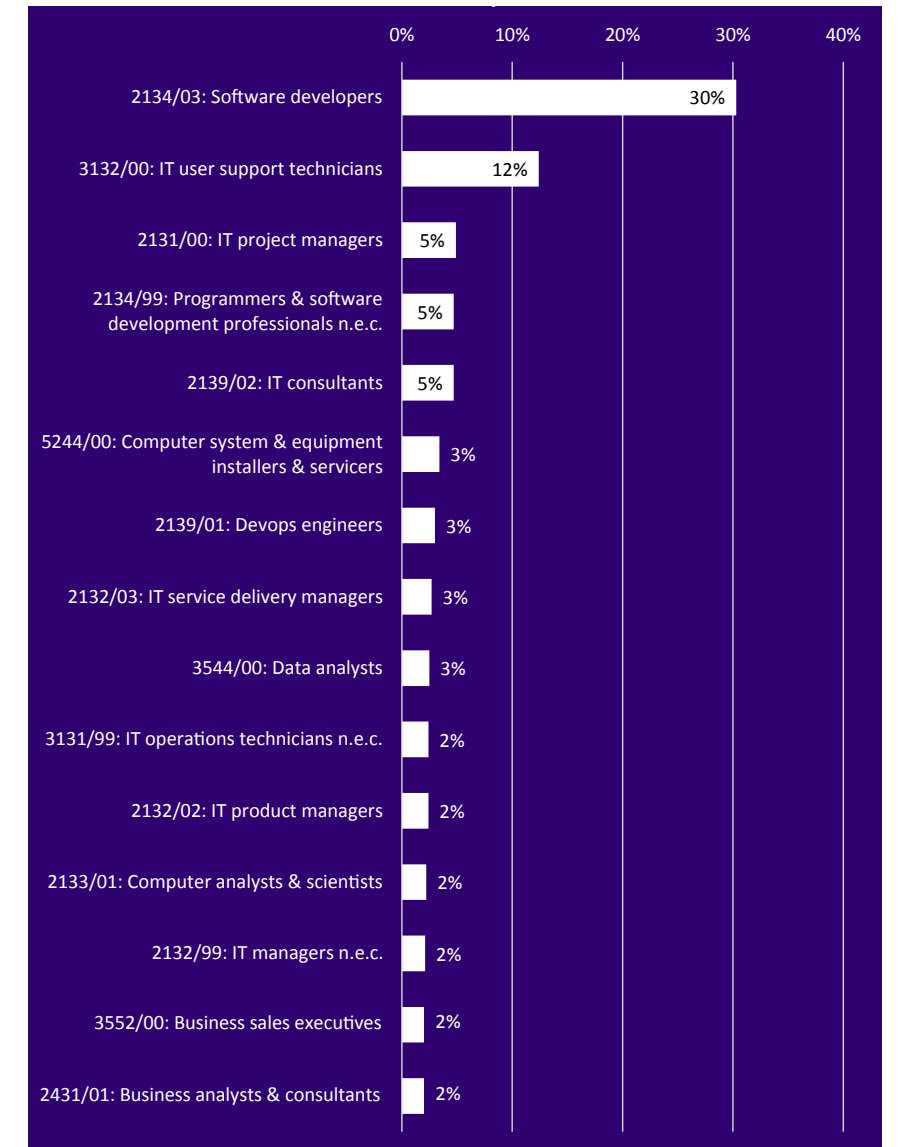


Source: CESS 2025

Figure 27: Occupations with upskilling needs, 2025

Q: In which specific occupations do you expect staff to have the greatest need to acquire new skills or knowledge over the next three to five years?

Top fifteen occupations cited. Base = establishments with upskilling needs (n = 134)



Source: CESS 2025

7. Future jobs and skills needs (continued)

CESS 2025 identifies the main specialist skills expected to be required by employers within the tech sector in the future. It highlights a range of advanced digital areas such as evolving software development (e.g. quantum programming and AI-assisted development tools using AI coding assistants, quantum computing and blockchain technology), AI and ML learning (i.e. mastery of AI/ML algorithms, neural networks and deep learning frameworks), data science and analytics (including data science programming, statistical analysis, data visualisation tools and handling big data), data engineering (including building data pipelines, and extract, transform and load processes), cybersecurity (i.e. malware analysis, security architecture design and secure coding practices), cloud Architecture and DevOps (i.e. design, deployment and management of cloud infrastructure), DevSecOps (integrating security skills into DevOps), wireless communications, telecoms infrastructure engineering and IT automation.

