

“Making the most of big data means adapting to its unique opportunities and challenges...”

THE DATA DIVIDEND

Max Wind-Cowie
Rohit Lekhi

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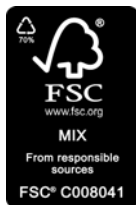
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All errors, omissions and mistakes remain, of course, entirely my own.

Max Wind-Cowie
March 2012

Executive summary

The transparency agenda is a cornerstone of the Coalition Government's ambitions for Britain. It is at the centre of efforts to improve efficiency, build trust in government and public agencies, and reduce costs overall. Much of the work that has been done on the benefits of transparency of data has focused on the impact this will have on the public and the potential for civil society to engage with government and to use data to transform service delivery. This is – obviously – a vital benefit of greater data transparency, but we must also emphasise the gains that can be made by exploiting the insight provided by data to drive decision-making *within* public services. What is more, if the transparency agenda is to take root in the culture of public services, public servants themselves must be shown the benefits to their work of sharing and using data well. Too often – as in the debate about spending transparency and local government – the focus has been placed on ‘checking up’ on public servants; this is important, but it must be matched with discernable benefits for those who are charged with spending public money and delivering public services.

In order for big data to play their part in transforming the state, public servants need to be skilled and confident users. The right mix of technology and culture change within public services can make data a tool for public servants, rather than simply a tool for complaint. This report looks at the uses of big data, the benefits to be gained from better use, and the challenges to effective deployment of data within public services. We do not oppose the ambitions of transparency and public and civil engagement – but we argue that this must be accompanied by radical changes to how government collects and collates data so as to ensure that public servants are part of the story too.

Radical changes to the way government collects and collates data

Data in the palm of your hand

Frontline public services, such as those for housing and social care, should learn from experiments in Berlin with handheld data collection and access devices. These devices give constant, mobile access to databases, enabling public servants to understand the needs of individuals and families, track their previous contact and check for problems and underlying issues that may have been recorded by other agencies. This has the potential massively to enhance the relationship between service providers and ‘clients’. But it also has another benefit. Public servants are able to record new, fresh, real-time information – improving the quality of the data themselves.

Make it modular

Modularity will be key to ensuring that big data are harnessed properly by government. The platforms that government uses to collate, store and make accessible its data are integral to how public servants ultimately use those data. What is more, a modular approach to involving the public in the improvement of public service outcomes is also made possible by data. The dynamics of service improvement through data use draw equally from technological and democratic sources. Government will not be able to encourage responsibility in public data use by restricting available data, but by including the public in those decisions where its perspective can drive improvements. For example, releasing budgetary information on local councils, as the Department for Communities and Local Government (DCLG) has recently proposed to do partially,¹ can ‘enable a dialogue to begin in the local community about council budgeting and what the council can and cannot do’.²

Invest in data stores

The London Data Store provides the model for making big data useful and transparent. Government must invest in ensuring that every unitary authority and/or super output area has a single

platform through which to publish big data generated by public agencies in the area. This will enable localised innovation, will engage the ‘civic long tail’ and will drive levels of oversight and ‘armchair auditing’. Overall, government could equip each unitary authority in England and Wales with a London Data Store platform for less than £3 million.³

Cross-curriculum data teaching

The UK does not have a sufficient skill base in data analysis. Primarily this is problematic because of the potential impact on the economy, competitiveness and levels of productivity. However, it also has a profound restraining impact on the UK’s ability to make the most of big data and to capitalise on the transparency of data. Resolving these issues will take time. Government must invest in cross-curriculum data analysis teaching in schools – learning from the SAS UK Curriculum Pathways® programme – to ensure that young people are equipped with quantitative reasoning skills and understand the cross-subject relevance of these skills.

Commission with data in mind

The very least that public bodies should expect from their contractors is that all data generated in the course of their work with them are shared with public servants. The good news is that this is something local authorities, primary care trusts and other public bodies can achieve without relying on central government intervention – it is perfectly possible to write such a requirement into commissioning guidelines and contracts, and to build data sharing into their ongoing relationships with contractors. But a backstop expectation of data sharing should also be built into central government guidance for commissioners and, indeed, into central government’s commissioning processes themselves.

We need a public sector that has a ‘can-do’ attitude to big data, is experimental and inventive about what can be achieved and has the instinct to innovate and to publish. Technology is necessary to making that happen but it is not sufficient. Government must see the value of data, their transformative

potential (many examples of which are described and discussed in this report) or run the risk of becoming ever more remote and redundant to citizens.

