

APPRENTICESHIPS
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MODERNISING THE
WORKFORCE THROUGH
DIGITAL APPRENTICESHIPS



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1. INTRODUCTION

Employers tell us digital apprenticeships are a success.

This policy brief reflects on these successes and makes recommendations to help ensure businesses, and the economy, have the skilled professionals necessary through apprenticeships to meet the next set of challenges that are likely to face us in the fourth industrial revolution.

In this policy brief we:

- › provide a wider economic, education and training context for digital apprenticeships to illustrate why they are so important to improving national productivity (section 2)
- › outline the views of employers with whom BCS has consulted on the state of digital apprenticeships (section 3)
- › consider how the UK can build on current successes to anticipate and meet our future digital skills needs and how BCS can best support those efforts (section 4)

BCS is a key stakeholder in a wide range of nationally important initiatives that are helping to close the digital skills gap, and helping everyone at every age to thrive in the fourth industrial revolution. These are summarised in section 5.

As the professional body for IT and as a registered charity we focus on

- › **advancing training and education in IT and computing** for the benefit of the public
- › **digital inclusion and diversity** to ensure the benefits of IT are equally accessible by all
- › **establishing the highest standards of ethical practice** so that IT is good for all of society

We believe, for the UK to continuously improve productivity, it's vitally important to develop the right digital and IT apprenticeships to ensure employers have access to competent, trusted and ethical professionals who play an important part not only in their businesses, but in the UK economy and society as a whole.

This is why, following the first round of the trailblazer development, BCS harnessed its networks of IT and computing experts (over 65,000 members) and experience of assessment (having certified more than 700,000 individuals over the past 10 years) to register as an end-point assessment organisation for all level 3 and 4 IT digital apprenticeship standards. In the past two years, BCS has delivered over 4,000 end-point assessments and has over 15,000 registered apprentices.

This paper explains how BCS, as the UK's professional body concerned with digital apprenticeships, can significantly contribute to the Government's strategic objective of using apprenticeships to enhance the UK's productivity and ensure, as a nation, we remain at the forefront of the fourth industrial revolution.

Our conclusions in section 4 on page 14 cover:

- › maximising apprenticeship opportunities
- › building on the success of digital apprenticeships through changes based on clear, objective and comprehensive evidence
- › ensuring the right investment in digital apprenticeships that is crucial for the economy

2. THE NEED FOR WORLD-LEADING DIGITAL APPRENTICESHIPS

The world is experiencing a fourth industrial revolution, driven by the ever-increasing generation of data, combined with automated technologies which intelligently turn data into economic prosperity and enhance societal well-being.

Yet at the same time, it's widely reported that UK productivity ranks poorly¹ compared to other advanced economies. As set out by the Government's Industrial Strategy², innovation and skilled people are two critical elements for the nation in addressing its productivity challenge.

We believe high quality apprenticeships are central to addressing this challenge.

Apprenticeships enable people in England to develop the essential knowledge, skills and behaviours in line with employer-defined standards of occupational competence.

An assessment at the end of the apprenticeship confirms competence against the standard.

The **apprenticeship levy**, introduced in April 2017, requires employers with an annual pay bill of over £3 million to invest 0.5% of it into apprenticeships. The levy pays for the training, assessment and quality assurance of apprenticeships. If employers do not use the levy, which is paid to HRMC, it is transferred to a general levy fund. From April 2019, the government permitted levy paying employers to transfer up to 25% of its levy funds to other employers.

To put into context the need for world leading digital apprenticeships, this section gives a summary of some of the key changes affecting the future of work. According to the ONS³, a key risk indicator of whether someone's job will become automated in the fourth industrial revolution is the level of education required for that job. The graph below, taken from the ONS report, shows the split between roles at risk of automation against educational attainment required for those jobs.

INNOVATION AND SKILLED PEOPLE ARE TWO CRITICAL ELEMENTS FOR THE NATION IN ADDRESSING ITS PRODUCTIVITY CHALLENGE.

