diversITy Series

Promoting e-skills training for a diverse tech workforce

Country report for the United Kingdom

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February 2019



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The *diversITy series* of reports presents information collected and compiled by empirica, supported by J.P. Morgan, on the technology skills training landscape in seven target countries: Spain, Germany, the United Kingdom, Ireland, Poland, France and South Africa. External sources of information and data have been credited accordingly where applicable.

The term *Information and Communications Technology* (ICT) *sector* used in this report refers to the technology or digital sector in all target countries.

The term *ICT skills* used in this report comprises two main categories:

ICT user skills: the capabilities required for effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work, which is, in most cases, not ICT. At the general level, they cover "digital literacy": the skills required for the confident and critical use of ICT for work, leisure, learning and communication.

ICT practitioner skills: The capabilities required for researching, developing and designing, managing, producing, consulting, marketing and selling, integrating, installing and administrating, maintaining, supporting and servicing ICT systems.

The term *ICT skills training* refers to programmes and initiatives aimed at improving or upgrading peoples' skills and knowledge in ICT user and practitioner skills.

The term *ICT specialists* refers to the European Commission's definition of ICT specialists as workers whose main job involves ICT and who can deal with a wide range of tasks concerning corporate ICT systems. The terms *ICT specialists* and *ICT workers* are used interchangeably in this report.

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Preface

The diversITy project carried out an evaluation and assessment of ICT skills and training programmes to support diverse populations to enter the labour market.

It identified and analysed ICT training programmes that aim to prepare and place jobseekers into meaningful tech jobs, with a focus on diverse target groups, including women, youth at risk of social exclusion or from difficult socio-economic backgrounds, people with migrant background or unemployed adults changing careers.

In the context of this study, the term ICT skills includes both, ICT user and ICT practitioner skills. However, more importance is given to ICT practitioner skills, which the European ICT skills Forum defines as, "The capabilities required for researching, developing and designing, managing, producing, consulting, marketing and selling, integrating, installing and administrating, maintaining, supporting and servicing ICT systems".¹

The target countries are Germany, France, the United Kingdom, Ireland, Spain, Poland and South Africa.

The work product of the diversITy project informs policy development on the European and national level and provides practical recommendations to nonprofit organisations and training providers. An initial assessment and evaluation of identified ICT skills training programmes in the target countries produced a repository of 96 inclusive programmes. Brief descriptions of these 96 cases are available on the diversITy online repository, which can be accessed at www.eskills4diversity.com. In addition to the online repository of case studies, we produced seven country reports for each target country, analysing indepth each country's ICT skills gap and unique training landscape. In each report we showcase a set of good practice show cases, setting a benchmark to foster exchange.

The diversITy project is part of the J.P. Morgan New Skills at Work initiative that aims to identify strategies and support solutions that help improve labour market infrastructure and develop the skilled workforce globally. This \$250 million five-year global initiative, first launched in December 2013, brings together leading policymakers, academics, business leaders, educators, training providers and nonprofits with the goal of connecting labour market policy with practice, supply with demand and employers with the workforce.

We greatly acknowledge the support and collaboration of J.P. Morgan to produce this report.

We would like to thank **Eriona Dashja** and **Aleksandra Szczodrowski** from the empirica team for research support for this report.

We would like to gratefully acknowledge the support of:

Jessica Cecil, Director, BBC Online Project, BBC Robbie Carroll, AWS Account Manager, National Security & Public Safety, AWS re:Start Programme Manager, Amazon Web Services (AWS) Max Costick, Education Programs Manager, EMEA, Amazon Web Services (AWS) Rebecca Plant, Apprenticeship Lead, Microsoft UK Maggie Philbin, CEO, TeenTech India Lucas, Policy Manager - Skills, Talent and Diversity, techUK Ismini Vasileiou, Associate Professor in Information Systems (Education), University of Plymouth and BCS Women Debbie Foster, MBE, CEO, Tech Talent Charter Prof. Dr. Liz Bacon, Vice-Principal and Deputy Vice-Chancellor (Academic), Abertay University, Dundee Adam Thilthorpe FBCS FRSA, Director for Professionalism, BCS, The Chartered Institute for IT Jack Orlik, Senior Researcher, NESTA.

We would also like to thank all the respondents of our ICT skills training programmes survey.

We are grateful to all our workshop participants for their insightful comments and contributions.

Report contributors:

Jza Abbas, Research Consultant, empirica. Karsten Gareis, Senior Research Consultant, empirica. Tobias Hüsing, Senior Research Consultant, empirica. Daniel Schmidtmann, Junior Research Consultant, empirica.

Christina Clemens, Research Assistant, empirica.

¹ See European Commission (2004), *e-skills for Europe*.

Executive summary

- > With 1.57 million ICT specialists the UK has the largest headcount of ICT workforce in Europe but is facing a shortage of 163,000 which is going to increase up to 575,000 in 2025.
- There is a wide consensus among both public and private sector stakeholders that the digital skills crisis can adversely affect the economic and social development of the country. This is especially due to the UK's economic reliance on sectors that depend heavily on digital skills.
- The Digital Skills Crisis report concluded that "only urgent action from industry, schools and universities and from the Government can prevent this skills crisis from damaging our productivity and economic competitiveness".
- Diversity in the workforce in general and specifically in ICT is a cause of special concern with vulnerable groups of people significantly under-represented. The gap in UK gender employment rate is at 9.5 percentage points (p.p.), somewhat below the EU average of 10.5 p.p. But the UK still ranks only 17th on this indicator, which points towards a sizeable labour reserve in the form of women at working age who do not participate in the labour market or are unemployed.
- Despite long standing campaigns from Government and industry there remains a marked gender imbalance in those studying computing—only 16% of computer science students at school are female and this low level of representation persists through higher education and in the workplace. Such shortcomings in inclusion levels for ICT jobs have changed hardly at all since 2011.
- The number of young people neither in employment nor in education and training (NEET), for which the UK figure (10.9%) is only slightly better than the EU28 average (11.6%), is generally considered a challenge. On this indicator the UK ranks 16th among the 28 EU member states.
- The UK has so far relied heavily on skilled migrant labour to fill the shortage in ICT specialists. The spectre of Brexit is causing many to question whether tech employers will have access to the talent necessary for the UK economy to prosper in the coming years.
- UK recruitment firms have reported that job vacancies for ICT specialists are one of the most difficult to fill in the UK. The existing shortages are related not only to a lack of candidates with appropriate formal qualification, but also soft skills such as the ability to work in teams and taking initiative.
- Both, apprenticeships and College-based technical and professional education (TPE) are particularly important for individuals from diverse and disadvantaged socio-economic backgrounds. However, employer demand for graduates from ICT apprenticeships and the vocational education system remains a challenge. Employers frequently mention that according to their experience, applicants who come with a qualification from an apprenticeship or further education course are found to be unfit for the type of jobs to be found in the digital sectors. This may be changing with introduction of digital apprenticeships and the overhaul of the TPE system, but robust evidence is not yet available because finishers from these programmes only gradually become available on the job market.
- Apprenticeships have traditionally also suffered from low demand from students due to their low status in the UK and their image of being of a 'low skilled – low pay' nature. On a positive note, the number of companies that offer digital apprenticeships has sharply increased in the last years. The Apprenticeship Levy may open up new opportunities for empowering SMEs to invest in training, including admittance of apprentices from underrepresented groups. This will, however require concerted, multi-stakeholder efforts at local level because SMEs typically lack the capacity and willingness to deal with the practical challenges surrounding working with persons from at-risk groups.

- The UK Digital Strategy 2017 proposes a revised multi-stakeholder partnership approach, in which central government deals directly with employers instead of via intermediaries through the establishment of a new Digital Skills Partnership (DSP). This opens up new opportunities for mainstreaming diversity in ICT training.
- Further activities include the Local Digital Skills Partnerships (LDSPs) started in 2018, the introduction of an Apprenticeship Levy in 2017 and the launch of a new College-based technical and professional education Strategy with the aim to identify a number of broad vocational routes that seek to encourage participation by simplifying the qualification landscape.
- In the UK there are a number of inclusive ICT training programmes and a range of promising approaches, but the overall picture is one of "too little, too few". Given the size of the challenge as outlined in the Country Report for the UK, these initiatives taken together are unlikely to make a real difference. There is a need for larger, more ambitious training schemes, which generate sufficient visibility to reach large shares of the target group.
- The promising practices identified include programmes which have managed to establish strong and effective partnerships of actors, designed demand driven curricula and programmes some leading to an industry certificate and achieved high rates of job placement or retention rates. The importance of these partnerships is underlined by the good practice showcases in the UK but also by the successful cases in the other countries under review and therefore seems to apply universally.
- It is still too early to draw robust conclusions about the recent reforms' overall impact on the opportunities offered to persons from groups currently underrepresented in the country's ICT workforce.

Current developments in the ICT labour market in the United Kingdom

Recent trends show shortages in ICT skills supply. These shortages have the potential to affect future economic growth for the UK. With 1.57 million ICT specialists the UK has the largest headcount of ICT workforce in Europe but is facing a shortage of 163,000 which is going to increase up to 575,000 in 2025. With the supply coming from the formal education and training system this gap will not be closed. Further means are needed which constitute an opportunity for inclusive ICT training programmes of different type.

The UK has so far relied heavily on skilled migrant labour to fill the shortage in ICT specialists, an opportunity which may no longer work in the future. The spectre of Brexit is causing many to question whether tech employers will have access to the talent necessary for the UK economy to prosper in the coming years.

Despite long standing campaigns from Government and industry there remains a marked gender imbalance in those studying computing. Only 16% of computer science students at school are female and this low level of representation persists through higher education and in the workplace. Such shortcomings in inclusion levels for ICT jobs have changed hardly at all since 2011.

Digital apprenticeships and other reforms of qualifications from technical and professional education have started but not yet revealed the intended success. It remains to be seen to what extent the picture will change over the longer term. There is no conclusive evidence yet whether the Apprenticeship Levy is helping to address disparities in access to ICT training.

The Digital Strategy 2017 for the UK aims at enabling a more diverse digital workforce by helping more women into tech and supporting other underrepresented groups, such as people with disabilities and those from minority background or lower socio-economic areas. It asked for establishment of new Digital Skills Partnerships (DSP), bringing together stakeholders who are passionate about closing the digital skills gap. This shall ensure strong collaboration between the public, private and third sector to tackle the digital skills gap in a coordinated and coherent way. The process only started in 2018. The Digital Strategy prioritises public-private partnerships with both the industry and the NGO sector to tackle the digital skills gap and fostering digital inclusion.

Key activities are expected to include the development of local digital skills strategies (LDSP), based on prior experience and in close collaboration with relevant local and combined authorities, as well as the business and NGO sectors. LDSPs will identify the skills needs for their local area, so that education and training provision can be better matched to local demand. Part of the funding can be derived from the Apprenticeship Levy, if local businesses pool the funding they receive as part of the apprenticeship levy and invest this in a set of agreed strategic initiatives to promote digital skills in their area, as we recommend they do.

The government has supported development of the so-called Tech Talent Charter as a means to promote action by employers on a purely voluntary basis. The

Charter provides organisations with guidelines and principles they may want to adopt to boost diversity and inclusiveness of their ICT workforce.

Overall, the ICT training landscape in the UK is in the midst of a radical overhaul. Its proponents promise that it will result in substantial improvement concerning inclusiveness of training offers and, ultimately, diversity of the ICT workforce. Such promises have been made before. It is certainly too early to draw robust conclusions about the reforms' overall impact on the opportunities offered to persons from groups currently underrepresented in the country's ICT workforce. Nevertheless, the available evidence including our own analysis of the inclusive ICT training landscape points to some serious hurdles, which need to be overcome if significant improvements are to be achieved.

Key Recommendations

Embed a focus on diversity in Local Digital Skills Partnerships

The current reshuffling of the UK's system for digital skills provision offers a window of opportunity for strengthening and mainstreaming an emphasis on diversity. The new focus on local level partnerships means that the work of "increasing the digital capability needed to build inclusive, thriving local economies" is being devolved to the regional and local level, for which Local Digital Skills Partnerships (LDSPs) are currently being launched. Additional funding is available from the Apprenticeship Levy if local SMEs can be convinced to pool their funding for initiatives promoting inclusiveness. Associations representing groups currently under-represented in the ICT workforce are recommended to mobilise resources to lobby for a strong emphasis on diversity in the local digital skills strategies being drafted.

Step up promotion of ICT careers, including digital apprenticeships, to women and the BAME community

The continuing problems in getting more women and members of other groups under-represented in the digital workforce to embark on careers in ICT point to the persistence of deep-rooted, cultural norms and outof-date value systems, including stereotypical views among key influencers such as parents, teachers and peers. Against this background, there are indications that Digital Apprenticeships can be attractive to and suitable for female school leavers and BAME youth in a way that a university degree in Computer Science is not. Substantial, concerted efforts are required, however, to effectively promote ICT careers to these target groups, and to overcome traditional prejudices against apprenticeships as a high-value pathway to employment. Such activities need to target the career guidance system as well as other key influencers and the wider public. Best use should be made of the experience of successful, volunteer-driven initiatives, like coding clubs addressed specifically at young women.

Open up ICT training to people with special support needs

Many individuals, including parents of young children, need flexible arrangements and additional support that indirectly help and motivate them to start and complete their ICT training. By allowing people to fit their job and training around their life, a wider range of people could be enabled to participate. Support services that can help overcome practical obstacles may include childcare, eldercare, coaching, networking, and time off from work. Companies as well as specialised training providers are also often found to be ill-equipped to deal with trainees from minority groups due to limited prior exposure. Targeted guidance is required to ensure that stakeholders can and do maximise their leverage in recruiting and supporting young people from underrepresented groups. In addition, more use should be made of 'in training' support for those who may find it harder to adjust to the training setting or workplace, for example through mentoring (see recommendation below).

Set up cross-organisational and cross-regional mentor networks

Mentoring using (mostly) volunteer, seasoned ICT specialists as mentors and role models has been tried and tested and proven to effectively address challenges in attracting and supporting underrepresented groups, in particular women to encourage girls and women to consider ICT careers. The main two reasons for this are: first, because female role models have been found to play a key role in young women's attitude to working in the digital sectors; second, because it tends to be comparatively easy to recruit volunteer mentors among women working in the digital sectors. This is because, as surveys have repeatedly shown, they have typically perceived a range of gender related obstacles themselves during their career, which they are often keen to help remove for future generations of women working in the sector. It is against this background that the establishment of cross-organisational and cross-regional mentor networks could help in supporting the diverse target groups in successfully completing training programmes.

Introduction

In 2017 the House of Common's Digital Skills Crisis report concluded that "only urgent action from industry, schools and universities and from the Government can prevent this skills crisis from damaging our productivity and economic competitiveness". Against this background, the lack of diversity in the current ICT workforce is cause for special concern, but it also indicates sizeable untapped potential. As an example, only 16% of ICT specialists are female compared to 51% of the entire working-age population. In this report, we discuss these issues and more, beginning with an overview for skills and diversity in the ICT labour market in the UK. The report provides an overview of policy measures introduced to address the development of ICT skills and findings from our diversITy survey of private sector approaches towards inclusive ICT skills training programmes. In the last section, we offer recommendations to key stakeholders for future action.



Introduction

The skills shortage in the digital domain has attracted considerable interest in the United Kingdom (UK). There is a wide consensus among both public and private sector stakeholders that the digital skills crisis can adversely affect the economic and social development of the country. This is especially due to the UK's economic reliance on sectors that depend heavily on digital skills.

