

Policy making in a digital world

How data and new technologies can
help government make better policy

About this report

Digital technologies offer the potential to transform how government makes policy, helping it to tackle the biggest challenges it faces: from climate change to the coronavirus pandemic.

This report offers an overview of recent technological developments and where the main opportunities lie, highlighting the key challenges that need to be addressed and setting out how government might do so.

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Summary

Advances in digital technology in recent years have created a wealth of opportunities for policy makers. With more and better data available about the world around us and dramatic improvements in connectivity and communication, policy should be better informed, more rigorously tested, more collaborative, and more responsive to external events and to the views and experiences of those it affects than ever before.

The Johnson government is aware of many of these opportunities and has already made moves to realise them in response to the major challenges it faces: from climate change to the coronavirus pandemic. But the use of digital technologies also raises new questions, for instance around privacy, fairness and accountability. Government needs to learn fast to take better advantage of new technologies in policy making at the same time as managing the risks they present.

The opportunities presented by digital technologies for policy making fall into three broad areas: knowledge and people management, analysis, and external involvement.

Knowledge and people management

Digital technology should support rather than hamper institutional memory, enable more collaborative ways of working and help policy makers draw more effectively on the experience and skills of civil servants across government.

- **Information management.** Currently, the information that government holds is scattered across disparate systems and saved in a variety of formats, making it difficult for policy makers to find what they need when they need it. New tools can help: improved search techniques make relevant documents and datasets easier to find, with automatic tagging, summarisation and retrieval of specific information increasingly possible.
- **People and skills.** Policy makers have no easy way to find colleagues with relevant experience and insight, with government struggling to harness the knowledge and expertise of its people as a result. Using data science techniques, information on staff skills and experience could be inferred from the documents they work on, the contents of their emails or CVs and their career progression, with this data made searchable on shared platforms.

Collaboration. Ministers and officials too often operate in silos, missing opportunities to join up their thinking with colleagues working on related issues elsewhere. New tools for online and in-person collaboration and for safely sharing data make it easier to bring a wider range of voices into policy conversations.

Analysis

Better use of data and technology should result in more comprehensive information being available at every stage of the policy making process, leading to better-informed proposals that can be more rigorously assessed, and more timely interventions subject to comprehensive evaluation.

- **Understanding the problem.** Policy makers often have limited information on their policy area, with data collected infrequently and little insight available into its interactions with other issues. Taking advantage of the enormous quantities of data now available, along with more sophisticated tools for analysing it, policy makers should be able to develop a more comprehensive and timely picture of an area, and be able to better predict some problems before they arise.
- **Testing and options appraisal.** Policies are usually adopted and implemented without rigorous testing or consideration of alternative approaches. More data makes it easier to run real-world trials and to conduct more sophisticated modelling to test initiatives in a virtual environment, helping policy makers interrogate assumptions and weigh up the trade-offs of different approaches.
- **Evaluation and iteration.** Policy evaluation is minimal, when it happens at all, with too many policies signed off for implementation and then forgotten about. Easier data collection increases the scope for more comprehensive evaluations, and more immediate feedback can help policy makers keep track of the impacts of policies as they are implemented to iron out problems over time.

External involvement

Technology allows policy makers to capitalise on the knowledge and expertise that sits outside government, using it to support decision making and opening up policy problems to greater public involvement.

- **Harnessing society's knowledge and expertise.** Policy making often draws on a limited pool of expertise, and consultations tend to be run in such a way as to be of little value. Digital tools make it easier to find and access a more diverse range of experts and offer the means of running more rewarding consultation processes – for both policy makers and participants.
- **Involving the public.** Policy making too often happens without taking account of the views and experiences of members of the public. Online tools create new opportunities for government to understand the public's views better and to involve them in developing, deliberating over and deciding policy.

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- **Collaborating to solve problems.** Government does not do enough to harness the capabilities of the private sector and other external actors, many of whom may be better placed to solve problems than government is. Policy makers could draw more effectively on data collected by others and do more to support organisations and individuals to develop their own solutions to problems.

Realising these opportunities will not be easy. Government still needs to 'fix the plumbing' when it comes to managing information, tackling problems with poor quality data, a lack of standardisation, and the use of legacy technology, all of which continue to impede progress. There are ethical issues that government will need to confront around the wider use of data and digital technologies, especially with respect to concerns about privacy and bias. While progress will require experimentation and some risk-taking, government must do everything it can to avoid major failures in the use of digital technologies that undermine public trust and risk holding back future work, with the A-level results fiasco the most recent example of this.

To maximise the benefits of digital technology for policy making while minimising the risks, government needs to:

- **Co-ordinate and incentivise** future work, by monitoring and evaluating existing projects to learn lessons, and ensuring funding processes encourage innovation.
 - The Government Digital Service (GDS) should be responsible for monitoring the use of new, digitally enabled approaches to policy making, developing government's understanding of what does and does not work, and supporting teams across government to take advantage of successful techniques.
 - Departments should be required to publish all research and evaluations they conduct and commission, including information about any new techniques they experiment with, to support this.
 - The Treasury should attach conditions to spending that require departments to use evidence effectively and make changes to the business case process to incentivise greater experimentation rather than guarding against risk.
- **Unblock barriers** to innovation by improving its management of data and information.
 - Government needs to appoint a chief data officer with responsibility for co-ordinating the organisations working in government's data landscape.
 - The chief data officer should lead work on and drive ongoing investment in efforts to improve data quality and tackle problems with government's legacy IT systems, both of which obstruct the effective use of data currently.

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- The chief data officer must work with the Data Standards Authority to develop a set of standards for managing data and information, to be applied and enforced across government, and to underpin common platforms enabling effective collaboration between departments.
 - **Strengthen oversight** of new approaches to address ethical challenges and ensure that the use of data and technology does not worsen existing problems and undermine the case for future progress in the process.
 - The Centre for Data Ethics and Innovation should work with practitioners to develop practical ethical guidance for particular applications of digital technology.
 - Government should increase funding for the Information Commissioner's Office, enabling it to extend its remit and oversee government's use of data and digital technologies properly, ensuring that it is held accountable – including by providing a route for redress for anyone adversely affected.
 - **Improve skills**, ensuring that teams and departments have the talent they need and that professional communities can communicate with each other effectively.
 - Civil Service HR should work with the relevant professions to plug key skills gaps, prioritising recruitment of data architects and modelling specialists, and for other areas of expertise in line with GDS's forthcoming Data Science Capability Audit.
 - GDS should work with the policy profession to ensure that training programmes reflect advances in technology, the opportunities these offer, the latest understanding of what works and the ethical challenges to be aware of, updating content regularly.
 - More emphasis should be placed on numerical and statistical literacy in the recruitment and training of policy officials, with analysts also encouraged to explore new ways of communicating the results of quantitative analysis more effectively.
 - Departments should make wider use of multidisciplinary teams, ensuring that a range of perspectives is brought to bear on problems and improving communication between professions.
 - **Work in the open**, to make sure that it harnesses the 'collective intelligence' of society as a whole when addressing problems and maintains public trust.
 - Government should set up a new body focused on involving the public in policy making more formally – with an immediate focus on conversations about government's use of digital technology.

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- Government should be as transparent as possible, publishing research, analysis and datasets that the private sector, academia and other external organisations can draw on and scrutinise for mutual benefit, and details of the algorithms and models it uses to improve accountability and public trust.
 - Government should support promising 'social innovation' projects run by individuals and civil society groups with seed funding, access to computing power, technical support and more, to help bring society's collective intelligence to bear on policy challenges.

Introduction

Progress in digital technology in recent decades has driven significant change in the economy, society and the way we carry out everyday activities. But the way government makes policy has stayed much the same.

Policy ideas from ministers or manifestos are still developed largely internally, usually with limited public consultation, and with light-touch monitoring of the impacts of policies after implementation. This model is outdated in a digital age: it fails to address many long-standing obstacles to effective policy making and is unsuitable for the more complex challenges government now faces. Better use of new tools and technologies can make policy making more effective and fit for a digital world.

Of course, technological change has hardly passed government by. The old world of composing documents on typewriters to be photocopied and distributed by hand, of communicating with and inviting feedback from the public by post, or of calling information up from physical files or 'bundles' stored in a Whitehall basement is firmly in the past. The drive towards making government more 'digital' since 2010, especially with the creation of the Government Digital Service (GDS) in 2011 and GOV.UK in 2012, has resulted in different ways of working and delivering services.

Policy making has also developed in recent years – to an extent. There has been a greater emphasis on experimentation and more interest in social psychology, popularised in the UK by the Behavioural Insights Team; more conscious investment in design and putting the user at the centre of policy, as shown in the work of Policy Lab; attempts to make policy making more agile and interdisciplinary, driven in part by the OneTeamGov movement; and an emphasis on collecting and synthesising evidence through the What Works Network.

But momentum has stalled in the past few years, as priorities have shifted under successive governments and in light of Brexit and the coronavirus pandemic. Despite attempts at reform, policy making is still suffering from age-old pitfalls, including poor record keeping, limited public input, slow feedback and minimal evaluation, resulting too often in policy failure – with the prolonged issues with Universal Credit,¹ misjudged attempts to reform probation,² and government's botched Green Deal initiative being just a handful of recent examples.³ Digital technologies offer ways of addressing these issues and helping government meet the challenges it faces.

Different parts of government are already experimenting with new tools and techniques to improve the quality of their policy making, and we highlight many of these examples below. But this experimentation is uncoordinated and lessons about what is working – and what is not – are not being shared across government. Long-standing challenges around government’s data infrastructure, legacy technology, skills, and funding and procurement processes remain, acting as further barriers to the wider uptake of promising techniques.

New approaches also come with their own challenges, which governments – perhaps even more so than private sector companies – need to negotiate carefully. Concerns about the possible effects of adopting new technologies on privacy and security, on fairness and accountability, on the environment and on public trust, result in understandable caution. Uncertainty about financial costs adds to this: many government digital transformation projects in recent years have promised substantial savings, only to prove much more expensive than anticipated. The programme to digitise rural payments, for instance, overran its budget by more than 40% in 2015.⁴

But the imperative to make use of the opportunities technology offers policy making has never been stronger. Issues such as Brexit, Covid-19 and climate change are more fast-moving, complex and unwieldy than any that government has had to contend with for decades. These problems cut across traditional policy and institutional boundaries. To manage problems of this scale effectively, government cannot continue with business as usual. It needs to better understand and make use of the possibilities offered by new technologies – and fast.

