University Alliance and CaSE roundtable

Standing out from the IT crowd: How do we make Britain a world leader in digital skills?

University Alliance and CaSE organised a roundtable discussion to inform the House of Commons Science and Technology Committee and its inquiry into digital skills. The event took place at the London offices of Google UK on Wednesday 2 March 2016 and involved representatives from universities, sector bodies and business. The meeting was chaired by Nicola Blackwood, Member of Parliament for Oxford West and Abingdon and Chair of the Science and Technology Committee.

This document summarises the main discussion points and solutions that emerged. The discussion was divided into three thematic sections – schools, higher education and employers – with equal time allocated to each. Questions for consideration under each theme included:

> What are **schools** doing to ensure everyone leaves with the digital skills needed to thrive, and which employers need? Are digital skills being effectively built into the curriculum and do learning resources reflect this? What collaborative work and outreach activity is taking place with universities and employers? Is there enough emphasis on digital skills within teacher training?
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> What are **universities** doing to ensure that all students have the skills they need to thrive in the digital economy? What are the reasons for the low employability rates of computer science graduates and how can this be addressed? Are graduates of all disciplines well suited to a career in digital industries? As the world of work becomes increasingly digital, what new skills will all graduates need in the future?
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> What are the barriers to upskilling the existing workforce, and what is the role of **employers**, both small and large? In light of widely reported skills gaps and shortages, what are employers not currently getting from the digital skills pipeline? If our goal by 2030 is for Britain to be a leading digital economy with more high-paid, high-skilled jobs, what does our educational and training architecture need to look like?

NB: The event was held under Chatham House Rule so comments below are unattributed.

Schools

The current picture

- The degree to which computing and digital technology are embedded in schools, teaching and the curriculum varies significantly across the UK.
- There was broad agreement that the new computing curriculum in England is an improvement and covers fundamental skills and

capabilities but ability to deliver it well is patchy and thought to be dependent on school leadership and teachers' competencies.
- A lot of work has been done to develop the primary and secondary computing curriculum, and resources and support to deliver it.
- Around 25% of schools nationally understand the need to develop pupils' digital knowledge and skills, 25% understand the need but lack the resources to meet it, 25% are only now realising the importance of this agenda and 25% are resistant.
- Sector bodies like BCS (Chartered Institute for IT) are playing an important role in helping schools and teachers, for instance through the Barefoot Computing resources. The shared aim is to help young people develop a way of thinking and teach principles that underpin the digital world, using computers as a 'laboratory' to learn concepts and approaches that will be useful regardless of their later career path.
- Girls in particular disengage from computing at schools between the ages of 11-14, which is similar to the picture in physics and maths.

Enablers

- There are patches of real progress, particularly seen where schools have access to universities, IT employers and other schools similarly seeking progress in their approach and teaching of computing and digital skills.
- Helping young people, and teachers, recognise the relevance and broader context of digital technology and computing to everyday life and future careers helps to raise interest, tackle negative perceptions of computing and mainstream digital skills.
- There are good examples of the formal curriculum being complemented by informal learning, for instance through code clubs, the hour of code or HRH The Duke of York's digital enterprise awards which are currently being developed.

Barriers

- Academy schools (in England) can choose to opt out of parts of the curriculum including the provision of computing or ICT at Key Stage 4. This could impede progress at secondary level.
- There is a significant shortage of teachers with the necessary knowledge and skills to teach computing both at primary and secondary level. With teacher subject knowledge and confidence shown to be linked to student enjoyment and attainment.[1] "If there are

[1] Science as a key component of the Primary Curriculum, The Wellcome Trust, 2008

16,000 computer science graduates each year, for the next five years all of them need to go into teaching if we are to meet the skills need".

- There are no formal measures for schools around their provision or pupil progress in computing resulting, understandably, in it not being prioritised.