The term 'digital skills crisis' entered into the policy discourse in recent years in a House of Commons Committee Report, which urged action from industry, schools, universities and the government to prevent the worsening of the crisis.²

According to our own forecast based on Eurostat data, more than 1 million additional ICT specialists will be needed by 2025, a demand which is all but impossible to meet if recent trends in production of ICT graduates, ICT specialist immigration and 'lateral entries' (persons without an ICT degree entering the ICT workforce) will continue. The Digital Skills Crisis report concluded that "only urgent action from industry, schools and universities and from the Government can prevent this skills crisis from damaging our productivity and economic competitiveness"³. The Brexit vote has added uncertainty to the picture, as reduced immigration from other European countries could lead to a worsening of skills gaps and a need for boosting the production of talent from within the UK.

Against this background, the lack of diversity in the current ICT workforce is cause for special concern, but it also indicates sizeable untapped potential. Only 16% of ICT specialists in the UK are female, and about 8% have a disability. This compares with ONS statistics that show 51% of the working-age population are female and 23% have a disability.⁴ The percentage of BAME employees in the British tech world is not known. Estimates by the British Computers Society set it at 1-2%. ⁵

A study, by the Institute for Social and Economic Research at the University of Essex, finds that black and minority ethnic graduates are between 5% and 15% less likely to be employed than their white British peers six months after graduation. There are also marked disparities in wages between many ethnic minority women and black Caribbean men who do manage to find jobs after graduation and their white counterparts.⁶

Not only is lack of diversity a waste of potential for addressing digital skills shortages, it also represents a serious case of inequality because large shares of the population do not have full access to career opportunities in a thriving segment of the labour market. This alone calls for effective action to open up ICT specialist training pathways to all regardless of gender, ethnic origin, socio-economic status and disability.

A great number of UK stakeholders - from government, business, associations, social partners, NGOs - are already involved in initiatives for fostering diversity in the digital training domain. For the present study, we conducted a comprehensive survey of inclusive ICT skills training programmes in the UK to gain insight into the approaches used, their effectiveness as well as key lessons learned. This report provides an analysis of our main findings. We focus on diverse groups, such as women, people from the BAME communities (Black, Asian, and Minority Ethnic), young people not in employment or education and training (NEET), vulnerable young people from disadvantaged economic backgrounds, people with disability and others at risk of exclusion from the labour market.

Section 1 of this report presents a snapshot of the UK's ICT workforce today and a forecast for its development over the coming years. Section 2 provides an overview of the current diversity situation in the UK labour market, with a focus on the ICT workforce. Section 3 summarises policies and frameworks introduced by the government sector to address ICT skills shortages. Section 4 presents the findings from the survey of existing inclusive ICT skills

² See House of Commons, Science and Technology Committee (2016), *Digital skills crisis*.

³ See House of Commons, Work and Pensions Committee (2017), *Disability employment gap*.

⁴ See BCS (2017), Whilst apprenticeship starts continue to decline BCS Digital IT Apprenticeships continue to grow'.

⁵ Inclusive Boards: Diversity in Tech Landscape:

http://www.inclusiveboards.co.uk/diversity-in-tech-landscape/

⁶ The Guardian (7 October 2017): People from ethnic minorities still facing major jobs gap in UK

training programmes. It provides a brief look into the pathways available to gain an entry into the digital labour market and investigates the success factors and challenges of a suggested training taxonomy. In the last section, we offer recommendations to key stakeholders for future action.



ICT Skills Forecast

The ICT workforce in the UK accounts for 1.57 million workers, or 5.1% of the total workforce. In absolute terms, this is the largest headcount of ICT workforce in Europe. Since 2011, the number of ICT workers has rapidly increased in the UK, as the dependence of the country's most dynamic sectors on ICT specialists has grown. The average annual need for new ICT specialists according to our model is about 116,600. These are significantly more than the 70,800 ICT graduates produced each year by the UK's education system. This does not yet take account of the current vacancy backlog, estimated to be about 163,000 and to increase to 575,000 in 2025.



Baseline figures and forecast for the UK

Trends in ICT workforce

The UK's ICT specialist workforce accounts for 1.57 million workers, or 5.1% of total employment. In absolute terms, this is the largest headcount of ICT workforce in Europe, comprising almost 20% of Europe's ICT practitioners. In relative terms, only three other EU member states sport an ICT workforce larger than in the UK. These countries are Finland (6.8%), Sweden 6.6% and Estonia (5.6%).⁷ Of the very core category of ICT professionals in Europe, i.e. software, database and network professionals, more than one in four (26%) work in the UK.

In comparison to EU averages, the UK's ICT workforce is especially prominent in the finance and professional services sectors, which corresponds with the importance of these sectors for the performance of the UK economy at large.

Figure 1 ICT workforce by key sub-major groups in the UK 2011-2015



Source: Eurostat, "Employed ICT specialists"

Figure 2 Employed ICT specialists in the UK 2008-2017



Source: Eurostat, "Employed ICT specialists"

⁷ Eurostat: ICT specialists in employment 2017: https://ec.europa.eu/eurostat/statisticsexplained/index.php/ICT_specialists_in_employment A closer look at the numbers shows that the largest relative growth can be found for the occupations 'IT and Telco directors', 'IT project and programme managers' and 'Graphic designers' (9% CAGR). The occupations exhibiting the largest growth in terms of number of jobs added were 'Programmers and software development professionals', 'IT and Telco directors', 'Graphic designers' and 'IT project and programme managers'. The presence of graphic designers among the high growth ICT jobs in high demand in industry indicates that not only occupations demanding higher level degrees offer good employment opportunities. Empirical evidence already shows that women have identified this opportunity which is indicated by the much higher share of women in this occupation compared to other ICT jobs (35% compared to an average of 16%).

United Kingdom	SOC code	Usually requires academic degree	Absolute employmen t growth (rank)	Absolute growth p.a. (5 year avg.)	%- Growth (rank)	%-Growth (5 year _{CAGR})	Share female (2016)
Programmers and software development professionals	2136	Y	1	16,900	4	7%	14%
Information technology & telecommunications directors	1136	Y	2	8,300	1	12%	10%
IT project and programme managers	2134	Y	3	5,900	2	9%	23%
Graphic designers	3421	Ν	3	5,900	2	9%	35%
Information technology and telecommunications professionals n.e.c.	2139	Y	5	5,700	9	3%	17%
IT business analysts, architects and systems designers	2135	Y	6	4,100	7	4%	22%
Electrical and electronic trades n.e.c.	5249	Ν	7	3,400	6	4%	
IT user support technicians	3132	Ν	8	2,800	8	3%	19%
IT engineers	5245	N	9	2,400	5	6%	

Table 1 ICT workforce per SOC classification in the UK 2016

Source: ONS

Vacancies

According to TechPartnership research done with IT Jobs Watch, a provider of specialist labour market data, there were on average 163,000 vacancies for digital specialists advertised across the UK during each quarter of 2015, which corresponds to a job vacancy rate of 9.2%.⁸ IT Jobs Watch identified the following top ten digital specialist roles in demand on the UK labour market. Web developer, front end developer and software developer are among the top 10 and are among those jobs within reach of graduates from inclusive ICT training programmes.

These findings are largely confirmed by a 2017 analysis carried out by the Institute for Public Policy Research (IPPR).⁹ When looking into demand for ICT positions according to level of qualification, the study found strong indications that – at least for the North of England –there is a significantly less unmet demand for ICT jobs suitable for further education leavers than for jobs requiring a certificate from higher education.

⁸ See TechPartnership (2016), *Factsheet: Demand for Digital Specialists*. TechPartnership (2017a), *Factsheet: Cyber Security Specialists in the UK*.

⁹ See Blakeley, G. (2017), *Devo Digital: Digital Skills For The Northern Powerhouse.*

Currently it appears, therefore, that "further education leavers do not have the requisite skills to meet the needs of digital tech employers. This is a particularly large problem in the North, because a much higher proportion of students enter further education in the North than national averages". This conclusion does not yet take account of the newly introduced digital apprenticeships, which as proponents hope will go some way to address the demand for ICT specialists without requiring a university degree.

the available information suggests that the majority have a degree in ICT.

According to the latest available figures, there were 50,800 vocational education graduates in 2013 (latest) and roughly 20,000 tertiary education graduates in 2014 (first degrees).¹¹ In total, roughly 70,800 ICT graduates leave colleges and universities for the labour market per year.¹²

Trends in education

In the UK, 65% of ICT specialists have an academic degree. This figure is above the European average of 62% and translates into rank 12 among EU member states. No statistics have been published as to the field of education, such as whether it is ICT or not, but

Table 2 The most extensively and most dynamically growing ICT occupations in the UK

1.	Project Manager	10,400	6.	Software Engineer	3,300
2.	Business Analyst	8,700	7.	Solutions Architect	3,200
3.	Support Analyst	4,400	8.	Software Developer	3,100
4.	Support Engineer	4,000	9.	Network Engineer	2,900
5.	Web Developer	3,500	10.	Front End Developer	2,900

Source: IT Jobs Watch

Table 3 ICT graduates in the UK

ICT graduates	Total 2014 or latest available	% ICT graduates/ all graduates	Percent female ICT graduates
[1] Upper secondary education - vocational ¹⁰	50,800	5%	19%
[2] Short-cycle tertiary education	4,600	4%	17%
[3] Bachelor's or equivalent level	15,500	4%	17%
[4] Master's or equivalent level	7,400	3%	24%
[5] Doctoral or equivalent level	1,000	4%	24%
Approximate maximum labour market inflow with ICT degree (1+2+3)	70,800		

Source: Eurostat [uoe_grad02]. Rounding applies

¹¹ Trend data for vocational education in ICT is not available, as the only data that appears in Eurostat's data base is the above data for 2013. All figures here were rounded to the next 100, but additions are done using unrounded figures, therefore some inaccuracies are introduced.

¹² To avoid double counting, we assume that all bachelor level graduates go *eventually* into the labour market, some with a master's or even PhD "detour", and that the flows from bachelor degree into masters studies are about the same size as the flows from masters or PhD studies into the labour market.

 $^{^{\}rm 10}$ In the UK these include "Diploma (Advanced Level), (phasing out)" and "Advanced Apprenticeships".

Box 1 Snapshot: UK's ICT Workforce

In UK, the ICT specialist workforce accounts for 1.6 million workers, or 5.1 percent of the workforce. In absolute terms, this is the largest headcount of ICT workforce in Europe, accounting for almost 20 percent of Europe's ICT specialists. In relative terms, only two other EU member states sport an ICT workforce larger than in the UK, the highest shares are found in Finland and Sweden. The larger continental countries all rank further below in the league table: Germany (11th), France (16th), Spain (17th), Italy (18th) and Poland (24th).

Table 4 Key figures at a glance – UK	UK	Rank in EU 28
ICT workforce	1.6 M	1
As % of domestic workforce	5.1%	3
% female	16.2%	15
Estimated annual replacement need	62,400	
Latest vacancy figures	163,000	
Vocational graduates	50,800	1
Tertiary graduates (only first degrees)	19,400	1
Projected jobs potential until 2025 (8 years)	1.15 M	
Of which expansion	651,000	
% of enterprises that employ ICT specialists	23%	13
% of enterprises providing training for ICT specialists	10%	14
% of ICT specialists with tertiary education	64%	12
Source: Eurostat (2015)		

Trend data are available for tertiary ICT graduates, indicating a decline in graduate figures that took place late in the last decade. In spite of numerous attempts by consecutive governments to turn around the trend, numbers have remained more or less unchanged since 2009, which has given rise to much concern among policy-makers and industry stakeholders.

Since Eurostat data are not yet available for the latest years, the impact of the introduction of digital apprenticeships is not yet reflected in these figures. These will take some years to have an effect on numbers of ICT graduates as defined here. There is some reason for optimism that digital apprenticeship completion numbers will contribute to addressing the need for boosting numbers of ICT specialists entering the UK labour market.

The approximate yearly labour market inflow of graduates with an ICT degree (from vocational and tertiary education) is therefore 70,800. It is obvious that even if all of them went into the ICT labour market, there must be inflow from other sources since the ICT workforce absorbs roughly 116,600 new ICT workers per year, as we saw earlier. The number of people entering the ICT labour market without a Vocational or Higher Education degree from a UK institution is thus *at least* 45,700 (116,600 – 70,800). Where do these ICT specialists come from?

Figure 3 United Kingdom - Tertiary ICT graduates, first degrees.



Source: Eurostat [educ_grad5 and uoe_grad0]

Other sources of workforce inflow and outflow

Apart from domestic production of ICT graduates, other sources of workforce inflow are:

- Immigration and out-migration of ICT workers;
- Lateral entries of non-ICT graduates;
- Re-entry of former graduates.

Reliable data for these categories have not been published. However, as the labour market has managed to grow while relying on average on this amount of inflow, we can postulate that a minimum lateral entries capacity (including immigration) of at least 45,700 exists in the UK. The future sustainability of this capacity depends on a continuing supply and recruitment of talent from non-ICT graduates as well as from ICT workers from abroad. It is the latter category which is causing concern given the likely impact of the UK's decision to leave the EU.

According to research commissioned by sector association techUK, 18% of the employees in the digital sectors are foreign-born, about one-third of which are from EU countries. "The contribution of foreign-born workers to net employment growth between 2009 and 2015 has been much greater accounting for 45% of digital sector net employment growth during this period"¹³. The Recruitment and Employment Confederation reports that EU citizens make up approximately 180,000 jobs in the 'tech sector'.¹⁴ These are heavily concentrated in a number of UK regions, first of all London and the South-East. In 2015, 11% and 20% of digital tech workers in London were born in rest of EU and non-EE countries, respectively.¹⁵

Against this background it is worrying that the Brexit vote appears already to have a significant impact on access to talent from EU countries. Patel reports from research on job advertisements. According to this report, UK tech companies in mid-2017 took on 60% fewer EU nationals than a year earlier.¹⁶ A 2017 survey by Hired, a job placement site, found that 70% of tech workers have already considered leaving the country in the wake of Brexit. British tech companies are also sending fewer offers to candidates outside

the country. These fell by one third between 2016 and 2017.¹⁷ Given this evidence, it appears questionable whether the UK will be able to continue relying on skilled migrant labour to fill the skills gap in the ICT specialist area.

Summary

When looking at the development of jobs in terms of workers, the first finding for the UK is that the number of ICT workers has rapidly increased since 2011, after a period of much slower growth. Secondly, most of the fastest growing ICT occupations in the UK traditionally require an academic education, and employers frequently voice a preference for candidates who come with a university degree. It remains to be seen to what extent the picture will change following the introduction of digital apprenticeships and the reform of qualifications from technical and professional education. Stronger use of non-academic ICT graduates by UK companies appears necessary given that numbers of tertiary ICT graduates have remained flat in recent years. Additional discussion on this follows in Sections 3 to 5.

Available data, including anecdotal evidence from industry insiders, suggest that the UK has so far relied heavily on skilled migrant labour to fill the shortage of ICT specialists. The spectre of Brexit is causing many to question whether tech employers will have access to the talent necessary for the UK economy to prosper in the coming years. In view of the lack of certainty about the country's future relationship with the EU, no robust forecast on the development of cross-border migration into and from the UK ICT workforce appears to be possible, but there are indications that the impact will be negative, and quite possibly significant.¹⁸

UK recruitment firms have reported that job vacancies for ICT specialists are one of the most difficult to fill in the UK. This view is confirmed by survey data according to which the share of employers facing difficulties in finding suitable candidates for open ICT positions has grown steadily over recent years. The existing shortages are related not only to a lack of candidates with appropriate formal qualification, but also soft skills such as the ability to work in teams and taking initiative. Training approaches discussed in Section 4 address this challenge in more detail.

¹³ See techUK et al. (2016), *London's Digital Future – The Mayoral Tech Manifesto 2016*.

¹⁴ See Recruitment and Employment Confederation (2017), *Building the Post-Brexit Immigration System*.

¹⁵ See TechCity UK & Nesta (2016), *The Nationality of Workers in the UK's Digital Tech Industries*.

¹⁶ See Patel (2017), *Post-Brexit Britain and the UK's Shrinking Tech Talent Pool.*

¹⁷ Ibid.