The current government is aware of the need for reform. In his Ditchley Annual Lecture in June 2020, Michael Gove stressed the need for a more empirical approach to policy making, underpinned by good quality data, widespread experimentation and robust evaluation.⁵ He emphasised the importance of greater diversity of thought, a closer alignment of the civil service with the general public, and the greater devolution of control over some policies to the communities they affect. This report offers an overview of where new technologies could help in these areas and more, with guidance on how to maximise the benefits of new approaches while minimising the risks, to help government make policy in a way that is fit for the 21st century.

The report is based on interviews with people from a range of government functions and professions, including individuals not only from the policy profession but analysts, economists and scientists, data architects and user researchers, HR and public engagement specialists. It also builds on discussions with people from outside government, in businesses, think tanks and other NGOs, who are working on similar issues. It is split into three parts:

- **Part 1** considers ‘what has changed’. It offers a brief overview of recent technological developments and of government’s response to these changes so far.

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- **Part 2** looks at the opportunities for policy makers arising from these changes. It considers the implications for knowledge and people management in government, for the analysis that underpins policy, and the scope for improved external involvement, with some discussion of where opportunities are already being realised and of the risks that government will need to navigate in the future.
 - **Part 3** sets out a series of recommendations for how government can maximise the benefits of new technologies in its policy making, while minimising the risks, including through improved monitoring and encouragement of innovative work, addressing fundamental challenges with its management of data, strengthening oversight of new technologies, developing skills and understanding, and working more closely with the private sector, the public and other external actors.

1. What has changed?

There have been two major developments in the digital technology landscape in recent years that have significant implications for policy making. The first is an increase in the quantity and quality of **data** available, and a corresponding increase in our ability to store, process and analyse that data. The second is an increase in the **connectivity** of society, with new ways of accessing and communicating information, and interacting with others. This section will consider each, before looking at government's response to these changes so far.

Data

As we live more of our lives online, we leave behind an increasingly long trail of data about ourselves. Around 87% of UK adults now use the internet, and every virtual move they make – when shopping, chatting to friends, sending work emails, streaming videos and music, and so on – is recorded.⁶

Some of this is personal data – such as our name, address and telephone number – that we give to businesses, government and other organisations to access services or buy products. The contents of our emails, messages and calls and the images and documents we share also feature. But the bulk of this information today is about our online behaviour – what we search for, click on, like and buy, and the people we interact with.⁷ Online platforms such as Google and Facebook use this data to infer our interests, as well as more sensitive information such as our gender, race, sexual orientation, and religious or political views, extending the trail yet further.

Our data trails increasingly follow us offline, too. Smartphones and smart watches track where we are at any given time – governments (including the UK government) are using this for coronavirus contact tracing⁸ – and every time we tap our contactless cards (or phones) rather than paying in cash, a stream of information about our whereabouts and what we are buying is collected and stored in the servers of our banks and payment networks. And as everyday objects are increasingly connected to the internet using ever smaller, cheaper and more powerful sensors – forming part of the growing 'Internet of Things' – smart speakers, vacuum cleaners, fridges and many other devices record progressively more niche details about our daily lives, from the content of our morning conversations to the layout of our houses.⁹

Advances in technology have also made it easier to monitor the wider environment. Sensors are used in street lights to not only respond to changes in light, but collect information about air pollution;¹⁰ on bridges and dams, they monitor structural

integrity while recording changes in water levels.¹¹ Satellite imagery is increasingly high quality, and available to us at the touch of a button using Google Maps, along with 10 million miles of street-level imagery.¹² Data is also being collected in a more granular way – every second or minute rather than every month or year, and with measurements that are ever more accurate and precise as tools improve.

Improvements in computer hardware have made the handling of this 'big data' dramatically easier and cheaper. The shift towards using the cloud – computing resources provided by massive server farms that can be accessed remotely and on demand over the internet, meaning that users do not need to maintain their own IT infrastructure – has also made it possible for organisations to collect and store more data and carry out ever more complex computations on it for less money.

Progress in software has been driving these changes, too. A surge in interest in data science has accelerated the development of sophisticated techniques for analysing and working with data. Compounded with more data and more computing power, this has led to huge advances in artificial intelligence (AI), with computers able to carry out tasks that would have been hard to fathom even a few years ago: from analysing medical scans to generating convincing humanlike text on almost any subject. AI systems can solve problems, find efficiencies in complex systems, make predictions about future events, and more.

Connectivity

In 2020, the overwhelming majority of people in the developed world – and many millions in developing countries – can access almost any information, communicate and collaborate with nigh on any person, and broadcast their opinions globally, from any location, at any time, and at an increasingly negligible cost.

Platforms for remote working and collaboration have all fallen under the public spotlight as countries around the world have responded to coronavirus. But social media is still arguably the most remarkable manifestation of increased connectivity today. Billions of people use platforms like Facebook, Instagram and Twitter (with billions more on Chinese platforms such as WeChat) to talk to friends, share their thoughts and activities, and keep up with the latest news in their social circles and the wider world.¹³ This has transformed the nature of communication: organisations and individuals can now communicate directly with the public without having to rely on conventional media outlets like newspapers or television, and messages can be personalised and targeted to a degree that was not possible previously.

These platforms have made it possible to 'crowdsource' knowledge and information, rather than having to rely solely on recognised individuals and institutions. People with questions (at least those that Google can't answer easily) turn to forums or their connections on social media. Wikipedia, the most comprehensive source of general knowledge currently available to us, was not written by qualified, vetted individuals, but by anyone who wanted to contribute. Although much of its content references more traditional, established sources, the labour of pulling that content together would have been unmanageable if restricted to the experts themselves.

This approach to crowdsourcing knowledge and information has expanded rapidly into science. In November 2000, Nasa invited members of the public to help it map Mars's craters from satellite images; each participant watched only a short tutorial beforehand, but the results were indistinguishable from those of expert geologists and collected much more quickly.¹⁴ The role of citizen scientists is typically only to collect data rather than provide analysis, and this now happens for everything from butterfly and bird populations to air quality and radiation levels, enabled by smartphones and cheaper sensors – further accelerating progress in the data landscape.¹⁵ But online challenges hosted on websites such as Kaggle (for data science) or Good Judgment Open (for forecasting) offer the opportunity for members of the public to apply their own analysis and expertise to problems, often drawing on freely available tools and a proliferation of online courses and materials.

Greater connectivity also enables improved community mobilisation, enabling members of the public to identify, coalesce around, and work to solve problems themselves. Social media plays a crucial role here, helping spread awareness of and co-ordinate responses to problems (with coronavirus mutual aid groups a recent example). But platforms designed specifically for political mobilisation also exist, including UK petition sites such as Change.org and 38 Degrees, and more global online activist organisations such as Avaaz. Grassroots projects are easier to get off the ground with crowdfunding: the Good Law Project, for example, raises money from the public to launch legal campaigns against the government. And online peer-to-peer networks make it possible for individuals to work together and share resources (not just money or information, but everything from household items to computer storage) without an intermediary, creating opportunities for community self-sufficiency. Many of the digital tools that underpin these technological developments are themselves built and maintained by self-organising online communities.

How has government changed?

Ministers and officials are aware of these changes and departments have already been adapting in response to them. Services are increasingly delivered digitally, enabled by greater connectivity and evolving to satisfy shifting public expectations.¹⁶ Government communications have largely moved online, on to GOV.UK and social media.¹⁷ Many teams and departments have experimented with new ways of involving the public in their work, and with the automation of some service delivery, administrative tasks, data analysis and more.¹⁸ Government's response to the coronavirus pandemic, too, has demonstrated a capacity for substantial innovation with data and technology under pressure, for instance through the rapid delivery of the furlough scheme.¹⁹

The last few years have also seen a proliferation of new bodies intended to improve government's use of data and new technologies. Among others, government now has:

- an **Office for Artificial Intelligence**, which works to improve the uptake of AI in the public and private sector
- an **AI Council**, intended to provide high-level expertise to government on AI

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- a **Centre for Data Ethics and Innovation**, an independent advisory body set up to investigate and advise on how the UK can maximise the benefits of data-driven technologies
 - a dedicated **innovation team** in GDS, tasked with driving technology innovation in government, with a focus on service delivery, public sector productivity and growing “the nascent GovTech sector”²⁰
 - a **Data Science Campus**, which sits in the Office for National Statistics and was established to “investigate the use of new data sources...for the public good”²¹
 - a **Geospatial Commission**, which works to promote the more effective use of geospatial data – or information tied to a particular geographic location.

These bodies have been accompanied by a slew of strategies, including a Government Transformation Strategy, a UK Digital Strategy, an Industrial Strategy (with a strong emphasis on data and AI), a Technology Innovation Strategy and, most recently, a National Data Strategy. Government has also published a range of guidance for civil servants working with digital technology, including a Data Ethics Framework and a guide to using AI in the public sector.*

Despite these efforts, like most other large organisations, government is only beginning to work out how best to harness the potential afforded by changes in the technology landscape. While it can point to some award-winning examples of doing things differently, performance is patchy. One enduring challenge has been its unwillingness to confront and address long-standing issues with how it manages data and information.²² Even when government has looked ahead, it is striking that such scant attention has been paid to the role that data and technology could play in policy and decision making, with the emphasis usually placed on service delivery and the improvement of administrative processes instead.

The current administration has given multiple indications that it hopes to change this. It has announced a new Data Quality Hub and a Data Standards Authority to help tackle some of the issues around the management of data.²³ And the creation of a dedicated data science unit in No.10 reflects the value that Boris Johnson’s chief adviser, Dominic Cummings, sees in data and more sophisticated quantitative analysis for supporting decision making, at least – although with the details still to be ironed out, the unit could create more problems than it solves.²⁴

The next section considers the opportunities offered by data and technology for policy making in more detail, while also highlighting some of the barriers that government will need to address if it is to fully bring itself into the digital age.