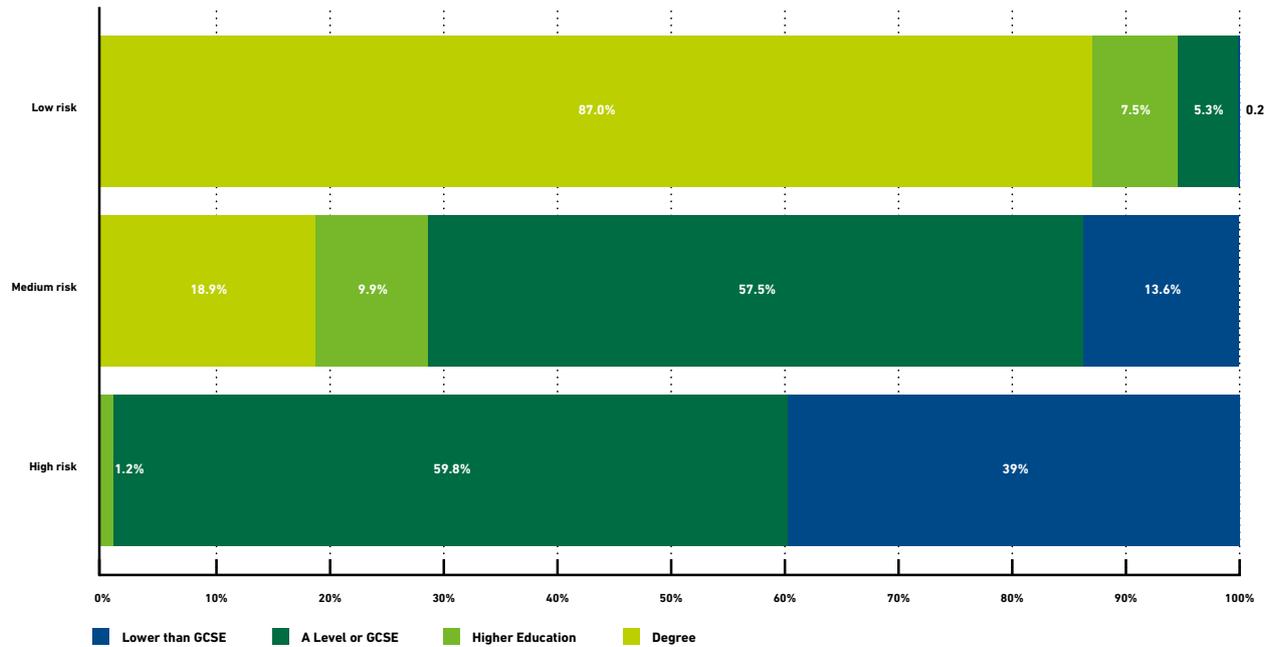
1 <https://www.mckinsey.com/featured-insights/regions-in-focus/solving-the-united-kingdoms-productivity-puzzle-in-a-digital-age>

2 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664563/industrial-strategy-white-paper-web-ready-version.pdf

3 <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/theprobabilityofautomationinengland/2011and2017#skills-and-tasks-at-risk-of-automation>

Figure 1:

RISK OF JOB BEING AUTOMATED COMPARED TO EDUCATION LEVEL REQUIRED FOR JOB



Source: Annual Survey Population, UK Survey of Adult Skills (PIAAC) and Frey and Osborne

