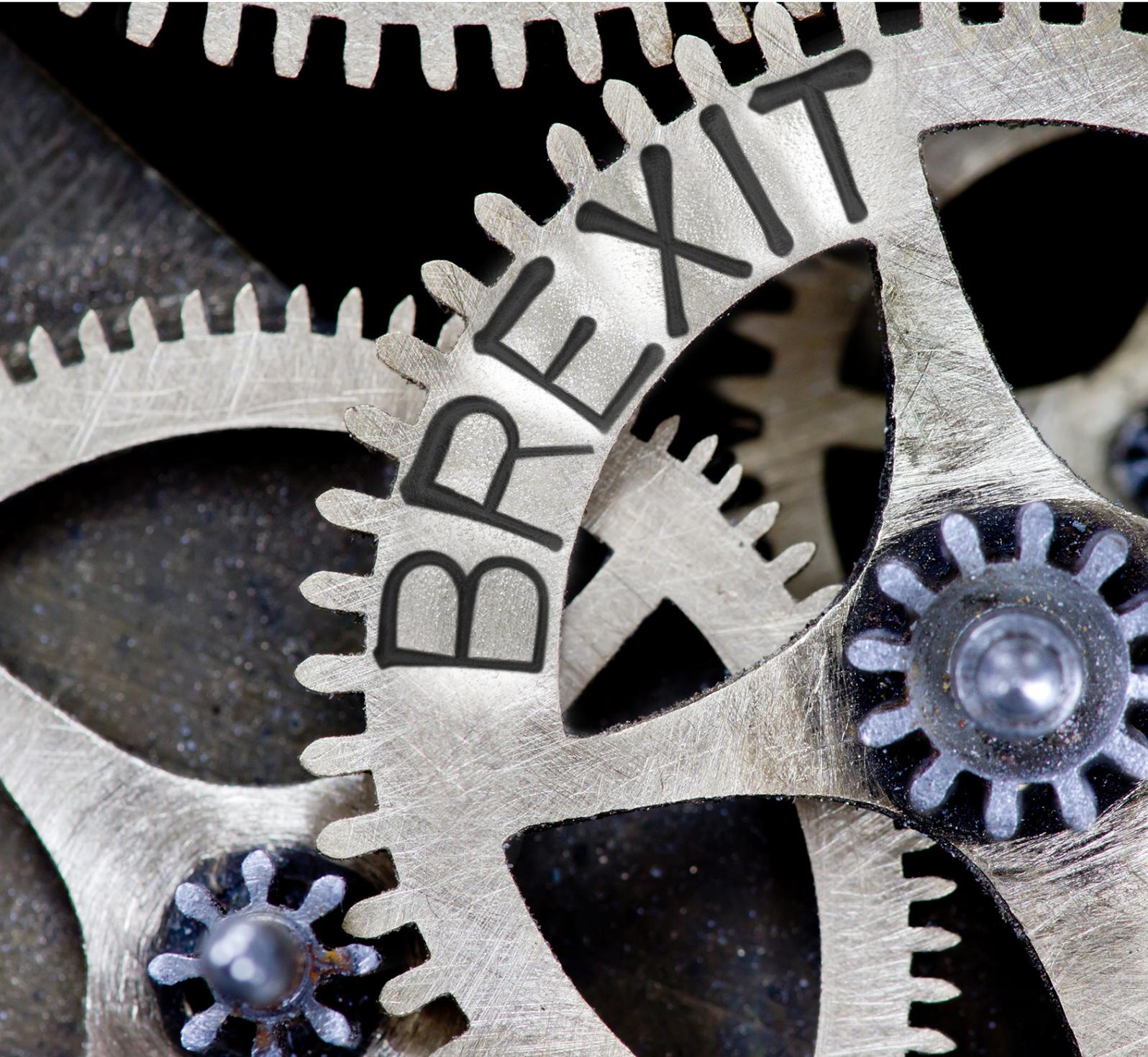


BREXIT AND INFORMATION & COMMUNICATION TECHNOLOGY (ICT) SHAPING ICT PRIORITIES

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SCOPE

Information and Communication Technology (ICT) is fundamental to the delivery and support of all aspects of society in addition to significantly contributing directly to each nation's GDP. This briefing captures key actions and requirements for the domain in the light of the UK's decision to exit the EU. It is based on the views of ICT and other professionals from the UK and internationally. It makes the case that the UK Government needs to work overtly with a wide range of ICT experts to ensure that laws are optimized for the ICT domain and that there are targeted policies and funding strategies to support and grow the ICT domain through this change. In addition, it raises the significance of international cooperation in particular to meet environmental and ICT ethical challenges.



