

PRIORITIES FOR THE NATIONAL AI STRATEGY

POLICY DISCUSSION DOCUMENT

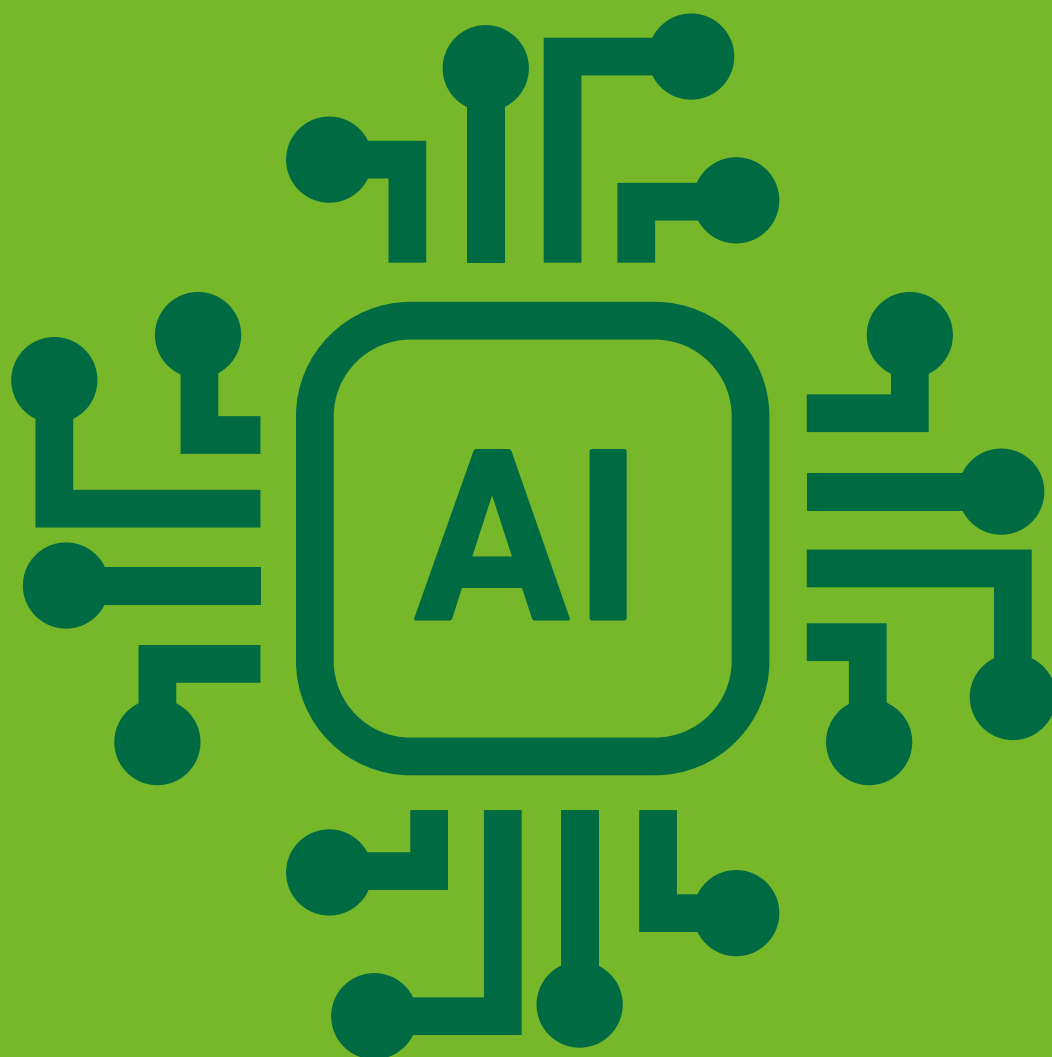


TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
OUTCOME - THE PUBLIC TRUSTS AI	3
OUTCOME - AI RELATED PROFESSIONS ARE DIVERSE AND INCLUSIVE	4
OUTCOME - ACCESSIBLE AI QUALIFICATIONS THAT HELP PEOPLE ESCAPE THE DIGITAL DIVIDE	4
OUTCOME - AI ACCELERATES PROGRESS TOWARDS SUSTAINABLE DECARBONISATION	4
SCALING UP AND INDUSTRIALISING OUR USE OF AI	5
1- WHAT IT WILL TAKE FOR THE PUBLIC TO TRUST AI	6
GOVERNMENT POLICY RECOGNISES THAT PUBLIC TRUST IS VITAL	6
LOSS OF PUBLIC TRUST	7
AI RESEARCH PRACTICE, THE REPRODUCIBILITY PROBLEM	7
PROFESSIONALISM IS ESSENTIAL TO RESTORING PUBLIC TRUST	8
CHARTERED STATUS AS A MEANS OF REPAIRING PUBLIC TRUST	8
EMPLOYERS SAY PROFESSIONALISM IS ONE OF THE TOP DIGITAL SKILLS THEY WANT	8
WHAT THE UK GOVERNMENT IS ALREADY DOING	8
THE EUROPEAN UNION IS REGULATING TO IMPOSE PROFESSIONALISM IN AI	10
WILL THE OBJECTIVE WORK?	10
2- WHAT IT WILL TAKE FOR AI TO BECOME DIVERSE AND INCLUSIVE	11
OVERVIEW AND BACKGROUND	11
WHAT'S BEING DONE	12
WHAT'S MISSING?	15
WILL THE OBJECTIVE WORK	15
3- WHAT IT WILL TAKE FOR THERE TO BE ACCESSIBLE AI QUALIFICATIONS THAT HELP PEOPLE ESCAPE THE DIGITAL DIVIDE	16
OVERVIEW AND BACKGROUND	16
WHAT'S BEING DONE	17
WHAT'S MISSING	17
4- WHAT IT WILL TAKE FOR AI TO ACCELERATE PROGRESS TOWARDS SUSTAINABLE DECARBONISATION	19
5- BACKGROUND ON LOSS OF PUBLIC TRUST IN DATA AND DIGITAL TECHNOLOGIES	21
6- YOUNG NATIONAL SURVEYS ON PUBLIC TRUST IN SEPTEMBER AND OCTOBER 2020	25
7- RELATED REFERENCES	28

EXECUTIVE SUMMARY

As we recover from the pandemic and adapt to being outside of the EU, the UK needs to harness the power of digital technologies to deliver step-changes in resilience, productivity, innovation, and sustainable growth across the private and public sectors. Artificial Intelligence (AI) will be at the heart of driving this transformation, provided we have the right national strategy in place, building on and amplifying the government's earlier National Data Strategy¹ and taking account of the current AI Council Roadmap².

The AI strategy will need to consider a number of complex and interconnected issues. These include how AI is going to be used to deliver the right societal outcomes for UK citizens, particularly how it enables the UK to be more inclusive, accelerates sustainable decarbonisation and improves prosperity for all. How we build a national data and digital infrastructure that supports a vibrant business environment, optimised for exporting AI products and services across international data sharing jurisdictions. How we develop a diverse and inclusive talent pipeline of AI professionals with the capacity to ensure the sustainable growth of UK PLC, and the capabilities to ensure the UK is recognised for leading the "gold standard" in AI professionalism. The

AI Council Roadmap includes themes that are relevant to these concerns and provides recommendations that should significantly help to address many of them, should the government choose to adopt them.

In this document, we focus on the following four nationally strategic outcomes, where the computing professions can make a material difference through collaborative partnerships with government and other key stakeholders. These are outcomes where BCS can add unique insight as the UK's professional body for computing³ governed by our Royal Charter⁴ to advance education and practice in computing and information technology for the benefit of the public. They are implicitly or sometimes explicitly included to some degree in the AI Council Roadmap and National Data Strategy, but we believe they should be given more significant emphasis and given 'top billing' in their own right in the AI Strategy.

OUTCOME - THE PUBLIC TRUSTS AI:

A key objective to achieving this is to ensure those practitioners and organisations who develop and deliver AI-enabled products and services are highly competent, ethical and are accountable for their professional conduct.

RISK:

There is a wide variation in the competency and ethical practice of organisations that develop or use AI, with several recent high-profile examples in the public and private sector that have significantly undermined public trust in the use of AI in high-stakes situations.

WHAT SHOULD HAPPEN:

Government works with the professions to update existing standards of competency, ethical values and accountability for software development and adoption in the public and private sectors, taking into account AI relevant issues. The government then ensures they are fully adopted by individual practitioners and by organisations. See Section 1 for more details.