¹⁸ See KPMG (2017), Brexit: The impact on sectors.

Box 2 Baseline Projection for the UK's ICT Skills Gap

The UK's ICT specialist workforce accounts for 1.57 million workers, or 5.1% of total employment. In absolute terms, this is the largest headcount of ICT workforce in Europe, comprising almost 20% of Europe's ICT practitioners. In relative terms, only two other EU member states sport an ICT workforce larger than in the UK. Of the very core category of ICT professionals in Europe, i.e. software, database and network professionals, more than one in four (26%) work in the UK. For analysing current and projecting future ICT skills gaps, we need to look at **demand** in terms of changes to the underlying demand exerted by employers (workforce expansion) as well as replacement demand – the need to replace workers who leave the workforce for good or temporarily, typically because of retirement. In terms of **supply**, the most important determinant is the number of ICT graduates who enter the labour market.

For our model we estimate that workforce expansion will continue along the same lines as it has since 2011, i.e. that the number of employed ICT specialists will grow by 54,200 jobs per year (see above). We derive an estimate of the annual net replacement from Cedefop, the EU agency responsible for the development of vocational training. Cedefop publishes estimates of future replacement demand by occupation. Presently these are 62,400 per year. The average annual need for new IT specialists is thus the sum of expansion (54,200) and replacement demand (62,400). To assess total demand, one has to also account for the current vacancy backlog (163,000 according to the data published by the Tech Partnership, see above). One could also split the demand into met and unmet demand, with the current vacancies being (in a simplistic model) "unmet demand" and actual expansion and actual replacement being "met demand". Over the last five years, the UK economy has managed to absorb on average 116,600 new ICT workers per year (roughly 54,200 accounting for expansion and 62,400 for replacement). We assume in our model calculation that this is the natural rate of "inflow" and that this will sustain for the near future.

The projection model basically rests on assuming a baseline scenario of a steady state of flows. It should be noted that this is a "Things stay the same"-scenario. It simply shows the number of jobs filled in the near future if the demand keeps growing in a linear fashion, with annual supply of new labour remaining the same as in the last five years. This is a baseline projection scenario, and not necessarily the one we would deem most likely after a deeper analysis of technological, socio-economic and political trends. Nevertheless, it shows a basis to ponder on trends and think about likely other, different scenarios, which might include technology leaps or disruptions, but also social, economical or political impact. The baseline projection model rests on these inputs:

- Demand growth follows an "only" linear trend, i.e., grows by an absolute figure per year and not a percentage. Demand is set to grow by 54,200 individuals p.a.
- New supply is set by the average supply of the last years.
- The degree gap or minimum lateral inflow has been 45,700 on average and this remains the case.¹⁹

The shortage of skills of 575,000 in 2025, highlighted by red font in the chart below, is to be understood as the shortage that remains when all expected domestic ICT graduates enter the labour market. It does not take account of the lateral entries, i.e. people without a domestic degree in ICT (such as immigration and out-migration by ICT specialists). It is, so to speak, the cumulative minimum scope for outsider entries to the ICT labour market.

It needs to be stressed that the model is constructed such that the actual projected shortage is exactly as "today", meaning at starting point of the model, namely 163,000.

The total potential for new jobs until 2025 will be 1,150,000 according to this model. This number represents the total number of new entrants to the ICT labour market in 8 years. Depending on perspective, both the total potential of 1,150,000 new entrants to the ICT labour market by 2025, or the outsider potential of 575,000, very well reflect the opportunities that may be grasped by participants of inclusive ICT training measures that are the subject of the present research.

¹⁹ It is unknown whether and to what extent this number can be increased by political or other measures. The relative persistence of skills gaps indicates that this is at least not an easy task. In the calculation we assume a yearly lateral inflow of exactly this size, and due to this the current shortage (i.e. the number vacancies, which is 163,000 currently) will remain at the same level until 2025 in our model.





Source: empirica (2017)

Trends in Diversity

The share of young people neither in employment nor in education and training (NEET) in the UK (10.9%) is only slightly better than the EU28 average (11.6%). On this indicator the UK ranks 16th among the 28 EU member states. The gap in UK gender employment rate is at 9.5 percentage points, somewhat below the EU average of 10.5%. But the UK still ranks only 17th on this indicator, which points towards a sizeable labour reserve in the form of women at working age who do not participate in the labour market or are unemployed. Despite long standing campaigns from Government and industry there remains a marked gender imbalance in those studying computing—only 16% of computer science students at school are female and this low level of representation persists through higher education and in the workplace. Such shortcomings in inclusion levels for ICT jobs have changed hardly at all since 2011.



Indicators on diversity in employment

The UK's long-term unemployment rate underwent a sharp rise in the aftermath of the 2008 financial crisis. It has decreased significantly again since the second half of 2013. In the second quarter of 2016, the figure was down to 1.3 %, lower than in 2008 and much lower than the country's average long-term unemployment rate from 1992 until 2016 (2.1 %). The youth unemployment rate shows a similar development over the last 10 years, but at a rate of 13.0% (2016) is still almost twice the figure of Europe's best-performing country, i.e. Germany (6.7%). The size of the challenge faced by the UK becomes clearer when looking at the number of young people neither in employment nor in education and training (NEET), for which the UK figure (10.9%) is only slightly better than the EU28 average (11.6%). On this indicator the UK ranks 16th among the 28 EU member states.

The gap in UK gender employment rate is at 9.5 percentage points (p.p.), somewhat below the EU average of 10.5% and Germany and France, both at 7.9 percentage points. The UK still ranks only 17th on this indicator, which points towards a sizeable labour reserve in the form of women at working age who do not participate in the labour market or are unemployed.²⁰ There appears to be a direct correlation between the countries' persisting gender employment gap and the lack of female ICT practitioners on the country's labour market (see next section). As an indicator for the labour market situation of ethnic minorities in the UK, we use the share of non-natives born outside of the EU in both total population and in employment.²¹ At 8.3%, the UK has the 12th largest share of such non-natives in the EU. The employment rate of non-EU, non-natives in the UK is 6 percentage points below the value for natives - significantly better than in other large EU countries with sizeable immigrant communities such as France (14.0%) and Germany (10.6%).

The latest statistical data from 2017 show a correlation exists between ethnicity and low income. 20% of people living in Asian and Black households lived in persistent low income, the highest

percentages out of all ethnic groups.²² 8% of people living in White households lived in persistent low income, the lowest percentage out of all ethnic groups.

When looking at the economic inactivity by qualification in the UK the following becomes apparent: overall, 12% of people aged 16 to 64 years with a level 4 qualification (such as a degree) or above were economically inactive (out of work and not looking for a job) and not in full-time education in 2017. This figure increased to 14% for people with a level 3 qualification, 21% for those with a level 2 qualification, and 49% for those with no qualifications. The largest difference between ethnic groups was found among those with below level 2 gualifications -24% of White people were economically inactive, compared with 41% of people from the 'other' ethnic group and 37% from the Asian group.²³

The UK's disability employment gap is one of the largest in the EU. Comparisons are difficult because of the different definitions used for measuring disability. The latest data that are comparable across the EU are from 2011, according to which the UK shows a disability employment gap of 27.8% against an EU average of 19.6%. Unemployment data show that people with disabilities face an unemployment rate that is 2.7% higher than for non-disabled individuals. The latest data from national sources (Learning & Work Institute 2017) show that the situation has hardly improved since 2011, in spite of a recent government pledge to make radical progress in the area, as discussed in section 3.

²⁰ Eurostat: Gender employment gap 2017:

https://ec.europa.eu/eurostat/web/products-

datasets/product?code=sdg 05_30 ²¹ Not to be confused with the BAME population, many of which are born in the UK. No comparable data is available for the BAME population.

²² Persistent low income is defined as earning less than 60% of the UK median income before housing costs in at least 3 out of 4 years ²³ GOV.UK: Ethnicity facts and figures: https://www.ethnicity-factsfigures.service.gov.uk/?utm_source=rdareport

Table 5 Employment and unemployment indicators for diverse groups

Indicators	UK	EU28	UK Rank
Long-term unemployment rate	1.3	4.0	1st
Young people not in employment, education and training (15-24 years) – NEET	10.9	11.6	16th
Youth unemployment	13.0	18.7	8th
Employment rate of older workers (55-64 years)	63.4	55.3	7th
Age employment rate gap (15-64 vs. 55-64 years) in p.p.	10.1	11.4	11th
Gender employment rate gap (15-64 years) in p.p.	9.5	10.5	17th
Non-natives born outside the EU, as share of total population	8.3	6.9	12th
Non-native employment rate gap, in p.p.	6.8	8.3	14th
Disability employment gap, 2011, in p.p.	27.8	19.6	19th
Disability unemployment gap, 2011 in p.p.	2.7	2.5	14th

Source: empirica calculations based on latest available Eurostat data (2016)

Diversity in the UK's ICT Workforce

The share of **women** in the ICT workforce, with 16.2%,²⁴ is very close to the EU average (16.1%) – which is surprising given that the UK's female labour force participation rate is significantly above average. The highest shares of women are found in the occupational groups 'Graphic designers', 'Assemblers of electrical and electronic products' (both 35%) and 'IT operations technicians' (24%) – against a meagre 14% for programmers/software developers.

The UK has seen a broad public debate about the causes of the gender gap in the ICT workforce, and the STEM workforce in more general. This is well reflected in the House of Commons Science and Technology Committee's 2016 Digital Skills Crisis Report. The report states that "despite long standing campaigns from Government and industry [...] there remains a marked gender imbalance in those studying computing—only 16% of computer science students at school are female (compared with 42% who studied ICT) and this low level of representation persists through higher education and in the workplace"²⁵. Such shortcomings in inclusion levels for ICT jobs have changed hardly at all since 2011.²⁶

2017 surveys indicate 11% of the engineering workforce is female.²⁷ This is a positive change from the 9% in 2015. On the other hand the number of women registered engineers and technicians (i.e. CEng, IEng, EngTech has dropped from 6% to 5% of total.²⁸ Only 15.1% of engineering undergraduates in the UK in 2017 are women.²⁹ The proportion of young women studying engineering and physics has remained virtually static since 2012.³⁰ Only around 20% of A Level physics students are girls and this has not changed in 25 years.³¹

Obstacles seem to be apparent at all major stages of the talent pipeline. Whilst it is positive to see an increase of women working in core STEM occupations, the proportion of the workforce made up by women has decreased from 25% in 2015 to 22% in 2018. The major problem is well described by WISE:

²⁴ Derived from Eurostat data for 2015. The Tech Partnership figure for both 2015 and 2016 is 17%, see The Tech Partnership & BCS (2016), *Women in IT Scorecard 2016*.

²⁵ See House of Commons, Science and Technology Committee (2016), *Digital skills crisis*, p. 30.

²⁶ See BCS (2017), Diversity in IT 2017 – Shaping Our Future Together.

²⁷ Women in STEM workforce, WISE Campaign, 2017 <u>https://www.wisecampaign.org.uk/resources/2017/10/women-in-stem-workforce-2017</u>

²⁸ Engineering UK 2017: The State of Engineering,

http://www.engineeringuk.com/media/1355/enguk-report-2017.pdf

Engineering UK 2015: The State of Engineering,

http://www.engineeringuk.com/EngineeringUK2015/EngUK_Report _2015_Interactive.pdf

²⁹ Skills and Demand in Industry 2015, IET,

https://www.theiet.org/factfiles/education/skills2015-page.cfm? ³⁰ Talent 2030 Dashboard, National Centre for Universities and

Business, 2015 http://www.ncub.co.uk/reports/talent-2030dashboard-2015.html

³¹ Key headline from the Institute of Physics – 'It's Different for Girls' research, 2014

http://www.iop.org/education/teacher/support/girls_physics/page _41593.html

Table 6 Share of women in the fastest growing ICT occupations in the UK, 2016

United Kingdom	Share male	Share female
Programmers and software development professionals	86%	14%
Information technology and telecommunications directors	90%	10%
IT project and programme managers	77%	23%
Graphic designers	75%	35%
Information technology and telecommunications professionals n.e.c.	93%	17%
IT business analysts, architects and systems designers	78%	22%
Electrical and electronic trades n.e.c.		
IT user support technicians	81%	19%
IT engineers		

Source: ONS

"Only 7% of the girls who take STEM GCSEs will go on to qualify at Level 4 in a Core STEM area, this is drastically lower than the 24% of boys who will leave education with these qualifications. This represents a real risk to the future STEM labour force and will likely exacerbate the current skills crisis."³²³³

A further example comes from a survey commissioned by the Tech Partnership. They found that 50% of women in tech were actively discouraged from entering a technology career by people close to them and 76% said they did not view technology as an attractive career path at school (even though 100% reported that they had since enjoyed their career in ICT).³⁴ For Scotland there is evidence that the majority of women with ICT and other STEM subject qualifications do not go on to work in related areas: In Scotland, 73% of female STEM graduates are lost from STEM occupations, compared to only 48% of males.³⁵ In the 2015/16 season, women made up 52% of apprenticeships, but only 18% of apprenticeships in ICT.³⁶ In depth analysis of the data showed that female ICT applicants tend to submit just one application to the sector, whereas men are much

more likely to submit two or more applications,³⁷ which is indicative of the hesitancy of young women to start a career in ICT.

Members of the main minority groups in the UK are affected by lack of diversity as well. This applies, in particular, to **people with disabilities**. An analysis of ONS data by BCS, the Chartered Institute for IT, found that only 8% of ICT specialists are disabled, compared with national statistics that show 23% of the working age population have some form of disability (the figures include persons with a long-standing health problem).³⁸ Just one in ten apprentices have a disability or learning difficulty,³⁹ but at least the share has been increasing somewhat over recent years.⁴⁰

17% of ICT specialists are of non-white ethnicity (**BAME**) – the same rate as for the entire BAME working age population.⁴¹ Unemployment rates for ICT specialists from BAME backgrounds, however, are significantly higher than for non-BAME groups, although markedly lower than for BAME groups with other or no qualifications. Closer analysis reveals that persons of Asian and other non-white ethnicities perform significantly better than Blacks on both of these indicators. Further analysis by BCS found that ICT workers from minority groups are particularly unlikely being employed in SMEs and within the manufacturing sector. Moreover, minority groups as

³³ WISE: From classroom to boardroom – the STEM pipeline: https://www.wisecampaign.org.uk/statistics/from-classroom-toboardroom-the-stem-pipeline/

³⁴ See Tech Partnership (2017b), *Half of women actively discouraged from tech careers, QA study finds.*

³⁵ See Royal Society of Edinburgh (2012), *Tapping all our Talents*. *Women in science, technology, engineering and mathematics: a strategy for Scotland*.

³⁶ See National Learning and Work Institute (2017), *Three million* apprenticeships – Building ladders of opportunity.

³⁷ Ibid.

³⁸ See BCS (2017)

³⁹ Compare National Learning & Work Institute (2017)

⁴⁰ See Powell (2018)

⁴¹ See BCS (2017)

well as women are strongly underrepresented in senior roles. $^{\rm 42}$

The evidence quoted above indicates continuing difficulties of the country's ICT sector (defined by occupation) to absorb women and people from many of the key minority groups, over and above the sector's difficulty to attract individuals from all segments of the labour force to seek a job as ICT specialist in the first place. Action is required.

 $^{^{\}rm 42}$ See House of Commons, Science and Technology Committee (2016)



Policy Overview

The UK Digital Strategy 2017 prioritises public-private partnerships with both the industry and the NGO sector to tackle the digital skills gap and fostering digital inclusion. To this end the government has supported development of the so-called Tech Talent Charter as a means to promote action by employers on a purely voluntary basis. As far as delivery of the Strategy's skills-related action points is concerned, the paper proposes a revised multi-stakeholder partnership approach, in which central government deals directly with employers instead of via intermediaries. The government established a new Digital Skills Partnership (DSP), "to bring greater coherence to provision of digital skills training at a national level, and to support local level partnerships to increase the digital capability needed to build inclusive, thriving local economies." Further activities include the Local Digital Skills Partnerships (LDSPs) started in 2018 and the introduction of an Apprenticeship Levy in 2017. Finally, the government launched a new College-based technical and professional education Strategy with the aim to identify a number of broad vocational routes that seek to encourage participation by simplifying the qualification landscape.