Context

Information and Communication Technology (ICT) is fundamental to the delivery and support of all aspects of society, in addition to significantly contributing directly to each nation's GDP (see www.ons.gov.uk/businessindustryandtrade/itandinternetindustry and <https://datamarket.com/data/set/19r3/percentage-of-the-ict-sector-in-gdp#!ds=19r3!6hv9=1.2.3.4.5.7.8.d.e.6.9.f.g.h.k.i.j.l.m.n.o.r.q.a.p.s:90!1=1&display=choropleth&map=europe&classifier=natural&numclasses=5>). The July 2017 Technology ICT Sector Report produced by the UK House of Commons Committee on Exiting the European Union recognises the role of ICT in supporting the UK's delivery of services and goods, providing employment and income generation (www.parliament.uk/documents/commons-committees/Exiting-the-European-Union/17-19/Sectoral%20Analyses/36-Technology-ICT-Report%20FINAL.pdf). This picture has been further developed by the evidence provided to the UK House of Commons' Digital Culture and Media Sport Committee as published in January 2018 (<https://publications.parliament.uk/pa/cm201719/cmselect/cmcumeds/365/365.pdf>). Further important work has been undertaken to understand aspects of ICT delivery, e.g. the ScotlandIS report on ICT public sector expenditure in Scotland (see www.scotlandis.com/news/2018/january/groundbreaking-insight-into-public-sector-ict-expenditure).

However, the needs of the so called 'ICT sector' are complex and are not fully encompassed in current publications. In fact, **there is no one ICT sector or industry**, akin to, for example the car manufacturing sector or pharmaceutical sector. The term 'ICT sector' is misleading. **ICT encompasses a number of sectors ranging from IT support within particular private and public sector contexts through to a range of ICT driven industries producing software, hardware, content and services including broadcasting, cyber-security, e-commerce, gaming, Fintech and telecommunications. ICT is an integral part of all sectors and is perhaps best described as a knowledge 'domain'**. This policy briefing captures high level needs for the ICT domain and makes the case for the UK Government in particular to take overt action to connect to ICT experts. In addition, it makes the case for ICT networks and ethical frameworks at an international level.

Data Collection

This briefing is based on research exploring perspectives on the needs of those working across the information/ICT domain in order to respond positively to the changes triggered by the Brexit decision. Data was gathered through two global surveys. The first was launched on the first working day after the Brexit decision and obtained 733 responses with the majority of responses (59%) being made by UK citizens. The results of this first survey have been more fully published and are available at <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0186452>¹. The second survey was launched one year after Article 50 was triggered in March 2018 and obtained 245 responses again with 59% of responses coming from UK citizens. The surveys considered both the opportunities and threats posed by the Brexit decision. In addition, two appreciative inquiry workshops were held, the first in Newcastle on 3rd May 2018 and the second in London on 26th June 2018. At each workshop there were nine participants who were from the UK and beyond. Appreciative inquiry is a strengths-based approach, intended to focus only on the potential positives for change.

Within the surveys and the workshops, a framework for focusing contributions from the participants was provided through a STEEPLE model (see for example https://ceopedia.org/index.php/STEEPLE_analysis). STEEPLE is an acronym for seven factors—Socio-cultural, Technological, Economic, Environmental, Political, Legal and Ethical. It is a common strategic management tool used in commercial circles, including ICT settings.

¹ Lomas E, McLeod J (2017) Engaging with change: Information and communication technology professionals' perspectives on change in the context of the 'Brexit' vote. PLoS ONE 12(11).