* This overview is far from comprehensive. See: IfG Whitehall Monitor, ‘List of important UK government reports on data, information and open government’, Google sheet, last updated 5 October 2020, retrieved 13 October 2020, <https://docs.google.com/spreadsheets/d/1bGnx9sD3eXuQazOyV6XClznDLwfd3X4PHfhEbSXKIs/edit#gid=0>

2. What opportunities does digital technology offer for policy making?

While technology has moved on, and in some areas dramatically, policy making has not kept up. What makes a good policy remains the same: it is an intervention that achieves the outcomes it intends, at acceptable cost and with manageable consequences, in a way that proves to be politically sustainable. But the *how* of effective policy making should look rather different today than it did in the past. The seven fundamentals of good policy making we set out in 2011 still stand, but it should be possible to realise these more effectively now, nearly a decade on.²⁵

We believe the opportunities fall, broadly, in three areas:

- **Knowledge and people management.** Digital technologies should make it easier for policy makers to access useful information, find knowledgeable colleagues, and join up their thinking with others outside their team or department.
- **Analysis.** Better data and technology should help improve policy makers' understanding of problems, as well as affording greater scope for testing options, evaluating the results of interventions, and iterating to improve them over time.
- **External involvement.** Greater connectivity makes it easier to harness the knowledge, expertise and experience that sits outside government to make policies better informed and more robust, and enables greater collaboration between government and other actors to tackle problems.

As the examples below demonstrate, government is already experimenting with new approaches in places – although usually on a small scale, and at relatively low cost (benefiting partly from open source tools). Learning from these examples and pushing for the wider adoption of successful approaches would be a step in the right direction.

Taking full advantage of the opportunities offered by new technologies, however, will be both more difficult and much more expensive. The cost of confronting government's data and information management problem and tackling outstanding issues with legacy IT systems will be particularly substantial. This work to 'fix the plumbing', crucial for any substantive progress, will require strong leadership over a number of years, and much greater investment than it has received so far.

Table 1 **The opportunities offered for realising the policy fundamentals**

Fundamental	Rationale	Possibility
Clarity on goals	Most policies fail because policy makers have not analysed the problem properly and are unclear on what the policy intends to achieve	Use of data and more advanced analysis to give policy maker a much better understanding of the policy problem Better communication of the outcomes of decisions to implementation specialists
Open and evidence-based idea generation	Policy needs to draw on the best available evidence and external knowledge and expertise rather than just being developed internally	Improved identification of a wider range of expertise and search for relevant publications and materials Wider calls for evidence and ideas
Rigorous policy design	Policy usually fails when an apparently reasonable idea faces implementation problems in practice	More testing, both through policy simulations and wider experimentation Increased scope for co-design with members of the public
Responsive external engagement	Policy does not take sufficient account of the attitudes and reactions of members of the public	Engagement of a wider range of stakeholders and the public in the development of policy Better analysis of responses to a policy: both written responses submitted to government and real-world behaviour
Thorough option appraisal	Too many options may be discarded too early, and appraisal may ignore some of the second-round costs and benefits	Improved modelling and simulation to understand a wider range of possible impacts to be incorporated into appraisal
Clarity on the role of central government and accountabilities	Policy makers need to determine the appropriate level of central government intervention	Better monitoring and modelling of policy systems to understand how the different parts interact, helping determine the most effective site and level of intervention
Establishment of mechanisms for feedback and evaluation	Policy makers need to be able to monitor impacts of policy as it hits the ground – and tweak as necessary	Rapid monitoring, with scope for capturing real-time information drawing on a wide range of data sources Predictive indicators allowing for earlier intervention and even automated iteration

This short-term pain will be for much greater long-term gain, however. The cost of not realising the opportunities offered by new technologies is difficult to quantify, but must outweigh the cost of change. Hundreds of millions of pounds are wasted annually by government simply as a result of poor knowledge management leading to the

repeating of past work.²⁶ Millions more are lost in the process of developing new but ineffectual policies, not to mention the additional money paid out to cancel contracts or pay compensation to those affected when policies fail.²⁷

Quantification is even more difficult when considering the most complex and wide-ranging challenges government faces. When it comes to making effective policy during the coronavirus pandemic, for example, the whole economy hangs in the balance – and millions of people’s lives. Failing to tackle climate change could come at an even greater cost.

Naturally, experimentation with new technologies and approaches comes with its own risks. But government should be using every lever available to it to make policy that can effectively tackle these challenges.

Knowledge and people management

Government suffers from a range of long-standing problems with its management of knowledge and people. A poorly handled transition from paper to email and electronic documents has left much of the information accumulated by government in the past 15 to 20 years “poorly organised, scattered across different systems and almost impossible to search effectively”.²⁸ Staff directories have fallen into disrepair, making it hard to find people with useful knowledge and experience. The information that government has on its workforce is currently so poor that many departments do not even know, at any given time, how many employees they have, let alone what their roles are or were.²⁹ And policy makers still too often work in a siloed way, failing to anticipate the consequences of their decisions for other departments’ responsibilities and missing potential synergies.

Technology does not offer a quick fix for any of these issues. But government could use it to help overcome some key barriers, making it easier for policy makers to access useful information, find knowledgeable colleagues and collaborate with others outside their team or department to solve common problems.

Information management

Searching for information held by government

Interviewees observed that while Google is sophisticated at retrieving documents and information, government systems remain a long way behind. Millions of documents exist only in an analogue format, in paper files and ‘bundles’ in Whitehall basements which, while typically well organised, can take more time to track down than policy makers have (as well as being inaccessible for people working remotely). Worse still, millions of digital files are virtually impossible to find, lost in a chaos of unsorted folders and email inboxes across government, often in formats and file systems that are not easily searchable. Without a store of collective knowledge, it is difficult for civil servants to know what their predecessors looked at or did, resulting in less informed initiatives, needless policy reinvention³⁰ and the repeating of past work – which the Cabinet Office estimates could cost government nearly £500 million per year.³¹

Digital technologies should make it more straightforward to address these problems. First, technology makes it easier to convert files to formats that are machine-readable, making it possible to search and extract information from them. Recent progress in computer vision means that any scanned or photographed paper document – even handwritten notes – can be converted to a searchable format automatically with increasing accuracy.* Information that is already in a digital format, but one that is difficult for computers to process (such as older pdfs and scans), can also be reformatted and made machine-readable automatically. Applying these techniques would still take time and require investment. But it could grant policy makers easier access to a much larger quantity of information, evidence and past work.

Finding relevant documents among the millions would remain difficult, but sophisticated search techniques can help. Rather than restricting search results to files matching specific keywords, machine learning can be used to make sure that documents containing words with similar meanings are also included – something that the Ministry of Justice is already doing to help spot trends in prison reports.³² Results can also be personalised, with documents and datasets used by members of the same team or related to areas the user has looked at in the past returned first. Establishing which files are most enduring and important (useful for helping policy makers who are new to an area get up to speed quickly) should be possible by tracking which are accessed or referred to in other documents and emails most regularly.³³

AI tools can also make it easier to sift search results by automatically summarising the contents of a document, offering key words, phrases or sentences (such as sub-headings) that are perceived to be most representative of the text as a whole, or an abstract that condenses the contents – something that is more challenging technically, but that could be particularly helpful for time-strapped officials trying to get across an area quickly. Natural language processing can even be used to retrieve information from documents, including facts about people, places, dates, or events mentioned in the text. Although it may seem unrealistic now, government could work towards a future in which ‘searching’ a particular question on internal systems returns an answer or a summary of existing knowledge, as is increasingly possible on Google.

Managing the information government creates

Throwing files into an unsorted ‘digital heap’ for people to run searches on is unlikely to reap significant rewards for frustrated policy makers in the near term, though, with the accuracy of new techniques still variable.** It also does not lend itself to finding numerical datasets, which may be machine-readable and ready to use, but that do not contain searchable keywords and phrases.

Consistently tagging files with additional information on the policy areas they relate to, and on when, where, why and by whom they were created, will help make search more effective.³⁴ Conventions for structuring and naming files and saving them in

* The technology that underpins this is known as optical character recognition (OCR) – accuracy for printed documents can be around 98–99%, with lower scores for handwritten documents (although this is improving). Commercial scanners are increasingly equipped with this sort of functionality, although even easier solutions also exist – including apps.

** Searching large collections of documents also comes at a high computational cost, with the result that searches would take a long time (and consume a lot of energy).

particular places and formats are also important. Currently, each department has a different and constantly changing approach to this (and departments themselves chop and change with reforms to the machinery of government), making it difficult for civil servants to keep track. Cross-government conventions should be agreed, with the new Data Standards Authority supporting efforts to make this happen and helping enforce them. Technology could support this, for instance with AI predicting where and how files should be saved in order to make them more easily accessible to others.

The automation of decisions about how to save files will become increasingly common as more information is generated without direct human involvement. Many news outlets already use machine learning systems to write stories,³⁵ and government is beginning to experiment with similar techniques for writing reports³⁶ as well as automating some aspects of correspondence and briefing.³⁷ Data collection and analysis is also increasingly automated.³⁸

People and skills

Accessing internal expertise

While the management of recorded information is important, lots of the knowledge government holds exists only in people's heads – and given how poor information management is in government, this is often the knowledge that policy makers rely on. High levels of turnover in government mean this is a problem: civil servants often develop an understanding of an area only to then move elsewhere.³⁹ In a particularly egregious example, the Ministry for Housing, Communities and Local Government (MHCLG) lost almost its entire homelessness team (more than 20 staff) in the space of two or three years from 2010, including subject experts and directors with links across Whitehall.⁴⁰ Attempts to develop a new strategy were criticised for failing to adequately draw on past experience, but there is no easy way for policy makers to find and contact colleagues who have worked on a problem previously, or who are working on similar issues elsewhere in government (handover processes also tend to be ad hoc, which does not help).*

One way of helping policy makers find colleagues with relevant expertise is to combine it with attempts to improve document management. Interviewees indicated that even when documents and datasets are easy to find, it is often the contact details of their authors and owners, rather than the files themselves, that are most valuable. Making sure that files include these details is therefore crucial.