Policy initiatives to address ICT skills in the UK

A Digital Strategy with emphasis on ICT workforce diversity

Tackling the digital skills gap and fostering digital inclusion are essential to the government's digital policy outlined in the UK **Digital Strategy 2017**, which prioritises public-private partnerships with both the industry and the NGO sector. The strategy paper outlines government action in particular for digital skills to be fully embedded in education; boosting lifelong learning to up-skill people across their working lives; reforming the technical education system to help develop a range of specialist digital skills to fill specific digital jobs; and strengthening cyber security skills.

The document explicitly addresses the need to "enable a more diverse digital workforce", for the purpose of which the government has supported development of the so-called **Tech Talent Charter**⁴³ as a means to promote action by employers on a purely voluntary basis. The Charter, launched in 2017, seeks to provide an impetus for change across the sector by presenting employers of ICT specialists with suggestions for effective actions and principles to adopt and embed into their organisations.

As far as delivery of the Strategy's skills-related action points is concerned, the paper proposes a revised multi-stakeholder partnership approach, in which central government deals directly with employers instead of via intermediaries, like the Sector Skills Councils and the Tech Partnership network. The latter had been the main vehicle for collaboration between employers for action on digital skills for the UK economy, and comprises over 1,000 employers. The government holds the view that the national system for digital skills provision has remained too fragmented, with too many poorly integrated programmes operating in some areas while other areas had none at all. Because of the government's withdrawal of support, the Tech Partnership (itself the successor of eSkills UK) decided to cease operations in September 2018.

In its place, the government established a new **Digital Skills Partnership (DSP)**, "to bring greater coherence to provision of digital skills training at a national level,

and to support local level partnerships to increase the digital capability needed to build inclusive, thriving local economies." Its mission is to "facilitate coordination between the various programmes, including the sharing of knowledge and best practice. The Partnership will also examine options for improving the coherence of digital skills provision, for example by setting ambitions for increasing the level of certain types of training on offer and agreeing how it can be targeted where it is needed most"⁴⁴.

For coordination of actions at local level, Local Digital Skills Partnerships (LDSPs) were launched in 2018 to increase collaboration between businesses, charity sectors, and public sector organisations to help address local digital skills needs in more targeted and innovative ways. There is no lack of ambitions: "We will explore how to identify digital vacancies area-byarea, and where possible look to make this data available to local authorities, combined authorities, LEPs and others. We will encourage and support local partnerships of government and business to make use of this data to tackle digital skills shortages in their area. Actions to address these shortages could include local firms offering more digital apprenticeships, or careers advice and work experience to local schools. It could also include national and international firms making training packages available to local partnerships. By identifying and acting on digital skills shortages at a local level, we will help more people across the country to access the training and information they need to move into highly-skilled, well-paid digital jobs across the economy"⁴⁵.

It remains to be seen to what extent these ambitions can be translated into effective practice at local level, including the promotion of greater inclusiveness in ICT training programmes. The first LDSP was launched in June 2018 by the Lancashire Enterprise Partnership. Many more are expected to follow in the coming months.

⁴³ See <u>https://techtalentcharter.co.uk/about-the-tech-talent-charter/</u>

⁴⁴ See Department for Digital, Culture, Media & Sport (2017), *UK Digital Strategy 2017*.

⁴⁵ See Department for Digital, Culture, Media & Sport (2017)

Box 3 Digital Strategy 2017 for UK

The UK Digital Strategy was launched by the Department for Digital, Culture, Media & Sport in 2017. In the context of Brexit, the strategy's aim is to create a digital economy which is resilient to change and fit for the future. The strategy is formed of seven strands: building world-class digital infrastructure for the UK, giving everyone access to the digital skills they need, making the UK the best place to start and grow a digital business, helping every British business become a digital business, making the UK the safest place in the world to live and work online, maintaining the UK government as a world leader in serving its citizens online and unlocking the power of data in the UK economy and improving public confidence in its use. The strand regarding digital skills and inclusion focuses on the following goals:

- continuing to tackle the root causes of digital exclusion;
- ensuring that everyone can increase their digital capability to make the most of the digital world;
- developing the full range of digital skills that individuals and companies across the country need in an increasingly digital economy;
- supporting people to up-skill and re-skill throughout their working lives;
- helping young people to engage with the digital economy;
- enabling a more diverse digital workforce by helping more women into tech and supporting other underrepresented groups, such as people with disabilities and those from minority background or lower socio-economic areas; and
- establishing a new Digital Skills Partnership, working together with partners who are passionate about closing the digital skills gap to ensure strong collaboration between the public, private and third sector to tackle the digital skills gap in a coordinated and coherent way.

Source: Department for Digital, Culture, Media & Sport (2017) Digital Strategy 2017.

Digital Apprenticeships

For more than 10 years, consecutive British governments have voiced their intention to give a stronger role to **apprenticeships** within the country's further education landscape. A policy decision to expand the apprenticeship programme was first taken in 2009. The resulting rapid increase in the number of apprenticeships, however, was largely due to a conversion of existing employees to apprentices rather than a higher number of school leavers starting apprenticeships.⁴⁶ A 2012 review of the performance of the UK apprenticeship system, the Richard Review of Apprenticeships, also found that apprentices were often considered by employers to be incompetent to perform in a job at the end of their apprenticeship. No wonder, then, that the role of apprenticeships in the UK education system has been minor - in particular in comparison to other countries such as Germany, where apprenticeships perform an important role in opening a pathway into employment to young persons.

In 2013, the UK government started to ask for groups of employers ('trailblazers') to collaboratively develop new apprenticeships, including apprenticeship standards and assessment approaches. The objective is to ensure that apprenticeships meet real-life labour demand by making employers set standards and specify the knowledge and skills that are required from individuals. Included are a number of so-called **digital apprenticeships** standards. 13 of which have been developed by end of 2017, with more to come. The Government set a target of 3 million apprenticeships starts by May 2020, continuing a cross-party consensus of recent decades to expand apprenticeships.

Apprenticeships generally fall into one of four categories:

- Intermediate level apprenticeship generally considered to be the same as five GCSE passes.
- Advanced level apprenticeship generally considered to be the same as two A level passes.
- Higher apprenticeship can lead to NVQ Level 4 and above (which equates to the European EQF level 5), or a foundation degree.

From September 2015, some universities started offering degree apprenticeships — these are new and enable apprentices to achieve a full bachelor's or master's degree as part of their apprenticeship.

April 2017 saw the introduction of an **Apprenticeship Levy** in the UK as a means to fund expansion of apprenticeships. The Levy is a payroll tax on large employers, with funds raised ring-fenced in a digital

⁴⁶ See Richard (2012). *Richard Review of Apprenticeships*.

account and only available to be spend on apprenticeships (somewhat different arrangements apply in Scotland and Wales). In early 2018, a new, employer-led **Digital Apprenticeship Quality Board** was established in order to assess and promote the quality of the apprenticeship system, mainly as a response to continued criticism that the system still suffers from low-quality provision.⁴⁷

The Levy has come under attack from various stakeholders, partly as a result of recent data showing that apprenticeship numbers have been decreasing since introduction of the Levy. However, digital apprenticeships have bucked the trend as their numbers have kept on increasing sharply – they constitute 14% of all apprenticeships across England in 2017/18, compared to just 3% in 2016/17.⁴⁸

Another area of criticism stems from evidence that the Levy is not helping to address disparities in access to apprenticeships. Analysis by the Social Mobility Commission (2016) has shown that young people from low-income households are much less likely to undertake an apprenticeship. People from BAME backgrounds are also under-represented. Partly in response to such criticism, the government recently introduced the target for 2020 to increase BAME apprenticeships starts by 20%. Apprenticeships are not the only way to develop work-related technical skills in the ICT domain. The key role of College-based technical and professional education (TPE) is acknowledged in the government's Post-16 Skills Plan for England (2016) as well as in the Industrial Strategy Green Paper (2017). There has been strong consensus for some time that further education colleges should be given the power to award higher technical and professional certificates, in partnership with employers. To this end, the government launched a new TPE Strategy with the aim to identify a number of broad vocational routes that seek to encourage participation by simplifying the qualification landscape. One of the 15 new technical education routes (each encompassing multiple occupations) to be developed until 2022 is called "Digital" and will be designed to lead towards occupation as programmer, software developer, network administrator, web designer or IT technician.⁴⁹ These so-called T-Levels will be gradually phased in over the coming years. The first 'pathfinder' routes are planned for teaching in September 2019.

Given the potential role which TPE can play in providing a pathway into ICT jobs to people for whom the academic route is not accessible, for example because of the personal investment required, the overhaul of the TPE system offers reason for hope.

Box 4 Apprenticeship training in England – a cost-effective model for firms?

The recent study on 'Apprenticeship training in England – a cost-effective model for firms?' for the Bertelsmann Stiftung, JPMorgan Chase Foundation and the Education Policy Institute revealed that most firms in England in most of the occupations for which simulations were run will only break-even (having no net-costs of training) if they pay apprentices' salaries that are either close to or even below current minimum wages. However, in some cases the simulations lead to net benefits that are extremely high, that is for bricklayers, electricians, and IT/software developers. The study concludes that apprenticeships for young people as an alternative to school-based general education or school-based vocational training may produce the best outcomes from the perspective of firms. It continues to state that from the perspective of apprentices, the programmes that would start at an early age, even at a very low pay, would in most cases also generate the highest private rates of return, compared to scenarios, where the apprentices follow a program at a later age. In most occupations and scenarios, big firms have the highest net benefits, whereas micro-companies (less than ten employees) may sometimes even face net costs in scenarios where the average firm can expect net benefits. The study also suggests policy measures specifically addressed to SMEs and asks for improvements in the quality of the training programmes: "In sectors where micro companies are the backbone of the industry, particular policy measures to stimulate firms' engagement would need to be considered, whereas bigger firms often do not need special stimuli." "Improvements in the quality of training programs that would improve the labour market outcomes of apprentices could be a necessity to secure talented applicants for the programs and thereby also reduce dropout rates."

Source: Wolter, Stefan C., Joho, Eva: Apprenticeship training in England – a cost-effective model for firms? Study for Bertelsmann Stiftung, JPMorgan Chase Foundation and Education Policy Institute, March 2018

⁴⁷ See National Learning and Work Institute (2017)

⁴⁸ BCS (2018)

⁴⁹ See Gathercole (2017), Making sense of the plans for T-Levels.

Again, it remains to be seen to what extent the current revisions will be more successful than previous ones in boosting the vocational education system's ability to produce the human resources that are required by employers. In the meantime, some "policy turbulence"⁵⁰ occurred, which also affects digital and tech in further education. It is likely to continue and pose a major challenge for all stakeholders involved.⁵¹.

Strong ambitions for getting people with disability into jobs

With regard to employment of people with **disability**, the government, in its 2015 Conservative Manifesto, pledged to halve the disability gap by the year 2020, which the government understands as implying that over a million disabled people will be helped to move into or maintain work. This initiative was applauded by UK stakeholders representing people with disabilities, as it indicated a "shift, away from a primary concern with benefit levels, towards employment opportunities and the benefits of working, [...] [i.e.] an important change in how government views the role of disabled people in our economy and society"⁵².

In spite of policy action, including the **Disability Confident** scheme, an offer to employers was designed to help them recruit and retain disabled people and people with health conditions and to which they were asked to sign up on a voluntary basis. Most observers agree that reaching the target has become all but impossible, as it would require a much stronger, better coordinated and better funded effort.⁵³ This relates, in particular, to implementation of effective outreach activities to promote employment of disabled people to businesses, including employers in the ICT sector.

STEM policies precise lack an understanding of the STEM skills problem and a better targeted approach is needed to demonstrate value for money

The National Audit Report on 'Delivering STEM skills for the economy'⁵⁴ states that "responsibility for

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developing STEM skills involves a number of government departments, and is embedded across a number of non-STEM specific policy areas. The Department for Education (DfE) is responsible for the majority of STEM skills interventions. The Department for Business, Energy & Industrial Strategy (BEIS) has a cross-cutting role, including work on doctoral training and STEM inspiration, and setting the national framework for science and technology. Other departments, including the Department for Digital, Culture, Media & Sport and the Ministry of Defence, run individual STEM-related programmes and initiatives. Aside from the core teaching of STEM subjects, some of the most significant initiatives in terms of spending are providing higher education institutions with additional money to support their, teaching of very high-cost STEM subjects, allocating capital funds to enhance higher education STEM teaching facilities, and running university technical colleges, which were set up to offer 14- to 19-yearolds a combination of technical, practical and academic learning". The same report concludes that some STEM initiatives have been effective but overall coordination has been lacking. Some initiatives have had a positive impact, and those targeted at A levels saw entries grow by 3% between 2011/12 and 2016/17. However, overall these initiatives are not sufficiently coordinated at programme level to take full advantage of synergies, or to mitigate the risk of duplication. In its conclusion on value for money it states that DfE and BEIS face a complex challenge to improve the quality of teaching and student take-up in key STEM subjects. Some of their initiatives are achieving positive results but there remains an urgent need for a shared vision of what they are trying to achieve and coordinated plans across government. The absence of a precise understanding of the STEM skills problem means the efforts of DfE and BEIS are not well prioritised and a better targeted approach is needed to demonstrate value for money.

⁵⁰ See Exlex (2017), *Sorry schools, it's FE's turn*.

⁵¹ See Blakeley (2017)

 ⁵² See House of Commons, Work and Pensions Committee (2017)
 ⁵³ See: Connolly et al. (2016), "Ahead of the Arc" – a Contribution to Halving the Disability Employment Gap. See also Centre for Social Justice (2017), Rethinking Disability At Work Recommendations, polling data and key statistics.

⁵⁴ National Audit Office: Department for Business, Energy & Industrial Strategy, Department for Education: Delivering STEM

⁽science, technology, engineering and mathematics) skills for the economy (17 January 2018): https://www.nao.org.uk/wpcontent/uploads/2018/01/Delivering-STEM-Science-technologyengineering-and-mathematics-skills-for-the-economy.pdf



Findings

Out of 57 programmes identified through desk research in the UK, 29 programmes were found to be directly relevant to inclusive ICT skills training. In this section we analyze the results of our survey of private sector approaches towards inclusive ICT skills training programmess. We provide a brief look into the pathways available to gain an entry into the digital labour market in the UK and suggest a taxonomy to classify the programmes surveyed. We conclude this section with a summary of lessons learned from our selected programmes.



Methodology and research

We conducted a comprehensive survey to determine the impact and challenges of inclusive ICT skills training programmes for diverse groups to enter the digital labour market. Our research combined both qualitative and quantitative methods, including surveys, individual interviews with training providers, and in-depth interviews with the selected good practice showcases and employers.

In the context of this study, the term ICT skills includes, both ICT user and ICT practitioner skills. However, more importance is given to ICT practitioner skills, which the European ICT skills Forum defines as, "The capabilities required for researching, developing and designing, managing, producing, consulting, marketing and selling, integrating, installing and administrating, maintaining, supporting and servicing ICT systems."

Out of the 57 programmes identified in the UK, 29 were identified as directly relevant to inclusive ICT skills training as defined in the scope of our study. These programmes were specifically targeted towards underrepresented groups such as women and disadvantaged socio-economic groups such as young persons not in employment or education and training (NEET), and job seekers at risk of long-term unemployment. Figures 4.1 and 4.2 show a further breakdown of these programmes in terms of target groups addressed and stakeholders involved in inclusive ICT training in the UK.