Assumptions and perspectives

The research assumed that Brexit will occur, although the format it will take and the continuing relationships between the UK and other EU member states remain uncertain. This briefing focuses on opportunities in the light of the Brexit decision. It is written from a largely UK perspective.

Those who contributed had differing perspectives on the benefits and wisdom of the Brexit decision. The majority wanted to continue to connect and collaborate across the EU (although in differing structures) as well as strengthening international networks professionally, politically and in terms of trading relations. In particular Commonwealth, USA and Chinese networks were seen to be significant in terms of opportunities for seizing shifting and changing relationships. Many recommendations related to UK specific opportunities but there were some points raised that, in particular, merit wider European and international consideration. Generally, amongst participants there was a desire for strong international collaboration which does align with how the ICT domain works.

Findings

This work draws out fifteen themes for further exploration with some suggested actions. Critically it is hoped that key agents involved in critical Brexit decision making will consider the needs of the ICT domain. As one participant stated, *“Decision makers in the public or private sector must understand how technology will affect their business, department or market. Technology directly affects our economy, our security, our competitiveness in global markets and our way of life, there is no hiding place for business, government or political leaders – get on board or quickly become irrelevant.”*

Acknowledgements

Thanks are due to all those who completed the surveys and participated in workshops. We are grateful for the global participants' constructive participation. Whilst most workshop participants chose to be anonymised, the following gave permission for their contributions to be credited: Sally Edgar, Adam Hill, May Ladd, Professor Tero Päivärinta, Cesare Rizzo, Alan Shipman and Professor Hrvoje Stancic. Dynamo NE (www.dynamonortheast.co.uk) are thanked for supporting the Newcastle workshop.

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15 STEPS TO SUPPORT THE ICT DOMAIN