This information could also be used to build online 'profiles' for policy makers to search when looking for people with particular expertise.⁴¹ Departments have experimented with 'people finder' platforms in the past, encouraging civil servants to set up profiles with an overview of their qualifications and skills to help them connect with each other, but clunky systems and few apparent incentives have typically resulted in poor uptake. Yet information on ownership and authorship of files could be used to infer civil servants' experience automatically, supplementing

* Finding people is less of an issue at Senior Civil Service level since this is a much smaller circle – but that brings its own problems around diversity of thought and experience.

patchy HR records and laying the foundations for individual profiles. This could be combined with other approaches, such as mining the content of emails to identify expertise, or using natural language processing to extract information about the skills and experience of newly recruited civil servants from their CVs or LinkedIn profiles. While civil servants could still volunteer their own information, the emphasis would then shift towards verifying rather than submitting information about themselves, encouraging wider participation.

This system could become more sophisticated over time. Rather than expecting civil servants to update profiles themselves, changes of role or participation in training programmes could be logged automatically. Government Shared Services is exploring the possibility of assigning each civil servant their own employee ID, which could be used when applying for new roles and attending training and linked to a constantly updating staff database.⁴² This would provide a clear repository of information that would enable civil servants to contact colleagues with expertise, insight and past experience in relevant areas – ensuring government is making best use of the knowledge that is available to it when making policy.

Improving strategic use of the workforce

Access to information on the skills and experience of civil servants would not just be helpful for individual policy makers looking to improve their understanding of an area, but for departmental leaders, functions and professions, and the centre of government when attempting to manage the civil service workforce, especially in response to rapidly changing policy priorities.

Organising staff on shared platforms and detailing their skills and experience, so that they can be more easily pulled together into time-limited project teams rather than 'owned' by departments, is something that the UK government has contemplated before.⁴³ It would make it easier, especially at times of crisis such as in the run-up to a potential no-deal Brexit or in response to a pandemic, to make sure that the best-suited people are parachuted into the most critical roles. It would also support a move towards multidisciplinary teams – something that was encouraged repeatedly in our interviews and has come up frequently in wider discussions about effective government in a complex, digital age – with senior civil servants able to pull together the best available group of people from the right backgrounds to address a given issue.⁴⁴

Having the right information is only part of the challenge here, though. This approach would mark a significant cultural change for the civil service and designing and implementing new structures would be complicated. In the near term, as well as working to improve its workforce data, government could run a smaller-scale pilot. For this, it might look to and learn from the Canadian government's experience with its Free Agents programme, which helps managers find talented civil servants with particular skills for short-term projects (as well as letting a small pool of public servants choose work that matches their interests).⁴⁵

Collaboration

Making collaboration easier

Digital technology means that civil servants no longer need to be in the same building, department, or even the same country to work together. The coronavirus pandemic has made this particularly apparent: departments that were planning to roll out changes to enable 'smarter working' (including video conferencing capability) by the end of the year have found themselves embracing shared documents, video calls, virtual whiteboards and more within a handful of months. Teams could use these tools to bring a wider range of voices, such as those of people working on the front lines of policy implementation or people working on related issues in other parts of government, into policy discussions more effectively – just as officials at the Department for International Development (recently rolled into the Foreign, Commonwealth and Development Office) have long used video calls to enable colleagues in country offices to contribute to meetings, making them better informed.*

Having teams and departments working on different proprietary platforms can act as a barrier to them being able to collaborate effectively, though, as we have found in recent research on the government's digital response to the coronavirus pandemic.⁴⁶ Government could push for, or even work to create, more open and advanced alternatives. GitHub, an online platform widely used in the software development community for version control, could serve as a starting point. It offers a streamlined mechanism for peer review and collaboration both within and across teams, does not depend on creating, sharing and updating files and documents (making information management more straightforward), and does not require people to be part of the same organisation to work on projects together.⁴⁷ This is seen as the industry standard for co-ordinating work on the development and maintenance of software, and offers a model that could be repurposed for policy making.

Technology has also enabled the creation and cultivation of more informal cross-government communities, helping people work across departmental and professional boundaries. In 2017, GDS launched 'Service Communities' to improve collaboration between civil servants working on different aspects of government services, with the result that processes to help citizens 'Start a Business' or 'Employ Someone', for example, are increasingly discussed and understood in their entirety, helping identify ways of improving them.⁴⁸ OneTeamGov was created in the same year to break down barriers between professions and disciplines, and has been particularly successful at joining up the digital and policy making communities,⁴⁹ while GDS's 'Communities of Practice' have connected civil servants from across government who are keen to share their and learn from others' experiences in a variety of areas, including data science, design and user research.⁵⁰ These communities are co-ordinated primarily through Slack channels, with word spread on Twitter and many meet-ups continuing in recent months on Zoom.

* These tools obviously have other benefits, too, including saving time, money and energy on travel, enabling home working and facilitating civil service relocation plans.

Technology can also be used to facilitate improved collaboration between policy makers and decision makers in physical spaces. Government has already experimented with this to some extent, with the Department for Environment, Food and Rural Affairs creating a central operations centre to track its preparations for a no-deal Brexit, bringing in ministers to talk through the preparations using visual aids to assist rapid decision making.⁵¹ But it could go further, creating interactive spaces where policy makers explore virtual representations of the systems they are overseeing, building on advances in modelling to test and see for themselves the likely consequences of possible interventions – as Dominic Cummings, Boris Johnson’s chief adviser, has envisaged.⁵² This might be applied to anything from considering the movement of people through the criminal justice system to the impact of different customs controls on transport systems operating around the UK border, for example.

Sharing information more widely

Collaboration between different parts of government is currently hindered by the difficulties of sharing documents and data. Legal barriers play a role here: often, information cannot be shared because it contains personal data or other sensitive information, and sharing would breach data protection laws. Increasingly, though, features of datasets can be made accessible without the need to share any data, ensuring privacy laws are respected. The NHS’s system for checking prescription eligibility, for example, runs enquiries on datasets held in other parts of government (such as those relating to receiving certain benefits) to see if an individual appears in them and receives simple Y/N responses. No access to the data underlying those responses is needed to run the check, so none is provided.⁵³ A range of other privacy-enhancing technologies is available,⁵⁴ with organisations such as the Open Data Institute working to develop an understanding of the advantages and disadvantages of a wider variety of data-sharing approaches⁵⁵ and the Government Office for Science recently publishing research into different approaches to effectively managing citizen data.⁵⁶ As well as improving government’s ability to collaborate and share useful information internally, these approaches should make it easier to share data between government and other sectors more safely, improving collaboration with business, academia and NGOs.

The bigger barriers to sharing information arguably relate to civil servants’ understanding of what is legal, however. Many people we spoke to stressed that regulatory barriers tend to be less significant than civil servants think, especially since the passage of the Digital Economy Act in 2017, which sought to make data sharing easier. Technology can be used to help people understand when, how and with whom they can and cannot share information. Regulatory technology, or ‘RegTech’, is already widely used in the financial services industry to automate compliance with the law. It could also be used in government, for instance using AI to propose appropriate access controls for different files, helping ensure information is shared in ways that are compliant with regulations. This more automated process could be monitored and tweaked to reflect changes in the regulatory landscape over time.

Challenges to address

Many of the problems with government's internal systems and processes – from not being able to find documents and people to difficulties with sharing information – derive from the poor management of data. New technology can help address some of these issues, but it should not be seen as a silver bullet. Better search techniques and methods for joining up information across government can certainly help departments draw on data more effectively, for example, but standards for saving data still need to be agreed and enforced – which will require strong leadership, especially when it comes to driving culture change in teams and departments where the effective management of information is not seen as a priority. AI might help by automatically tagging and saving files in line with conventions, but manual effort will be needed to improve the quality of the data and information within those files, and to label a (still large) subset with tags that AI systems can learn from before applying them to others. This, as well as addressing other fundamental and enduring challenges like extracting the huge amount of information that is currently locked up in legacy IT systems, will require substantial investment and resource over a number of years. There is no quick fix.

In the near term, departments are likely to continue procuring solutions to problems (although they must make sure that they do this in line with any newly agreed standards). But over time, government could develop its own solutions to most of the above, building on open source technologies and the wealth of data it already has to ensure a joined up approach across departments. Driving change from the centre always comes at the risk of creating tensions – as well as making the consequences of getting change wrong more severe. Departments with different needs are unlikely to accept a one-size-fits-all solution that forces them into certain ways of doing things. But a federated model – where the foundations of a document management or people finder tool are created and developed by the centre, with departments building on these foundations to develop their own versions, but where these different versions are able to communicate with each other using common standards – would be a sensible way forward. GDS already develops common components for departments to build on when developing and delivering digital public services. This 'Government as a Platform' approach should be extended to support other fundamental aspects of government's work.⁵⁷

There are, of course, other barriers to cross-government join-up and collaboration, such as an absence of departmental incentives, ministerial disinterest, and fear of the unknown. Technology alone cannot get around these issues. But if it does manage to facilitate pockets of improvement, and if this progress is apparent to civil servants *and* to ministers, these cultural and political issues may also prove more easily navigable.

Analysis

Many other obstacles to effective policy making persist. Policy solutions are too often developed without an understanding of the problem, increasing the chance that they fail to realise their intended objective – or even backfire.⁵⁸ While the impact of interventions is always difficult to predict, government does not help itself, often failing to test options rigorously. And policies are too rarely evaluated after implementation to enable iteration or inform future work: according to Michael Gove, chancellor of the Duchy of Lancaster, only 8% of the 108 major programmes for which government is responsible are assessed on an ongoing basis to judge if they have brought about the desired effects.⁵⁹

Data and new technology can help to address these challenges. They can improve policy analysis, resulting in better informed policies that can be designed and tested more rigorously, with more effective monitoring of their results to ensure improvement over time.

Understanding the problem

Government should have more information on a given problem

Understanding the problem is the essential starting point for making policy. Using the huge amounts of data available and new tools for analysing this data, technology enables policy makers to develop a more accurate and comprehensive picture of their policy areas and the interactions between them than ever before. This should only improve over time, helping clarify the nature of any given problem and the different factors that may be contributing to it.