Figure 5: Share of target groups in inclusive ICT training in the UK, % of programmes surveyed

Source: diversITy Survey, empirica (2017)



Figure 6: Share of stakeholders in inclusive ICT training in the UK, % of total programmes surveyed

Pathways to ICT skills training and jobs

There are multiple pathways for individuals to gain an entry into the digital labour market; in the UK, traditional education in the form of university degrees is still the most common, but recent reforms of the systems for apprenticeships and technical and professional education have increased the number of training options available for entering the ICT workforce. The favourable conditions on the UK labour market for ICT specialists have resulted in a strong demand for possibilities to add digital skills training to educational attainments from another area, such as a degree in the humanities. In response, new pathways have emerged for young people seeking to transition from other sectors into the ICT sector. The five main pathways in the UK are discussed below.

Pathways

University education

In the UK, the most common traditional pathway for students is a university degree in Computer Science or a related subject. This is typically a three year undergraduate (BA) or four year master's degree (e.g. Master of Computer Science). Most of the graduates working in the ICT sector have a university degree. A major deterrent are the tuition fees, which can easily exceed €10,000 for UK students.

Apprenticeships

After being neglected for a long time, apprenticeships have emerged in recent years as an important route into the digital workforce. The range of Digital Apprenticeships to choose from is steadily growing, as new apprenticeship standards continue to develop in close collaboration between employers and approved by the Department for Education. A digital apprenticeship takes between one and four years to complete and consists of a full-time job with learning on the job, plus training at a college or training provider, usually on a dayrelease basis. It results in a nationally recognised qualification.

Industry-lead trainings

Employers in the UK consider Industry-led / ICT vendor trainings as useful further training certificates. The certificates enjoy a high reputation as further training certificates and are accepted as valuable also for career transitioning youth and adults and specifically if obtained from reputable international ICT vendors.

Career transition and re-start

Many students who enrol in ICT skills training in the UK have an educational background in subjects other than Computer Science, such as Humanities or Social Sciences. They may choose to do so for better career prospects or stable and higher-paying jobs. A number of reskilling and up-skilling training programmes are specifically targeting people who face problems in finding a quality job aligned to their education, and may be interested in changing towards a career in ICT. In addition, some programmes are targeting women who are interested in re-starting their career in ICT after a family break. These programmes are aimed at re-skilling and u-skilling and preparing students for an ICT job.

Technical and Professional Education

Apprenticeships are not the only way to develop work-related technical skills in the ICT domain. The key role of College-based technical and professional education (TPE; formerly called 'vocational education') has been acknowledged by the government. Typically, TPE includes A Levels, AS Levels, Scottish higher and vocational qualifications, generally up to the standard of GCE A-level or NVQ level 3 or the Scottish equivalent. Most UK colleges are public institutions, but there are also many private colleges, which cater to specific types of students as well. Courses last for either one or two years, after which students can either enter the job market, continue to higher education, or opt for additional training to increase the value of their TPE certificate.

As previously discussed, the main issue in higher education pathways is the low share of women choosing ICT subjects, which has not improved over recent years. UK stakeholders agree that systematic efforts are required to mitigate the situation, which would need to address all main stages of the talent pipeline. In this respect, the government's implementation of the 'coding curriculum' in 2014 has been widely welcomed. It requires all children aged five and above to learn how to code at school. It will take many years to have an impact on enrolment rates of women and other groups currently underrepresented in higher education in ICT. In the meantime, valuable work is done by NGO programmes driven by activist's intrinsic interest in boosting diversity, exemplified by the Girls in Tech London and Code First: Girls initiatives.

Both, apprenticeships and TPE are particularly important for individuals from diverse and disadvantaged socio-economic backgrounds, for several reasons. First, VET provides direct pathways into the labour market for individuals who lack the ability to finance a higher education route – especially relevant in the UK, where university tuition fees place a serious burden on students. Apprenticeships, in particular, are attractive because they allow learners to earn a living from the first day of the training, and promise a smooth entry into the labour market after completion. Secondly, apprenticeships address the need for experiential training, which is deemed of special importance for employment of persons who find it difficult to access jobs through the traditional pathways, including those from groups suffering from deeply embedded negative attitudes of employers, such as people with disabilities and from an ethnic minority background.

Employer demand for graduates from ICT apprenticeships and the vocational education system remains a challenge. Employers frequently mention that according to their experience, applicants who come with a qualification from an apprenticeship or further education course are found to be unfit for the type of jobs to be found in the digital sectors. This may be changing with introduction of digital apprenticeships and the overhaul of the TPE system, but robust evidence is not yet available because finishers from these programmes only gradually become available on the job market. On a positive note, the number of companies that offer digital apprenticeships has sharply increased in the last years. Apprenticeships have traditionally also suffered from low demand from students due to their low status in the UK and their image of being of a 'low skilled – low pay' nature.⁵⁵ Studies found that BAME families, in particular, often view higher education as the only appropriate career option for their younger members – although unemployment rates for higher education graduates from BAME backgrounds are significantly higher than for white graduates.⁵⁶ Digital apprenticeships also do not seem to be an attractive option for the majority of young women.

In this respect, much blame is put on the ineffectiveness of the UK's system for career guidance, widely perceived to be due to lack of funding and inconsistency in policy guidance.⁵⁷ There is evidence that key influencers such as parents and teachers are ill-informed about the opportunities to be found in the ICT sector, which is confirmed by the experts interviewed for the present study. Newton and Williams argue that "a comprehensive package of careers education is needed early on, before young people have developed entrenched stereotypes about jobs, on which careers guidance might build"⁵⁸. In January 2016, the then Education Secretary announced that the government would introduce legislation to "require schools to ensure nonacademic routes received 'equal airtime' with academic routes in schools career advice". The Department for Education's Careers Strategy published in December 2017, set out a series of measures foreseen for implementation during 2018-20. The measures have the goal to improve careers guidance in England, including new benchmarks, an investment fund for disadvantaged pupils, and a named Careers Leader in every school and college. A 2017 amendment to the Technical and Further Education Bill meant that schools are now required to admit providers of technical education and apprenticeships to contact pupils to promote their courses. Again, it will take time before these interventions can result in tangible impact specifically when no funding for these activities is given to apprenticeship providers.

⁵⁵ See London Assembly, Economy Committee (2017), *Apprenticeships: an un-level playing field.*

⁵⁶ See Skills Development Scotland (SDS)(2015), *Equalities action plan For Modern Apprenticeships in Scotland*.

⁵⁷ See Long & Hubble (2018), *Careers guidance in schools, colleges and universities.*

⁵⁸ See Newton & Williams (2013), Under-representation by gender and race in Apprenticeships.

For **career transitioning youth and adults**, the experts contacted for the present study considered **IT vendor certificates** to be relevant for most technology and ICT job profiles. However, for most employers such certificates are only relevant if obtained from reputable UK or international training institutions.

We found a number of programmes with a particular focus on women (and men) who want to re-start their career in ICT after a family break, or who want to make use of free time during their family break for updating and further developing their digital skills (e.g. London-based Mums in Technology). These programmes take into account, e.g. young parents' need for flexibility in the daily organisation of training activities. This is an area where demand is strong,⁵⁹ but – as observers have noted – not yet sufficiently met e.g. in the digital apprenticeship schemes.⁶⁰

Our survey of ICT training programmes shows that three types of offers are particularly helpful for youth and adults without the qualification required to enter one of the traditional pathways into ICT.

- First, ICT training programmes offering free, intensive training courses including periods of work placement. They are available to unemployed youth who can demonstrate a strong motivation to work in the digital sector, and are likely to lead quickly to employment after successful completion.
- Second, for individuals who require stronger activation to enable them to embark on the ICT training journey local online centre provision of tailored services, often in collaboration with local providers of social services could be identified as training offers.
- Third, programmes working with intermediaries known to have excellent access to groups at risk of social exclusion. By making use of the handson experience of youth workers in how to motivate hard-to-reach young people, such ICT training programmes can open a route to a career in ICT to those furthest away from access to traditional education programmes.

⁵⁹ See Newton & Williams (2013)

⁶⁰ See National Learning and Work Institute (2017)

Good Practice Showcase: BBC Make It Digital

Unlock Britain's digital potential and create genuinely life-changing opportunities for young people

BBC's Make It Digital project aims to grow basic level digital skills and prepare trainees for employment or progression into apprenticeships. It targets 'Digital Immigrants' – people who are not using digital technology to its full extent – in a bid to professionalise them. It is also aimed at people who do not have a high level of educational attainment. The BBC Academy works in partnership with training providers and job centres to firstly, deliver the training and secondly, place trainees into internships and apprenticeships leading to jobs. The training curriculum is developed by the BBC Academy, taking into account the needs of the industry, its various sectors and the skills required. Additionally, the programme is designed to be highly relevant to the small and medium business sector, where research shows that these skills are in short supply across the UK. The content draws on existing BBC training and involves major brands to help inspire trainees. The programme is in total an eight-week course, including classroom-based training as well as three weeks work experience in a professional setting. 4,000 learners participate per year nationwide and 70% of learners have secured an ICT-related job directly after completion of the programme.

Why a best practice?

- Consistently high retention rates and trainees have a high rate of job placement.
- Strong and effective partnership of actors: It is the largest traineeship of its kind owing to an ambitious partnership between the BBC, DWP and SFA, supported by a range of other organisations.
- **Demand driven curricula and programme design:** The programme utilises a collaborative model where the BBC Academy, training providers, job centres and other local agencies work together developing trainings including sector-specific skills.
- **High impact:** It correctly identified market needs and adapted the training content by involving sector experts.

For full details of the case, see Appendix D.

Good Practice Showcase: Microsoft Partner Apprenticeship Programme – Get On

Provide ICT training opportunities to individuals who would otherwise not have the opportunity for a career in ICT

The Microsoft Partner Apprenticeship is a vocational training programme aimed at young people. It prepares them to work primarily in IT roles within the IT industry. In a typical one year apprenticeship, Microsoft supports the training providers by supporting the programme design and delivery. This includes access to certifications, e-learning, lesson plans and other key learning benefits. Opportunities for apprentices are communicated by Microsoft through its UK Partner Network. An additional aim is to increase the rate of female participation – part of this is through an Ambassador Network of ex-Microsoft Apprentices who attend careers fairs, parliamentary receptions, schools visits and arrange technical demo sessions. Apprentices are recruited into a Microsoft Partner or customer company prior to the start of the programme. The programme is split between in-house training and application of the gained knowledge in the workplace. The programme aims for apprentices to be performing 90-100 percent of the full role within 6 months of starting the programme. The final 6 months involve completing the curriculum and building further knowledge and experience. Once qualified, apprentices are then regarded as IT professionals with opportunities to progress to higher apprentices hips or degree level qualifications.

Over 7,500 apprentices started their career through this route in over 5,000 employers since the programme was rolled out nationally in 2010. Currently, there are around 3,500 apprentice starts per year. 92% of apprentices get a job and stay with the company where they started their apprenticeship.

Why a best practice?

- **Certification**: one of the main success factors is the Microsoft Certifications that are attractive to employers and young people as they are often considered industry benchmarks that demonstrate competence in specific technologies.
- **High retention rates:** 92% of apprentices stay with the company with which they started their apprenticeship.
- **Demand driven programme:** permanent process of consulting with employers to ensure the continued relevance of both content and delivery, as well as meeting sector skills demand.

For full details of the case, see Appendix E.

Training taxonomy

We classified the ICT skills training programmes identified in the UK in six categories based on the programmes' approaches to learning. The most promising programmes use multiple methods that are a combination of two or more approaches. The advantage of using integrated approaches is that it allows for the development of both technical and cognitive skills. These approaches are discussed in more detail below.

Cognitive and non-cognitive skills

Feedback from UK employers reveals that learners with well-developed soft skills are better positioned and have higher chances to be recruited by employers. Digital skills, in particular, are linked to a number of different soft skills such as creativity and communication. For this reason, exposure to the digital tech sector itself is seen as crucial to support someone into employment. Such exposure can take the form of a work placement as part of the training course, or an apprenticeship combining training and work experience throughout. Soft skills in demand range from effective communication and coordination to problem-solving, negotiation, teamwork and collaboration, and decision making. Employers indicated that graduates and trainees with no prior work experience tend to lack such skills, which points towards the potential of digital apprenticeships to significantly increase the number of suitable candidates available on the job market.

Good ICT skills training programmes in the UK address the development of soft skills, for example, by using

smaller sessions within larger training modules. Such sessions are specialised to account for different needs of the trainees, such as conducting interview simulations, workshops on communication and teambuilding exercises.

Programmes such as the Fujitsu Apprenticeship Scheme address the development of behavioural and mind-set skills by including personal learning & thinking Skills to develops skills to help apprentices succeed and develop in the work place, such as in teamwork. This approach helps to prepare trainees for actual situations encountered at work.

Experiential learning

Mixed or integrated approaches to training are the most desirable for both trainees and employers in the UK, particularly those in an experiential learning setting. Co-operation with businesses, if possible from the local economy, is especially relevant for designing curricula of training programmes for both technical and soft skill-sets because employer-driven programmes respond better to market demands for ICT and work-relevant skills. In this respect IT vendor programmes such as the Fujitsu's Apprenticeship Scheme and the Microsoft Partner Apprenticeship Programme have an obvious advantage because of their close links to in-house and partner HRM departments (See our Good Practice Showcase for Microsoft's Get On Programme in the Annex).



Bootcamps

Intensive training programmes generally lasting for a few days to several months. Training can be full- or part-time depending on the programme and consists of lessons, individual and team projects, 1:1 tutoring and tests.



Workshops

These typically take one to three days. Training is on specialised topics and consists of presentations and interactive peer-to-peer sessions.

A variety of training providers use both bootcamps and workshops (the terms are used interchangeably in the UK digital training landscape). Coding bootcamps for example have a skill-intensive focus that cover areas such as intermediate to advanced programming languages, supplemented by smaller sessions or workshops on soft skills training.

Success factors

- Affordability: Bootcamps are an affordable alternative to a four-year university degree as they require less time to complete and tend to cost less.
- **Flexibility:** Compared to university programmes, bootcamps are more flexible in terms of curricula and can respond faster to changing market demands.
- **Prior Experience:** Bootcamps are less selective than universities in terms of prior qualifications. Individuals who are interested and do not necessarily have an ICT background can enrol in training bootcamps.

Challenges

- **Certifications:** Bootcamps tend to not offer standardised certifications but rather follow a variety of teaching and training techniques.
- **Employability:** In terms of employability, bootcamp qualifications are typically not well known by employers, i.e. businesses tend to require more traditional technology qualifications or longer work experience in the ICT sector.



Classroom

Traditional, instructor-led training in a classroom setting, in most cases using tailored e-learning platforms. Training usually leads to a certificate and can last for several months.



Online

Training includes but is not limited to massive open online courses (MOOCs). Courses are available on online platforms, are mostly free to join and may or may not have instructors. Assessments are sometimes selfadministered or based on peer-to-peer feedback. Others offer the possibility to take a final exam and earn a certificate.

Classroom training with online learning elements is by far the more popular approach towards ICT skills training and used by most training programmes in the UK.

Success factors

- Flexibility: Learning through online platforms can be more flexible as trainees can access courses and schedule tests based on their own availability. However, this may not be possible with classroom training if programmes follow a strict in-house schedule.
- Learner engagement: Classroom training tends to be much more suitable for ensuring engagement of persons who lack self-efficacy, such as often found among NEET youth and the long-term unemployed.
- **Certifications:** Courses include but are not limited to content provided by IT vendors, such as Microsoft, IBM, Cisco, AWS and Oracle. Vendor-specific trainings follow a partner-centric approach in which companies create the curricula which is delivered by partners.
- **Employability:** Such trainings have the advantage of providing certifications that are valued by employers in the UK as indicated by employers and experts in interviews.