HOW WE DEVELOP A DIVERSE AND INCLUSIVE TALENT PIPELINE OF AI PROFESSIONALS WITH THE CAPACITY TO ENSURE THE SUSTAINABLE GROWTH OF UK PLC, AND THE CAPABILITIES TO ENSURE THE UK IS RECOGNISED FOR LEADING THE "GOLD STANDARD" IN AI PROFESSIONALISM.

¹ www.gov.uk/government/publications/uk-national-data-strategy/national-data-strategy

² assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/949539/AI_Council_AI_Roadmap.pdf

³ By which we include IT, data, and digital professionals as well as computer scientists in academia and industry

⁴ www.bcs.org/media/1447/royal-charter.pdf

OUTCOME - AI RELATED PROFESSIONS ARE DIVERSE AND INCLUSIVE:

A key objective to achieving this is to develop a wide range of inclusive pathways into AI-related professions that attract talented people from all backgrounds.

RISK:

The education and training system is still mainly 'linear', expecting students to follow a single path into a profession they have already chosen by age 16, which excludes adults with non-STEM backgrounds upskilling or changing to AI roles later in life.

WHAT SHOULD HAPPEN:

Government provides strong leadership in the development of a diverse range of easily accessible flexible pathways into AI professions suitable for people with non-STEM qualifications and career changers who have no prior skills in AI. See Section 2 for more details.

OUTCOME - ACCESSIBLE AI QUALIFICATIONS THAT HELP PEOPLE ESCAPE THE DIGITAL DIVIDE:

Everyone should have the right data, AI and digital skills, the right access to AI-enabled technologies, and a safe, secure, rewarding AI-enhanced environment in which to live, study and work. A key objective to achieving this is that everyone can access high-quality qualifications (both technical, academic and through apprenticeships) that equip them with the skills to successfully adopt AI in their work and daily life.

RISK:

Without the right skills, education and training people can't take advantage of AI-enabled technologies to get good jobs, which means they are more likely to be permanently trapped in the digital divide even if they have access to affordable or freely donated hardware and broadband.

WHAT SHOULD HAPPEN:

Government ensures everyone, whether still in school or in the workforce, can access a wide range of academic, technical, and professional qualifications and certifications that give them the AI capabilities needed to thrive in their daily lives and at work. See Section 3 for more details.

OUTCOME - AI ACCELERATES PROGRESS TOWARDS SUSTAINABLE DECARBONISATION:

A key objective to achieving this is to develop AI technologies that allow the UK to massively and sustainably reduce our carbon emissions across the areas of transport, energy supply and business, which are the biggest greenhouse gas emitters⁵.

RISK:

Lack of cross-sector cooperation between key stakeholders will inhibit the rapid development of AI systems that have a material impact on decarbonisation. In particular such cooperation is necessary for government and corporations to have the right tools and capability to make insightful policy and operational decisions leading to net-zero sustainability.



⁵ assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957887/2019_Final_greenhouse_gas_emissions_statistical_release.pdf

WHAT SHOULD HAPPEN:

Government should take leadership in developing interdisciplinary and cross-sector collaboration across professions to rapidly accelerate the design, development and adoption of AI, data and digital technologies that support achieving net-zero carbon emissions. See Section 4 for more details.

SCALING UP AND INDUSTRIALISING OUR USE OF AI

Beyond the objectives and actions listed above, which are directly relevant to the computing professions, the National AI Strategy also needs to take into account *how* we create the conditions in the UK for scaling up and industrialising our use of AI. This includes considering the following factors:

INFRASTRUCTURE TO SUPPORT WIDE SCALE ADOPTION OF AI ACROSS MULTIPLE SECTORS:

Cloud services are not necessarily the panacea for all uses of AI. It's possible to imagine in the future there will be use cases that require the training of neural nets with billions of parameters. That kind of exponential growth could become prohibitively expensive if dependant on commoditised cloud provider services. The UK government should review what kinds of investments will be needed to scale up dedicated High-Performance Clusters and data centres for use by industry, academia, and public service, which align with the recommendations on investment in the AI Council Roadmap covering future R&D and innovation. Providing this kind of infrastructure is likely to

significantly stimulate more rapid adoption of AI. This will need to be achieved sustainably, so it will be important that if this is done it is used as a means to also stimulate the development of highly energy efficient AI processors and hyperscale architectures.

STIMULATING MARKET SECTORS TO EXPLORE AND ADOPT THE RIGHT KIND OF AI:

Based on our assessment of the UKRI AI review³³ and the DCMS report¹⁹ 'Quantifying the UK Data Skills Gap' there is a skills-gap in the UK workforce with relation to repurposing and reengineering existing processes/products/ services to gain the optimal benefit from AI, especially in those sectors where digital/data-rich practices are not part of the core business. This is a similar assessment to that in the AI Council Roadmap in the section covering 'Cross-sector Adoption'. This is a bigger issue in those industries and market sectors that are currently not heavily reliant on digital practices and are not data driven. For example, this can be the case in the construction sector and infrastructure sector. The transformation of those sectors is strategically important to achieve net-zero (see Section 4 for further details on decarbonisation).

DATA QUALITY FOR PUBLIC SERVICES:

The publication of the Government Technology Innovation Strategy in 2019 encouraged greater interest in developing and deploying AI solutions across public services. Also in 2019, the NAO published a study on 'Challenges in using data across government'⁶ that states "Government is exploring the use

of new technology, such as robotic process automation and artificial intelligence in developing public services. These have the potential to achieve largescale efficiencies longer-term through delivering accurate and tailored services to individual customers. However, layering new technology on top of existing data carries a significant risk of magnifying rather than overcoming the problems associated with data quality, for example if calculations cannot be adequately tested." This issue was picked up in the National Data Strategy, under the pillar of 'Data Availability', which highlighted the need for data to be 'appropriately accessible, mobile and re-usable'. These are issues that need to be picked up and developed further in the National AI Strategy.

**GOVERNMENT IS EXPLORING THE USE OF NEW TECHNOLOGY****FUNDAMENTAL RESEARCH INTO BREAKTHROUGH AI CAPABILITIES:**

While this report is focused on outcomes that relate to improving education and the professionalisation of AI for the benefit of the public, the National Strategy should also explain how the UK will invest in the necessary basic science to develop new algorithms, models and paradigms of machine intelligence that are not as reliant on very large datasets, and which will lead to far more transparency and explainability⁷. This is another area highlighted in the AI Council Roadmap in the section on research, development, and innovation.

⁶ nao.org.uk/report/challenges-in-using-data-across-government/

⁷ royalsociety.org/-/media/policy/projects/explainable-ai/AI-and-interpretability-policy-briefing.pdf

1 WHAT IT WILL TAKE FOR THE PUBLIC TO TRUST AI

This section looks at the importance of public trust in AI and what needs to be done to ensure the public can trust how AI is developed, when it is used and how it is used. The discussion in this section shows that:

- Governments recognises the importance of building public trust in AI.
- The public currently do not trust organisations that use AI to make decisions about them. Many recent examples of events that have undermined public trust have as their root cause a lack of professional good practice (covered separately in Section 5).
- There is also a lack of sufficiently good professional practice underpinning the way basic research in machine learning is conducted, which is another contributing factor in eroding public trust.
- The Civil Service is ahead of the game in developing professional standards in the development and adoption of AI in the public sector, which are based on competency, ethical behaviours, accountability, and include guidelines around the procurement of AI systems.

- Some form of regulation from the EU that will cover professionalism in AI is very probable in the medium term, which means it is important for the UK government to show leadership in this area for the UK to remain at the forefront of AI.
- Why the 'what should happen next' action in the Executive Summary is likely to achieve the stated objective.

GOVERNMENT POLICY RECOGNISES THAT PUBLIC TRUST IS VITAL:

The **UK government** National Data Strategy¹ is the most recent major policy position that will shape future government data and digital strategy across all departments. It states:

- *"The strategy is a central part of the government's wider ambition for a thriving, fast-growing digital sector in the UK, underpinned by public trust."*
- *"Used badly, data could harm people or communities, or have its overwhelming benefits overshadowed by public mistrust."*

The **OECD** in 2019 published a set of principles⁸ designed to ensure "trustworthy AI". The **G20** group of Trade Ministers and Digital Economy Ministers put out a public statement⁹ in June 2019 that emphasised the need to "foster public trust and confidence in AI technologies", which was based on the OECD principles. The **Scottish Government** in 2021 published its own strategy¹⁰ 'Artificial intelligence strategy: trustworthy, ethical and inclusive', which is also based on the OECD principles and focuses on the strategic priority of delivering trustworthy AI.

