Leaving the EU: implications and opportunities for science and research inquiry

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Executive summary

- Computer science is crucial to achieve the UK's strategic economic aims (§1–3) and it is at risk of fierce international competition (§4). Computer science is a blend of science, technology and engineering which gives rise to an ecosystem (§5), where students and researchers flow through our universities to then fill key position in the UK economic system (§7). The whole ecosystem is at risk and requires a holistic understanding under Brexit (§5).
- Our universities employ the best staff available, regardless of nationality. For Computer Science this translates to many departments where UK nationals are a substantial and vital fraction of staff (§6). EU staff are attracted to contribute to the UK Computer Science because in doing so they invest in their own future (§7). Brexit breaks this synergy (§8), and has the potential to drive the best away (§9). UK Computer Science needs freedom of movement for scientists —even non-EU— and students (§9).
- EU research funding is very significant, triggers key strategic collaboration, and is not easily replaceable because of its focus (§10), complementarity to UK home funding (§11), and support for industry (§13). None of the existing models allow third-party countries to contribute to set the research agenda, and as such are not suitable for the UK (§12).
- Across border export restrictions and IP regulations stifle collaboration and innovation (§14).
- Brexit is anecdotally already happening in academia, with UK partners dropping out of EU consortia because of the current uncertainty (§15). It would hardly be possible for Computer Science to recover the lost ground in strategic hot areas such as e.g. Cybersecurity, Big data and the Internet-of-Things if we to spend 2.5 years in this uncertainty.
- Laws and mechanisms concerning the protection of the public from computer-related

threats are better handled at the European rather than national level (§16).
- Leaving the EU affords us no new opportunity, no new initiative that is not available to us today (§17).
- *From these findings, and as experts of the UK's Computer science ecosystem, in §18 below we make 9 key recommendations to the Brexit negotiators*.

Introduction

The Council of Professors and Heads of Computing (CPHC) exists to promote public education in Computing and its applications and to provide a forum for those responsible for management and research in university computing departments. CPHC includes Professors and/or Heads of Computing Departments in all UK Universities. It currently has nearly 800 individual members, drawn from over 100 UK universities, which provides us with the mandate to be the representational body for this group in the UK.

The UK Computing Research Committee (UKCRC) aims to promote the vitality, quality and impact of Computing Research in the UK. Its members are internationally leading computing researchers drawn from both academia and industry. The UKCRC was formed in November 2002 and is an Expert Panel of the British Computer Society, the Council of Professors and Heads of Computing and the Institution of Engineering & Technology. By contributing to policy formation within these three key national bodies, UKCRC enables UK Computing Research to speak with a single voice.

Context and risks

1. There is consensus that UK universities are a major driver behind the country's strategy to base its economic future on sophisticated, highly-profitable goods and services. The Nurse review places great emphasis on this. But the UK faces a key strategic risk in that many other countries also follow exactly the same strategy, and are actively engaged in building the resources to do so.

2. The UK's current assets in this regard are nearly unmatched. It has leading universities whose names are familiar to everyone in the educated world, and a significant number of others that operate routinely on the international stage with distinction. Arguably, only the US has this combination of both absolute top-tier international excellence and strength in depth.

3. The discipline of Computer Science is critical to the UK, given that all of the advanced goods and services involve the use of innovative digital technology at some point. Excellence in our area is a key enabler for delivery across the spectrum, as well as being vital in its own right in areas acknowledged by the UK government as worthy of strategic investment. These include for instance Cybersecurity (keeping our digital assets and infrastructures safe from the ever-increasing attack they are under), Big Data (monetising the vast amounts of data held by companies and allowing the development of radically new capabilities and services), and the Internet-of-Things (exploiting the power of connectivity between billions of everyday devices).