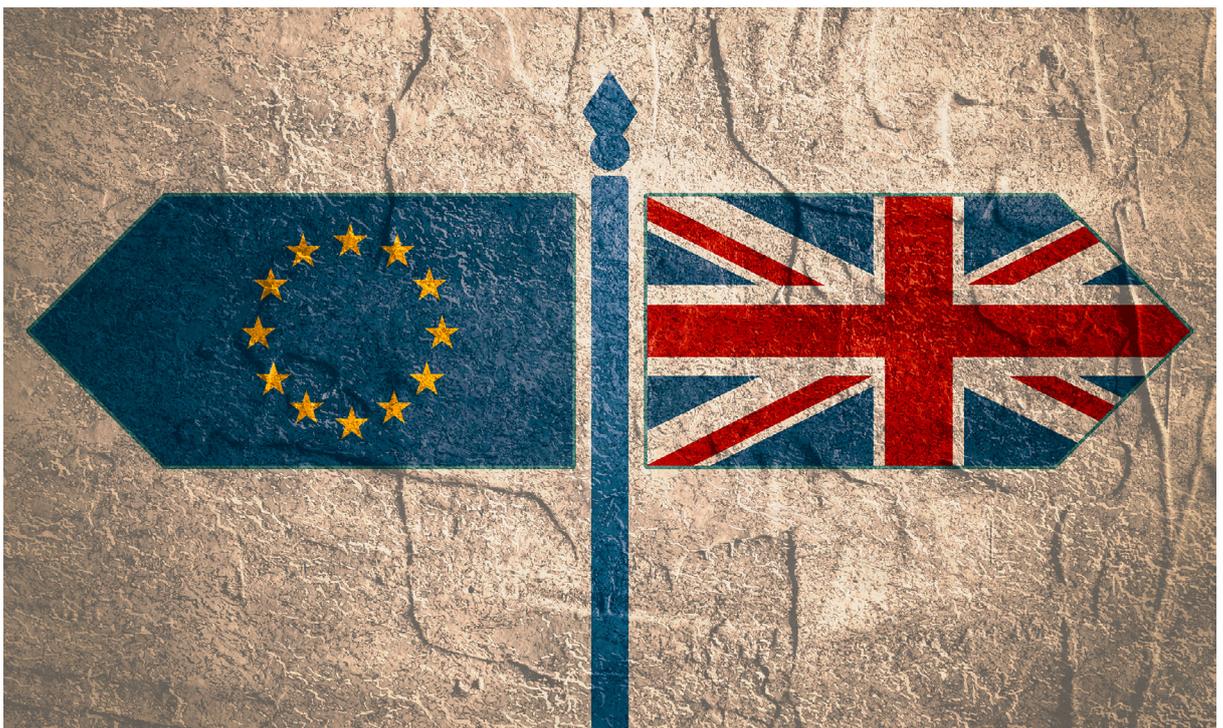
1

A UK/EU Brexit plan and an ICT Brexit roadmap to reduce uncertainty and enable planning across both the UK and the EU

All organisations need a clear Brexit roadmap from the UK Government and the EU in order to plan. Whilst those working in ICT are used to engaging with change, uncertainty is far harder to navigate. It remains very unclear what will occur in March 2019, and thereafter, in terms of transition planning. ICT solutions will be core to assisting all areas of public and private delivery in adapting to the changes Brexit triggers, both within the UK and the EU. However, the ICT domain needs to be connected to Government agendas in order that a range of ICT solutions can be put in place to support Brexit change. In some areas new ICT solutions are required. An example is the technological infrastructure that is needed to manage the soft and hard borders that may emerge. In regards to the latter, it was noted that one company may be able to set up the infrastructure to track the movement of goods but, in fact, agreed industry wide tracking software is needed to aid the smooth passage of goods through UK/EU networks. This is one example

where support and investment linked to a UK/EU Brexit roadmap could reap significant benefits.

From a UK context, if the ICT domain is to remain rooted in the UK, it needs facts on which to anchor economic, manufacturing and service strategies. Of the 245 responses to the 2018 ICT survey only 28% indicated that they were aware their organisation had any plans in place in the light of the Brexit decision. Where plans were in place the most commonly cited were moving some operations overseas. This response may become more common if it is not understood what is to be the nature of relations with the EU and where there are potential new opportunities. In the workshops it was noted that organisations need to know as soon as possible whether the UK will have an EU customs agreement, and what this will look like for both services and goods, or whether the UK will be working under the World Trade Organization's rules.



2

Active and evidenced Government engagement with the ICT domain

Whilst the UK Government has been taking evidence and holding meetings with representatives across the ICT domain, Government responses to these meetings are not well evidenced. Generally, it is unclear where Government does take actions that are linked to recommendations made from across the ICT domain. **It would be beneficial for the UK Government to make clear links between ICT recommendations and the subsequent actions and outcomes delivered. This should be part of a bigger Open Government agenda that acknowledges policy contributions and, as such, delivers accountable and comprehensible decision making.**

The ICT domain is vast and, **in order for Governments across the world to make strong**

ICT decisions advice must be drawn from a wide pool of ICT experts. As a global industry, the ICT decisions of one government can impact ICT internationally. For example, it was noted in the workshops that during Mark Zuckerberg's 2018 testimony to the USA Congress an opportunity was lost to ask meaningful questions relating to Facebook's policies and processes. Clearly a better briefing by experts on social media issues ahead of the meeting would have been beneficial. This hearing had a global bearing. The need to draw on ICT expertise is not only relevant to the Brexit process. However, in the context of considering Brexit, it is particularly important to ensure well informed ICT decisions are made which take into account their wider global ramifications.

3

UK infrastructure to support ICT delivery

Whilst ICT and broadband are now understood to be a utility, core infrastructure is still inadequate in the UK.

Telecommunications must be prioritised to push forward the UK's connectivity and productivity.



4

Pushing new knowledge and ICT development

ICT is integral to societal lifestyle choices and is embedded in business growth. ICT development needs to work through global cooperation wherever possible. The UK needs to identify areas where it excels now and can develop moving forward, considering where to lead and where to collaborate globally as a major player. For example, the UK has centres of cyber-security

excellence. However, cyber-security needs to be discussed on a global scale so this is an area where the UK needs to retain a position as a major global player. The UK can offer leadership, for example, in aspects of Artificial Intelligence and the Fintech industries. Having strong UK University centres linked into practice and business development will ensure that ICT boundaries are pushed further.