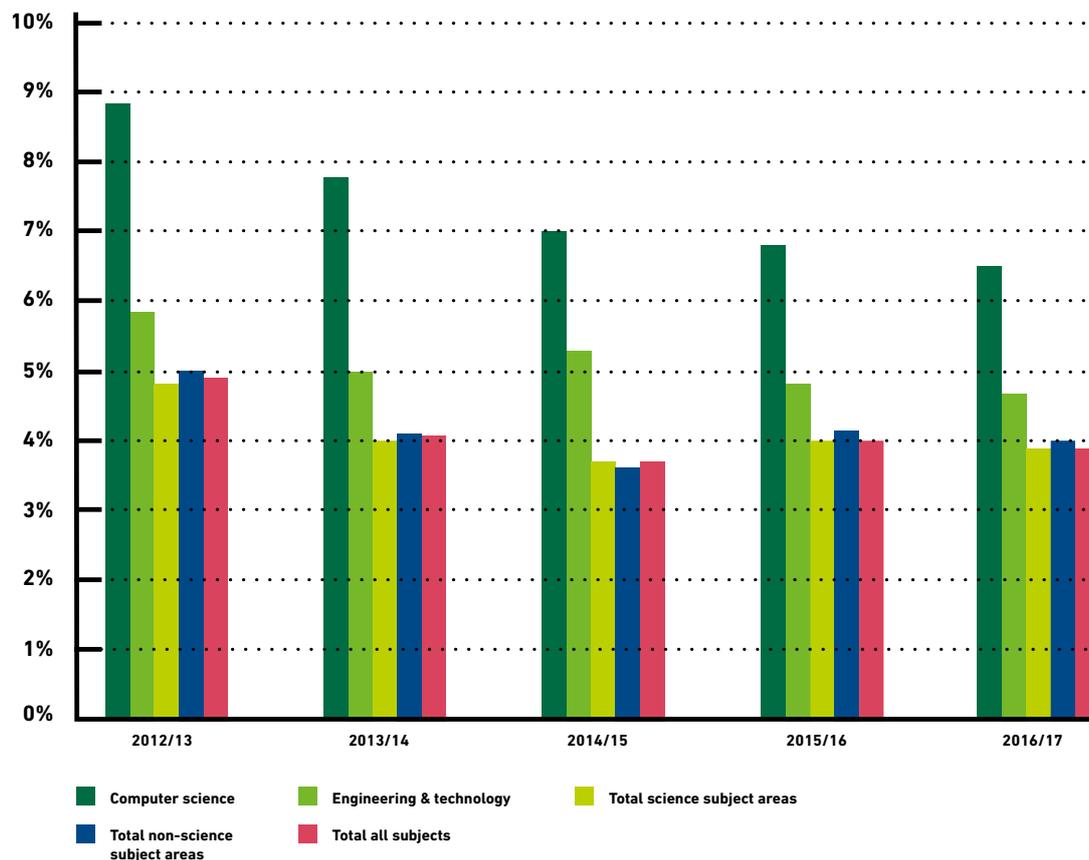
Although this graph suggests higher education and holding a degree mean an individual is likely to be more future-proof, in the UK at present too high a proportion of university computing graduates have skills that are perceived to be out of line with employer needs (according to the Home Office Shortage Occupation Review⁴). This is shown in the following graph, taken from the Home Office review, by the percentage of computer science undergraduates unemployed after six months compared to other subject disciplines.

59.8%

**JOBS THAT REQUIRE
CANDIDATES TO HAVE
A LEVELS OR GCSES
MAYBE AT THE HIGHEST
RISK OF OBSOLESCENCE
THROUGH AUTOMATION.**

Figure 2:

PERCENTAGE OF GRADUATES UNEMPLOYED SIX MONTHS AFTER GRADUATING



Source: Higher Education Statistics Agency

Whilst universities are working hard to address this issue, it means the UK must ensure we have a strong training and education pipeline that includes a diverse, inclusive range of pathways into the IT profession and the wider digital economy. As a strategic priority, this must include digital apprenticeships which, by design, are aligned with employers' skills needs.

The Home Office review recommends adding the following occupations to the Shortage Occupational List, in addition to the IT-related occupations already on the list:

- › IT business analysts, architects and systems designers
- › programmers and software development professionals

› web design and development professionals

These occupations are especially relevant to the fourth industrial revolution, and the UK needs to do everything it can to produce more homegrown talent to fill these shortages.

⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/806331/28_05_2019_Full_Review_SOL_Final_Report_1159.pdf?_ga=2.123413195.1187257991.1566767505-1164014281.1566767505

Although ultimately some jobs are going to be replaced by algorithms, it's likely that, over the medium term at least, jobs will become augmented by data driven technologies rather than completely replaced. The World Economic Forum's The Future of Jobs Report⁵ stated:

'Technological disruptions such as robotics and machine learning—rather than completely replacing existing occupations and job categories—are likely to substitute specific tasks previously carried out as part of these jobs, freeing workers up to focus on new tasks and leading to rapidly changing core skill sets in these occupations. Even those jobs that are less directly affected by technological change and have a largely stable employment outlook may require very different skill sets just a few years from now as the ecosystems within which they operate change.'

⁵ http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf



The shortages reported by the Home Office are consistent with the predicted level of data-based technology adoption over 2018-2022 in the World Economic Forum report. The following table shows the percentage of companies across all sectors that report they'll be adopting the key fourth industrial revolution technologies of big data analytics, machine learning and cloud by 2022.

Figure 3:

% OF COMPANIES ADOPTING FOURTH INDUSTRIAL REVOLUTION TECHNOLOGIES BY SECTOR BY 2022

Sectors of economy	Used entity big data analytics	Machine learning	Cloud
Overall	85%	73%	72%
Automotive, Aerospace, Supply Chain & Transport	84%	87%	76%
Aviation, Travel & Tourism	89%	79%	79%
Chemistry, Advanced Materials & Biotechnology	79%	58%	67%
Consumer	85%	82%	67%
Energy Utilities & Technologies	85%	77%	73%
Financial Services & Investors	86%	73%	65%
Global Health & Healthcare	87%	80%	73%
Information & Communication Technologies	93%	91%	91%
Infrastructure	65%	53%	71%
Mining & Metals	62%	69%	62%
Oil & Gas	87%	70%	78%
Professional Services	85%	74%	76%

Source: Future of Jobs Survey 2018, World Economic Forum.

The World Economic Forum also gives results from its survey of companies showing the likely trend in changing job roles over the 2018-2022 period, which is given in the table below.

Figure 4:

WORLD ECONOMIC FORUM SURVEY OF LIKELY CHANGING JOB ROLES OVER 2018-2022

Stable roles	New roles	Redundant roles
Managing Directors and Chief Executives	Data Analysts and Scientists*	Data Entry Clerks
General and Operations Managers*	AI and Machine Learning Specialists	Accounting, Bookkeeping and Payroll Clerks
Software and Applications Developers and Analysts*	General and Operations Managers*	Administrative and Executive Secretaries
Data Analysts and Scientists*	Big Data Specialists	Assembly and Factory Workers
Sales and Marketing Professionals*	Digital Transformation Specialists	Client Information and Customer Service Workers*
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	Sales and Marketing Professionals*	Business Services and Administration Managers
Human Resources Specialists	New Technology Specialists	Accountants and Auditors
Financial and Investment Advisers	Organizational Development Specialists*	Material-Recording and Stock-Keeping Clerks
Database and Network Professionals	Software and Applications Developers and Analysts*	General and Operations Managers*
Supply Chain and Logistics Specialists	Information Technology Services	Postal Service Clerks
Risk Management Specialists	Process Automation Specialists	Financial Analysts
Information Security Analysts*	Innovation Professionals	Cashiers and Ticket Clerks
Management and Organization Analysts	Information Security Analysts*	Mechanics and Machinery Repairers
Electrotechnology Engineers	Ecommerce and Social Media Specialists	Telemarketers
Organizational Development Specialists*	User Experience and Human-Machine Interaction Designers	Electronics and Telecommunications Installers and Repairers
Chemical Processing Plant Operators	Training and Development Specialists	Bank Tellers and Related Clerks
University and Higher Education Teachers	Robotics Specialists and Engineers	Car, Van and Motorcycle Drivers
Compliance Officers	People and Culture Specialists	Sales and Purchasing Agents and Brokers
Energy and Petroleum Engineers	Client Information and Customer Service Workers*	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers
Robotics Specialists and Engineers	Service and Solutions Designers	Statistical, Finance and Insurance Clerks
Petroleum and Natural Gas Refining Plant Operators	Digital Marketing and Strategy Specialists	Lawyers

Source: Future of Jobs Survey 2018, World Economic Forum.