Recommendations

- To 'mainstream' computing, support teachers and schools to build in computing as a tool right across the curriculum, for instance using programming to explore a subject in history, compose music or analyse data from a chemistry experiment, not just in 'computing' class. A similar principle at primary has been championed by Government through the Big Write and seen success in wider attainment and could be replicated for computing – equipping and encouraging teachers to weave computing into every subject taught that day.
- Focused, top level political leadership for the hour of code, to raise visibility and increase participation.
- Introduce a statutory entitlement for access to computing, as there has previously been for music.
- To raise the perceived importance of these skills by schools, Ofsted could be required to ask about provision of computing/ICT/computer science, and at secondary this should include whether there is post-16 provision in these subjects.[2]
- Teaching standards include specific requirements around literacy, reading and mathematics, these could be expanded to include digital literacy.
- Science – including computing, should be given higher priority within primary teacher initial teacher training, addressing knowledge gaps and boosting teacher confidence.
- Government policy should recognise and reflect that these subjects will be delivered in large part by non-specialist teachers due to existing and growing teacher shortages in computing at secondary, and shortages in primary teachers confident to deliver the computing curriculum.
- There was a widespread call for long-term policy certainty and a stable environment, to allow current schemes and initiatives – to embed and take root. Ministers should maintain support for and

[2] In a 2015 Wellcome Trust review of Ofsted, 73% of primary school inspection reports did not mention science, but 100% mentioned maths. At secondary, 33% of full school inspection reports did not mention science, whereas 100% mentioned maths.

evaluation of existing initiatives and seek to build on and enhance the current system, not seek to 'reinvent the wheel'.

Higher education

The current picture

- The main topic of discussion in this section was the employability of computer science graduates. Computing graduates are recorded as having the highest unemployment rates for all subjects, six months after graduation, although the numbers of unemployed graduates at six months varies widely between institutions, from 2% to 26%.[3]
- There is also recognition that all people need to be digitally literate, for future employment but also to participate in society: to drive their car or operate their TV, and therefore how these skills are integrated across subjects is a challenge.
- There are potential trade-offs between training students with technical skills which can date quickly, and more fundamental problem-solving and analytical skills. It was suggested that from an employer perspective 'it is better for a computer science graduate to have engaged with a number of programming languages rather than learning a single one inside out'.

Barriers

- There is a tendency for employers to recruit computer science graduates from a small number of universities, whilst high quality computing courses exist across the sector. This may artificially exacerbate the employer view that there is a shortage of suitably qualified candidates.
- Computer Science students are more likely to come from a black and minority ethnic (BME) background and across all subjects BME students have the highest unemployment rates suggesting employer bias. Computer Science graduates are half as likely to go on to further study compared to the average (8% versus 16% of the wider sector). Research has also found that graduates often use family and friends to find employment, but this is less common amongst computer science graduates perhaps due to the age of the sector. This combination of factors could be combining resulting in higher unemployment rates for computer science alongside demand from employers.

[3]https://cphcuk.files.wordpress.com/2016/01/computinggraduateemployabilitysharingpractice.pdf

- Employers don't always know or understand what qualifications mean – for example, telling someone you have "a degree in computer science" can imply any number of things. In addition, some universities are bad at labelling their courses using the standard JACs subject classifications. Employers need to know what constitutes a good course and universities must give a clear picture of what they are teaching.
- A lack of transparency from universities on the specialisms which exist in individual courses and faculties (such as cybersecurity), and from employers on the specialisms they require – in the natural sciences, different specialisms (such as inorganic chemistry) are well understood but the same is not true for computer science.
- BCS accredit the vast majority of computing courses in the UK meaning there is a lack of granularity for employers as to the differing strengths of different courses. This is being addressed by BCS and through the Shadbolt Review.
- Particular concerns were raised on the decline in part-time degree study, which is a crucial option for those wishing to study computer science later in life in order to change careers. It was noted that this has had a disproportionate impact on women who tend to come into computing as a second career and but may already have a level 6-7 qualification. Current Equivalent and Lower Qualification (ELQ) policy would prevent career switchers accessing funding unless they wanted to complete a full undergraduate degree.