5

UK workforce frameworks to attract the best ICT talent

The UK needs to be a magnet for a skilled workforce. The EU has provided the UK with a strong labour market, however post-Brexit the UK can potentially source ICT skills globally in order to draw on the best international ICT talent from, for example, China or India.

Unlike a doctor or nurse, ICT skills are harder to define for visa purposes. Therefore, ICT visas based on employee sponsorship for an existing position should be developed as part of the immigration system.

Underpinning the strategy of employment from overseas, there does need to be a better understanding of what these international connections may deliver in the longer term.

Where overseas citizens are employed only in the short term, knowledge and business may be lost back to other countries in the longer term. However, the connections made through UK employment could be routes to enhance better international collaboration in particular work streams longer term. Work on the bigger holistic implications of employment decisions would be beneficial as an area for Government/research investigation beyond the immediate concerns of ensuring the flow of labour.

Employment law needs to be optimized to support business growth. Whilst it may be hard to accept that UK employees can be dismissed with ease, this same position does attract businesses into the UK to hire in greater numbers in the first instance.



6

Growing ICT skills in schools

The UK must grow ICT education and skills in schools as this is essential to delivering a highly ICT skilled and digitally literate UK workforce.

Currently a very low number of students elect to continue with ICT studies throughout their schooling. For example, **research by Dynamo NE found that more students in England study religious studies at A level than computing.** In 2017 less than 1% of A level students in England took computing as an A level option. ICT needs to be better embedded within the core curriculum in primary and secondary education as it underpins delivery in all subject domains.

It is recognized that it is more challenging for ICT teachers to keep their skills up-to-date than in some other subject domains. In addition, the ICT domain is vast. Schools need new strategies to aid teachers to have current knowledge and skills and to assist teachers to remain connected to ICT developments and opportunities. Stronger industry connections and networks need to be fostered by Government. For example, **industry teaching could be funded as part of a mixed picture of delivery into schools.** This would provide an economic boost to some companies and better engage students with ICT potential. In addition, the mathematics curriculum needs to be shaped to ensure it directly supports ICT skills and ICT delivery.

7

Planning for future societal needs and linked ICT requirements/skills

In the UK and internationally **we must better anticipate and plan for the new and emerging ICT skills required in practice.** For example, we know that digital data will be retained over very long periods of time and more can be done to grow digital curations skillsets. There are currently very few archivists in training to meet the demand for digital curation. There have been developments to make some of these courses available to a wider range of participants, for example UCLeXtend offered a free digital curation module and new models of teaching are being offered by others such as the Digital Preservation

Coalition and the Digital Curation Centre. Support for new modes of teaching in particular areas needs exploration. A better mix of apprenticeships and traditional educational routes may be required. The UK University system is held in high esteem for traditional models of teaching that link to research and these forms of teaching must not be diminished but rather complemented by carefully developed apprenticeships. This needs careful consideration so as not to undermine existing programmes. Internationally there is a need to consider ICT skills.



8

Supporting international study in the UK

Students should be seen as a vital economic asset and investment for the future. **Students should not be counted in overall UK immigration levels.** International students have been proven not only to bring in University funding streams through fees, but also to provide a large injection of investment into the economy through expenditure during their term of stay (see <https://>

www.universitiesuk.ac.uk/policy-and-analysis/reports/Pages/briefing-economic-impact-of-international-students.aspx). In addition, UK study builds the UK a network of global allies and industry partners over the longer term. If International students are blocked from UK study then the profile of UK universities and UK networks will be diminished.