GOVERNMENTS RECOGNISES THE IMPORTANCE OF BUILDING PUBLIC TRUST IN AI

This highlights that establishing public trust needs to be a key outcome of the National AI Strategy if it is to succeed in delivering the UK government's ambitions.

⁸ oecd.org/going-digital/ai/principles

⁹ mofa.go.jp/files/000486596.pdf

¹⁰ gov.scot/publications/scotlands-ai-strategy-trustworthy-ethical-inclusive

LOSS OF PUBLIC TRUST:

The general public have become increasingly aware that algorithms, Artificial Intelligence and Machine Learning permeate all areas of public policy and society, from estimating exam results to modelling the health impact of pandemics.

Public trust in AI and algorithmic systems in general has been seriously eroded by events during the pandemic, as shown in two national surveys by YouGov commissioned in 2020 by BCS (for more details on the surveys see Section 6):

- Over half (53%) of UK adults have **no faith** in any organisation to use algorithms when making judgements about them¹¹, in issues ranging from education to welfare decisions.
- 63% of UK adults **disagree** with the statement “Students graduating with a computer science university degree are qualified to write software that makes life decisions about people”

Section 5 looks in more detail at several of the recent incidents that have led to the loss of public trust. What these surveys show is the root causes of these incidents are often professional practice that falls short of what we should expect. In some cases, the root cause is due to a lack of sufficiently good ethical practice, while in other cases it is due to insufficiently high standards of competency in the design, development, or adoption of information systems. The fact that this can happen is due to a lack of accountability, of both individual practitioners as well as organisations. Accountability when professional practice falls short, either in terms of competency or ethical behaviour, is a vital mechanism for restoring public trust.

AI RESEARCH PRACTICE, THE REPRODUCIBILITY PROBLEM:

It is well documented that across large parts of scientific research there is a growing reproducibility problem, and the field of machine learning is no exception^{12, 13, 14, 15, 16}.

A core tenet of scientific research is that new basic research is published in a form that makes it possible for other scientists to reproduce, thus allowing results to be verified independently, but also allowing others to use that research to further advance the state of the art. Reproducibility is vital for science to progress. Without it, new scientific research simply becomes untenable, and it is vital in establishing trust in the science itself. However, as the above references make clear there is now a reproducibility ‘crisis’¹² in machine learning research, where many in the field are publicly highlighting that too many published research results can’t be reproduced and in fact some published work is so flawed as to be invalid.

53%

OF UK ADULTS HAVE NO FAITH IN ANY ORGANISATION TO USE ALGORITHMS WHEN MAKING JUDGEMENTS ABOUT THEM

In the case of machine learning there are several contributory factors to the reproducibility problem. Many of these would be resolved if researchers followed established professional research software development standards and good practice. For example, as developed by the Society of Research Software Engineering¹⁷, and the work of the Software Sustainability Institute, which is funded by UKRI¹⁸.

¹¹ [bcs.org/more/about-us/press-office/press-releases/the-public-dont-trust-computer-algorithms-to-make-decisions-about-them-survey-finds/](https://www.bcs.org/more/about-us/press-office/press-releases/the-public-dont-trust-computer-algorithms-to-make-decisions-about-them-survey-finds/)

¹² [bbc.co.uk/news/science-environment-47267081](https://www.bbc.co.uk/news/science-environment-47267081)

¹³ news.rice.edu/2019/02/28/rice-statisticians-warning-about-machine-learning-grabs-headlines-around-the-globe/

¹⁴ [nature.com/articles/d41586-020-01282-z](https://www.nature.com/articles/d41586-020-01282-z)

¹⁵ [nature.com/news/2010/101013/full/467775a.html](https://www.nature.com/news/2010/101013/full/467775a.html)

¹⁶ [nature.com/articles/d41586-019-02307-y](https://www.nature.com/articles/d41586-019-02307-y)

¹⁷ software.ac.uk/resources/guides

¹⁸ gtr.ukri.org/projects?ref=EP%2FN006410%2F1

PROFESSIONALISM IS ESSENTIAL TO RESTORING PUBLIC TRUST:

A central tenet of professionalism is that public trust is a cornerstone of professional practice. Public trust in information technology is founded on the principle that:

- ✓ **Competency**
- ✓ **Ethical values, and**
- ✓ **Accountability**

are central to all professional practice that involves digital and data technologies. Note this principle is true for all professions, not just computing specific professions, although this discussion document focuses on AI practitioners and those who manage and use AI systems.

CHARTERED STATUS AS A MEANS OF REPAIRING PUBLIC TRUST:

The YouGov survey also reported that:

- 62% of UK adults believe someone who for a living develops computer software that can significantly affect people's lives should be qualified as a government-approved Chartered professional.



EMPLOYERS SAY PROFESSIONALISM IS ONE OF THE TOP DIGITAL SKILLS THEY WANT:

According to the 2021 UK government report¹⁹ 'Quantifying the UK Data Skills Gap', which surveyed just over a thousand businesses, the top 5 priority skills businesses want to improve in the context of working with data are:

1. **Communication**
2. **Professionalism**
3. **Problem-solving**
4. **Data ethics**
5. **Basic IT skills**

This is significant data at the national level, from a broad range of employers across the economy, which shows they recognise the need to improve professionalism in relation to working with data and that includes the adoption and use of AI.

WHAT THE UK GOVERNMENT IS ALREADY DOING:

Government has set out in the National Data Strategy, in its AI sector deal, the UK National Digital Skills Strategy, the Cyber Security Skills Strategy and before that in its Industrial Strategy the vital importance of highly skilled professionals in computer science, digital technologies, data science, artificial intelligence, and cyber security. The National Data Strategy recognises the work being done by the Royal Statistical Society alongside BCS, the Operational Research Society, the Royal Academy of Engineering, the National Physical Laboratory, the Royal Society and the Institute of Mathematics and its Applications working to develop data science as a profession²⁰.

¹⁹ [gov.uk/government/publications/quantifying-the-uk-data-skills-gap/quantifying-the-uk-data-skills-gap-full-report](https://www.gov.uk/government/publications/quantifying-the-uk-data-skills-gap/quantifying-the-uk-data-skills-gap-full-report)

²⁰ royalsocietypublishing.org/~/media/policy/projects/dynamics-of-data-science/dynamics-of-data-science-skills-report.pdf

²¹ topol.hee.nhs.uk/

In **healthcare** government has commissioned the Topol review²¹ 'Preparing the healthcare workforce to deliver the digital future'.

The report includes the comment that:

'The [clinical] workforce needs expertise, standards and guidance to evaluate technology applications. A fit-for purpose, legal and ethical governance framework that patients, public and staff can trust is required.'

In 2016 the Federation for Informatics Professionals in health and care (**FedIP**) was established, backed by the NHS, with the mission to professionalise the informatics community in the UK in Health and Social Care.

It was established with dual core purposes encompassing the 2 functions of:

- Voluntary registration/regulation and
- Developing the Health and Care Informatics profession.

Membership of FedIP is currently available for Informaticians belonging to any members of BCS, the Association of Professional HealthCare Analysts, the Institute of Health Records and Information Management, the Society for Innovation, Technical and Modernisation, the Chartered Institute of Library and Information Professionals, Faculty of Clinical Information.

The **Civil Service** has developed a body of professional practice, including ethical guidelines, for developing and adopting automated information systems, including AI, within public services.

These include:

- An Ethics, Transparency and Accountability Framework²² for Automated Decision-Making.
- Guidance on developing Reproducible Analytical Pipelines²³ in data science.
- A Code of Practice for Statistics²⁴.
- Professional good practice²⁵ in quality assurance of code used in data analysis.

- A Technology Service manual²⁶, covering good practice in technology choice, development, integration, hosting, testing, security and maintenance.
- A Guide to Using AI in the Public Sector²⁷.
- Guidelines for AI procurement²⁸, which has extensive guidance on ensuring the teams responsible for procurement are highly competent in the commissioning and adoption of AI, understand ethical AI good practice, are as diverse as possible, and know how to make their work transparent and accountable.