The Office for National Statistics, for example, has started analysing HMRC tax returns, shipping and road traffic data to develop faster indicators of changes in economic activity, offering policy makers a more immediate insight into the health of the economy that allows them to make more timely decisions.⁶⁰ The Department for International Development (now part of the Foreign, Commonwealth and Development Office) has applied AI to satellite imagery to estimate population distributions in countries where it is delivering programmes, and where conflict or insecurity makes a census difficult.⁶¹ And the Department for International Trade (DIT) is experimenting with alternative data types to improve trade statistics – especially around digital trade, which is notoriously difficult to measure.⁶²

In the past, the sheer volume of this information would have been unmanageable. But analysing it is much easier now thanks to advances in computation and data science, and possible with free-to-use tools. Sophisticated visualisation software makes it easier to explore datasets, helping highlight variation on any given measure by location or demographic and over time. And while statistical methods enabled by computers have been commonplace in government for many years, these analyses can now be carried out on a significantly larger scale. Rather than assessing the impact of a handful of variables at a time on a particular problem, analysts should be able to consider hundreds, thousands, or even millions of data points at once, finding correlations between different variables, identifying patterns, trends and particularly

interesting pieces of information, and visualising the results to communicate them to decision makers. These techniques serve as a good complement to more qualitative work – helping identify potentially interesting questions, issues and possibilities for further investigation.*

Government is beginning to apply these approaches to the problems it faces. The Department for Work and Pensions' Stat-Xplore tool allows users to access data relating to 16 different programmes, including Universal Credit, Jobseeker's Allowance and State Pension, and visualise how their use varies across the country and over time, and how they relate to each other, using interactive charts. MHCLG's Open Data Communities site pulls together and visualises data from every local authority in England to help understand local variation on the department's key priority areas, including deprivation, housing, finances and more.⁶³ Departments such as the Ministry of Justice and Business, Energy and Industrial Strategy (BEIS) have developed their own analytical platforms that bring together data from across their operations with the tools and technologies needed for more sophisticated analysis.⁶⁴ A number of local councils, including Newham,⁶⁵ Barking and Dagenham, and the City of Glasgow,⁶⁶ are applying similar approaches, too. These tools make it possible for policy makers to develop a clearer picture of the problems confronting them, helping establish what the goals of any future intervention should be, and where best to target those interventions.

More data and more powerful computers enable more effective monitoring and prediction of problems

Progress in the data landscape also makes it possible to keep track of developments in a policy area more effectively, ensuring that policy makers' understanding is as up to date as possible, alerting them to the most pressing problems and allowing for more timely and targeted interventions.

Dashboards that pull in data from multiple sources are increasingly used in departments, especially to monitor the performance of and inform decision making on digital public services.⁶⁷ During the coronavirus pandemic, more than 70 datasets have been made available for daily meetings in No.10, with information fed in in real time and available to all participants, making it easier to hold ministers and officials accountable for progress. The EU Exit Operations cabinet committee also used a dashboard to track progress against 350 milestones in the run-up to a possible no-deal Brexit on 31 October 2019.⁶⁸

A similar approach is common in the management of cities. Not only dashboards but 'digital twins' (virtual representations of physical infrastructure) are used by cities such as London and Manchester to visualise and keep track of activity on many networks, including water and sewage, gas, internet, power, public transport, roads and more. The Centre for Digital Built Britain – a collaboration between BEIS and the University of Cambridge – is currently developing a national digital twin, which would enable policy makers to monitor physical infrastructure across the whole of the UK,

* It is important, for example, to bear in mind that correlations between different variables in quantitative analysis may be coincidental and not reflect any causal relationship. Further, more qualitative work will be required before deciding on an intervention.

informing decisions and enabling more rapid responses to problems such as natural disasters, power shortages and traffic accidents.⁶⁹ No human can keep up with all of this information, but computers can also be used to identify and flag potential issues when they arise.

AI systems can also be trained to identify patterns in data that consistently lead to certain outcomes, allowing them to predict events before they happen. Weather forecasting is the obvious example: significant improvements have been made in recent decades, making it possible for governments and other organisations to plan for and respond more rapidly to weather emergencies.⁷⁰ At a smaller scale, local councils are using data science to anticipate spikes in homelessness or social care demand, and similar approaches could be used to predict traffic congestion, or increases in demand for school places, hospital beds or medicines.⁷¹ Some claim that it is now possible to predict wars, economic crises and instances of civil unrest with increasing accuracy, drawing on big data and complex machine learning models,⁷² although combining computational approaches with advanced human forecasting may lead to improved results on certain kinds of question, for instance about the likelihood of political events.⁷³

Testing and options appraisal

Rigorous policy design, modelling and testing in simulations

Modelling is used not only for forecasting future events, but also to look at the potential impact that decisions will have on those events. This is particularly useful for when policy makers are planning to intervene in complex systems, the behaviours of which can be difficult to predict, with our intuitions about those behaviours often wrong.⁷⁴

Computational models are already used across government to improve departments' ability to assess the likely impact of interventions in light of this uncertainty, with the models used in recent months to predict the impact of different policies on the spread of coronavirus a particularly high-profile example. But many of the models used in government are relatively simple, and they have been hampered in the past by poor quality data and unrealistic assumptions.⁷⁵ With better data and the increasing availability of more sophisticated techniques, government should, in theory, be able to get closer to replicating the complexity of reality, enabling more robust decision making.*

Assumptions are made in models – for instance about how people behave under certain conditions, or how natural systems react to changes in weather – because analysts lack data on how things actually are (or, if they have data, they lack the time and computational capacity to process enough of it). With more data, analysed at greater speed and scale, fewer assumptions should be necessary. Economic models, for example, should not need to be based on assumptions about how the average person might behave, but can be grounded in a concrete understanding of how millions of people act and interact in the real world, based

* For a more comprehensive overview of the techniques available and how they are currently being used in different sectors, see the Blackett review 2018 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/682579/computational-modelling-blackett-review.pdf

on the wealth of data currently collected about our online and offline activities.⁷⁶ As well as improving macro forecasts by mapping the complexity of reality more closely, this more complete picture should provide a better impression of the likely impact of policies on particular regions, demographics, or even individuals, giving policy makers a more detailed understanding of the likely consequences of their decisions.

No model will be without assumptions, though. While they may continue to increase in complexity, none will have perfect information – and making models that are based on limited data more complex risks making them less accurate rather than more, since compounding assumptions leads to compounded uncertainty.⁷⁷ This means it is important that analysts developing models and decision makers using them do not give the impression of uncontested precision (by referring, for instance, to ‘the science’ as if it is monolithic and unchallengeable), but acknowledge areas of ignorance and be clear about the uncertainty of any results.* For all the models it uses, and not just the most high profile, government should also be transparent about the data they are built on, the assumptions being made and the technical approaches being used, making it possible for others to spot potential problems and gaps in understanding that may have been glossed over.⁷⁸

Given this uncertainty, even the most complex and sophisticated models should not be treated as a way of finding concrete answers, but as a means for exploring policy questions in greater depth. One of the key benefits of having access to more computing power is that models can be run over and over again, with different assumptions built in each time to get a more comprehensive picture of the range of possible outcomes. Rather than just presenting the results to decision makers, these models could also be made interactive, built by analysts but made accessible to ministers and senior officials to allow them to explore the possible implications of different decisions and assumptions for themselves. For a number of interviewees, modelling was primarily useful in this sense: as a mechanism for convening people and prompting conversation, testing assumptions about what might or might not work and weighing up the trade-offs that are inherent in all policy making.

Wider and more effective use of experimentation in the real world

While technology offers greater potential for simulating the results of interventions virtually, the best way of testing policy options remains to try them out in the real world. Randomised controlled trials (RCTs), where an intervention is delivered to a randomly selected group, with outcomes compared to another randomly selected group who did not receive the intervention, are often seen as the ‘gold standard’ for this real world experimentation. But there are still debates about their effectiveness and how much they can tell us about *why* things work; in some contexts a standard RCT may also prove impossible, with faster, cheaper or more iterative

* Those developing and working with models can also refer to the quality assurance advice set out in the Macpherson review, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/206946/review_of_qa_of_govt_analytical_models_final_report_040313.pdf, and the *Magenta Book*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/879438/HMT_Magenta_Book.pdf

approaches more suitable. More data and better technology can be used to help run RCTs more effectively, while also enabling alternative methods – especially when interventions can be delivered online.*

First, with data easier to collect and existing data easier to process and analyse, the outcomes of randomised controlled trials can be evaluated more effectively and comprehensively. In many cases, this data will also be available in closer to real time, making it possible to run more 'nimble' trials when the window for experimentation is narrow and the focus is on short-term operational outcomes. The Department for Education recently used this approach in collaboration with Nesta to quickly trial the use of new technologies in schools – or trials where interventions are tweaked over time to find an optimal approach.⁷⁹ Collecting qualitative feedback to establish why interventions do or do not work, and for whom, should also be easier and cheaper drawing on advances in connectivity, by encouraging participants to submit responses online.

All of this and more is particularly easy and low cost for policies that are implemented online. Many tech companies and, increasingly, governments already test possible changes to their online services and communications by providing slightly different versions to different users to test which works better – an approach known as A/B testing. The Behavioural Insights Team used this method to improve organ donation registration via GOV.UK, testing more than eight options before settling on the best.⁸⁰ Machine learning can also be used to determine which version of a service is best suited to a particular user, enabling the more personalised experiences that we see with social media news feeds, for example.

While the creation of the What Works Network and the Trial Advice Panel indicates a move towards greater experimentation in the UK, it has yet to hit the mainstream in policy making. Major policy areas like skills and employment, and policing and crime remain relatively untouched.⁸¹ To an extent, this will be due to caution resulting from the ethical issues that arise from experimenting – especially if the presence or absence of an intervention could have a significant impact on individual outcomes. But experimentation is still often the best way of testing policies to optimise interventions and guard against future failure on a much larger scale. Policy makers should not be afraid of experimenting more with experimentation. The proliferation of platforms to help with running online tests, including the Behavioural Insights Team's Test+Build, Wextor, Testable and others, should offer a way in.