9

R&D and innovation frameworks and funding

To date the UK has benefitted from the EU research and development (R&D) funding models which have resulted in driving research and collaboration. It is hoped that some of these collaborations will continue to be maintained and developed. Separately it was noted that there are some issues with the EU research and subsequent development programmes. The EU structures necessitate agreement on high level priorities and in some instances national opportunities and concerns are overlooked. Provided the UK directs its contribution for EU R&D support back into the same domain, and does not divert it (for example into the NHS), it can develop more targeted and strategic research which could work to the UK's benefit. UK research grant programmes could consider supporting new international networks and collaborations which may in addition offer some different opportunities for collaboration with EU neighbours. In addition, simpler bidding frameworks could increase research efficiency. A study by the European

University Association suggests that there are significant losses generated from the resource input into failed EU bids, which outnumber those awarded grants (see <https://www.slideshare.net/EurUniversityAssociation/trends-in-university-funding-in-europe-and-the-impact-on-universities-and-management>, <https://www.leru.org/news/lerus-interim-evaluation-of-horizon-2020> and <https://policyexchange.org.uk/is-it-time-to-think-about-spending-eu-funded-science-money-better/>). Internationally there are lessons to be learnt on improving the bidding process for research grants.

R&D rules are currently set by the EU. **New UK R&D tax models could grow R&D and innovation.** There is some potential benefit in having more equitable partnerships between industry and academia as well as greater equity across all knowledge domains in order to encourage knowledge fertilisation between, for example, the arts and sciences.



10

New international business models and tax frameworks

Business is driving international government and networks. If it is outside the EU, the UK can develop new forms of business modelling and, akin to other continents, provide state aid to push forward new business.

The UK has been successful in starting up new businesses but not in terms of growing these under UK ownership. When an SME is successful it is often purchased by a global entity. Consideration could be given to providing incentives or mandates for 50% of the business to remain in UK hands, akin to French systems. Such systems of 'golden shares' have enabled nation states to maintain varying degrees of control in a business by keeping a minority stake that carries more than 50% of voting rights. However, whilst the EU has accepted that this is lawful, depending on the public interest, this practice is under scrutiny. In France President Macron has been considering further strengthening French

protectionism, in particular to protect ICT assets (see <https://uk.reuters.com/article/uk-france-investment/france-to-bolster-anti-takeover-measures-amid-foreign-investment-boom-idUKKBN1K92QN>). Historically the UK has its own modelling of 'golden shares'. Such models are not necessarily ideal as they may limit inward investment due to the fact they limit the free flow of capital. Creating and maintaining intellectual property and patent rights in UK hands may be the key to retaining control rather than necessarily ownership per se. In a document of this length and depth it is not possible to draw a definitive conclusion on this matter but further work is now required. A committee must be established to consider new UK business models and the support mechanisms they require.

More generally there is a benefit in looking internationally at business models. Businesses are now a new power challenge to Governments.

11

Optimising legislation and regulatory frameworks for an ICT driven world

Within the EU, legislation is slow to be agreed and ultimately is determined at the lowest common denominator, given it needs to be agreed across 28 member states. Release from EU legislative systems would enable the UK to shape laws which can provide ethical leadership and, in addition, allow the UK to engage quickly with new technical challenges requiring legislation. Light touch legislation and frameworks are needed to prevent the production of legal obstacles for ICT development but, at the same time, laws are needed to enable safe and ethical development of technologies. Generally, in an EU context, there were seen to be issues around the balances of privacy rights. Although the General Data Protection Regulation has sought to provide a framework which balances rights, it has the potential to promote a culture of fear around

the handling of all personal data. The French privacy legislation dating back to the 1970s and subsequent cyber security laws were cited as blocking French delivery and, in addition, deterring companies from setting up in France due to the potential penalties of any compliance failure (see <https://thelawreviews.co.uk/edition/the-privacy-data-protection-and-cybersecurity-law-review-edition-4/1151281/france>). Whilst ethical laws are needed, careful consideration needs to be given to ensuring ICT obstacles are not legislated for. However, legislation is needed for many new developments including Artificial Intelligence, blockchain and Fintech. **Agile and ethical UK legal structures could provide a competitive edge and position the UK as an ICT market leader in a number of business areas.**



12

UK leading on international standards

International standards provide agreed best practice. **The UK should identify and invest in representation on international standards committees which will then enable business contingent on these standards, to be routed back into the UK.** For example, ISO/TC 307's work on blockchain and distributed ledgers which

provides a current opportunity. In addition, it is to be noted that there are some EU bodies which the UK should seek to remain part of, such as the European Committee for Standardization (CEN), European Committee for Electrotechnical Standardization (CENELEC) and European Telecommunications Standards Institute (ETSI).