4. While the UK's strength in Computer Science is in line with its strength in other sciences, its international standing in the face of intense and growing competition is more at risk than others. Because investment in digital technology is comparatively cheap and carries a strong multiplier through its links to subjects across the board, other countries are prioritising investment in Computer Science. Brexit does therefore raise significant challenges to our community that will need to be counterbalanced in negotiations, if UK-based Computer Science is to retain its position and deliver the output needed to support the UK. *We make 9 key suggestions in §18 below.*

5. As a discipline, Computer Science is a rare blend of science, engineering and technology whose academic aspects are indivisible from those of innovation, industry engagement and talent scouting. It is this entire ecosystem consisting of people, research, collaboration, funding, innovation and industry synergies that needs to be considered holistically during the negotiations.

People & free movement

6. One of the main characteristics that has enabled UK universities to maintain their leading position has been their openness to foreign staff, like the openness in the USA. Our leading universities employ staff who are the best in the world at what they do, regardless of nationality, and facilitate their integration in the UK community. Our universities aim to bring them here so that they are contributing to the UK's national future, and have been very successful at that. As a result, a substantial fraction of staff —often the majority— in leading UK Computer Science departments now are EU (non-UK) nationals. This, together with the existence of competitive centres in EU countries and our highly-mobile, high-value staff, makes our discipline extremely vulnerable to Brexit.

7. The free movement of labour in the EU is therefore an enormous asset for Computer Science. It gives access to a pool of talent that is large and contains high quality. In return,

foreign staff members coming to the UK can build their whole career here, knowing that they can move freely to other positions, and that their partners and other family members will be able to work. Being able to invest in their own future while contributing to the UK is what makes the deal attractive. It also feeds the supply-chain, as our students and researchers move on to become innovators and key workers in the UK service economy. There is already anecdotal evidence of (professorial level) appointments and studentships turned down over lack of clarity of future status. The risk is that of a brain drain, followed by a decline of students numbers, followed in turn by a decline of the UK IT industry.

8. Early indications from internal surveys are that the vote to leave has been unsettling for university staff. This includes non-EU foreign nationals and UK nationals, who believe that their future success depends on the UK staying open to the world. Many EU nationals would like to stay in the UK but are currently unsure what future there is for them and their families here. Many think of taking up UK nationality, but the process for that is long and complex. *We therefore recommend to set up streamlined procedures for the naturalisation of university staff who have made of the UK their home.*

9. We have a moral obligation to support people who came to the UK to work on the basis that they were doing so under a stable framework that would let them build their lives here. This is intensified by the fact that many of them have put significant parts of their lives into work that is ultimately for the benefit of the UK. Computer science students and post-doctoral researchers often stay on to work in the UK and substantially contribute to the economy. The complex work permit requirements for overseas people would deter these people from staying to fulfil high-tech IT posts. In any case, our exposure is such that it makes good sense to behave generously towards them. We will otherwise lose many of the brightest and the best, and we know from our internal attitude surveys that the losses may not be confined to EU nationals but include other foreign nationals and our own citizens as well. *We therefore recommend that government makes a forceful unilateral pledge to preserve freedom of movement and work for all scientists and their immediate families, those already in the country and those who will come in the future.*

Research & collaboration funding

10. Ultimately, the EU's research provision is not something we can replicate in any simple way, because of its scientific focus, its support for small (and not so small) business, its integrated networks, multinational consortia and support for infrastructures. In particular, our view is that research collaboration at EU level is irreplaceable. *We therefore recommend that government does not attempt to build alternatives, but negotiates unchanged access for the*

UK to EU research funding, inasmuch as possible.

11. The UK's own research support provision is currently designed not to replicate Horizon2020 and other EU programmes. Given our unparalleled success in attracting funding from such programmes, and in the interest of efficiency, UK programmes focus on areas and parts of the research pipeline that are either of strategic national importance to the UK, or left relatively uncovered by the EU. Groups and departments specialising in the aspects supported by the EU are now critically over-exposed and at risk. It also means that without full access to EU funding, it will not be enough simply to increase funding to the exisiting UK provision: the whole support programme will have to be reassessed. *We therefore recommend that government puts on holds current plans to restructure its research support until the role we need it to carry out has become clearer.*

12. Several models exist for third-countries to access EU funding (Norwegian, Canadian, Swiss, Turkish, Hong Kong, Albanian models). Roughly, they allow increasing rights to join research consortia, matching EU funds with home programmes or drawing directly from the EU pot. Crucially, none of these models allows to sit at the table where research funding policies and priorities are established. Because of the UK reliance on EU research funding, and because of our scientific weight, to just be able to bid for grants is not sufficient. It is crucial for the UK to be able to shape research strategies. *We therefore recommend that government negotiates an entirely new model for the UK, whereby we are also allowed to contribute to shaping the research programme*.