Note: Roles marked with * appear across multiple columns. This reflects the fact that they might be seeing stable or declining demand across one industry but be in demand in another.

This is again consistent with the Home Office review and with their recommended additions to the list of shortage occupations.

2.1 The BCS IT Leaders Survey

More recently, in 2019, BCS conducted the IT Leaders Survey, which provided further insight into the specific skills needs of employers, and where apprenticeships can help address shortfalls in expertise. The survey's data sheds light on today's skills market but also points to technologies that businesses are eyeing for the future. Some of the top findings from the survey that reinforce the World Economic Forum's findings and which are relevant to apprenticeships, include:

- › The priorities for 2019 are continuous innovation (54%), operational efficiencies (52%), and business transformation and organisational change (45%).
- › When asked to single out their number one priority, 22% of participants cited business transformation and organisational change.
- › The technologies organisations are prioritising for 2019 are cloud (53%), cyber security (52%), automation (36%), IT governance (34%), and agile methods (34%).
- › 21% of respondents mentioned artificial intelligence, which is becoming more of a reality for business and not just a piece of horizon scanning.
- › When asked to identify their top priority, cyber security and cloud could not be separated with both on 15%.
- › Alarming only 12% of participants felt their organisation has enough resources to achieve success in 2019.

Taken together, all this evidence from the ONS, from the World Economic Forum, from the Home Office and our own survey of IT leaders should set off alarm bells for anyone trying to support the UK's Industrial Strategy. It demonstrates more than ever, the importance of focusing on technological innovation and upskilling people.

Furthermore, as can be seen from the changing nature of occupations in Fig 4 on page 10, tech skills are infiltrating all occupations, which means there's a strong case to ensure digital competencies are appropriately embedded across a range of, if not all, occupational standards as well as digital apprenticeships.

**EMPLOYERS SURVEYED
INDICATED CLOUD
AND CYBER SECURITY
ARE THEIR TOP TECH
PRIORITIES.**

3. DIGITAL APPRENTICESHIPS NOW

National apprenticeship data shows that there have been 19,070 starts on digital apprenticeship standards to date, between August 2017 and April 2019. BCS has seen apprenticeships gain momentum, with an increasing number of employers engaging with them and the mindset of training providers positively shifting from framework delivery to the new standards.

Encouragingly, lessons on training delivery and end-point assessment have generally been learned, and improved practices are being incrementally implemented. BCS aim to help increase the momentum of improving practice through our professional networks of employers, practitioners, university computer scientists, and our certified digital practitioners working across all areas of the economy as well as in the digital sector.

In our recent apprenticeship survey, conducted in April 2019, with 200 directors, managers and other decision makers of digital apprenticeship employers, we found:

- › 71% of employers indicated that the apprenticeship levy delivers a high return on investment
- › 82% of participants think that digital apprenticeships are relevant to businesses today
- › after completing a digital apprenticeship, 73% stated that it is important to their organisation that an individual appears on a professional register of competence