Challenges

- Affordability: Classroom training following a vendor-specified curriculum resulting in a certification tends to cost more, both for trainees and training providers. These programmes, unless funded through sponsors and other mechanisms, are unable to reach low income segments of the population, i.e. large parts of the at risk-groups covered by this study.
- Accessibility: Training programmes which require the presence of the learner at the location of the training provider tend to be available most of all in the major urban centres of the country, as our assessment of the training landscape shows. Other parts of the country tend to be underserved. Classroom based training is also less suited for persons requiring flexibility about when to learn, such as parents of young children in particular single mothers.
- **Prior Experience:** These programmes, especially if offered free of charge, tend to be more selective when choosing prospective participants. Stricter selection criteria have the risk of excluding those who may have the most to gain from such employability skills.



Experiential

A mix of technical and experiential learning including classroom-oriented learning and company placements. In most cases apart from apprenticeships, placements take place once trainees have passed all the learning components. Digital apprenticeships, meanwhile, are totally build around experiential learning.



Mentorships

Not a stand-alone training type and is integrated with other types. A trainee can choose or is appointed a mentor who is an experienced instructor or employee. The mentor is responsible for providing 1:1 guidance. In inclusive training programmes, mentors are typically volunteers with an interest in helping young persons succeed in the ICT sector.

Experiential programmes such as an internships or compulsory work placement are a more recent approach towards ICT skills training. Depending on the programme, training can last from a few weeks to more than a year. The latter type is typical for digital apprenticeships which results in a certification or degree. Many of such ICT trainings in the UK are developed due to effective business-education partnerships as the training curriculum is designed to reflect the demands of employers.

Success factors

- **Certifications:** Depending on the programme, a trainee may or may not receive a certification. However, the number of hours worked are recognised as formal work experience.
- **Employability:** Internships and workplace learning programmes have high added value for trainees as they learn both technical skills and soft skills, and get in touch with employers who may want to offer them a job after completion.
- As trainings are structured to reflect the demands of employers, employers can benefit from being involved in the training by getting relevant skills in return. This is a major success factor of experiential training programmes, especially those developed with the help of business-education partnerships.
- Mentorships: In many such programmes, technical training is accompanied by mentorships. Mentors are a valuable source of learning for new trainees or employees at the beginning of their careers. Mentorships work well if mentors are selected based on an intrinsic interest in supporting others during their career.

Challenges

- **Prior Experience:** Trainees must be enrolled in a training programme to get placed into an internship. Few training programmes guarantee an internship for all participants and places might be limited. Training programmes that offer compulsory work experience tend to be more selective in terms of prospective participants.
- Affordability: It is challenging for training providers to find employers who are willing to train and hire interns because of the resource burden on employers. Usually, experiential training is offered by well-reputed training programmes with a vast network of partners.

Good Practice Showcase: Amazon Web Services (AWS) re:Start for the Military

An ICT vendor-driven programme for 1,000 people from military or disadvantaged backgrounds providing training, knowledge and skills to jump start their career

The Amazon Web Services re:Start for the Military supports former members of the military looking for a career transition into the digital economy. AWS re:Start is designed to accommodate participants at all levels of experience, even those who do not have a background in technical education. The training consists of a free, four week programme to provide the foundational knowledge of AWS services. The aim of the course is to equip participants with the knowledge and skills to design, develop and implement solutions on AWS. Training content is developed by AWS in collaboration with QA Consulting, who are also delivering the training courses. The courses run every 6-8 weeks in Manchester and London, with further locations to be confirmed. After the first four weeks of Fundamentals training, learners have the option to move onto the Intermediate-level training, which is a further three weeks course providing a deeper dive into AWS services. After completing the full seven weeks (Fundamentals and Intermediate training), participants should ideally be able to take the AWS Associate level exam. Once the training ends, each learner will get a work-experience placement, based on merit, with one of the participating partners.

Why a best practice?

- Strong partnership: Partnering with organisations which provide industry expertise to enhance the programme has been invaluable: Military Recruitment (CTP), Youth employability (Princes Trust) Mentoring (Sage), Training (QA) & IT Recruitment (Experis).
- **Customer orientation:** AWS re:Start works backwards from the customer to understand their skills requirements building these skills into the training to ensure graduates can be effective in their new role.
- ICT training for career change: The programme part addressed to veterans can be seen as a successful model for supporting the change of career of (young) adults with outdated skills increasing their chances for labour market entry with 250 veterans having completed the programme, 60% securing an ICT placement, 85% of learners staying with the company where they gained practical on-the-job experience and 45 employers having completed the Sage mentoring training which supports military personnel into the IT sector.

For full details of the case, see Appendix E.

Lessons learned

Added value of certifications

IT vendor certifications, such as those mentioned above, provide an added value for both trainees and employers. An IT vendor certification is the most widely accepted form of further training certificate because it is recognizable and uses benchmarks for skills assessment of trainees. Moreover, these certifications designed for a variety of specific skill sets, can be adapted and updated to match the changing needs of the ICT sector. For this reason, vendor certified programmes generally require individuals to retake assessments at regular intervals.

The added advantage of skill-specific certifications is that many of them do not require an extensive educational background. Training providers can utilise this advantage by focusing on training content that specifically addresses low-skilled ICT occupations that do not require an educational background and for which certifications are sufficient for finding employment in the ICT sector. Examples from the UK include Amazon Web Services' (AWS) re:Start and the BBC Make it Digital Traineeship.

Apprenticeships as a potential new opportunity

Traditionally, employers in the UK have been reluctant to hire candidates who do not have an academic background in ICT or related fields, regardless of certifications. The shortage of ICT specialists and the introduction of digital apprenticeships, however, have started to change this. This is opening up new opportunities for many individuals belonging to diverse socio-economic groups, for whom an academic background is a difficult criterion to meet due to considerable investment of time and finances.

Both, apprenticeships and TPE are particularly important for individuals from diverse and disadvantaged socio-economic backgrounds for reasons outlined above. However, employer demand for graduates from ICT apprenticeships and the vocational education system remains a challenge. Employers frequently mention that according to their experience, applicants who come with a qualification from an apprenticeship or further education course are unfit for the type of jobs found in the digital sectors. This may be changing with introduction of digital apprenticeships and the overhaul of the TPE system, but robust evidence is not yet available because finishers from these programmes only gradually become available on the job market. On a positive note, the number of companies that offer digital apprenticeships has sharply increased in the last years. Apprenticeships have traditionally also suffered from low demand from students due to their low status in the UK and their image of being of a 'low skilled – low pay' nature.

Furthermore, the Apprenticeship Levy recently introduced by government opens up new opportunities for empowering industry and specifically SMEs to invest in training, including admittance of apprentices from underrepresented groups. Specifically Digital apprenticeships offer a highly promising route into employment and could be of special value to underrepresented groups if employers, including SMEs, should they be convinced to accept candidates from these groups.

Importance of mentorship

Mentoring using (mostly) volunteer, seasoned ICT specialists as mentors and role models has been tried and tested and proven to effectively address challenges in attracting and supporting underrepresented groups, in particular women to encourage girls and women to consider ICT careers. The main two reasons for this are: first, because female role models have been found to play a key role in young women's attitude to working in the digital sectors;⁶¹ second, because it tends to be comparatively easy to recruit volunteer mentors among women working in the digital sectors. This is because, as surveys have repeatedly shown, they have typically perceived a range of gender related obstacles themselves during their career, which they are often keen to help remove for future generations of women working in the sector.

Business-education partnerships are essential

Business-education partnerships are essential for developing training curricula for our target groups and the creation of more diversity in the labour market. Training programmes designed with strong input from industry or IT vendors can better reflect the market need for ICT skills.

The importance of these partnerships is underlined by the good practice showcases in the UK but also by the successful cases in the other countries under review and therefore seems to apply universally.

⁶¹ See Newton & Williams (2013)

Box 5 Key lessons learned from ICT training in the UK Outreach Programmes target a variety of socio-economic groups (see Figure 2.A). A large number is aimed at NEET youth, unemployed job seekers and women including girls not yet in work, those already 'passionate about technology' and interested in attending a bootcamp but also women after a family break. Outreach to highly vulnerable groups is achieved jointly with the public and NGO sectors, for example, through local associations in co-operation with job centres. Initiatives jointly operated by non-profits with major employers in the digital sectors are the most effective in terms of outreach, particularly through effective campaigning using well-established channels of communication. The overall capacity of these programmes in terms of places offered is limited, with exception of the Good Things Foundation's Future Digital Inclusion programme, which however is mainly providing basic digital skills rather than opening a direct pathway to ICT specialist jobs. Training Business-education partnerships are essential for developing training curricula. Training programmes designed with strong input from industry or IT vendors can better reflect the market need for ICT skills. An added advantage of IT vendor programmes is the lower risk of training being outdated because of frequent new qualification offers and options to renew past certifications. Successful trainings combine a variety of training methods. The most important aspect of multi-level training is the development of both technical and cognitive skills, such as the ability to work in teams, effective communication and problem-solving skills. In addition, many successful programmes equip participants with skills in self-marketing. Mentoring using (mostly) volunteer, seasoned ICT specialists as mentors and role models has been tried and tested and proven to be able to effectively address challenges in attracting and supporting underrepresented groups, in particular women. The low number of potential role models in the digital apprenticeship sector, however, presents a challenge to use of mentoring for this particular pathway into the ICT careers. The Apprenticeship Levy has the potential to open up new opportunities for empowering SMEs to invest in training, including admittance of apprentices from underrepresented groups. This will, however require concerted, multi-stakeholder efforts at local level because SMEs typically lack the capacity and willingness to deal with the practical challenges surrounding working with persons from at-risk groups. Employability UK employers frequently state that both the level of technical skills and prior experience in the work environment are important. Digital apprenticeships, therefore, offer a highly promising route into employment and could be of special value to underrepresented groups if employers, including SMEs, can be convinced to accept candidates from these groups. Programmes designed with strong input from employers in the digital sectors and at the same time offer periods of work placement often lead to direct employment after participants have completed the training. The main challenge in this case is ensuring that the selection process for admitting candidates to the training does not work to keep out members of groups currently underrepresented in the ICT workforce. Certifications have a high added value for job seekers. Employers prefer hiring those candidates who have successfully completed high quality training from reputable training institutions. If programmes do not equip successful participants with well established third-party certifications, they risk to be of limited impact in terms of improving

Source: diversITy Survey, empirica (2017)

employability.



Conclusion

The ICT training landscape in the UK is in the midst of a radical overhaul. Its proponents promise that it will result in substantial improvement concerning inclusiveness of training offers and, ultimately, diversity of the ICT workforce. However, it is certainly too early to draw robust conclusions about the reforms' overall impact on the opportunities offered to persons from groups currently underrepresented in the country's ICT workforce. The available evidence including an analysis of the inclusive ICT training landscape points to some serious hurdles, which need to be overcome if significant improvements are to be achieved. The training programmes studied in this report offer some promising pathways. Intervention mechanisms for which recommendations are specified should be developed to reach a variety of vulnerable communities.



Conclusions and recommendations

Our investigation of the inclusive ICT training landscape in the UK found a number of successful programmes and a range of promising approaches, but the overall picture is one of "too little, too few". Given the size of the challenge as outlined in previous section of this report, these initiatives taken together are unlikely to make a real difference. For example, the BBC's inclusive ICT training programme Make It Digital, the self-described "largest traineeship of its kind", has a capacity of merely 20 trainees per programme and a target to train "up to 400" participants each year. There is a need for larger, more ambitious training schemes, which generate sufficient visibility to reach large shares of the target group.

The introduction of the Apprenticeship Levy in England in 2017 has the aim to force greater employer investment in skills in the UK, with a potential for including many more persons from groups currently underrepresented in the ICT workforce, but "it is modest in scope, covering around 2 per cent of larger employers, and in scale, amounting to only 0.5 per cent of payroll bills"⁶². There is, therefore, need for additional, targeted ICT training programmes for giving underrepresented groups access to training leading to employment.

The ICT training landscape in the UK is in the midst of a radical overhaul, which as its proponents promise will result in substantial improvement concerning inclusiveness of training offers and, ultimately, diversity of the ICT workforce. Such promises have been made before. It is certainly too early to draw robust conclusions about the reforms' overall impact on the opportunities offered to persons from groups currently underrepresented in the country's ICT workforce. Nevertheless, the available evidence including our own analysis of the inclusive ICT training landscape points to some serious hurdles, which need to be overcome if significant improvements are to be achieved. In this section we give a summary of these issues and present recommendations how they can be addressed based on experience from successful initiatives for inclusive ICT training.

Promote ICT careers to women

Stakeholders tend to agree that the main cause of the low interest of young women to embark on a career in ICT include stereotypical views among key influencers (e.g. parents, teachers, peers) regarding young women's choices in school subjects before GSCE and jobs. Intervention in the form of awarenessraising and taster programmes is already being utilised by UK programmes to encourage young women to contemplate careers in technology. An example of such a campaign is the Code First: Girls initiative. These activities should be continued and extended to reach many more young women and their main influencers.

There are indications that Digital Apprenticeships can be attractive to female school leavers in a way that a university degree in Computer Science is not. In contrast to the academic pathway into ICT, apprenticeships give companies the possibility to communicate directly to young women in words that are specific to female attitudes, describing real career opportunities that young people can understand and relate to.⁶³

There should be a high profile, multi channel marketing campaign on opportunities in digital apprenticeship, with a particular focus on young women, people with a BAME background, and young disabled people (see below). This needs to challenge traditional perceptions around apprenticeships and include parents, teachers and the wider public in general.

Promote ICT careers to members of the BAME community

As described earlier in this report, perceptions and attitudes in some parts of the BAME community tend to view non-academic pathways into employment such as apprenticeships and vocational education as of little value. There is a need to work with employers to create a wider openness towards accepting applications from the BAME community. Changing deep-rooted perceptions among BAME communities will require concerted efforts, be driven by UK bodies

⁶² See Dromey & McNeil (2017), *Skills 2030 – Why the adult skills system is failing to build an economy that works for everyone.*

⁶³ See ELATT (2018), How Apprenticeships Can Help to Close the Gender Gap in IT.

representing BAME communities including the Ethnic Minority Employment Stakeholder Group.

Extensive use should be made of diverse role models. Hands-on support through the application process and development of new forms of marketing and communication needed to help tackle underrepresentation. Insiders also recommend target group specific 'in apprenticeship' support for those who may find it harder to adjust to the workplace or complete their apprenticeship. Some form of preapprenticeship training might also help applicants from under-represented groups including BAME to compete successfully for apprenticeships.

However, there seems to be more to that. A Resolution Foundation report revealed that the proportion of working-age Indian, Pakistani and Bangladeshi people with degrees has more than trebled since the end of the 1990s to their current levels of 50%, 30% and 25% respectively. But the analysis showed that despite this, Pakistani and Bangladeshi graduates are about 12% less likely to be in work than white British graduates, and that Indian and Black Caribbean graduates have a jobs gap of about 5%. The report concludes that with graduates of all BAME groups facing a jobs gap compared with white people with degrees there is a long way to go before progress on educational attainment will fully feed through to the labour market.⁶⁴ In the Guardian article and quoting experts, universities get the blame: "Universities are meant to be this great leveller and are simply not doing the job required." It may also be helpful to carefully analyse recruitment strategies of employers with the aim of making employers review and re-consider their recruitment strategies with the view to putting aside stereotypical behaviours.

Leverage the potential of ICT training for people with disabilities

We found little in terms of ICT training programmes specifically targeted at persons with disability, including persons with learning difficulties. This is worrying given the UK government's pledge to help over a million disabled people to move into or maintain work over the coming years. Without making full use of the re-launched apprenticeship system, including digital apprenticeships, delivering on this promise will be impossible. In view of evidence from abroad highlighting a significant potential in this area, UK stakeholders should assess possibility to design and operate schemes tailored to the needs of this target group. This will require making best use of available funding streams as well as additional funding. Action should be coordinated at national level (for example by the new Institute for Apprenticeships and Technical Education (IfATE) but provision needs to be developed and put into practice at local levels, leveraging the expertise and local knowledge of stakeholders who work directly with members of the target group.