Evaluation and iteration

More comprehensive evaluations, conducted more easily

Evaluation of the results of policy interventions is patchy across government – sometimes there is no evaluation at all – and findings are typically limited by a lack of information, time and resources to conduct the evaluation properly.⁸² But with access to more information and better tools for analysing it, it should be possible to run evaluations more easily and effectively than before.

* This is a very brief overview. The Alliance for Useful Evidence's The Experimenter's Inventory offers a more comprehensive introduction, www.alliance4usefulevidence.org/assets/2020/01/The-Experimenters-Inventory-A-catalogue-of-experiments-for-decision-makers-and-professionals.pdf

With more data available to help measure the impact of a policy on a larger number of individuals and across a wider range of metrics, evaluations can be increasingly sophisticated and comprehensive. MHCLG's evaluation of the Troubled Families Programme 2015–20, published last year, is a good example.⁸³ The team involved managed to access and link together numerous administrative datasets from across multiple local authorities and years, covering more than a million cases and more than 3,000 variables, combining this with case study research and surveys to draw conclusions about the cost-effectiveness of the programme and its impact on the number of children being taken into care, crime and antisocial behaviour, and more.⁸⁴

This evaluation was much more difficult than it could have been, though. Much of the work that went into it was making up for the fact that effective processes for collecting and collating data from across local authorities were not in place, and that there was no variation in how the policy was implemented over time or across the country, which would have made the assessment of its impact easier. More thought needs to be given at the start of the policy process to how an intervention might be assessed later on – the latest Treasury guidance makes clear that evaluation should be designed into any policy process at the outset and be in place as the policy is launched – with an implementation approach that allows for easy assessment of impact against a baseline, and structures put in place to collect relevant data, to make sure that similarly comprehensive evaluations can be conducted more widely.⁸⁵

Greater scope for feedback, iteration and automation

As well as evaluation, better data and analysis tools should improve the feedback policy makers get as policies are implemented, allowing for iteration and adaptation as problems are identified and worked through. This is increasingly common as more departments embrace 'agile' ways of working (particularly in the delivery of digital services) but a similar approach could be taken in most instances where delivery does not have to be 'right first time'. It should also be more straightforward to act on this feedback – policies that have been delivered digitally are easier to tweak than physical infrastructure and paper-based processes – making it possible for policy makers to act as 'system stewards', responsible for the continued oversight of policy areas rather than delivering an intervention and moving on, much more effectively than would have been the case when we first recommended it in 2011.⁸⁶

More granular feedback also means that policies can be tailored to different regions, demographics or even individuals more effectively, depending on what proves to be effective under different circumstances. Government has already adopted something of this approach with its 'local lockdowns', with different measures introduced in different regions of the country according to the spread of coronavirus locally, based on policy makers' assessment of the latest data. As this experience has made clear, though, government will need to weigh up the opportunities offered by greater personalisation and tailoring of policies with the need to maintain a degree of consistency nationwide, to ensure clarity and fairness.

Computer systems could also increasingly take on the stewarding role. As the models that are processing data to monitor systems and make forecasts become more complex, algorithms could be trained to identify where further intervention is required. This is already happening in a more operational context: HMRC has been using AI to spot potential instances of tax evasion and target raids on businesses,⁸⁷ and the Department for Transport has used AI to assign risk scores to garages that provide MOT tests, targeting its inspections accordingly rather than operating at random.⁸⁸

Usually, these algorithms suggest interventions to the people making and delivering policy. But in future it is likely that changes will increasingly be made to real-world systems automatically. In Singapore, an automated system varies road charges according to how busy the roads are to try to limit congestion.⁸⁹ Similar approaches have been discussed for energy systems: Google DeepMind has previously been in discussions with the National Grid about using AI to optimise the distribution of energy in the UK in real time and reduce overall consumption automatically.⁹⁰

Challenges to address

The biggest barriers to realising the opportunities offered by digital technology for analysis, repeatedly flagged both by interviewees and by speakers at our Data Bites events, relate to the quality and accessibility of data.⁹¹ Departments do not know what data they hold, making it difficult to find; the data they have is often locked up in legacy IT systems or published in formats that make analysis difficult; failure to adhere to common standards makes datasets difficult to link up; and data sharing is further limited by a lack of understanding over when it is or is not legal.⁹² As set out above, government needs clear leadership and ongoing investment to solve these problems.

Departments also often lack the skills needed to use data and technology effectively. Although not everyone we spoke to agreed, many found filling digital roles, especially at more senior levels, difficult given the higher salaries on offer in the private sector. Some indicated that the big gap in government is not around data scientists but data architects, who lay the foundations for later analysis, ensuring data is properly structured and easy to access at the right time. The Blackett review on computational modelling also highlighted a significant gap in modelling expertise in 2018, which government will need to fill.⁹³ GDS's forthcoming Data Science Capability Audit should help clarify the picture further and shape government's response.

Perhaps even bigger than in skills might be the gap in understanding. Interviewees felt that policy makers (particularly when more senior) are often not numerically or technologically literate – an issue that Michael Gove flagged in his Ditchley Annual Lecture in June 2020.⁹⁴ At the same time, many said that technologists often have too little grasp of the realities of policy making to bridge the gap in the other direction. As data and algorithms play an increasingly prominent role in decision making, training in how to communicate (for analysts) and interpret or interrogate the results of analysis (for policy makers) will be increasingly important.*

* There is no easy way of communicating uncertainty in data visualisations, for instance, which can lead decision makers astray – especially when they are presented with more compelling, immersive simulations in 3D or virtual reality.

Policy makers, in particular, need to be critical users of models and algorithmic systems, able to challenge and understand the limitations of data and the nuances of analysis, to make the best-informed decisions on the basis of it. Data does not offer a complete and objective 'truth', after all. The streams of data that government increasingly works with provide only a part of the picture and need to be combined with more qualitative approaches to investigating and understanding problems to ensure that crucial information is not missed.⁹⁵ Data reflects the biases of those who collect and analyse it – choices about what to measure and how to measure it play a significant role in determining outcomes – and the biases that are embedded in our institutions and society. This has been apparent in debates about predictive policing and the use of algorithms in the criminal justice system, where automating decisions based on historical examples can lead to discrimination against poorer and minority communities.⁹⁶ Government needs to make sure its use of data does not deepen existing inequalities, with teams and departments conscious of how any systems they do use affect different communities, and act to minimise any discriminatory impact.⁹⁷

This is also important to maintain public trust and avoid a backlash against the use of data and digital technologies, which could stand in the way of realising many of the benefits they offer. The blunders committed in government's attempt to use an algorithm to decide A-level results must not be repeated.⁹⁸ Government needs to ensure that the oversight of new approaches is robust to avoid significant failures, improve its understanding of public opinion on when and where algorithms and other data-driven approaches are seen as appropriate to inform decisions about their use,⁹⁹ be more open about how it is using them already to improve public trust,¹⁰⁰ and ensure there are always mechanisms for redress when people feel a decision is unjust.¹⁰¹

External involvement

For the most part, the opportunities discussed above involve government looking inward, using technology to enhance internal processes and capabilities to improve policy making. But policy making also fails to capitalise on the knowledge and capabilities of individuals and organisations outside government, or properly take account of the reality of people's lives. It draws on a narrow range of expertise, shows little appetite for wider public participation, and remains too closed to the insights of business and civil society.

Yet the potential to draw on the 'collective intelligence' of society has never been so great. Using digital technology, government should be able to harness external knowledge, expertise and capacity and bring the public into policy design and decision making processes more effectively, helping develop more robust solutions to issues.

Harnessing external knowledge and expertise

Accessing a wider range of perspectives

In interviews about policy making, civil servants have typically described their engagement with experts as limited to the same relatively small groups of individuals. While the creation of the What Works Network, dedicated advisory groups and committees (the Scientific Advisory Group for Emergencies, or SAGE, is currently the most high profile of these), secondment programmes and more formalised expert networks has deepened government's engagement with academia,¹⁰² government still risks overlooking lots of external expert advice, perspectives from those working 'on the ground' and comparable international experiences.

Improvements in connectivity should help, making it easier to identify experts who can contribute to policy making in particular areas.* In some cases, they may be academics, perhaps identified by their profiles on Twitter, or on expert discovery platforms like Google Scholar. In others, they might be people with particular professional experience, found on LinkedIn or other professional networking sites. They could also be people from other governments: online platform Apolitical allows civil servants to connect with policy makers around the world to discuss approaches to common problems, outside of diplomatic channels and multilateral forums.

Technology can also make it easier to identify and draw on published work conducted outside government that might be relevant. Policy makers already use Twitter to follow developments in their fields, but government could also use AI to scan for relevant research, scraping the home pages of useful organisations and uploads to academic publishing sites to source documents and even summarise them to make them more digestible for time-strapped policy makers. Advances in machine translation mean that policy makers could do this for material published internationally, too.

Improving consultations to inform policy development

Government could also transform how it runs consultations using technology. Interviewees pointed to a range of current shortcomings: consultations are often too narrow in their reach and constraining in the way they are presented; for civil servants, the outputs of consultations are often difficult to interpret or take on board; and individuals who contribute rarely know what, if any, impact their involvement has had. New technology could help address some of these issues.

First, government could use technology to promote consultations more effectively. Anyone can respond to a consultation – but only if they know it is happening. Policy teams could use the approaches discussed above to identify a wider pool of individuals and organisations with knowledge of a subject area, before contacting them to invite them to participate. They could also use online targeting: the same tools that are used to advertise products to us based on our online behaviour could be repurposed to find people who may have something meaningful to contribute, with consultations promoted to individuals searching for, reading articles about and posting on related issues.

* Beth Simone Noveck, who runs New York University's GovLab, wrote about these developments in *Smart Citizens, Smarter State: The technologies of expertise and the future of governing*, Harvard University Press, 2015.