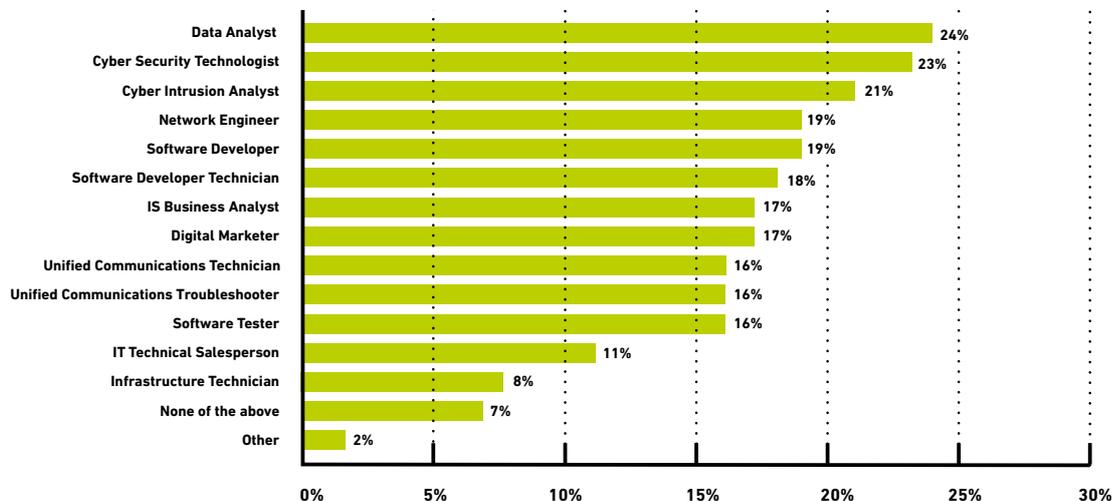
There was also a clear indication of employers' intention to continue using apprenticeships as part of their talent management strategies. In line with the opening of this paper, it is clear that employers are prioritising data and its security, as illustrated by the BCS survey data in Figure 5.

The conclusion drawn from our research is that digital apprenticeships are working well on the whole, and larger employers are taking an increasingly positive view of their levy investment.

However, we believe engaging SMEs remains challenging.

Figure 5:

WHAT DO YOU THINK YOUR ORGANISATION'S FUTURE AREAS OF INTEREST WILL BE IN RELATION TO AI?



Source: BCS Apprenticeship Survey 2019

3.1 Government's statutory review of digital apprenticeships

The government's statutory review of digital apprenticeships – conducted with 200 respondents including employers, training providers and apprentices – also paints a generally positive picture:

- › 85% of apprentices said the apprenticeship met their expectations.
- › 95% of respondents said the title of the standard reflected the content.
- › However, 41% of respondents (employers and training providers) encountered difficulties training apprentices, which has in the main been attributed to the inclusion of "knowledge units" in the training.

On the outcomes of its survey⁶, the Institute for Apprenticeships and Technical Education (IfATE) has decided that:

- › **Cyber Security Technologist (Level 4)** will be broadened to incorporate Cyber Intrusion Analyst (Level 4).
- › **Infrastructure Technician (Level 3)** will be broadened to incorporate Unified Communications Technician (Level 3)
- › **Network Engineer (Level 4)** will be broadened to incorporate to Unified Communications Trouble Shooter (Level 4). It will be renamed Network & Infrastructure Engineer.
- › **Digital and Technology Solutions Professional (Level 6)** will be retained on the basis that each of the individual options are reviewed in detail to ensure they each meet the requirements of an occupation.
- › **IS Business Analyst (Level 4)** will be revised and broadened in scope to become Digital Product Analyst/Digital Business Analyst (Level 4). The occupation should apply to a broader range of sectors rather than just Information Systems to better serve the needs of employers.

- › **Software Tester (Level 4)** will be revised but should be set at Level 3. An assessment demonstrated that a majority of the content aligned with Level 3 occupation level descriptors rather than Level 4.
- › **Data Analyst (Level 4)** will be revised to ensure it is relevant to employers.
- › **Software Developer (Level 4)** will be revised to ensure it is relevant to employers.
- › **Software Development Technician (Level 3)** will be revised to ensure it is relevant to employers.

The changes will result in the following apprenticeship standards being withdrawn:

- › Cyber Intrusion Analyst (Level 4)
- › Unified Communications Technician (Level 3)
- › Unified Communications Trouble Shooter (Level 4)

Additionally, content should be updated and improved by:

- › reflect advances in technology from work undertaken by the panel responsible for T-level standards (new technical equivalent to A levels)
- › remove the knowledge units
- › ensure small businesses are better represented
- › review the levelling of apprenticeships
- › promote diversity, including gender-neutral language

The work to deliver the above is being undertaken by a range of employer trailblazers and is expected to conclude in early 2020.