13

Smart living underpinned by ICT driven global environmental solutions

Biodiversity offsetting is not an overall environmental solution. In addition, countries must not pay other nations to deal with their environmental waste or push environmental problems down the supply chain. ICT provides tools for better managing our resources. We must develop new ways of working and living. **ICT can support sustainable smart living.**

As well as ICT enabling us to manage resources, it can change the ways we work, as it has done with the potential to meet and work virtually thus cutting transport impacts. Data storage impacts can be managed. **The UK can and should take a lead to develop UK smart living recognising that environmental change must happen internationally.**

14

Ethical data storage, management and deletion

The UK has a reputation for fairness, balance and stability. **The UK can be the main centre for banking and managing data.** Building on unique legislative and regulatory structures combined with IT know-how, the UK can store, protect, manipulate and exploit data. These storage models could mediate Government, business and personal boundaries. Just as people now brand published documentation with an easily applied Creative Commons License, personal data contracts could be developed with short clauses with visual symbols to aid the simplification of storage and service agreements. These could enable services to be charged or discounted, dependent upon the choices made around data protection. They could rebalance the transparency and power balance between business and data subject/consumer.

Key to managing data is also keeping it securely and destroying it in a timely manner. The 'Right to be Forgotten' enshrined into the EU's General Data Protection Regulation (see <https://gdpr-info.eu/art-17-gdpr/>), requires technical skillsets to ensure the eradication of certain document sets. Better basic management solutions can ensure people get used to managing their data as they do their household rubbish, with different data bins to ensure key data is retained or destroyed subject to certain triggers. Automation can assist with this task.

The UK is a small land mass and should be investing in understanding deep sea data storage in international waters, or new forms of data storage such as DNA digital data storage.

15

Ethical ICT delivered from across ICT practice and into society

ICT professionals need to play a stronger role in helping society and lawmakers understand ICT concerns and considerations. Examples of data corruption and manipulation, as identified in the case of Cambridge Analytica and social media influences in political campaigns from malevolent forces (see <https://ico.org.uk/about-the-ico/news-and-events/news-and-blogs/2018/07/findings-recommendations-and-actions-from-ico-investigation-into-data-analytics->

in-political-campaigns), were not a surprise to those who participated in the research workshops. **ICT professionals should work together to flag ICT dangers and malpractice to wider society.** The role, place and scale of whistleblowing in this regard needs consideration. In addition, ICT can provide tools to minimise corruption, e.g. money laundering. This needs to be an international agenda.



STEEPLE HIGHLIGHTS

Social-cultural

- Growing ICT skills in schools through education linked to practice.
- Workforce frameworks to attract the best ICT skills and talent to the UK.
- Planning for future societal needs and linked ICT requirements/skills.

Technological

- Pushing new knowledge and ICT development, e.g. the UK can lead in AI, blockchain and Fintech.
- R&D and innovation frameworks and funding.
- UK leading on ethical data storage, management and deletion.
- Collaboration in areas which require international strength, e.g. cyber security.

Ethical

- Laws which preempt potential ethical considerations aligned to the pace of ICT development.
- Ethical ICT delivered from across ICT practice and into society, e.g. ICT sector whistleblowing on bad data practices.

Economic

- UK infrastructure to support ICT delivery.
- New international business models and tax frameworks, e.g. UK committee to consider business models and UK R&D tax reliefs and state aid to targeted sectors.

ICT opportunities

Legal

- Optimising legislation and regulatory frameworks for an ICT driven world.
- UK leading on highlighted international standards, e.g. ISO/TC 307 work on blockchain.

Environmental

- Smart living underpinned by ICT driven global environmental solutions.
- Sustainable and managed data storage and infrastructure.

Political

- A Brexit plan and an ICT Brexit roadmap to reduce uncertainty and enable planning.
- Active and evidenced Government engagement with the ICT domain.
- Supporting international study in the UK.