The development of these standards is driven by the need for the public sector to be able to share data assets, the need for good governance of systems when deployed, that it is essential for there to be trust in the whole data and information stack, which covers vitally important areas such as trust in data provenance, for example.

These issues are relevant across all sectors in the economy. For example, within the built environment sector, the government is working with academics at the University of Cambridge to develop an Information Management Framework (IMF). This considers areas such as 'Building Information Modelling' (BIM), Digital Twins in the Built Environment, and Digital Ways of Working and Digitally Enabled Living. The point is the IMF relies on adapting existing good practice in the software engineering and software development communities to meet sufficiently high standards to be trustworthy.

The above shows government recognises the importance of professionalism in AI and is starting to establish de-facto standards around competency, ethical behaviour and accountability that it expects the public sector to adopt.

In talking about the reproducibility problem in science, above, we pointed out there is a wealth of good practice and advice and guidance funded by UKRI grants, that already exists in the scientific community, which adapts existing software development and engineering good practice to statistical, AI and machine learning contexts that are relevant to the scientific community. This is an exemplary case study that shows adaption of existing good practice in software engineering and software development to new contexts is entirely doable and affordable.

²² [gov.uk/government/publications/ethics-transparency-and-accountability-framework-for-automated-decision-making/ethics-transparency-and-accountability-framework-for-automated-decision-making](https://www.gov.uk/government/publications/ethics-transparency-and-accountability-framework-for-automated-decision-making/ethics-transparency-and-accountability-framework-for-automated-decision-making)

²³ dataingovernment.blog.gov.uk/2017/03/27/reproducible-analytical-pipeline/

²⁴ code.statisticsauthority.gov.uk/

²⁵ best-practice-and-impact.github.io/qa-of-code-guidance/intro.html

²⁶ [gov.uk/service-manual/technology](https://www.gov.uk/service-manual/technology)

²⁷ [gov.uk/government/collections/a-guide-to-using-artificial-intelligence-in-the-public-sector](https://www.gov.uk/government/collections/a-guide-to-using-artificial-intelligence-in-the-public-sector)

²⁸ [gov.uk/government/publications/guidelines-for-ai-procurement/guidelines-for-ai-procurement](https://www.gov.uk/government/publications/guidelines-for-ai-procurement/guidelines-for-ai-procurement)

Combined with the examples from the Civil Service there is a clear body of evidence that demonstrates adopting existing good practice and recognised standards from the computing professions across government and industry is both feasible, desirable, and likely to significantly build public trust.

THE EUROPEAN UNION IS REGULATING TO IMPOSE PROFESSIONALISM IN AI:

In April 2021 the European Commission published a draft regulation for harmonising rules across the European Union for the putting into service and the use of AI systems, which

- prohibit certain AI practices
- specify requirements for the design, development, and adoption of high-risk AI systems
- specify obligations for operators and managers of high-risk AI systems
- define harmonised transparency rules for high-risk AI systems
- includes a code of conduct that organisations will be expected to follow if they are developing or using high-risk AI systems.

A large part of the requirements and obligations placed on practitioners is effectively defining underpinning principles of professional practice that organisations will need to comply with if they are to legally provide or use high-risk AI products and services. Even though the UK is no longer with the EU, clearly any UK business operating in the EU or providing products or services within the EU will need to be compliant with this regulation in the future.

KEY OBJECTIVE FOR NATIONAL AI STRATEGY:

The above discussion shows that a key objective that would go a long way to building public trust in AI is for the government to ensure those practitioners who develop and deliver AI enabled products and services are highly competent, ethical and are accountable for their professional conduct. Moreover, it would allow the UK to show strong leadership in an area that currently is being led by the EU.

WHAT SHOULD HAPPEN:

Government can show real leadership by working with the professions to update established standards of competency, ethical values, and accountability that already exist for software development and adoption in the public and private sectors to take account of AI relevant issues. We've shown in the above discussion that the Civil Service is leading in doing exactly this for the public sector. Updating standards should be in combination with ensuring those standards are then fully adopted by individual practitioners and by organisations.

A secondary enabling action the government should consider is only procuring AI-enabled systems, services and products from organisations that can evidence that high standards of competency, ethical values, and accountability are central to the professional practice in their organisations and in all of the partners in their supply chains.

Beyond actions where the government can directly influence professionalism for both individual practitioners and organisations, there is also a need for a long-term comprehensive public engagement campaign. The general public can themselves be essential agitators for positive change, providing they are properly informed of the issues that affect the adoption of AI in the public and private sectors. The Ofqual estimated assessment⁶¹ of GCSE and A-level grades over the summer of 2020 illustrates the power of public awareness when an issue is particularly high-stakes and affects much of the population.

WILL THE OBJECTIVE WORK?:

The central enabling action does not require legislation, and government already has guidelines for procuring AI systems that spell out how professionalism relates to standards of competency, ethical behaviours, and accountability in the Civil Service. All that is required is to modify these guidelines so that these same standards of professionalism must be met by organisations tendering to government and by their supply chains.

If organisations have to demonstrate high standards of professionalism to tender for government contracts, that will by default establish best practice in AI, which will then likely be demanded by private sector organisations when they procure AI-enabled systems that directly affect the public. This will create a virtuous cycle of steadily improving professionalism, which as explained is critical to building public trust in AI.

2 WHAT IT WILL TAKE FOR AI TO BECOME DIVERSE AND INCLUSIVE



In this section we focus on how to ensure the talent pipeline into AI related roles in science, engineering and business is diverse and inclusive. This is where BCS as the professional body for IT can offer unique insight. Others, such as the Centre for Data Ethics and Innovation, have already published extensive studies²⁹ into the challenges and opportunities of ensuring AI enabled systems are developed and used ethically.

OVERVIEW AND BACKGROUND

AI is going to be a key enabler for changing the economy and our personal lives. It needs ethical stewardship to ensure it enables greater diversity and inclusivity in society and the workplace. However, as commented on by Professor Kate Crawford of the University of Southern California and principal researcher at Microsoft Research in a 2021 public interview³⁰:

"I've tried to look at these deeper logics of [AI] classification and you start to see forms of discrimination, not just when systems are applied, but in how they are built and trained to see the world"

²⁹ [gov.uk/government/publications/cdei-publishes-review-into-bias-in-algorithmic-decision-making/main-report-cdei-review-into-bias-in-algorithmic-decision-making](https://www.gov.uk/government/publications/cdei-publishes-review-into-bias-in-algorithmic-decision-making/main-report-cdei-review-into-bias-in-algorithmic-decision-making)

³⁰ [theguardian.com/technology/2021/jun/06/microsofts-kate-crawford-ai-is-neither-artificial-nor-intelligent](https://www.theguardian.com/technology/2021/jun/06/microsofts-kate-crawford-ai-is-neither-artificial-nor-intelligent)



IN 2020, MORE WOMEN THAN EVER WERE WORKING IN IT ROLES (326,00), ALTHOUGH THEY STILL MAKE UP JUST 20% OF THE IT SECTOR'S WORKFORCE

The respected scientific journal **Nature** published an article³¹ in 2020 highlighting that technology companies are trying various approaches to address issues around bias and potentially discriminatory AI models. In particular, they are working to ensure the teams that design, develop and deploy AI systems are as diverse as possible, but this is difficult due to a lack of people from diverse backgrounds in those organisations.

The 2020 BCS analysis³² of ONS data shows that:

- In 2020, more women than ever were working in IT roles (326,00), although they still make up just 20% of the IT sector's workforce.
- 0.7% of IT specialists are black women.
- 11% of IT directors are from an ethnic minority background.

The recent 2021 UKRI review³³ of AI reports that

- The UK is ranked third in the world for our research and innovation in AI but only eleventh for our ability to realise innovation and impact from it.

The **World Economic Forum** in 2020 pointed out³⁴ that for both societal and economic reasons it is imperative that the AI talent pipeline is genuinely diverse and inclusive.

The 2021 AI Council Roadmap includes the recommendation:

- Make diversity and inclusion a priority [in developing the AI talent pipeline]. We suggest benchmarking and forensically tracking levels of diversity to make data-led decisions about where to invest and ensure that underrepresented groups are given equal opportunity and included in all programs.

Employers large and small have told BCS during many consultations that digital transformation is held back by the lack of diverse interdisciplinary teams that collectively are highly skilled at ethically:

- transferring a deep scientific knowledge of computing into business contexts.
- engineering digital systems that meet business needs.
- managing the adoption of digital technologies and maximising their value across strategic business units.