⁶ <https://www.instituteforapprenticeships.org/reviews/statutory-review-report-digital-route/>

3.2 The apprenticeship levy

There are varying views on how effectively the levy is working and whether it's working as effectively as it could.

The National Audit Office's March 2019 report⁷, The apprenticeships programme also states that "Financial constraints could inhibit growth in the number of apprenticeships. Under current funding arrangements, the Department and HM Treasury had expected levy-paying employers to access up to around half of the funds in their accounts to cover both new starts and existing apprenticeships. The Department's projections show that, even if starts remain at current levels, spending could rise to more than £3 billion a year once frameworks are withdrawn and all apprenticeships are on standards. The Department recognises that there are ways to control spending if necessary. The options could include limiting the number of new apprenticeships or reducing the level of public funding for certain types of apprenticeship. However, these measures are likely to be unpopular and could damage confidence in the programme"

While this matter is acknowledged by government, and subject to much discussion and debate, there remains after many months, no further clarification on how it will be addressed. This should again raise alarm bells for business of all sizes, in particular for dynamic occupations that are crucial to an IT and digitally driven economy.

However, in conclusion, while there are important decisions to be made on the sustainability and financial structure to support apprenticeship growth while maintaining high quality outputs, we must not miss the significant opportunities that the levy has presented.

Without doubt the levy has focused employers' minds on apprenticeship as a 'business investment' and a respected programme that, more now than ever before, is firmly integrated within organisations' talent management strategies. In our view this is something to build on, rather than dilute at this point and time.

4. BUILDING ON THE SUCCESS OF DIGITAL APPRENTICESHIPS

Having consulted with employers and training providers, BCS believes there are three important considerations to building on the success of digital apprenticeships:

1.

Creating opportunities to maximise the output of apprenticeships for dynamic tech occupations, which may require looking at how to stimulate supply to meet strong employer demand.

2.

Making improvements to apprenticeships based on where there is clear, objective, comprehensive evidence that these will have significant benefit and result in improved productivity.

3.

Ensuring that there is a sustainable mechanism for allowing access for non-levy paying, small businesses to access funding generated from the apprenticeship levy.

⁷ <https://www.nao.org.uk/wp-content/uploads/2019/03/The-apprenticeships-programme.pdf>

4.1 Creating opportunities

We believe that the dynamic nature of digital technology occupations demands continuously updated insight and horizon scanning to meet evolving skills needs to future proof apprenticeships and support employers and their contribution to the economy.

Alongside developing occupational competence it's also vital to embed ethical practices to ensure IT genuinely benefits all of society. On this basis BCS recommends a focus on these areas:

- a. Continuously conduct in-depth, wide-ranging research into future IT and digital skills. BCS will support that effort through the range of research we undertake, and will continue to undertake, on the future of IT and digital skills through our various professional networks.
- b. Take a more joined up approach to foster greater alignment between apprenticeships and professional recognition, to support the ongoing CPD of qualified apprentices, which is consistent with current government policy on higher technical education.
- c. Galvanise stakeholders to develop thought leadership on IT and digital transformation. BCS is facilitating a variety of communications, including events, in 2019/20 to this end.
- d. Fix the diversity problem in IT and computing. Employers keep telling us this issue needs to be addressed. BCS has placed diversity and inclusivity as a key priority in our strategy for supporting the IT profession. In November 2019 we're launching our diversity campaign, with a particular focus on increasing the number of women apprenticeship starts, and at the same time supporting partners' initiatives to nurture greater inclusion in apprenticeships.

4.2 Making improvements

Improving digital apprenticeships to engage more employers and individuals is welcomed. To do so we must be mindful of what is already working well and build on these opportunities. BCS recommends to:

- a. undertake more transparent and open collaboration across a wide range of apprenticeship stakeholders to achieve fit for purpose and future-proofed apprenticeships.
- b. access subject matter expertise, technical support, and market intelligence to help the design, content and assessment of reformed apprenticeship standards.