Stepping up promotion of inclusive ICT training, in particular to SMEs

Most SMEs find it difficult to divert resources to offering apprenticeships or work placements to young persons, especially if they are asked to consider taking on persons from groups currently underrepresented in the ICT workforce, many of whom need special support in one way or the other (see further below). While the funding available from the Apprenticeship Levy goes some way to remove financial constraints, SMEs still suffer from a perceived "excessive number of frameworks", the different apprenticeships levels and standards, "complexity within funding arrangements" and a "lack of clear information about training providers"⁶⁵.

Promotional campaigns and activities should strive to communicate with employers using language that they recognise, and emphasise the business case for diversity in apprenticeships and ICT training more generally. The Apprenticeship Diversity Champions Network and the Tech Talent Charter have published valuable information and best practice examples of how diversity can be boosted. But both tend to appeal to larger organisations rather than to SMEs who lack time and willingness to consult guideline publications. Marketing campaigns on opportunities in digital apprenticeship for SMEs should be devised at national level, complemented by targeted promotional efforts at local level (see below).

The government should further develop the recently launched online apprenticeships service⁶⁶ to effectively communicate the benefits of, and assuage the fears about, recruiting apprentices from minority

 $^{^{64}}$ The Guardian (7 October 2017): People from ethnic minorities still facing major jobs gap in UK

⁶⁵ See Orlik (2018), *Delivering digital skills – A guide to preparing the workforce for an inclusive digital economy.*

⁶⁶ Available at <u>https://manage-apprenticeships.service.gov.uk</u>

groups.⁶⁷ The service is employer focused, allowing them to set up accounts, get information about funding, choose the apprenticeships they want to run, find suitable training providers and post apprenticeship opportunities. The service should proactively market the benefits of diversity in recruitment of apprentices, e.g. through case studies, performance data and other information about the business case for diversity. It should also clearly signpost the financial support that is available to deal with additional costs, if applicable. Bodies representing people with disability, the BAME communities and other minority groups should be asked to review the service.

Empower training providers to deliver inclusive ICT training

While larger companies are able to develop and deliver training in the context of digital apprenticeships in-house, SMEs typically make use of external training providers. The latter are often illequipped to deal with trainees from minority groups due to limited prior exposure. Targeted training activities are required to ensure that training providers can and do maximise their leverage in recruiting and supporting young people from underrepresented groups. Public sector agencies contracting out the delivery of training to third party providers should include provisions in their contracts to make sure that training providers are sufficiently qualified to support inclusive practices.

Open up ICT training to people with special support needs

Many individuals need flexible arrangements and additional support that indirectly help and motivate them to complete their ICT training. With regard to apprenticeships, there is anecdotal evidence showing that parents of young children find it difficult to balance work, study and family commitments.⁶⁸ As the National Learning and Work Institute states, "a range of people could potentially benefit from flexible apprenticeships, including people with disabilities and health problems, and with caring responsibilities (and as the population ages this number is likely to increase). [...] The argument for flexible apprenticeships is similar to that for flexible working and learning (such as part-time degrees): by allowing people to fit their job and training around their life, a wider range of people can participate. The aim is not to reduce the amount of learning, it is to find different ways to fit learning and work around people's lives"⁶⁹. Government and local authority rules about what constitutes an apprenticeship can have the consequence that employers seeking to offer flexible arrangements risk to violate such regulation and therefore would become ineligible for funding. Support services that can help overcome practical obstacles may include childcare, eldercare, coaching, networking, and time off from work. Meanwhile, the government should review regulation under which there is no funding to support the costs of childcare while undertaking an apprenticeship, while young parents who study within the further education sector are entitled to financial support.

More mentorship!

Mentoring programmes have been discussed previously as a training approach in experiential learning. There is, in addition, the possibility of mentorship programmes for students and trainees during their education, specifically for women and people from minority groups. Mentors can play an important role as role models who help question traditional gender roles; they can demonstrate career opportunities for groups currently underrepresented in the ICT workforce; and they can provide practical, tried-and-tested ways how to address obstacles in day-to-day training. Moreover, mentors provide network contacts, which can make all the difference once the time has come to apply for a job.

Many mentorship programmes make use of seasoned employees who volunteer for the role based on an intrinsic interest in advancing progress in the diversity area. However, the small number of people from many under-represented groups in the workplace means that findings mentors in-house – for example, successful employees with a disability – can pose a challenge. For this purpose, innovative models may need to be developed, such as cross-organisational and cross-regional mentor networks, possibly operating online only, for which employers can apply.

Unlock dormant potential within companies to invest in inclusive training

There is wide consensus that EU companies do not invest sufficient resources in training current and

⁶⁷ See Centre for Social Justice (2017)

⁶⁸ See London Assembly (2017)

⁶⁹ See National Learning and Work Institute (2017)

future employees, compared to other countries.⁷⁰ The introduction of the apprenticeship levy in 2017 forces greater employer investment in skills in the UK, but is not expected to be enough to close the gap in investment between the UK and the world's leading countries. This opens up the question whether there are innovative ways how to make it more attractive to UK employers to divest resources into training.

Make full use of the Window of Opportunity for mainstreaming diversity and inclusiveness at local level

Most of the recommendations discussed above require coordination and tailoring to the specific contexts of training provision. In this respect, the current reshuffling of the UK's system for digital skills provision offers a unique opportunity. In place of the national level Tech Partnership, the government recently established the Digital Skills Partnership (DSP) with the explicit goal "to support local level partnerships to increase the digital capability needed to build inclusive, thriving local economies"⁷¹. Much of the work is devolved to the regional and local level, for which Local Digital Skills Partnerships (LDSPs) are currently being launched. Their objective is to increase collaboration between businesses, NGOs, and public sector organisations to help address local digital skills needs in "more targeted and innovative ways" (see description in section 3).

Key activities are expected to include the development of digital skills strategies, based on prior experience and in close collaboration with relevant local and combined authorities, as well as the business and NGO sectors. LDSPs will identify the skills needs for their local area, so that education and training provision can be better matched to local demand. Part of the funding can be derived from the apprenticeship levy, if local businesses "pool the funding they receive as part of the apprenticeship levy and invest this in a set of agreed strategic initiatives to promote digital skills in their area" ⁷², as we recommend they do.

We argue that the current process of building up local structures and processes in the digital training domain offers a window of opportunity for the establishment and mainstreaming of diversity and inclusiveness in ICT training. Associations representing groups currently underrepresented in the ICT workforce should mobilise their resources to lobby for a strong emphasis on diversity in the local digital skills strategies being drafted. An example worth consulting for this purpose is Skills Development Scotland's 'Equalities Action Plan For Modern Apprenticeships in Scotland' ⁷³. Concrete actions could include the following:

- Sharing of local initiatives and best practice ('what works');
- Monitoring of data on diversity in the local ICT workforce and in ICT training programmes;
- Dissemination and promotion of the Tech Talent Charter to local companies and other stakeholders,
- Identification and promotion of local role models for inclusiveness at work and in training;
- Collaboration between local schools, employers and training providers to include "positive action taster activities" linking young women and young persons from minority groups with digital sector employers;⁷⁴
- Pilot projects engaging local industry, government and third sector partners towards increasing the diversity of the ICT workforce;
- Development and execution of promotional campaigns for increasing awareness on the part of both school-leavers and employers of the benefits of diversity in ICT careers;
- Set-up of dedicated help lines to support diverse applicants for apprenticeships, local companies (to be) engaged in providing training to members of diversity groups, and others who need to be empowered to make diversity and inclusiveness reality.

⁷⁰ See Dromey & McNeil (2017)

⁷¹ See Department for Digital, Culture, Media & Sport (2017)

⁷² See Blakeley (2017)

 ⁷³ See Skills Development Scotland (SDS)(2015). See also Skills Development Scotland (SDS)(2017), Equalities action plan For Modern Apprenticeships in Scotland – Year 1 Update.
 ⁷⁴ See Good Things Foundation & Tech Nation UK (2018), Local Digital Skills Partnerships: A Playbook for Local Partners.

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Appendices

Appendix A: Definitions and methodology

Appendix A.1: Methodology for baseline projection of ICT skills gap

Demand is following a linear trend, i.e. the average absolute growth of the last few years with plausible data is extrapolated.

Minimum supply is calculated as incumbents' workforce in a previous year minus exits plus domestic graduates. Exits are calculated using a percentage derived from Cedefop applied to the last year where data for the incumbent workforce available (it is fixed, i.e. static, to avoid repercussions from the model itself). Domestic graduates are assumed to be constant and equal to the latest available plausible official statistics. Graduates counted are VET graduates, short cycle programme and bachelor level graduates. Masters and PhD level graduates are not counted because they usually have previously earned a bachelor's degree and would hence be double counted.

Supply in a scenario with constant lateral entries adds also the "Minimum lateral entry inflow" to minimum supply Minimum lateral entry inflow is the calculatory structural gap that remains when the number of domestic graduates (as defined in minimum supply) is subtracted from the need for new labour market entries (expansion and replacement).

Shortage without lateral entries is the gap that remains when the need for new labour market entries were only covered from domestic graduates.

Shortage with constant lateral entries ("everything stays the same") is the gap the remains when a constant number of lateral entries flows into the labour market.

The total potential for new jobs until 2025 is calculated as:

Demand 2025	2,250,000
inus incumbent jobs 2016	- 1,599,000
Plus cumulative replacement 2017-2025	+ 499,000
Jobs potential	1,150,000

Appendix A.2: Yearly breakdown for baseline projection of ICT skills gap

(in '000s)	2017	2018	2019	2020	2021	2022	2023	2024	2025
Demand (linear trend)	1,816	1,870	1,925	1,979	2,033	2,087	2,141	2,196	2,250
Minimum supply (incumbents minus exits plus domestic graduates)	1,607	1,616	1,624	1,633	1,641	1,650	1,658	1,667	1,675
Supply in a scenario with constant lateral entries	1,653	1,707	1,762	1,816	1,870	1,924	1,978	2,033	2,087
Shortage without lateral entries	209	254	300	346	392	437	483	529	575
Shortage with constant lateral entries ("everything stays the same")	163	163	163	163	163	163	163	163	163

Source: empirica (2017)

Appendix B: Definition of ICT occupations according to ISCO

ICT Specialists by skill level according to ISCO (International standard classification of occupations)

Level	ISCO (International standard classification of occupations)	
High	Management, architecture & analysis	
Mid	Core ICT practitioners – professional level	
Mid	Other ICT practitioners – professional level	
Lower	Core ICT practitioners – associate / technician level	
Lower	Other ICT practitioners – associate / technician level	

Management, architecture & analysis 1333 ICT Service managers 25111 Systems analysts Core ICT practitioners - professional level 2512 Software developers 2513 Web and multimedia developers 2514 Application programmers 2515 Software and multimedia developers and analysts not elsewhere classified 2521 Database designers and administrators 2522 Systems administrators 2523 Computer network professionals 2520 Database and network professionals n.e.c. Other ICT practitioners - professional level 2152 Electronic engineers 2153 Telecommunication engineers 2166 Graphic and multimedia designers 2356 Information technology trainers 2351 Computer network and systems technicians 3512 ICT user support technicians 3512 ICT operations technicians 3513 Computer network and systems technicians 3512 Computer network and systems technicians 3513 Computer network and systems technicians 3513 Computer network and systems technicians 3514 Web technicians 3512 Computer network and systems technicians 3512 Roadcasting and audio-visual technicians 3521 Broadcasting and audio-visual technicians <th colspan="5">Eurostat: ICT specialists according to ISCO</th>	Eurostat: ICT specialists according to ISCO				
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Appendix C: Workforce Diversity Indicators

Indicator	Definition/Source	
Long-term unemployment rate	Share of persons unemployed for 12 months or more in the total number of active persons in the labour market.	
	Source: Eurostat [une_ltu_a], data from 2016.	
Young people neither in employment nor in education and training (15-24 years) – NEET	Percentage of the population in age group 15-24 years who is not employed and not involved in further education or training. Source: Eurostat [edat_lfse_20], data from 2016.	
Youth unemployment	Number of persons under 25 years who are unemployed, as share of the total number of young people in the labour market.	
	Source: Eurostat [une_rt_a], data from 2016.	
Employment rate of older workers (55-64 years)	Number of persons in age group 55-64 years who worked at least one hour for pay or profit during the reference week or were temporarily absent from such work, as share of the labour force in that age group.	
	Source: Eurostat [lfsi_emp_a], data from 2016.	
Age employment rate gap (15-64 vs. 55- 64 years) in p.p.	Difference in percentage points between the employment rates of persons in age group 15-64 to age group 55-64 years. A positive figure denotes that the employment rate for older persons is lower than for the entire workforce. Source: Own calculation from Eurostat [lfsi_emp_a], data from 2016.	
Gender employment rate gap (15-64 years) in p.p.	Difference in percentage points between the employment rate (15 to 64 years) for women and the rate for men. A positive figure denotes that the employment rate for women is lower than for women.	
	Source: Own calculation from Eurostat [Ifsa_ergaed], data from 2016.	
Non-natives born outside the EU, as share	Total population born outside of the EU (borders as of 2016) on January 1.	
of total population	Source: Eurostat [migr_pop3ctb], data from 2016.	
Non-native employment rate gap, in p.p.	Difference in percentage points between the employment rate (15 to 64 years) for population born outside of the EU (borders as of 2016) and the rate for the population born in the reporting country. A positive figure denotes that the employment rate for persons born outside of the EU is lower than for those born in the reporting country.	
	Source: Own calculation from Eurostat [Ifsa_ergaed], data from 2016.	
Disability employment gap, 2011, in p.p.	Difference in percentage points between the employment rate (15 to 64 years) of persons reporting difficulties in performing basic activities, and the rate for persons reporting no such difficulties. Difficulties can relate to seeing, hearing, walking, and communicating, and must have lasted or be expected to last for six months or more. A positive gap figure denotes that the employment rate for persons facing difficulties in basic activities is lower than for those without. Source: Own calculation from Eurostat [hlth_dlm010], data from 2011 (latest available).	
Disability unemployment gap, 2011 in p.p.	Difference in percentage points between the unemployment rate of persons reporting difficulties in performing basic activities, and the rate for persons reporting no such difficulties. Difficulties can relate to seeing, hearing, walking, and communicating, and must have lasted or be expected to last for six months or more. A positive gap figure denotes that the unemployment rate for persons facing difficulties in basic activities is higher than for those without. Source: Own calculation from Eurostat [hlth_dlm030], data from 2011 (latest available).	

Research framework and survey design

The analysis and findings of this report are a result of extensive desk research and two surveys carried out with ICT skills training providers and employers across the target countries. The approach to select and benchmark good practice showcases of ICT training programmes was based on a four-step process illustrated below. The research findings were further analysed and strengthened expert workshops. Three expert workshops were held in Spain (Madrid), Germany (Berlin) and United Kingdom (London) and attended by a panel of experts from academia, policy, the non-profit sector and businesses.