All of this illustrates that improving diversity in the AI skills pipeline requires making science more diverse, engineering more diverse and business more diverse, and doing so across the economy wherever digital and data technologies are driving innovation and growth.

WHAT'S BEING DONE:

There are a huge range of initiatives to improve the overall talent pipeline into data and digital professional careers, which we summarise below. They include in England work done by DCMS, DfE, UKRI, the Office for Students and the Office for Artificial Intelligence.

The UK government **National Data Strategy** includes these actions to improve data skills:

³¹ [nature.com/articles/d41586-020-00160-y](https://www.nature.com/articles/d41586-020-00160-y)

³² [bcs.org/media/5766/diversity-report-2020-part2.pdf](https://www.bcs.org/media/5766/diversity-report-2020-part2.pdf)

³³ [ukri.org/about-us/what-we-do/strategies-and-reviews/ai-review-transforming-our-world-with-ai](https://www.ukri.org/about-us/what-we-do/strategies-and-reviews/ai-review-transforming-our-world-with-ai)

³⁴ [weforum.org/agenda/2020/09/ai-needs-diverse-workforce](https://www.weforum.org/agenda/2020/09/ai-needs-diverse-workforce)

Table 1:

NATIONAL DATA STRATEGY
ACTIONS ON SKILLS

We will publish a working definition of data skills in the wider economy that sets out clear distinctions between data skills, digital skills and AI skills, and consider the benefits of providing information on pathways into data related careers.

We will consider the roles of the Alan Turing Institute, the National Innovation Centre for Data, the Open Data Institute, the Data Skills Taskforce, the AI Council, the UK Cyber Security Council, the Data Lab, and others in the data skills ecosystem for ways to improve the leadership and facilitation of new and better collaborations between industry, the public sector, universities and institutes.

We will work with the appropriate bodies to understand how data science is integrated into relevant technical qualifications, ensure that good quality data science courses are offered and that data related skills are given due consideration in their work to support emerging skills.

We will test the most effective ways to teach foundational data skills to undergraduates in two ways – through offering modules including wider subjects such as AI, cyber and digital skills, and by integrating data skills in other subject areas. Universities will take part in the pilot on a voluntary basis.

We will examine ways of expanding the supply of advanced data skills across research engineers and professionals to help maximise R&D investments and to increase mobility across business and academia, and to foster the links between industry and universities at the regional level.

We will launch an online portal that will support businesses' access to data skills training, helping signpost SMEs to good quality online training material matched to their technical data science capabilities and ambitions.

We will recruit leaders with data and digital skills across government to build a strong cadre of technical, policy, legal and analytical data experts in the centre of government..

We will train 500 analysts across the public sector in data science by 2021, through the Data Science Campus at the ONS, the Government Analysis Function, and GDS. This will be reviewed in 2021 with a new capacity building strategy meeting the emerging needs of government up to 2025.

We will deliver the range of actions to be outlined in the Public Sector Data Science Capability Audit.

We will review the data training available to all civil servants and develop proposals to enhance and extend this offering.

We will design a career pathway for data expertise in government.

We will agree a shared definition of data expertise across central government.

We will review the needs of local government in having the capabilities to manage, use and disseminate data.

In January 2021 the UK government published³⁵ the **'Skills for Jobs: lifelong Learning for Opportunity and Growth'** white paper, which considered how to strengthen the further education sector and included these initiatives:

- Investing in higher-level technical qualifications that provide a valuable alternative to a university degree.
- Making sure people can access training and learning flexibly throughout their lives and are well-informed about what is on offer through great careers support.
- Create a Life-long learning Entitlement, which will be the equivalent of four years of post-18 education, and will include changing the funding system so it is as easy to get a loan for a higher technical course as it is for a full-length university degree.
- Use the new £2.5 billion National Skills Fund to enhance the funding to support adults to upskill and reskill.
- Create clear progression routes for students towards the higher-level technical qualifications that employers need.
- Expand the Institutes of Technology programme to every part of the England by the end of this Parliament, to spearhead the increase in higher-level technical skills in Science, Technology, Engineering and Maths.



MAKING SURE PEOPLE CAN ACCESS TRAINING AND LEARNING FLEXIBLY THROUGHOUT THEIR LIVES AND ARE WELL-INFORMED ABOUT WHAT IS ON OFFER THROUGH GREAT CAREERS SUPPORT.

- Continue to roll out T-Levels, to prepare students for entry into skilled employment or higher levels of technical study, including apprenticeships.

In Higher Education relevant initiatives are:

- The Q-Step programme³⁶ across 17 universities in the UK to run Q-Step Centres that support the development and delivery of specialist quantitative modules within social science degree programmes.
- In 2019 the Office for Students launched MSc conversion courses in AI and in Data Science for non-STEM graduates in nearly 30 universities across England, which were supported by bursaries to attract women and ethnic minorities, black and disabled students.
- The Office for AI commissioned BCS to conduct a study³⁸ into scaling up the ethical MSc AI pipeline, which was influential in shaping funding for HE courses.

- UKRI AI Centres for Doctoral Training are funded by £100m from government along with additional leveraged funding to bring the total investment to over £200m. 1000 students will be funded over five years across the different CDTs.

- As a comparator, in New Zealand the University of Otago has introduced³⁹ new postgraduate degrees in digital health, which support inclusivity through progressive entry requirement that allow applicants without a degree to apply if they can evidence equivalence through work experience, and which is taught entirely online, which for example is more flexible for people with child-care commitments.

WHAT'S MISSING?:

The above discussion shows there is a considerable range of different initiatives across several departments and other offices of government, which in principle could significantly improve the talent pipeline into AI roles related to science, engineering and across business.

³⁵ assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957856/Skills_for_jobs_lifelong_learning_for_opportunity_and_growth__web_version_.pdf

³⁶ esrc.ukri.org/research/our-research/quantitative-methods-initiative/undergraduate-activities

³⁷ officeforstudents.org.uk/for-students/planning-to-study/study-artificial-intelligence-and-data-science-as-a-postgraduate/find-courses-in-artificial-intelligence-ai-and-data-science

³⁸ bcs.org/media/6553/scaling-up-ethical-ai-pipeline.pdf

³⁹ otago.ac.nz/info-science/study/postgraduate/otago743170.html



Currently what is lacking across these disparate initiatives is leadership from the government to ensure they collectively provide coherent and flexible pathways for the vast majority of adults and students who do not have STEM qualifications. These pathways should allow people in work to progress into AI related roles that fit with their individual circumstances, and that support career changers and those with some current expertise. This is an area that historically all governments have found challenging, so it is important to raise it as a specific objective within the AI strategy.

KEY OBJECTIVE FOR THE NATIONAL AI STRATEGY:

Develop a wide range of inclusive pathways into AI related professions that attract talented people from all backgrounds.

WHAT SHOULD HAPPEN:

As explained in the Executive Summary for this objective to be achieved government should provide strong leadership in the development of a wide range of easily accessible flexible pathways into AI professions suitable for people with non-STEM qualifications and career changers who have no prior skills in AI.

WILL THE OBJECTIVE WORK?:

This action is likely to work provided that, as part of its leadership, government proactively engages with expert stakeholders who understand professional pathways and have experience in designing and executing supporting mechanisms to build these pathways at scale. Amongst those stakeholders are professional bodies.

3 WHAT IT WILL TAKE FOR THERE TO BE ACCESSIBLE AI QUALIFICATIONS THAT HELP PEOPLE ESCAPE THE DIGITAL DIVIDE

In this section we focus on those aspects of the digital divide that can be addressed through improvements in education and training, since these are the underlying aspects of the issue where BCS can provide unique insight as a qualifications awarding organisation, an end point assessor for digital apprenticeships, in its role as a partner in the consortium establishing the National Centre for Computing Education, and because of its UK wide community of educators in the Computing At School (CAS) group.

OVERVIEW AND BACKGROUND⁴⁹:

The national lockdowns caused by the pandemic have brought into stark relief how the digital divide has affected millions of students, their families, and their schools and colleges.

By the time of the second lockdown schools, overall, had reviewed and modified their approach to remote teaching and in-school provision - in many secondary and FE settings resulting in a significant, almost wholesale, shifted to timetabled live lessons. Reports from schools showed that uptake from students was far higher than in Lockdown One, even in areas of socio-economic disadvantage.