Second, technology could be used to help civil servants interpret and synthesise responses to consultations – even in their hundreds of thousands or millions. In the UK, departments are already moving to a model where consultation responses are initially processed automatically to categorise them (based on whether they are from individuals, businesses, NGOs or campaigns) and draw out key themes and questions. DIT did this with more than half a million responses to consultations on trade negotiations last year, using a computer system to pull out key points (often more accurately than a person would) to support more detailed analysis by civil servants.¹⁰³

Third, government could communicate with participants more effectively during the consultation process. Replies to contributors, setting out what impact their contribution has had, could be generated automatically and tailored to the original input (personalised to the individual, even) in a way that civil servants would not have time for. The governments of Scotland and Jersey have gone a step further, using chatbots on Facebook Messenger to engage people in dialogue on issues such as the environment and social security in place of traditional consultations; soliciting responses to questions, offering users fact-checked information where appropriate, and giving them feedback about how their opinions compare with those of other users.¹⁰⁴

Involving members of the public

Understanding the opinions and experiences of citizens

As well as lacking in expert input, interviewees felt that policy making often happens blind to the values, opinions and day-to-day experiences of the general public.* This can result in policy failure when initiatives are implemented that prove unpopular or misaligned with people's actual problems and concerns. Some departments do track public attitudes, and an increasing emphasis on user research and digital design principles is a step in the right direction, but these practices are still not widespread. Other technology-enabled approaches are increasingly possible to supplement and enhance this work.

Many interviewees pointed out that government could make better use of social media, applying AI to tweets and other posts to establish what the primary concerns of the public are, work out how people feel about particular issues, and establish how this changes over time as policies are implemented, breaking the results down by demographic. The United Nations, for example, analysed more than 500 million tweets to ascertain which countries (and people of which genders within those countries) were most concerned about various issues when it was developing its Sustainable Development Goals in 2015.¹⁰⁵

Citizens could also be engaged more actively in policy making, particularly on issues that affect them on a day-to-day basis. A number of more specialised platforms now exist for crowdsourcing ideas and enabling discussion and debate to feed into decision making processes. Consul, which has been used by more than 100 political institutions worldwide, including the governments of Argentina and New York City,

* The results of public polls and No.10 focus groups – which have become increasingly common under the Johnson government – can be informative, but these (understandably) have a political rather than policy leaning and focus on high-profile issues.

lets users submit, support and comment on policy proposals on any issue, with the most popular put to local legislatures for a vote.¹⁰⁶ Your Priorities, a platform which has been pioneered by the Icelandic government, allows users to add points 'for' and 'against' submitted proposals that others can then vote up and down, encouraging the development of positions over time.¹⁰⁷ As well as using these platforms to source new ideas, government could use them as an alternative, or supplement, to traditional consultation processes to test its own proposals, working out which are popular and helping identify possible problems in advance.

Perhaps the most high-profile platform is Polis, which underpins vTaiwan – a platform used by the Taiwanese government to identify areas of consensus on controversial issues such as the regulation of ride-sharing services like Uber.¹⁰⁸ Users can submit opinions on pre-determined questions that other users can choose to support (but not comment on). Unlike other platforms, the point of 'upvoting' is not to pick out and promote the most popular opinions, but to identify clusters of people with similar opinions, with the result that it does not matter how many people are on either side of the debate. The system then poses questions to people that it thinks might be able to bridge the gaps between these opinion clusters, with a view to finding statements that everyone agrees with and feeding the outputs into the policy and legislative process.

Enabling public deliberation

The idea that the public should be involved in deliberation on contentious issues, increasing legitimacy for a given course of action, has become increasingly popular in recent years. The most common approach currently, particularly after their success in framing the debate on abortion in Ireland prior to the referendum in May 2018, is to use citizens' assemblies (or 'juries'). The UK parliament has just finished running a citizens' assembly on climate change, and government has promoted further experimentation through its recent Innovation in Democracy Programme.*

There are ways in which technology can facilitate the running of in-person citizens' assemblies, for instance by helping source participants or initial ideas to be fed in more easily,¹⁰⁹ but the most significant recent development has been citizens' assemblies being run online – something that was being experimented with before the coronavirus pandemic, but has since become necessary as a result of social distancing measures. Experience so far indicates that conducting citizens' assemblies over video link produces largely the same interactions and outcomes as having people in a room together, although more research still needs to be done.¹¹⁰ Online citizens' assemblies could also be run at a much greater scale, helping address concerns around inclusivity given the low numbers of participants.

Government could also go one step beyond inviting members of the public to deliberate on issues and come to conclusions, and ask them to design solutions in more detail. A number of councils in the UK have experimented with getting citizens involved in decision making on spending, especially in Scotland, with Glasgow and Fife

* A handbook capturing the lessons learned from the Innovations in Democracy Programme was published in June 2020, along with case studies of each of the citizens' assemblies that were run. While it is primarily targeted at local government, lots will still be relevant to policy makers in government departments www.mysociety.org/2020/06/30/citizens-assemblies-are-back-in-handbook-form/

particularly prominent examples.¹¹¹ Other tools allow for the co-drafting of policies and legislation, or what has been called 'wiki democracy': the French parliament has a platform called *Parlement & Citoyens* that enables its members to co-draft legislative proposals with members of the public.¹¹² Technology can also be used to help participants explore options more effectively to inform their contributions to these processes: the Department of Energy and Climate Change's 2050 Energy Calculator is a good example of an interactive tool designed to improve understanding of the trade-offs inherent in a complex policy problem, which could be repurposed for other policy areas and used to support public deliberation.¹¹³

Collaborating to solve problems

Drawing on the capacity of business and civil society

Government could also benefit from involving external actors in addressing problems more actively. It might not always make sense for departments to collect and analyse their own information and develop and implement solutions from scratch. In some instances, collaborating with external individuals and organisations to tackle problems will prove more effective. This already happens to an extent – government commissions research and runs countless procurement rounds – but there is much greater scope for harnessing the collective intelligence of society when everyone is more connected and has easier access to the tools and knowledge to contribute.

Data collected and held by private companies and other organisations will often be of a higher quality and more comprehensive than anything that government holds and could help inform decision making.¹¹⁴ For instance, decisions about transport, such as whether and where to create new bike lanes, could be improved by supplementing government data with information from Waze on traffic information and Strava on popular cycle routes. In recent months, government has joined forces with companies such as O2 and Citymapper to track population movements and improve its understanding of compliance with a nationwide 'lockdown'. Charities also often hold useful data: Citizens Advice data on visits to its website could be used to improve government's understanding of the public's key concerns during the coronavirus pandemic, for example, and where more public information might be needed.¹¹⁵ But this sort of collaboration to expand government's understanding of society and inform policy making does not appear to be happening as often as it could.

Departments could also make it easier for citizens to help collect data where government's may not be adequate. Some local councils have supported the crowdsourcing of air pollution data, for example, and governments like Taiwan's make extensive use of crowdsourcing to improve their services.¹¹⁶ Government could facilitate wider citizen e-monitoring of services, which has been found to result in better outcomes across a range of metrics, improving delivery performance, minimising inefficiencies and making officials more likely to accept responsibility for problems.¹¹⁷ Multiple councils use mySociety's FixMyStreet app to crowdsource the reporting of everyday problems like potholes and broken street lights, but this could be more widespread.¹¹⁸

Enabling others to solve problems

Government should also be more open with its own data and analysis. As Michael Gove observed in his Ditchley Annual Lecture in June 2020, greater openness can improve scrutiny of government work to increase the chances that problems are picked up, as well as helping establish which policy initiatives are more or less successful. But greater openness could also enable people outside government to develop their own analyses of and solutions to problems, plugging gaps and creating benefits that government may not have the capacity or capability to realise itself. Deloitte estimated in 2017 that Transport for London (TfL) opening up its data to external app developers such as Citymapper had contributed up to £130m per year to the London economy, by both saving time for Londoners and reducing costs for TfL.¹¹⁹ The Geospatial Commission has estimated that better use of geospatial data alone could unlock £6bn–£11bn of economic value.¹²⁰

Making data publicly available is preferable, where appropriate, since people may find uses that would not occur to policy makers, and government has published many thousands of datasets online to take advantage of this. But many are not especially useful – or even interpretable for anyone apart from subject experts – and they are still too often in formats that are not machine-readable. To improve, government will need to do more to identify and prioritise useful datasets to share (and in what manner to share them),* through discussion with those who would look to use them.¹²¹ Government could stimulate rapid progress in some areas simply by releasing even a subset of its data: making a tiny proportion of the NHS’s medical imagery available could accelerate progress in automated medical screening, for instance, where advances are largely held back by lack of data.¹²² Drawing on advances in technology for sharing data should ensure that this can happen while respecting privacy.

Government might also want to consider other ways of supporting people to develop useful solutions to problems. Running competitions and ‘challenges’ online, using its own channels (the GovTech Catalyst, which uses a £20m fund to support innovators to solve problems that have been crowdsourced from departments, is the best example of this) or existing websites like Kaggle – which would serve as a good platform for inviting people to tackle data science challenges faced by departments – is one option. It could also offer more direct support, for instance by providing access to computing power or technical expertise, or online promotion, to ‘civic tech’ initiatives that people set up organically to tackle problems, like the mutual aid groups that were created by citizens across the country at the start of the coronavirus pandemic.

Challenges to address

Technology cannot revolutionise government’s engagement with the public and other actors on its own. Government will also need to change its attitude and general approach, otherwise all these techniques do is provide the props for more elaborate ‘engagement theatre’ – where government goes through the motions of involving

* Government will need to find ways to balance the benefits of sharing data openly with the opportunity for monetising some of its data assets: giving away valuable data that it has collected at its own expense for large commercial organisations to benefit from is unlikely to be the best approach in many cases – for example with respect to medical data.

the public because it feels as though it should, without taking it seriously.* Improved, technology-enabled consultations, for example, will still have little value if they are run late in the policy process, after options have been narrowed down or decisions have broadly been made. As we have observed before in our work on *Smarter Engagement*,¹²³ it is also important that policy makers are clear about what the purpose of public participation is and what its impact will be – and that they communicate the impact contributions have had afterwards – so those involved do not become disillusioned.