Tech employers also anticipated that there would continue to be growing skills needs in broader business areas, including finance, people management, sales, marketing and project management.

CESS 2025 found that when tech employers were asked explicitly about future upskilling needs in digital skills, 59% of tech employers identified areas for improvement. This was expected to include growing requirements in specialist software and hardware skills (27%); web development skills (7%); data analysis, analytics and data science (7%); and app programming and development (7%). A significant focus for the future relates to AI. This has multiple dimensions – that is, enhancing general awareness/use, extending more bespoke technical applications and putting in place controls to manage copyright and ethical concerns.

Figure 28: Specialist skills needs in next three to five years, 2025

Q: Which, if any, specialist skills or knowledge do you feel will need improving over the next three to five years?

Base = establishments with upskilling needs (n = 134)

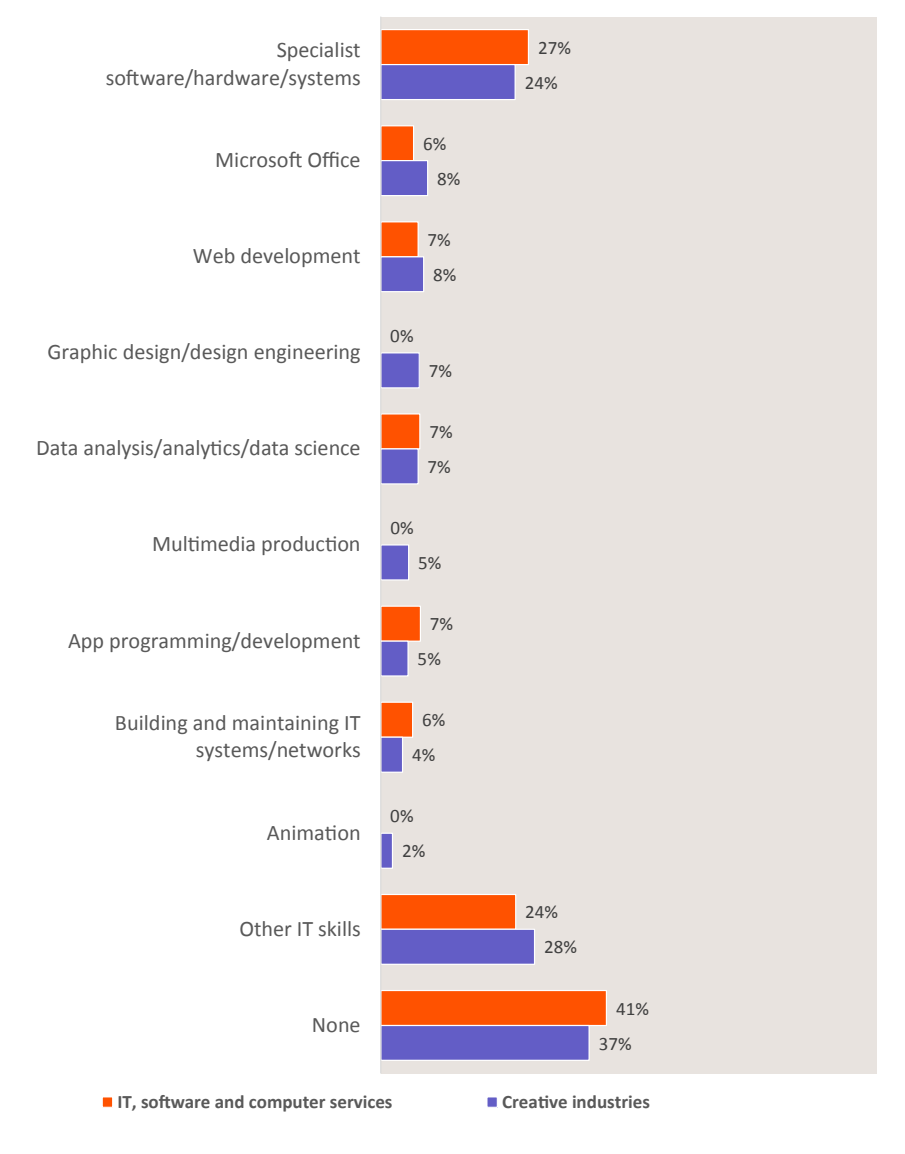


Source: CESS 2025

Figure 29: Digital skills needs in next three to five years, 2025

Q: Do you expect staff will need to acquire new IT skills over the next three to five years? If so, which specific IT skills do you feel will need improving?

Base = establishments with upskilling needs (n = 134)



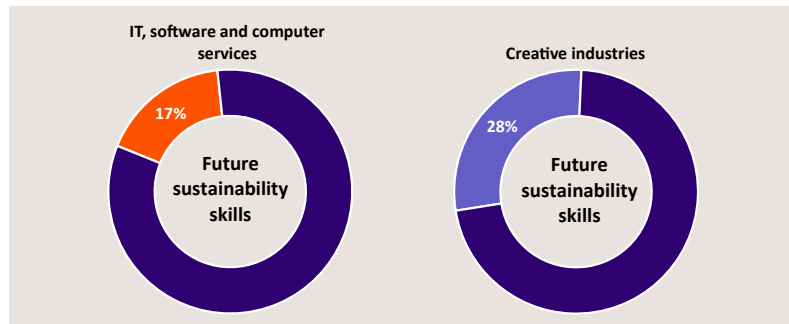
Source: CESS 2025

7. Future jobs and skills needs (continued)

Figure 30: Sustainability skills needs in next three to five years, 2025