In primary schools, it was more of a mixed picture, with some teachers introducing lesson starters and plenary sessions live, and others increasing the amount of teacher-led video content, along with the introduction of live social connection sessions amongst classes, such as a daily story-time.

The Computing at School (CAS) peer to peer network of computer science teachers has seen a huge demand from fellow teachers for support in technology platforms such as Microsoft Teams and Google Classroom. CAS is supporting several thousand teachers to explore how to use these platforms for live lessons and to share practical tips on what works in the context of teaching and learning.

Adapting to these fundamental changes during lockdown has put pressure on households to have access to adequate connectivity, appropriate devices, and the digital competence to use them. Juggling working from home alongside children at different stages of education is a reality in many households right now.

⁴⁹ Note: much of the content for this part of the section is adapted from a BCS blog www.bcs.org/content-hub/bridging-the-digital-divide-in-education

If the household has sufficient devices to enable each child to access their learning activities and has adequate broadband connectivity to support those activities, then it has the foundation for success. The issue is that for many, if not most, this is simply not a reality. ONS and Ofcom estimate that 2% of households with school-age children live in a household that is not online (227,000 - 559,000 children) and that around one million children only have access to the internet via a mobile phone.

WHAT'S BEING DONE:

In England there's the DfE 'get help with technology' scheme⁴¹ with over £400m invested, including the provision of 1.3m laptops and 54,000 4G wireless routers for pupils; 'help to get online' scheme⁴² in Scotland and a specific £25m investment to support digital inclusion amongst learners.



THERE'S ALSO THE 'STAY SAFE. STAY LEARNING.' SCHEME⁴³ IN WALES AND LOAN SCHEME⁴⁴ PLANS IN NORTHERN IRELAND TO HELP WITH DEVICES, INTERNET ACCESS AND SUPPORT TO PROVIDE REMOTE EDUCATION AND ACCESS TO CHILDREN'S SOCIAL CARE DURING COVID-19

There's also the 'Stay safe. Stay learning.' scheme⁴³ in Wales and loan scheme⁴⁴ plans in Northern Ireland to help with devices, internet access and support to provide remote education and access to children's social care during COVID-19. This, as well as donations from charitable organisations and the public to some schools, is helping to ensure many young people can fully engage in learning from home. There is also a huge effort in schools to get devices set up and shipped out to those who need them most.

The BBC has recently launched 'Give a Laptop' to promote⁴⁵ details of companies and charities who can help get devices to pupils by taking donations from the public and organisations - refurbishing them and sending them out to those that need them most.

But when pupils do get a provided device, some schools are reporting households don't have access to Wi-Fi, so there is still a lot to be done to improve the holistic response needed to resolve the whole issue. BT's Lockdown Learning Support Package⁴⁶ is a positive example of an industry response to the issue. The package includes free unlimited mobile data for those families and carers supporting children with no internet access, free WiFi vouchers for schools and charity partners for access to BT Wi-Fi Hotspots, as well as zero-rating of some of the most popular educational websites designed to support home learning. Plus, there's up-to-date online educational resources, tech tips and digital skills with the BT Skills for Tomorrow programme.

WHAT'S MISSING:

The above initiatives show that a great deal is being done to get hardware and internet access to those trapped in the digital divide, and shows tremendous progress compared to where the UK was before the pandemic. What needs to be addressed is ensuring students and adults can now gain the skills, training, and education to get the maximum benefit from their technology and particularly AI-enabled technology, and to progress into good jobs or further education that leads to professional careers that develop or use AI. That will guarantee that families escape the digital divide once and for all.

The government, through the Office for AI and the Institute for Apprenticeships and Technical Education (IFaTE), has created an Artificial Intelligence Data Specialist apprenticeship⁴⁷ at level 7, which is MSc level. There is also an existing Data Analyst apprenticeship⁴⁸ at level 4. At level 3 there is the new T-level Digital Business Services, which is designed to lead to a role as a Data Technician. T-levels are excellent courses but require two years of full-time education to complete and are aimed primarily at students having just finished secondary school. Also, completion of a T-level requires a three-month placement, which means in areas where there isn't a local employer who can provide such a placement students can't complete the qualification. In socially deprived areas where the digital divide is likely to be more acute it is also likely there will be far fewer high tech local employers who could provide a worthwhile data or digital placement.

⁴¹ get-help-with-tech.education.gov.uk/

⁴² gov.scot/news/help-to-get-online/

⁴³ gov.wales/device-and-connectivity-update-digitally-excluded-learners-during-coronavirus-covid-19.html

⁴⁴ education-ni.gov.uk/news/minister-outlines-plans-provide-digital-devices-disadvantaged-children

⁴⁵ bbc.co.uk/programmes/articles/5SqHJMTKZx5sYhlltXJvB1Q/give-a-laptop

⁴⁶ newsroom.bt.com/bt-announces-lockdown-learning-support-scheme-for-kids-and-families/



These are high quality apprenticeships and qualifications, but they don't sufficiently support those in the workforce already who do not have a STEM background and want to change to AI related roles, and who may have significant family or caring responsibilities. This is significant given we expect almost everyone in the workforce to gain a high level of data and digital literacy and be capable of adapting to a world of work where, in any skilled job, AI is going to augment the day-to-day tasks people perform.

DfE have established through the National Skills Fund⁴⁹ a wide range of level 3 qualifications⁵⁰, and established new Digital Bootcamps, primarily aimed at young adults. The Bootcamps and approved qualifications provide high quality training and education, but currently are missing training and qualifications that provide a direct pathway to Data Science, Data Engineering or other AI related careers.

KEY OBJECTIVE:

What this shows is there is a lack of different sized, modular qualifications aligned with a set of flexible training pathways that allow adults (aged 16+), with varying personal circumstances and in areas where there is a stark digital divide, to upskill or change careers into jobs that require a high level of AI skills.

WHAT SHOULD HAPPEN:

As explained in the Executive Summary, strong leadership from government is needed to ensure the various existing initiatives discussed in this section have suitable AI-related qualifications and training added to them to provide coherent pathways out of the digital divide.

DFE HAVE ESTABLISHED THROUGH THE NATIONAL SKILLS FUND A WIDE RANGE OF LEVEL 3 QUALIFICATIONS, AND ESTABLISHED NEW DIGITAL BOOTCAMPS, PRIMARILY AIMED AT YOUNG ADULTS

⁴⁷ [instituteofapprenticeships.org/apprenticeship-standards/artificial-intelligence-\(ai\)-data-specialist-v1-0](https://instituteofapprenticeships.org/apprenticeship-standards/artificial-intelligence-(ai)-data-specialist-v1-0)

⁴⁸ instituteofapprenticeships.org/apprenticeship-standards/data-analyst-v1-1

⁴⁹ gov.uk/guidance/national-skills-fund

⁵⁰ gov.uk/government/publications/qualifications-in-new-funded-offers

4 WHAT IT WILL TAKE FOR AI TO ACCELERATE PROGRESS TOWARDS SUSTAINABLE DECARBONISATION

The UK will host the COP26 international summit at the Scottish Event Campus (SEC) in Glasgow in November 2021. Among the priorities for COP26 are:

- All countries to commit to reaching net zero emissions as soon as possible, and to significant further cuts by 2030
- Step up and help societies and economies adapt to climate change – particularly the most vulnerable
- Turn the corner on polluting energy systems and seize the opportunity of rapidly falling costs of renewables and energy storage
- Accelerate the transition to zero carbon transport, phasing out petrol and diesel engines
- Accelerate the green transformation of the financial system so all countries can drive clean and resilient investment
- Harness the innovation and commitment of all – citizens, investors, business, countries, cities and regions – to move the global economy to net zero.

The 2020 Royal Society report⁵¹ 'Digital Technology and the Planet' states:

- *"Nearly a third of the 50% carbon emissions reductions the UK needs to make by 2030 could be achieved through existing digital technology"*
- *"Data-driven systems for net zero must be taken up across society and the economy, and to be trusted they will need to work for everyone. The design and deployment of data-driven systems for net zero should be inclusive and grounded in engagement with all stakeholders and communities affected by their use."*
- *"The UK Government should use COP26 as an opportunity to lead the way in establishing ambitious programmes that bring together governments, industry and the third sector – committing funding, data, skills, and computing facilities – to develop computing as infrastructure for the planet".*

NEARLY A THIRD OF THE 50% CARBON EMISSIONS REDUCTIONS THE UK NEEDS TO MAKE BY 2030 COULD BE ACHIEVED THROUGH EXISTING DIGITAL TECHNOLOGY

⁵¹ royalsocietypublishing.org/doi/10.1098/rsos.200201

The National Engineering Policy Centre (NEPC), which BCS is a member of, and which is hosted by the Royal Academy of Engineering, has produced a study⁵² into engineering- based solutions to support achieving net-zero carbon emissions in line with the COP26 priorities. That study recommends that driving digital transformation that enables net-zero carbon emissions and national resilience should be an area that is prioritised in a national response.