Public participation enabled by digital technology also raises concerns around inclusivity. Using social media to track public opinion, for example, risks creating a picture that is not representative of the population as a whole, since not everyone uses social media, and some of those that do are much more vocal than others. (Interviewees also stressed the risks in platform drift, where a change in policy on the part of social media companies results in some types of post being promoted more than others in a way that does not reflect public opinion.) Newer platforms are likely to have an even narrower range of participants and be used by smaller numbers, increasing their susceptibility to hijack by an organised minority (although some platforms, such as Polis, are designed to guard against this). Many people in the UK struggle to get online at all, with the result that most processes, to be truly inclusive, will require a complementary offline component.¹²⁴ Any effective engagement process will need to take into account the benefits and drawbacks of different online and offline approaches, and government will need to learn (particularly given the novelty of many online approaches) how to strike the right balance over time.

Government itself may not be best placed to do this, however. Interviewees suggested that while it makes sense for government to run consultations, more open-ended and deliberative engagement processes might be better run by an arm's length body, to improve public trust in the process. We have argued previously that France's Commission Nationale du Débat Public would serve as a good model for a body that involves the public in decisions on infrastructure, but the remit of a UK equivalent could be drawn more widely.¹²⁵

One priority for this body should be to lead a public conversation about how government should use data and technology in the future. The wider sharing of personal data within government and between government and external organisations, for example, will (understandably, given breaches in the past) raise concerns about privacy. The improvements in privacy-enhancing technologies discussed above might be able to offer technical solutions in many cases, and some parts of government are already relatively trusted by the public to share data appropriately.¹²⁶ But many civil society groups and members of the public are still cautious – as has been evident in the mixed response to the NHS track and trace app.

* The term 'engagement theatre' has been used recently in discussion of Google's much criticised attempts to engage the Toronto public in the smart city project being run by its subsidiary, Sidewalk Labs. See <https://placesjournal.org/article/post-it-note-city/>

Many are also concerned about surveillance. As digital technologies increase the potential for monitoring and analysing the world around us, so too do they offer potential for monitoring populations. The coronavirus pandemic poses these questions starkly: with social media, phone location, payments data and more, government has had a myriad of options when it comes to monitoring compliance with guidance, laws and quarantine instructions. While it has chosen *not* to exploit these, for the most part, other countries have.¹²⁷ Government will need to work closely with the public to ensure that its use of data reflects these concerns and builds trust, rather than undermines it.

3. Conclusions and recommendations

Digital technologies offer huge potential for policy makers. They make possible more effective management of knowledge and improved collaboration; more comprehensive analysis of problems and possible solutions, and of their ultimate effectiveness; and better engagement with external actors to help understand public opinion and draw on the 'collective intelligence' of society.

In some cases, departments are already exploring this potential, finding new ways of collaborating with each other, of sharing, collecting and using data, of drawing on external expertise and more. But this exploration is not happening fast enough, or at sufficient scale. Policy making needs to adapt at pace to keep up with changes in the technology landscape, at the same time as managing the limitations of new approaches and addressing concerns around ethics, privacy and more.

Government needs to make improvements in five key areas to move forward:

Co-ordinating and incentivising future work

Government needs to better understand the work that is already being done to realise the opportunities offered by digital technologies, find ways of incentivising further experimentation with new approaches, and evaluate the success of different techniques to develop an understanding of what works that will help it drive improvement in policy making over time.

- **The Government Digital Service (GDS) should be responsible for monitoring, evaluating and promoting the use of new, digitally enabled approaches to policy making**

Its innovation team's remit should be expanded to include a more explicit consideration of the innovative use of technology for policy making, keeping track of what does and does not work, and supporting teams across government to take advantage of successful techniques – especially if it spots gaps where new techniques could reap significant rewards, but opportunities are not currently being realised.

- **Teams and departments should be required to publish all non-sensitive research they conduct, as well as evaluations of all their policies, including information about any new techniques they use**

This should help GDS monitor existing work, with the outputs also recorded in a register that others in government (and outside) can refer to. The commitment to mandate the open publication of research outputs funded by the government in the recent UK Research and Development Roadmap is a significant step in the right direction.¹²⁸

- **The Treasury should attach conditions to spending that require departments to use evidence effectively, and make changes to the business case process to incentivise greater experimentation rather than guarding against risk**

Funding is a common barrier to digital transformation, as we have observed before.¹²⁹ Plans to experiment with new techniques that do not have easily quantifiable benefits do not play well in business cases. HMT is currently working with the What Works Network to explore ways of attaching conditions to spending that encourage departments to use evidence more effectively; it should explore ways to incentivise more innovative work similarly.

Unblocking barriers

Problems with the management of knowledge and data within government act as a significant barrier, both to effective policy making in the here and now – given the difficulties of finding relevant information and colleagues – and to the realisation of the opportunities offered by new technologies in future – since the effective management of good quality data underpins all of these. Government has been unwilling to confront this in the past, but it needs to ‘fix the plumbing’ urgently.

- **Government needs to appoint a chief data officer with responsibility for co-ordinating the different organisations working in government’s data landscape**

Government originally committed itself to appointing a chief data officer for the whole of government in 2017, but this appointment still has not been made, with reasons for the delay unclear. This has left a significant gap in accountability for managing government’s data problems, which needs to be filled as soon as possible.

- **The chief data officer should lead work on and drive ongoing investment in efforts to improve data quality and tackle problems with government’s legacy IT systems**

Recently announced initiatives, such as plans to explore the possibility of an ‘integrated data platform’ for government, are positive, but will not be sufficient to address the scale of the issues around data quality and legacy IT.¹³⁰ Significant investment will be needed over a number of years to turn the situation around. As a starting point, government needs to develop a more comprehensive picture of the information it holds and where, in what formats and of what quality, what the information is used for and when, and who it is shared with, to help understand the landscape and prioritise future work.

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- **The chief data officer must work with the Data Standards Authority to develop a set of standards for managing data and information, to be applied and enforced across government**

These standards should underpin the development of common platforms that allow for effective knowledge management and collaboration across departmental boundaries, and between different levels of government.

Strengthening oversight

Ensuring that work with data and new technologies is carried out in a way that addresses ethical concerns and mitigates any adverse impacts will be crucial to create an environment conducive to widespread adoption.

- **The Centre for Data Ethics and Innovation should work with practitioners to develop practical ethical guidance for context-specific applications of digital technology, which is easy for practitioners to use**

For this, it should build on existing material produced in the UK (the Data Ethics Framework, in particular) and internationally (the Organisation for Economic Co-operation and Development's principles for ethical AI being a prominent example), collaborating with teams to establish and address their key concerns. This is not just to stop things going wrong, but to help teams know what they *are* allowed to do under different circumstances.

- **Government should increase funding for the Information Commissioner's Office (ICO), enabling it to extend its remit and oversee government's use of data and digital technologies properly, ensuring it is held accountable – including by providing a route for redress for anyone adversely affected**

The ICO is already overstretched and would struggle in its current form to provide effective oversight as government expands its use of data and technology. But its thinking in this area is already advanced, and strengthening an already established regulator should be more straightforward than creating a new one.

Improving skills

The government is keen to push ahead with a programme of civil service reform, and has skills very much in its sights. There are already training programmes to improve digital skills in government – the 12-week Data Science Accelerator, for example, gives analysts from across the public sector the opportunity to develop their data science capabilities in the process of tackling a chosen problem.¹³¹ But much more can be done, especially to improve the statistical literacy of policy makers, which will be increasingly important as data and modelling play a larger role in policy making.

- **Civil Service HR should work with the relevant professions to plug key skills gaps, prioritising recruitment for data architects and modelling specialists, and for other areas of expertise in line with GDS's forthcoming Data Science Capability Audit**

This work could be supported by better information on the government workforce, allowing government to monitor and work to fill gaps in expertise in different departments as they arise on an ongoing basis.

- **GDS should work with the policy profession to ensure that training programmes reflect advances in technology, the opportunities these offer, the latest understanding of what works and the ethical challenges to be aware of**

This would help ensure that the understanding GDS develops of new techniques is shared effectively, particularly to policy makers who would otherwise be less aware of the opportunities available to them. The content of this training would need to be updated regularly.

- **More emphasis should be placed on numerical and statistical literacy in the recruitment and training of policy officials**

Testing for numerical and technological literacy should be made a stronger component for applications to the generalist fast stream to ensure government's pipeline of future leaders have these skills, and in recruitment to the senior civil service. Analysts should also be encouraged to explore new ways of communicating the results of quantitative analysis to policy makers more effectively, to help aid understanding from the other direction.

- **Departments should make wider use of multidisciplinary teams, ensuring that a wide range of perspectives are brought to bear on problems from the start, and improving communication between different professions**

Civil servants should also be encouraged to attend meet-ups that cross professional boundaries: OneTeamGov and the IfG's Data Bites series are both continuing online during the coronavirus pandemic, for example.

Working in the open

Ultimately, government's ability to capitalise on the opportunities offered by digital technologies will depend on it avoiding a backlash against new approaches. Greater openness should help improve public trust, at the same time as creating opportunities for government to benefit from the expertise and capabilities of external actors when addressing policy problems.

- **Government should set up a new body focused on public engagement, to lead efforts to involve the public in policy making more formally**

A key priority for this body, in the near term, should be to enable public deliberation and debate on how and when government should use data and technology in the future, as a starting point for ensuring government maintains public trust as it explores new opportunities. There are already some examples of similar initiatives that the body could build on, for instance discussions about the National Data Guardian and the Wellcome Trust's Understanding Patient Data programme.¹³² Its wider work should

ensure that the views and experiences of the public are effectively fed into efforts to tackle problems across the policy spectrum.

- **Government should be as transparent as possible, publishing research, analysis and datasets that others can draw on and scrutinise for mutual benefit, and details of the algorithms and models it uses to improve accountability**

As well as being more transparent about where it is using new approaches, government should more effectively communicate the reasons underlying its decisions and the trade-offs involved, to strengthen public trust.

- **Government should support promising 'social innovation' projects run by individuals and civil society groups with seed funding, access to computing power, technical support and promotion**

Combined with the more open engagement of external actors in policy discussions more generally, this should help bring society's collective intelligence to bear on policy problems. Even with the help of better data and more advanced technology, government will not be able to tackle most issues – and especially more complex policy challenges – on its own. It needs to draw on advances in connectivity not only to expand its own capabilities, but to harness those of others more effectively.

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