Q: Are any of the skills you expect staff will need to acquire over the next three to five years related to wanting to be more sustainable or carbon-neutral? If so, what specific sustainability or 'green' skills will need improving?

Base = establishments with upskilling needs (n = 134)



Transferable skills were also highlighted with reference to future skills that would need improving in the next three to five years.

Most commonly, these involved planning and organising (cited by 25% of employers with upskilling needs), working with others (26%) and speaking (21%).

In addition, notably more tech employers than those in the creative industries overall highlighted a need for skills of problem-solving and decision-making (17% vs 13%) and digital literacy (13% vs 9%).

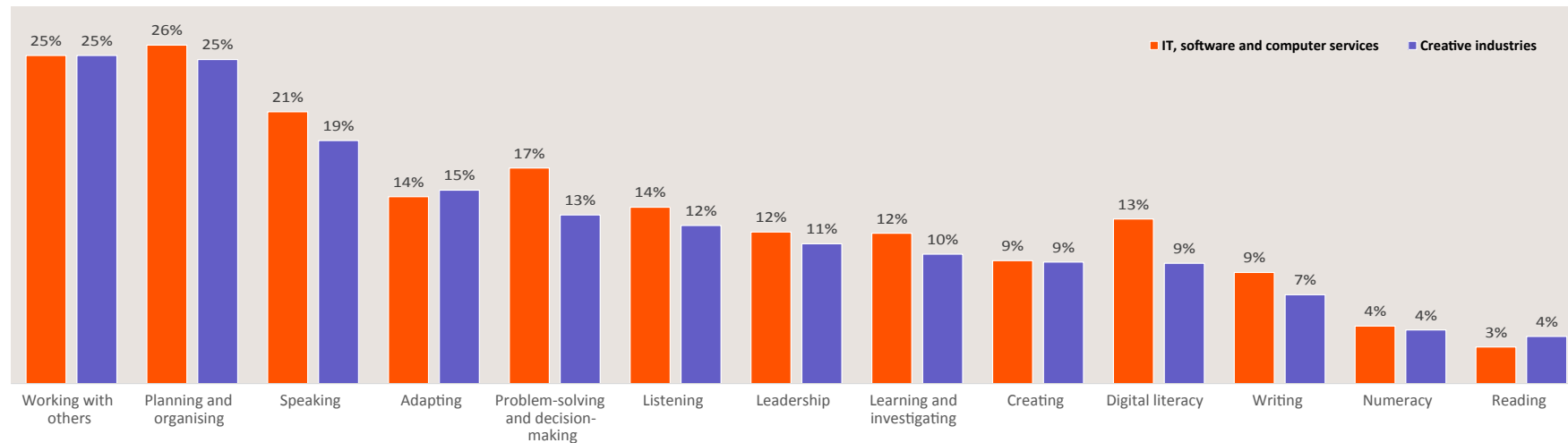
Wider research and employer insights from the roundtable have reinforced the need to combine technical and transversal skills in future (WEF, 2025). In particular, employers emphasised the increasing importance of human capability to optimise the full value of working alongside machines. In such a context, this was attached to many core skills, such as critical thinking and creativity, problem-solving, adaptability, communication skills, collaboration and teamwork, emotional intelligence and data capabilities. At the same time, given the ongoing pace of technological developments and innovation, a growing future focus was also attached to continuous learning, leadership and management of technology, and the fusion of digital skills with wider business functions (e.g. finance and stakeholder management).