In particular the study highlights:

- The need to rapidly scale up the 'Internet of Things' and 5G as enablers of data gathering across all sectors on carbon emissions at a micro-scale, which is used to monitor and optimise carbon emission reduction solutions as well as to provide data for developing innovative technologies to accelerate decarbonisation.
- Developing data-driven infrastructure to reduce the need for new-builds and optimise maintenance as a key element of decarbonisation.
- Using digital technologies to facilitate the transition to smart local energy systems, which can effectively manage heterogeneous renewable energy sources such as wind and solar. This is also recommended by the World Economic Forum in their report on digitising cities⁵³
- The need for trusted data sharing frameworks between organisations from all sectors to maximise finding opportunities for decarbonisation.

What is clear from these extensive studies is that highly sophisticated and innovative data analysis and data science techniques will be required to support these decarbonisation initiatives. This is where AI can play a central role.

These studies clearly show that an outcome of a National AI strategy should be, as we included in

the Executive Summary, that **AI accelerates progress towards net-zero carbon emissions**. Following the actions to support this outcome outlined in the Executive Summary will mean the recommendations from the work of the Royal Society and the National Engineering Policy Centre, which BCS wholeheartedly backs, have a much better chance of success.



⁵² raeng.org.uk/publications/reports/beyond-covid-19-laying-the-foundations-for-a-net-z

⁵³ weforum.org/agenda/2021/03/path-to-a-greener-future-begins-cities

5 BACKGROUND ON LOSS OF PUBLIC TRUST IN DATA AND DIGITAL TECHNOLOGIES

Figure 1:
EXAMPLE OF HIGHLY CRITICAL NATIONAL PRESS ITEM ON COMPUTER CODE UNDERPINNING EPIDEMIOLOGICAL MODEL

The Telegraph

Coding that led to lockdown was 'totally unreliable' and a 'buggy mess', say experts

The code, written by Professor Neil Ferguson and his team at Imperial College London, was impossible to read, scientists claim

By Hannah Boland and Ellie Zolfaghari

16 May 2020 • 1:32pm



The following section outlines events that have seriously eroded public trust in the use of data and digital technologies in public services since COVID-19. Between May and November 2020 there has been a constant series of high-profile incidents that have significantly eroded public trust in the use of computing in public services.

MAY:

In May there were a series of high-profile articles in the national press, such as for example in the Telegraph⁵⁴, that asserted computer code developed by Professor Neil Ferguson to model the spread of COVID-19, and which was key to government decisions about imposing national lockdown, was highly flawed and implied it was not fit for purpose.

Since then, Professor Ferguson's epidemiological computer code has been shown to be fit for purpose, for example in articles⁵⁵ in the scientific journal Nature. The general public however do not read Nature and are mostly only aware of articles such as those in the Telegraph that were highly critical.

What became apparent during this episode is that the scientific community⁵⁶ has not in general adopted software development standards that would ensure their computer code is easy to reproduce and be understood by the wider scientific community. This has become a major issue across the global scientific community⁵⁷. Such standards do exist, such as those developed by the Software Sustainability Institute (SSI). BCS is

now collaborating with the Society of Research Software Engineering and SSI on increasing the adoption of these software development standards across all of science.

MAY:

The NHS COVID-19 contact tracing app was meant to launch in May but was pushed back to September because of a series of technical difficulties and issues with ensuring ethical data gathering and processing⁵⁸. Additionally, it didn't work as Public Health England wanted because of Google and Apple privacy concerns that meant the technology was prevented from collecting data as intended.

⁵⁴ telegraph.co.uk/technology/2020/05/16/coding-led-lockdown-totally-unreliable-buggy-mess-say-experts/

⁵⁵ Nature reproducibility: Critiqued coronavirus simulation gets thumbs up from code-checking efforts

⁵⁶ bcs.org/media/5780/professionalising-software-development.pdf

⁵⁷ bbc.co.uk/news/science-environment-47267081

⁵⁸ bbc.co.uk/news/technology-53114251

BCS prior to the launch of the app had laid out the ethical practicalities that would need to be addressed in a policy paper⁵⁹.

AUGUST:

In August Ofqual used an algorithm to estimate GCSE and A-level grades that resulted in widespread public mistrust in algorithms making high stakes decisions about people⁶⁰, which resulted in the Secretary of State for Education having to make a public apology.

BCS published a policy paper⁶¹ after the incident explaining why data driven algorithm design is challenging and requires interdisciplinary teams of professionals working collaboratively and to the right professional standards in order to make algorithms work as intended.



Figure 2:

PUBLIC TRUST WAS ERODED BY ONGOING DIFFICULTIES WITH LAUNCH OF THE CONTACT TRACING APP



⁵⁹ [bcs.org/media/5689/contact-tracing-report.pdf](https://www.bcs.org/media/5689/contact-tracing-report.pdf)

⁶⁰ [bbc.co.uk/news/uk-53815089](https://www.bbc.co.uk/news/uk-53815089)

⁶¹ [bcs.org/media/6135/algorithms-report-2020.pdf](https://www.bcs.org/media/6135/algorithms-report-2020.pdf)

Figure 3:

BBC NEWS ITEM OF PUBLIC APOLOGY FROM THE SECRETARY OF STATE FOR EDUCATION ABOUT 'OFQUAL ALGORITHM'



Figure 4:

WWW.BBC.CO.UK/NEWS/TECHNOLOGY-54423988



OCTOBER:

In October Public Health England lost 16,000 COVID-19 test results due to human error when importing data from a CSV⁶² file into an Excel spreadsheet.

Members of the public understandably questioned the apparent inability of Public Health England to automate such a routine but vital part of their data handling, which affected the public's perception of the digital competency of PHE.

NOVEMBER:

In November the Public Accounts Committee published a highly critical report⁶³ on progress with NHS Digital Transformation. The committee commented that:

- The Department and National Health Service have a poor track record for transforming NHS IT and have made insufficient progress against national ambitions

- The Department's previous attempt to reform how the NHS uses IT, running between 2002 and 2011, was both expensive and largely unsuccessful
- The use of digital services within the health and social care system has increased during the COVID-19 pandemic—including providing more services remotely—showing the substantial potential for organisations to use digital services more and adapt quickly.

⁶² CSV: comma separated values, which is a standard format used for sharing tables of data between different proprietary spreadsheet and database applications.

⁶³ publications.parliament.uk/pa/cm5801/cmselect/cmpublic/680/68002.htm

Such a report from one of the most respected parliamentary select committees significantly added to the general sense that there is a lack of competence around digital programmes within the public sector. The report follows on from a NAO report⁶⁴ with similar conclusions.

NOVEMBER:

Also in November more highly critical national media stories appeared concerning IT problems with the test and trace system, such as for example in the Daily Mail shown in the following figure.

MORE HIGHLY CRITICAL NATIONAL MEDIA STORIES APPEARED CONCERNING IT PROBLEMS WITH THE TEST AND TRACE SYSTEM.