4.3 Ensuring that there is a sustainable mechanism

Addressing concerns regarding the sustainability of the levy are fundamental. Employers large, medium and small, in all sectors, rely on dynamic IT and digital skills – they are critical to the economy and are key to improving our productivity over the long term. On this basis BCS recommends:

- a. government increases the breadth and depth of dialogue with key stakeholders to understand and determine economic priorities and ways in which they can be addressed.
- b. changes to apprenticeships focus solely on the best interests of apprentices, employers, and society as a whole.
- c. to ensure people continuously maintain relevant competencies over the long-term, support progression and alignment to professional recognition at all levels.



82%

OF BCS EMPLOYERS SURVEYED THINK
THAT DIGITAL APPRENTICESHIPS ARE
RELEVANT TO BUSINESSES TODAY

5. FURTHER INFORMATION ON BCS, THE CHARTERED INSTITUTE FOR IT

The purpose of BCS, defined by its Royal Charter, is to promote and advance the education and practice of computing for the benefit of the public. We are the professional body for information technology in the UK. We are also a key stakeholder in a wide range of initiatives that are helping to close the digital skills gap for everyone at every age, to help them thrive in the fourth industrial revolution.

5.1 Schools

In 2012 the Secretary of State for Education invited BCS to coordinate the development of the now statutory computing curriculum for schools, in partnership with the Royal Academy of Engineering. Ever since BCS has played a key role throughout the UK, including Scotland, Wales and Northern Ireland, in equipping teachers with the skills needed to teach all children the essential computational thinking skills they will need in life.

BCS is a partner in the consortium establishing the National Centre for Computing Education (NCCE) in schools, funded by an £84m contract from the DfE to upskill and provide ongoing CPD to computing teachers. Through the Barefoot Computing project⁸, run in partnership with BT, we've helped over half the primary schools throughout the whole of the UK gain initial training in computing. BCS also runs the DfE funded scholarship scheme to attract outstanding candidates onto computing initial teacher training courses.

5.2 Universities

BCS has accredited the computing degree programmes in over a hundred UK universities, ensuring that their curricula and teaching methods meet appropriate standards. BCS is a partner in the Institute of Coding⁹, set up by the government to help address the UK digital skills gap at undergraduate level.

5.3 Apprenticeships

BCS is recognised to end-point assess 13 digital apprenticeship standards and has delivered over 4,000 end-point assessments, which is central to our role in ensuring IT practitioners achieve the highest standards of professionalism. As part of this role, we undertake a variety of activities to promote apprenticeship, drive inclusion and diversity, and support the future-proofing of apprenticeships for dynamic tech occupations.

⁸ <https://www.barefootcomputing.org/>

⁹ <https://www.gov.uk/government/news/prime-minister-announces-20-million-institute-of-coding>

5.4 Professional registration

Through professional registration – such as the RITTech standard¹⁰ developed in collaboration with the Gatsby Foundation, and Chartered IT Professional status¹¹ – we ensure everyone from whichever background can gain the same professional recognition based solely on their proven competencies, whether they've followed an academic route, a technical route or a combination of the two.

BCS is a partner in the consortium establishing the new UK Cyber Security Council, funded by a grant from DCMS to support the development of cyber security into a fully mature profession. BCS is also a founding member of **FEDIP**¹², which is a professional register for NHS informaticians to improve modern health and care services through digital technologies demonstrated against publicly available competency standards.

5.5 Continuous professional development

Through certification, BCS supports practitioners to continuously develop professionally beyond their initial qualification, which may have been through diverse pathways such as an apprenticeship or university degree, e.g. over 100,000 practitioners worldwide hold BCS Business Analysis professional certificates.

73%

OF EMPLOYERS SAID
IT IS IMPORTANT POST-
APPRENTICESHIP
TO APPEAR ON A
PROFESSIONAL REGISTER
OF IT COMPETENCE

Source: BCS Apprenticeship Survey 2019

10 <https://www.bcs.org/membership/get-registered/professional-registration-for-it-technicians-rittech/>

11 <https://www.bcs.org/get-qualified/become-chartered/chartered-it-professional/>

12 <http://fedip.org/why-it-matters>

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