With a growing need for managing environmental and sustainability concerns among businesses, CESS 2025 also reviewed the emphasis on sustainable or carbon-neutral skills. In particular, it explored whether employers' anticipated need to upgrade workforce skills were related to organisational goals to become more environmentally sustainable or carbon neutral in future. This suggests that 17% of those with upskilling needs anticipate a need for their workforce to have stronger sustainability skills in future, slightly below the average across the creative industries (28%).

Figure 31: Core skills needs in next three to five years, 2025

Q: Which, if any, core or 'transversal' skills do you feel will need improving among your staff over the next three to five years?

Base = establishments with upskilling needs (n = 134)



8. Employer investment in skills

CESS 2025 enables an assessment of the impact of skills challenges on employers in the tech sector, relative to the creative industries – that is, it explores the effects of skills shortage vacancies and/or skills gaps on firms.

It appears that the effects are widespread, with 69% of tech employers reporting some kind of impact – similar to all creative industries employers (69%). This suggests, as does wider evidence, that skills deficiencies are an important business concern for the sector (Giles, Carey and O'Brien, 2025). Indeed, a sizeable minority (34%) reported that such skills challenges are increasing the workload for other staff. Other common impacts reported include difficulties meeting deadlines (25%), increased operating costs (19%) and delays in developing new products or services (21%).

The majority of employers across the sector are taking some action in response to skills challenges (78% of tech employers and 82% of creative industries employers). The most frequent response was to increase training for the existing workforce, which was pursued by 43% of tech employers, albeit a lower level than the creative industries as a whole (47%). Other common actions include taking on and training less-well-qualified recruits (21% vs 20%), expanding trainee and apprenticeship programmes (19% vs 15%) and bringing in contractors (16% vs 17%). Interestingly, more employers in the tech sector are also recruiting workers who are non-UK nationals (13% vs 7%).

Figure 32: Impact of skills challenges, 2025

Q: Thinking now about all occupations in which you have skills challenges – that is, either where you cannot recruit someone with the right skills or where the people doing these jobs do not have all the skills that they need – what impact are these skills issues having on this site?

Base = establishments with skills shortages or skills gaps (n = 115)