Figure 5:

FRONT PAGE OF NAO REPORT ON NHS DIGITAL TRANSFORMATION



Figure 6:

DAILY MAIL STORY ON IT PROBLEMS WITH TEST AND TRACE SYSTEM



⁶⁴ nao.org.uk/wp-content/uploads/2019/05/Digital-transformation-in-the-NHS-Summary.pdf

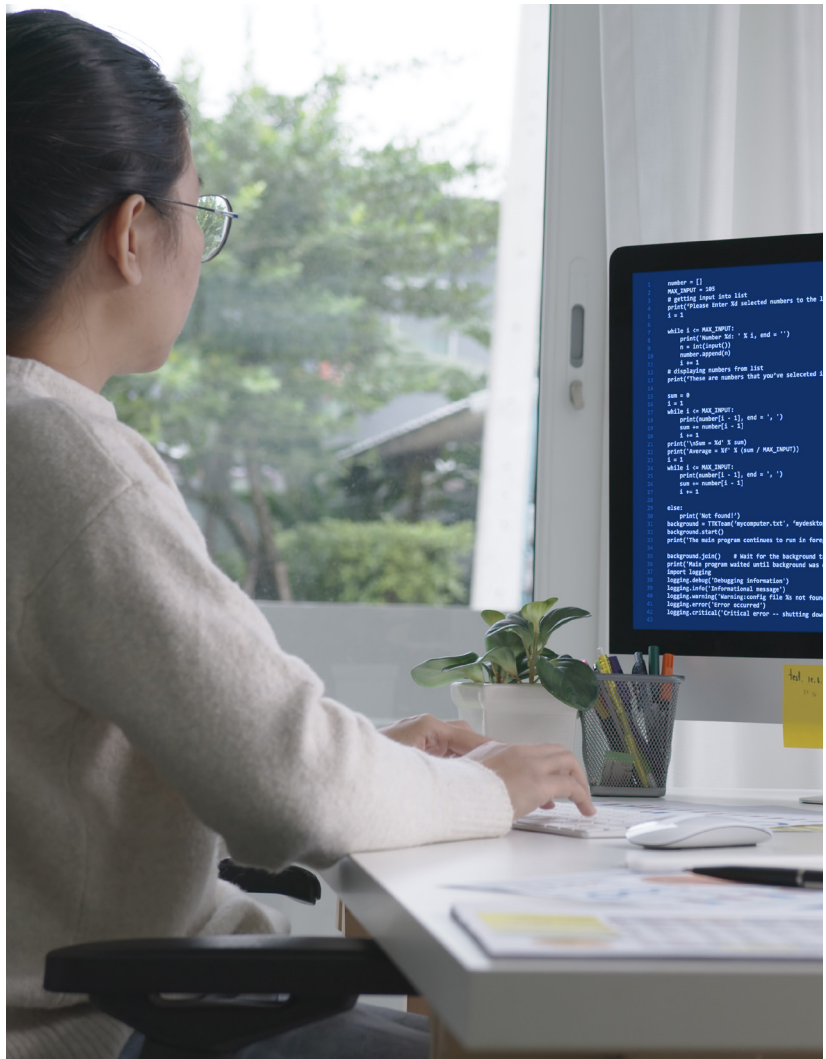
6 YOUNG NATIONAL SURVEYS ON PUBLIC TRUST IN SEPTEMBER AND OCTOBER 2020

We commissioned YouGov to conduct two national surveys of representative samples of the UK adult population across all devolved nations to find out how badly public trust had been eroded.

The headline results from those surveys were:

- Over half (53%) of UK adults have **no faith** in any organisation to use algorithms when making judgements about them⁶⁵, in issues ranging from education to welfare decisions.
- 63% of UK adults **disagree** with the statement “*Students graduating with a computer science university degree are qualified to write software that makes life decisions about people*”
- 62% of UK adults believe someone who for a living develops computer software that can significantly affect people’s lives should be qualified as a government-approved **Chartered professional**.

The following lists the detailed questions and responses from those surveys.



⁶⁵ [bcs.org/more/about-us/press-office/press-releases/the-public-dont-trust-computer-algorithms-to-make-decisions-about-them-survey-finds/](https://www.bcs.org/more/about-us/press-office/press-releases/the-public-dont-trust-computer-algorithms-to-make-decisions-about-them-survey-finds/)

Question:

WHICH, IF ANY, OF THE FOLLOWING ORGANISATIONS DO YOU TRUST TO USE ALGORITHMS TO MAKE DECISIONS ABOUT YOU PERSONALLY:

59%

THOUGHT AN INDEPENDENT REGULATING BODY SHOULD BE RESPONSIBLE FOR ENSURING THAT DIGITAL TECHNOLOGY IS USED TO SOLVE ETHICAL ISSUES

Base: All UK adults	2076
The Government	10%
Social media companies (e.g. Facebook, Instagram etc.)	8%
'Big Tech' companies (e.g. Apple, Google etc.)	11%
Financial services (e.g. banks, insurance companies etc.)	16%
Health and social care (e.g. the NHS, private health care, the council etc.)	17%
Armed Forces	7%
The education sector	7%
The police	11%
Social Services	7%
National Security and Intelligence services	12%
Housing associations	6%
Other	1%
Don't know	16%
I do not trust any organisations to use algorithms to make decisions about me	53%

Question:

WHO, IF ANYONE, DO YOU THINK SHOULD BE RESPONSIBLE FOR ENSURING THAT DIGITAL TECHNOLOGY IS USED TO SOLVE ETHICAL ISSUES?

Base: All UK adults	2063
Politicians	22%
Universities	18%
Technology companies (e.g. Apple, Google etc.)	23%
An independent regulating body	59%
The individual computer programmer	13%
Other	3%
Don't know	13%
I do not think anyone should have responsibility for this	14%

Question:

TO WHAT EXTENT DO YOU AGREE OR DISAGREE WITH THE FOLLOWING STATEMENT?

“STUDENTS GRADUATING WITH A COMPUTER SCIENCE UNIVERSITY DEGREE ARE QUALIFIED TO WRITE SOFTWARE THAT MAKES LIFE DECISIONS ABOUT PEOPLE”

Base: All UK adults	2063
Strongly agree	2%
Tend to agree	16%
Tend to disagree	32%
Strongly disagree	31%
Don't know	19%
Net: Agree	18%
Net: Disagree	63%

63%

DISAGREE WITH THE STATEMENT

Question:

TO WHAT EXTENT DO YOU AGREE OR DISAGREE WITH THE FOLLOWING STATEMENT:

“SOMEONE WHO DEVELOPS COMPUTER SOFTWARE FOR A LIVING THAT CAN SIGNIFICANTLY AFFECT PEOPLE'S LIVES, SHOULD BE QUALIFIED AS A GOVERNMENT-APPROVED CHARTERED PROFESSIONAL”

Base: All UK adults	2063
Strongly agree	22%
Tend to agree	40%
Tend to disagree	11%
Strongly disagree	6%
Don't know	21%
Net: Agree	62%
Net: Disagree	17%

62%

AGREE WITH THE STATEMENT

7 RELATED REFERENCES

Title	Link
EU Proposal for a Regulation laying down harmonised rules on artificial intelligence	EU
UK National Data Strategy	Gov.uk
Ethics, Transparency and Accountability Framework for Automated Decision Making	Gov.uk
Decision making by algorithm must meet Nolan's tests - Committee on Standards in Public Life	Cspl.blog.uk
Review into bias in algorithmic decision making	Gov.uk
Quantifying the UK Data Skills Gap	Gov.uk
Landmark laws to keep children safe, stop racial hate and protect democracy online	Gov.uk
Reproducible Analytical Pipelines	Gov.uk
Code of Practice for Statistics	Code.statisticsauthority.uk
GDS Technology Service Manual	Gov.uk
Ensuring statistical models command public confidence	OSR.statisticsauthority.uk
Guides from Software Sustainability Institute	Software.ac.uk
Civil Service Quality Assurance of Code for Analysis and Research	GitHub
A guide to using artificial intelligence in the public sector	Gov.uk
UKRI grant to Software Sustainability Institute	UKRI
The exam question: How do we make algorithms do the right thing? – BCS policy paper	BCS
AI Council Roadmap	Gov.uk
UK Government Guidelines for AI procurement	Gov.uk
UK Government Technology Innovation Strategy	Gov.uk
Challenges in using data across government	NAO
ICO Guidance on the AI auditing framework consultation	ICO

For further information please contact:

BCS

The Chartered Institute for IT
3 Newbridge Square
Swindon
SN1 1BY

T +44 (0)1793 417 417

www.bcs.org

© 2021 Reserved. BCS, The Chartered Institute for IT

All rights reserved. No part of this material protected by this copyright may be reproduced or utilised in any form, or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system without prior authorisation and credit to BCS, The Chartered Institute for IT.

Although BCS, The Chartered Institute for IT has used reasonable endeavours in compiling the document it does not guarantee nor shall it be responsible for reliance upon the contents of the document and shall not be liable for any false, inaccurate or incomplete information. Any reliance placed upon the contents by the reader is at the reader's sole risk and BCS, The Chartered Institute for IT shall not be liable for any consequences of such reliance.