Step 1: Collection of 300 initiatives	Step 2: Selection of 96 initiatives for the online repository
 The first phase of the project, using comprehensive desk research we identified more than 300 initiatives based on the following criteria: 1 Type of programme: Any type of ICT training programme activity, project, initiative and multistakeholder partnership of different levels of government, PPPs (public private partnerships), MSPs (multi-stakeholder partnerships), non-profit organisations, IT vendors, addressed to: 2 Target group: diverse target groups, including women, vulnerable youth with low educational achievement or from difficult socio-economic backgrounds, migrants, unemployed adults changing careers, etc., 3 Scope: to enable them to obtain and develop indemand ICT skills and support their entry into the labour market. The process started with the: 4 Analysis of around 300 e-skills programmes and initiatives identified in desk research throughout selected countries, followed by: 5 Identification of further programmes not covered by the initial list by national correspondents from the empirica Global Network for Innovation Research (ENIR) (www.enir.org) and other national experts where appropriate. 	 In the second phase, 96 inclusive programmes were shortlisted from the 300+ collected cases. Each case was given a score on a scale from 0 (low) to 2 (high) based on the following evaluation scheme: 1 Outcome: To what extent is the programme effective in enabling diverse populations' access employment opportunities through the acquisition of demand-driven e-skills? 2 Target Fit: To what extent does the programme or initiative target diverse populations to support to enter the labour market? 3 Scalability and Continuity: What is the potential for the initiative or programme to replicate, expand or continue to reach more beneficiaries and contribute to the skills development at regional and national level? 4 Maturity: Has the programme been in operation for long enough to make it possible to assess performance and to learn from its experience? 5 Policy Fit: To what extent is the programme or initiative embedded in a broader policy context? Textual descriptions of the relevant inclusive ICT skills training programmes were addressed and implemented. The selected training programmes are part of an online repository of an estimated 96 programmes, which were selected for further analysis.

Ste	ep 3: Identification of Good Practice Showcases	Step 4: Evaluation of Good Practice Showcases
The selection of good practice showcases from the shortlisted programmes was based on the following framework, with each case given a score from 1 (low) to 3 (high):		The main objective of the final phase of analysis was to further evaluate and benchmark the 22 good practice showcases against a set of defined criteria (evaluation criteria), to identify best practice elements and lessons
1	Relevance: To what extent is the programme relevant in terms of creating a diverse skilled workforce responding to demands in the labour market?	learned. The evaluation and assessment of best practice ICT skills training programmes was carried out making use of a qualitative survey of key stakeholders. This consisted of in-depth interviews (with decision
2	Transparency: To what extent is it possible to have access to information about the programme?	and selected employers) and a SWOT analysis to help
3	Effectiveness: How effective is the programme in providing participants with the ICT knowledge and skills, in line with current demands in the labour market?	address and understand issues relevant and factors influencing the success of training measures from different perspectives.
4	Efficiency: How efficiently has the programme been implemented?	
5	Impact: What were the effects of the programme on the target groups involved?	
6	Sustainability: To what extent are the achieved benefits from the programme sustainable?	

Employer survey

Format: in-depth telephone interviews of around 60+ minutes duration each plus completion of a questionnaire by the interviewee either prior or after the telephone interview.

Target group: 12 HR key decision makers in mainly large organisations from Spain, the United Kingdom, Germany, France, Belgium, the Netherlands, Poland and South Africa, several of which global players.

Objectives: to gather **insights about experiences and expectations related to (inclusive) training programmes**. The primarily objective was to find out whether the current ICT training(s) are attractive and making use of these would equip participants with the in-demand ICT skill sets and **would qualify them for further consideration by employers**. The interview results served as an input for the policy recommendations developed in the course of the project to inform policy development on the European and national level, and provide practical recommendations to non-profit organisations and training providers.

Structure of interviews:

- 1. **General Job profiles**: type of ICT people / professions needed in the organization; roles / competences relevant and required in the organization.
- 2. **(Digital) skills and competences needed**: relevant digital skills and competences required from an employee in the organisation either already working for the organisation or those applying for a job.
- 3. **Recruitment criteria**: recruitment process, the different steps involved and main decision makers as well as main sources of recruitment and main prerequisites; minimum entry standards / credentials (e.g. degrees and certifications) required for a potential candidate to be eligible.
- 4. Employer involvement and collaborations: organisation already involved in training schemes addressed to diverse / vulnerable groups of people including vulnerable youth with low educational achievement or from difficult socio-economic backgrounds, migrants or unemployed adults changing careers; providing any offers to such training schemes (internships, apprenticeships, mentoring, training for specific subjects, other) or involved in any collaborations with the training providers (skills needs assessment / matching, curriculum reform, research & development, equipment and facilities, advisory panels, on the job placement, certification standards, other).
- 5. **Proposed policy interventions and programmes**
- 6. **Recommendations**: to training providers for assuring delivery of the skills and talent needed in the labour market and the organisation through their education / training programmes as well as recommendations to policy makers.

Timing: October – November 2017

Appendix E1: BBC Make it Digital Traineeship

The Make It Digital partnership project aims to unlock Britain's digital potential and create genuinely lifechanging opportunities for young people. It is the largest traineeship of its kind owing to an ambitious partnership between the BBC, DWP and SFA, supported by a range of other organisations.

Target group

Unemployed youth, aged between 16 - 24 years and who have fewer than 2 A Levels; Digital immigrants and people belonging to high unemployment regions and with lower educational attainment.

Main activities

BBC's Make It Digital project aims to grow basic level digital skills and prepare trainees for employment or progression into apprenticeships. It targets 'Digital Immigrants' – people who are not using digital technology to its full extent - in a bid to professionalise them. It is also aimed at people who do not have a high level of educational attainment. The BBC Academy works in partnership with training providers and job centres to firstly, deliver the training and secondly, place trainees into internships and apprenticeships leading to jobs. The training curriculum is developed by the BBC Academy, taking into account the needs of the industry, its various sectors and the skills required. Additionally, the programme is designed to be highly relevant to the small and medium business sector, where research shows that these skills are in short supply across the UK. The content draws on existing BBC training and involves major brands to help inspire trainees. The programme is in total an eight-week course, including classroom-based training as well as three weeks work experience in a professional setting. The training covers two broad areas:

Basic digital skills: such as planning social media campaigns, creating pages on Facebook or utilizing other social platforms, such as TripAdvisor, building simple websites and creating short videos for the web.

Employability skills: including how to give and receive feedback, create cover letters and CVs, and other key skills including budgeting, basic project management, team working, and English. The final stage of the Traineeship is a three-week structured work placement, with focus on companies who are likely to require basic-level digital skills. The companies are sourced with the help of Tech Partnership, the Federation of Small Businesses, the National Apprenticeship Service and other partners, such as job centres, at the local level. In the first wave of the programme (2015-2016), it specifically targeted young people from regions with high unemployment and those with low educational attainment. In the second wave, the pilot phase of which ended in the first half of 2017, the programme was broadened to include universality in terms of age and the focus shifted instead to sector-specific needs, such as in the hospitality and health care sectors. The programme intends to keep its inspirational and creative approach to digital skills training, focusing on finding 'new' talent that has previously not been integrated into the job market.

The programme is funded by the Adult Skills Budget (ASB) – a public investment scheme of the UK government. The ASB is an important financier for adult skills training programmes as the budget is revised and allocated yearly. Training providers receive a share of the budget, along with training content developed by the BBC Academy, which enable them to run the programmes consistently at low costs across the UK.

Industry input

Design and delivery with the help of effective partnerships

The programme utilises a collaborative model where the BBC Academy, training providers, job centres and other local agencies work together to deliver digital training across the UK. The training curriculum is designed by the BBC Academy. In certain cases, where the training to be delivered includes sector-specific skills, such as health care services, the Academy involves specialists. For example, one programme that had a health care focus was designed with contribution from partners at the National Health Service (NHS). In the delivery phase, the curriculum and training content is provided at very low cost to participating training providers. Additionally, training providers collaborate with job centres and local agencies to find apprenticeships and jobs for trainees.

Response to current market demand for skills

The programme ensures its curricula responds to current market demands by focusing on regions and areas with high unemployment. More recently, that approach has been broadened to include focus on sector-specific skills. A higher priority is given to sectors which are at risk from post-Brexit policy, primarily those affecting overseas workers. Two of the sectors which face this risk were identified (by the programme) to be in health care and hospitality industries. Based on such analyses, the programme is adapted to consider future changes; for example, complementary to the basic digital skills training, in the few of the recent programmes, training modules on aspects of health care and hospitality were also included.

Lessons learned

The programme has shown consistently high retention rates and trainees have a high rate of job placement. Several factors have contributed to these results:

- The emphasis on training components using creative digital technologies has helped to inspire and motivate trainees;
- Tapping into the creative potential of trainees by using methods such as setting up social media campaigns, building websites and creating other digital content such as videos;

- A focus on discovering new talent rather than just providing standardised training, an approach which welcomes applicants from all backgrounds;
- Limiting individual programmes to no more than 20 trainees to ensure personalised training and coaching;
- Adding components of sector-specific knowledge and skills to the training programmes, such as in the case of health care and hospitality management, which acts as a USP and has helped trainees in securing jobs in these sectors;
- In terms of impact, correctly identifying market needs and adapting the training content by involving sector experts when required and;

A well-grounded network of agencies and local partners who help to deliver the training and place trainees into relevant jobs.



Appendix E2: Microsoft Partner Apprenticeship Programme – Get On

The programme is part of Microsoft's global YouthSpark initiative, the goal of which is to empower 300 million young people with opportunities for education and employment in technology sector. The UK programme specifically aims to provide opportunities to individuals who would otherwise not



have the opportunity for a career in ICT.

Target group

• Young people aged 16-24 who do not hold degree level qualifications.

Main activities

The Microsoft Partner Apprenticeship is a vocational training programme aimed at young people. It prepares them to work primarily in IT roles within the IT industry. In a typical one year apprenticeship, Microsoft supports the training providers by supporting the programme design and delivery. This includes access to certifications, e-learning, lesson plans and other key learning benefits. Opportunities for apprentices are communicated by Microsoft through its UK Partner Network. An additional aim is to increase the rate of female participation – part of this is through an Ambassador Network of exMicrosoft Apprentices who attend careers fairs, parliamentary receptions, schools visits and arrange technical demo sessions. Apprentices are recruited into a Microsoft Partner or customer company prior to the start of the programme. Recruitment criteria are based on some school-level qualifications but more on the potential of the applicants. The programme is split between in-house training and application of the gained knowledge in the workplace. The training is given in week-blocks or day releases, depending on the flexibility of the programme. Apprentices are trained by using traditional face-to-face classroom methods, as well as residential 'boot camps' – some events are also fully remote using Microsoft Technology (Lync) as a virtual classroom and assessment tool. Learning is front-loaded to build the trainees skill-set as quickly as possible while giving them time for experiential learning. The programme aims for apprentices to be performing 90-100 percent of the full role within 6 months of starting the traineeship. The final 6 months involve completing the curriculum and building further knowledge and experience. Once qualified, apprentices are then regarded as IT professionals with opportunities to progress to higher apprenticeships or degree level qualifications.

Over 7,500 apprentices started their career through this route in over 5,000 employers since the programme was rolled out nationally in 2010. Currently, there are around 3,500 apprentice starts per year. 92% of apprentices stay with the company with which they started their apprenticeship.

Industry input

The programme is delivered in England by six 'Learning Partner' training providers (QA, Remit, Baltic, Firebrand, IT Skillsman & PDS) and Scotland by two (QA & YouTrain); employers are mainly Microsoft Partners but increasingly Microsoft customers; other partners include City & Guilds and the Skills Funding Agency. Additionally, Microsoft maintains an ongoing dialogue with the government, NGOs and other relevant bodies to ensure that the apprenticeship programme is prioritised and recognised by relevant institutions.

Lessons learned

One of the main success factors is the Microsoft Certifications that are most attractive to employers and young people as they are often considered as industry benchmarks that demonstrate competence in specific technologies (74% apprentices and 72% of businesses say the Microsoft certification provides the core value of the programme). The programme, however, has proved successful also because of the following reasons:

- The ability of the programme to address skill shortages in the ICT sector by opening up a career route to many young people who would have otherwise not considered a career in technology.
- By constantly consulting with employers to ensure the continued relevance of both content and delivery, as well as meeting sector skills demand.

From consultation and feedback from members of the MPN and input from Microsoft Learning & Certification, the programme produces optimal certification combinations for apprenticeships specific to entry level roles. Evaluation of the Programme found that a large share of apprentices stumbled upon Get On by accident, which suggests that visibility of the training could be improved: "40% of Apprentices would like to see more outreach to increase awareness of apprenticeship programmes and 41% of businesses suggest improving relationships with secondary education to encourage more people to apply and increase interest in the IT sector"

In order to ensure that employers or young people in any location can participate in the programme, Microsoft plans to establish new methods of delivery using technology such as remote and MOOCs.

Appendix E3: Amazon Web Services (AWS) re:Start for Military

AWS re: Start was launched in January 2017 with the aim of addressing the growing deficit of digital skills to available jobs by increasing the digitally skilled population in the UK. Working in partnership with The Ministry of Defence, The Princes Trust, Experis, Sage and QA Consulting, AWS re: Start aims to see 1,000 people from the military community and disadvantaged backgrounds be given the knowledge and skills to build a career within the digital economy.

Target group

• Former members of the military reserves, veterans, service leavers, and service spouses

Main activities

Participants who join the AWS re:Start programme complete technical training classes, delivered by QA Consulting and supported by AWS certified instructors. They learn about cloud computing and how to architect, design, and develop cloud-based applications using AWS. They also learn how to set up new cloud environments using proven best practices in security and compliance and to build applications using software development toolkits for popular languages, such as Python. The AWS re: Start curriculum is designed to accommodate differing levels of experience – even those with no previous technical knowledge can sign up. The course and overall support provided is completely free of charge. During the training Experis deliver 4 Employability workshops to help support participants with their job search. These cover: 'Opportunities in Technology', 'CV Writing for the IT jobs market', 'Searching for a role in IT' and 'Effective interviewing'. Pre and post course mentoring support is provided by Sage.

Courses run every 6-8 weeks in both Manchester and London. After the four weeks of training, graduates of the programme are connected with AWS customers & partners with the aim of securing work placements of 3-months (or longer), or full-time opportunities. However, there is no guarantee that the work placement will lead to a permanent role. This depends on participants' individual performance and agreement with the company they choose to work for. Graduates from the programme have been delivering some incredible results in their job placements in roles such Cloud Engineer, Junior Dev Ops Engineer, Presales Consultant, Senior Manager – Cyber Security, Technical Support Analyst, Site Reliability Engineer, Junior Digital Operations Engineer, Junior Cyber Security Analyst, Digital Products & Services Project Manager

Industry input

AWS re:Start is delivered in partnership with a growing community of over 100 AWS customers, and partners who are committed to support AWS re:Start graduates in helping them establish a career in tech including Rackspace, Deloitte, KPMG, NHS, Rackspace, Doddle, Centrica Hive, Splunk, SecureCloud+, 6Point6 and BJSS

Lessons learned

AWS re:Start has been recognised for several prestigious awards including the Prince's Trust 'Working Together' award and the UK Defence Employer Recognition Scheme Silver award. In addition it was reported in The Times Supplement as one of the Top 10 UK apprenticeships in 2017.

Over the last 12 months, the AWS re:Start team has received feedback from delivery partners, AWS customers and partners, and from the AWS re:Start graduates themselves. The AWS re:Start programme is having a positive impact on the UK armed forces community and disadvantaged young people. "I truly believe it will prove to be life changing for me, and I hope the initiative is supported by Amazon and AWS re:Start's partners for a very long time." Rick Johnson, British Army AWS re:Start graduate.

Partners recognise AWS re:Start as a pioneering, socially progressive programme: "It's rare these days that you find a company doing something good for no other reason than it's the right thing to do" Matthew Smith-Wright, Operations Director, Clckwrk.

Customers appreciate the quality of the education provided by the AWS re:Start programme: "Of all my friends and contacts that have made the transition in to a civilian work environment, none of them have received such a comprehensive and empowering education, for such a 'hot' market." Ross Boyd MBE, Digital Product Owner, Virgin Money.

The programme has proved successful also because of the following reasons:

 AWS re:Start works backwards from the customer to understand their skills requirements building these skills into the training to ensure graduates can be effective in their new role Partnering with organisations who provide industry expertise to enhance the programme has been invaluable - Military Recruitment (CTP), Youth employability (Princes Trust) Mentoring (Sage), Training (QA) & IT Recruitment (Experis)







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