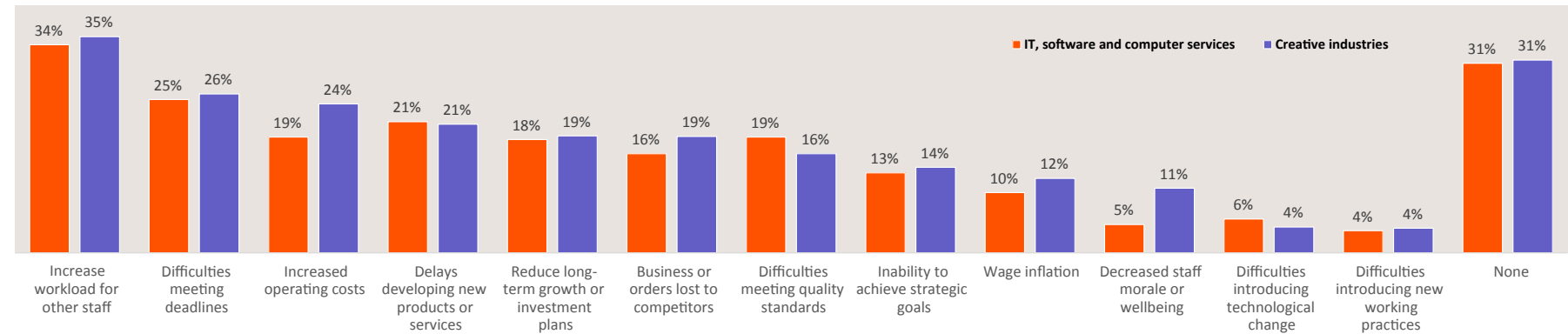
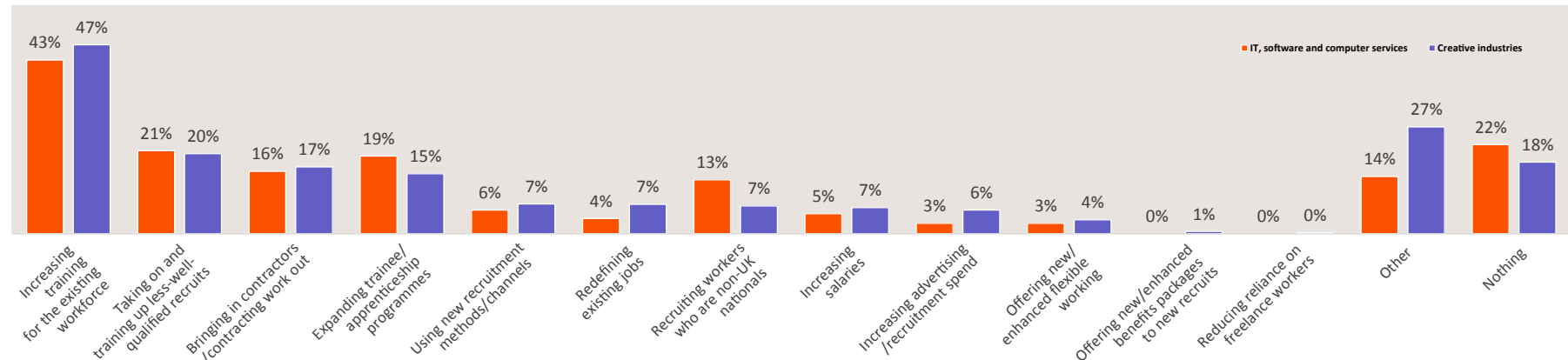


Figure 33: Response to skills challenges, 2025

Q: What, if anything, is your site doing to overcome these skills challenges?

Base = establishments with skills shortages or skills gaps (n = 115)



Source: CESS 2025

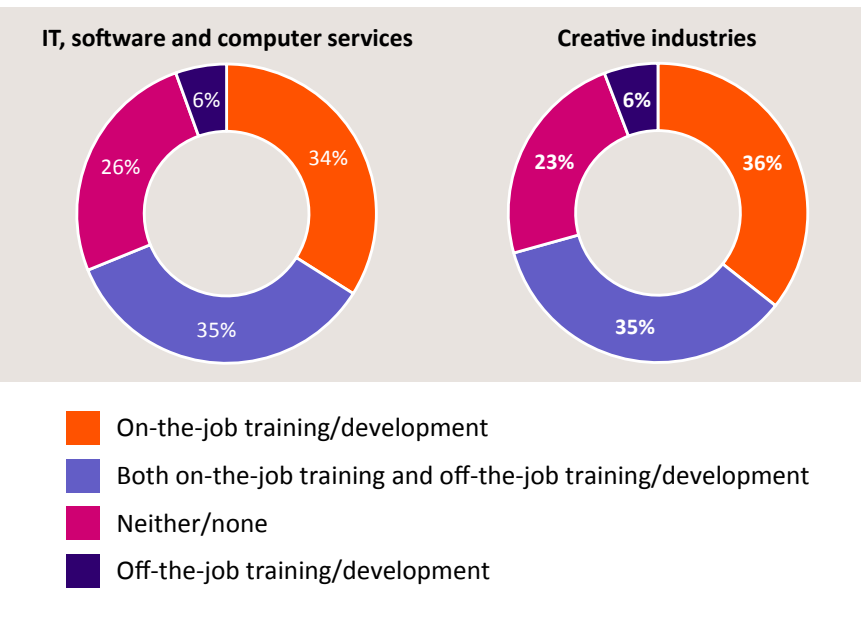
8. Employer investment in skills (continued)