Networking, innovation & industry support

13. Horizon2020 and other EU programmes are not only research funders, but support vast networking events that participants are subsidised to attend. The beneficiaries are not just universities. Specifically, they include business and local authorities too. In particular, UK companies and local administrations benefit directly from the EU research programmes, e.g. by setting problems to be addressed, by receiving financial support for their R&D processes, by receiving subsidies to deliver innovation in partnership with universities. The international access to potential commercial partners and the support that they provide for small businesses for large scale research exploitation and commercialisation cannot be replicated by any UK-based replacement, and must not be lost.

Ideas & free movement

14. One key enabler of opportunity and growth from research is the free circulation of ideas.

The risk is that Brexit could bring about new national barriers for export of restricted technologies, which may well include Computer Science. *We recommend that government negotiates a restriction-free Intellectual property and export rules with our EU partners.*

The price of uncertainty

15. Anecdotal evidence is that Brexit is already taking a toll for academia, as we are experiencing increasing reluctance to partner with UK institutions. EU bidding rounds are extremely competitive and —all other things being equal— UK partners present higher risks. Extrapolating from this, and looking forward to months of uncertainty, we argue that the *UK risks to fall behind whatever the negotiations will bring*. For very competitive technological areas like Computer Science, it will be very difficult to recover from that —just think about trying to catch up on the Internet-of-Things three years from now. The relevant evidence here is from Switzerland, that has not recovered from the temporary exclusion in 2014, with success and income dropping respectively from 3.2% to 1.8% and from 4.2% to 2.2%, and bid coordination crashing from 3.9% to 0.3%. *We therefore recommend that government makes a forceful unilateral pledge to work in consortia with EU partners, no matter what.* A stronger statement is required than those already made on the opportunistic basis of favourable proceeds, one rather based on the basis that the UK believes in EU level research and is strategically committed to it.

Relevant EU legislation

16. Computer Science and Law meet on very sensitives issues related to computer misuse, cyber security, cyber crime, data privacy, surveillance, monetisation of user data held by large companies, data repositories, and competition laws. We believe that these issues are better faced at EU level rather than national. *We therefore recommend that government proceeds jointly with other EU countries on legal issues relating to the protection of the public from cyber threats.*

Opportunities

17. We observe that after Brexit there is no longer a reason to make a difference between EU and non-EU researchers, and therefore both should allowed free immigration to the UK, so as to enlarge the pool of talent we can draw from. Beyond that, the EU has not stood in our way as far as access to other research networks and partnerships is concerned. Therefore, Brexit really seems not to afford to Computer Science specifically, and universities in general, any opportunity that we do not already have.

Recommendations

18. As experts of the research and academic UK in Computer Science, we make the following recommendations towards the Brexit negotiations.

a. That the entire ecosystem consisting of people, research, collaboration, funding, innovation and industry synergies be considered holistically during the negotiations.

b. That up streamlined procedures for the naturalisation of university staff who have made of the UK their home.

c. That government makes a forceful unilateral pledge to preserve freedom of movement and work for all scientists and their immediate families, those already in the country and those who will come in the future.

d. That government does not attempt to build alternatives, but negotiates unchanged access for the UK to EU research funding, inasmuch as possible.

e. That government puts on holds current plans to restructure its research support until the role we need it to carry out has become clearer.

f. That government negotiates an entirely new model for the UK, whereby we are also allowed to contribute to shaping the research programme.

g. That government negotiates restriction-free Intellectual property and export rules with our EU partners.

h. That government makes a forceful unilateral pledge to work in consortia with EU partners, no matter what.

i. That government proceeds jointly with other EU countries on legal issues relating to the protection of the public from cyber threats.