Enablers

- A conversion course for graduates of other degree subjects moving into computing could offer an effective route to jobs in the digital sector. The HEFCE funding to support the development of conversion courses in engineering, including engineering-related computer science, via a pilot scheme in 2016/17 is very welcome.[4]
- At Harvard, CS50, is one of the most popular courses taken by non-specialists. It teaches programming and is designed to be applicable far beyond computer science. The US model of combined (major/minor subject) degrees allows students from other degree disciplines to pick up essential digital skills for the workplace.
- Degree apprenticeships are a welcome development and the digital technologies programme is in its early stages.
- Placements, short-term or a full sandwich year as part of a degree, boost employability and support university-employer links. Engagement

[4] http://www.hefce.ac.uk/pubs/year/2015/cl,252015/

between universities and employers can take other forms like incorporating real-world problems into degree programmes.

Recommendations

- To address concerns over bias against certain groups of students or universities, employers should do more to open up their recruitment practices, offer more internships and work placements, offshore fewer graduate jobs, and provide unconscious bias training for staff.
- Employers and universities should work together to facilitate work experience during study, as well as in year-long placements and summer schools, providing real-world problems for students to solve, supported by meaningful engagement, and helping students become work-ready.
- Relax ELQ requirements to enable career switchers or those seeking to upskill in-work to access funding for taking short courses or modules, and to support credit transfers.
- Universities should work with employers to make placements a compulsory part of more courses.
- Higher Education Innovation Funding is effective in supporting knowledge exchange between universities and – particularly – small and medium sized companies including in the tech sector. It should be protected for that purpose.

Employers

The current picture

- Tech sector employers look for students who have been taught how to embrace and enjoy fast changing digital technology and university courses need to respond to that.
- There are good examples of employers getting involved in digital skills training, ranging from MOOCs to face-to-face interactions in schools, universities and the workplace.
- One of the big challenges for tech sector businesses of all sizes is the lack of skills concentration in any one jurisdiction. Large companies have the resources to recruit from a global talent pool with a number of global hubs, but this can be restrictive for smaller or new companies looking for talented people to expand.

Barriers

- Restrictive immigration policies for skilled workers are a concern for a sector with great potential for growth and some highly specialised skills needs.[5]

Enablers

- Apprenticeship and "grow your own" schemes where employers take young people on and train them are an essential part of the skills and training mix.
- In Scotland there are a series of Government-supported placement schemes including e-Placement Scotland, ScotGrad and Adopt an Intern, which have seen success in expanding the number of employers actively engaging in offering placements. e-Placement Scotland reports that 53% of placements are offered by SMEs.
- Universities should support a culture where a placement year becomes rather than the exception – student decisions are often informed by peers.

Recommendations

- Ensure coherence in competency frameworks for the sector. These are well defined for computer science degrees through accreditation competency frameworks and this should be transferrable for degree apprenticeship competency frameworks too, reducing complexity in the system.
- Ministers must ensure the digital skills agenda is reflected in BIS' industrial and sector strategies, and that this takes into account the fast-changing landscape of the digital economy.
- If skills gaps are well evidenced, the sector should ensure that they engage with the next update on Migration Advisory Committee's shortage occupation list.
- The digital industries can learn from other sectors in developing recognised professional standards with broad agreement.
- Given the significance of SMEs and startups to the digital economy, small firms need additional support to enable them to offer placements.
- The Department for Business, Innovation and Skills should incentivise degree apprenticeships or set an aspiration for numbers within the three million target to ensure the expansion of apprenticeships helps to meet the well-identified digital skills gap.

[5] http://www.sciencecampaign.org.uk/caseimmigrationreport2016.pdf

- Larger employers with successful graduate, apprenticeship and placement schemes should work with smaller employers in their supply chains and sector to signpost additional applicants to wider opportunities in the sector and support smaller firms with the process.