In reflecting on the skills challenges employers are facing and the anticipated need to develop new skills in the years ahead, an important question concerns whether employers in the creative industries sub-sector, such as tech, are investing sufficiently in upskilling and reskilling their workforce.

As highlighted earlier, occupations relevant to the tech sector rely heavily on HE pathways to provide the baseline, foundation education for early-career workers. In particular, there is a focus on specialist subjects including computer science (12%), engineering and technology (11%), physical sciences (6%) and biological sciences (5%) (Skills England, 2025).

Figure 34: Employer training provision, 2025

Q: What, if any, training has your organisation arranged or funded over the past twelve months?
Base = all establishments (n = 252)



Source: CESS 2025

CESS 2025 provides an indication of the extent of employer training provision arranged or funded by tech employers relative the creative industries over the last twelve months to keep the baseline of skills relevant. This includes training not only for employees but also agency staff and self-employed or freelance workers.

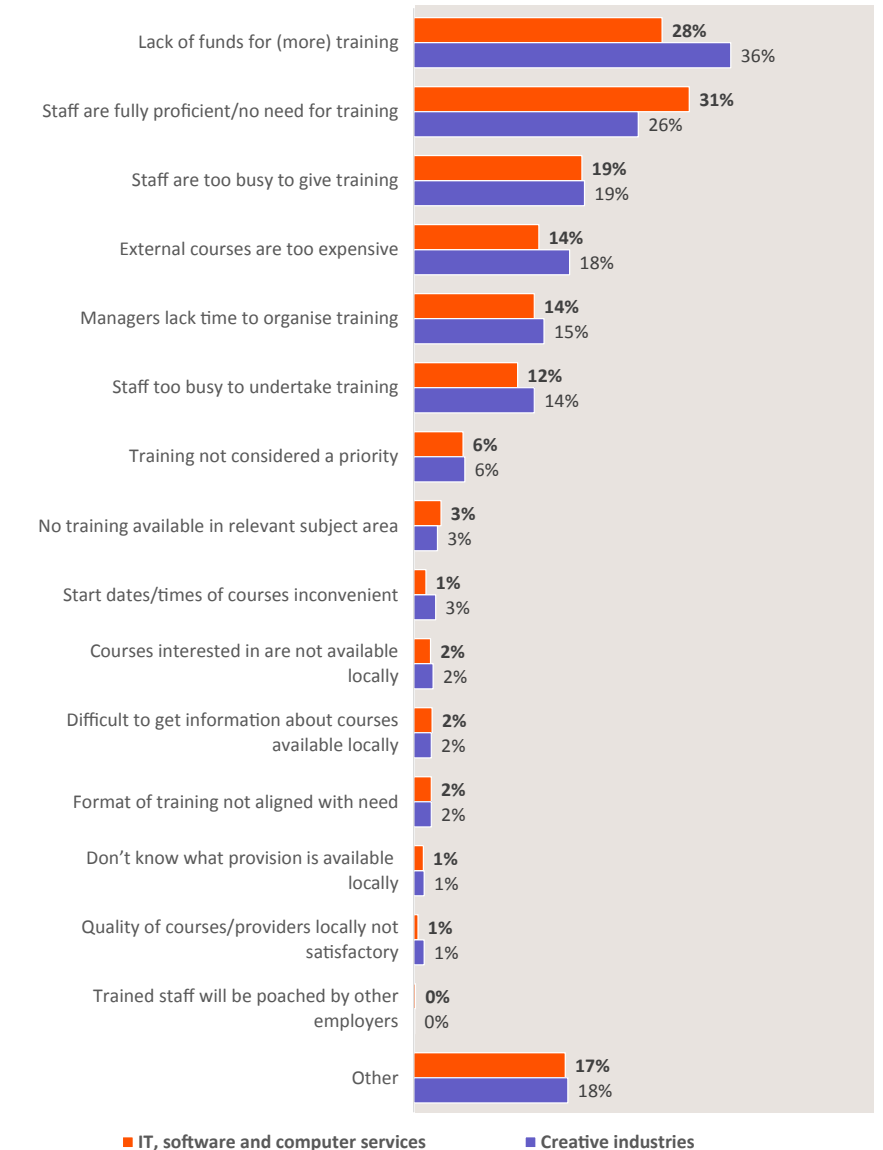
Positively, CESS 2025 data points to higher levels of training within this broader definition than indicated elsewhere (see, for example, the Employer Skills Survey 2022; Giles, Carey and O'Brien, 2025). Indeed, around three quarters of firms (74%) in the tech sector provide some kind of development compared to 77% in the creative industries. In contrast, this means around a quarter have not provided any training to their staff in the last year.

Further, most of the training provided is either a blend of off and on the job (35%) or on the job only (34%). In the case of the latter, this is less likely to lead to transferable, accredited skills attainment that supports individual progression and labour market mobility (OECD, 2019). Indeed, employers at the roundtable suggested much of this training was likely to be very targeted, of short duration and related to understanding and deploying off-the-shelf digital applications provided by IT suppliers such as Microsoft, Amazon and Google. In a context of ongoing technological advances in working practices, existing skills deficiencies and growing future skills needs, there is a strong case for ongoing improvement.

A closer examination of the factors influencing tech employers' training intentions highlights a range of issues. The most common reason for employers in the tech sector not training is that staff are fully proficient (31% vs 26% in the creative industries). In addition, employers are inhibited by a lack of funds for more training (28% vs 36%) and staff being too busy to give training (19% vs 19%). Higher levels of tech employers, compared to the creative industries overall, feel their staff are fully proficient and fewer tech employers reported a lack of funds. More generally, the roundtables pointed the uncertainty created by continual skills-policy changes, which to risk greater confusion and reduce the likelihood of employer engagement.

Figure 35: Barriers to training provision, 2025

Q: What, if anything, prevents your organisation from offering (more) training for staff at this site?
Base = all establishments (n = 252)



Source: CESS 2025

8. Employer investment in skills (continued)

Although CESS 2025 points to high levels of training, in the context of considerable future upskilling needs, it is important that employers within the tech sector are supported to continue to invest in the skills of their workforce.

When considering the measures that would enable tech employers to enhance their ongoing investment in skills and training, a range of factors are considered important. Indeed, the majority of tech employers would value financial subsidies towards the cost of training (57%), with tax relief on expenditure on staff training also being frequently reported (52%). This is perhaps not surprising given the high level of employers reporting financial pressures as a significant barrier to training.

Furthermore, with widespread concerns about constraints on time as a further barrier, there is also stronger support for measures such as more flexible forms of training (42%).

In addition, other common responses among tech employers included opportunities to collaborate with providers to develop training aligned to business needs (36%) and opportunities to collaborate with other businesses to develop training aligned to business needs (32%). In contrast, fewer businesses highlighted different types of information and advice as being an important measure (around a quarter of tech businesses for each option).

CESS 2025 findings were supported by the employer consultations at the roundtable. In that light, positive reference was made to relevant policy developments in the different skills systems and the opportunities these present to tech employers.

This includes steps to enhance collaboration between industry and education providers to improve the relevance of training for the sector (e.g. enhancing HE provision and widening the apprenticeship and placements offer), improvements to careers information and campaigning, and the funding of modular training such as through the Growth and Skills Levy and Lifelong Learning Entitlement (HM Government, 2025).

Figure 36: Enablers of employer investment in training, 2025

Q: What measures would enable your organisation to offer (more) training in future?

Base = all establishments (n = 252)



Source: CESS 2025

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