There is a vast resource of publicly collected and publicly held data that – if put to use both inside and outside government – have the potential to drive efficiency, better resource allocation and fundamentally improve the delivery of public services. We can effect a radical gear-change and place Britain on a world-class footing in the way we understand and improve citizens’ relationship to the state, but only if we exploit and develop the data we hold.

Coping with big data

Tim Kelsey, the Government’s open data and transparency tsar, believes that big data – used well – can save lives. In a speech at Demos shortly after his appointment, Kelsey claimed that publishing data on the mortality rates of cardiac surgeons led to a steep, identifiable drop in patient deaths. This is the promise of big data.

But delivering on that promise is fraught with difficulties – practical, political and ethical. For a start, the low-hanging fruit represented by fairly straightforward information such as mortality rates is by no means representative of the broader picture of data. Much of what we want to know – and collect some of the information to ascertain – is inherently more complicated, with more complex causal relationships, than is the link between a good surgeon and good outcomes for patients.

Secondarily, a transformative approach to using big data will have to include and involve more than government bureaucrats. The Coalition Government – with its commitment to greater transparency as well as to better data use – wants the public to play a role, becoming armchair auditors and holding the public sector to account. All well and good until we remember the much bemoaned lack of quantitative and analytical skills in our society – the data may well be open but the auditors aren’t fully equipped to respond to it. The ethical problems that big data poses are myriad, too. We saw during

outbreaks of looting over the summer that attitudes to how data can and should be used were heavily divided – with the Government threatening to shut down data-producing networks such as Twitter and the BlackBerry Messenger system in order to safeguard the public while many civil libertarians objected even to the use of those data to inform criminal justice responses.

All in all, while the importance of big data to informing and enhancing government and to involving the public more in policy – by analysing the data they produce and allowing them in to the analytical process – is broadly acknowledged, the route we must take is not. This report, building on structured engagement with policy-makers, technologists, public services and the corporate sector, aims to highlight both the opportunities presented by the age of big data and the problems that must be overcome. Despite the potential pitfalls – and in spite of our scepticism about some of the evangelism for big data and for transparency as catch-all solutions – we remain excited by the potential of data and transparency to transform public services. But the very best rewards for engagement with big data and transparency will only come if the Government approaches these issues with the objective of transformation rather than of improvement – they must become part of the Government’s soul not so as to make better the services we have but so as to play a part in revolutionising how and what services are.

Much has been written about the growing distance between how the public engages with each other, the corporate world and government – and many doom-laden predictions have been made about the degree to which dissatisfaction with the universality, bureaucracy and lack of responsiveness of the public sector will ultimately lead to its demise. The promise of big data and smart transparency is not a sticking-plaster to cover over those cracks, rather it is a government and public sector that leapfrogs in its understanding, communication, delivery and democracy in order once again to be at the forefront of intelligent and popular service provision.

We argue that the Government must use the data it has not just to finesse but to transform.

1 Promises and paradoxes

Many current views of big data conjure up unmanageable flows of information overcoming individuals and organisations. When the Aspen Institute, a renowned US research organisation, held a conference on this topic last year some of the technologists, entrepreneurs and academics participating asked if big data are a ‘tempting seduction best avoided’.⁴ The reasons why expose another concern: some see the force behind big data to be increased storage capacity, not the pursuit of improved knowledge. Indeed, the emergence of big data is too often seen as a purely technological change, subject to the same evolutionary dynamics described by Moore’s Law.⁵

We put forward a different view. It is true that the increasing ubiquity of technologies such as social media, the internet of things and internet-first services means that every interaction leaves an increasing large and persistent trail of data. However, the increasing complexity of our online lives mirrors the increasing complexity of lived experience, and the complexity of the communities and organisations of every level of formality in which we now participate.

Legitimacy and effectiveness

Data overload

The public’s considerable discomfort over government attempts to harness the power of big data has been exacerbated by a number of high-profile failures to maintain even the most basic standards of data security. Prominent among these was the loss of personal details of 25 million people – two-fifths of the UK population – when an HM Revenue & Customs (HMRC) employee posted discs in error to the National Audit Office through standard postage.⁶ Such breaches represent the failure

of government to act as a responsible steward of data that cannot simply be addressed by such cursory organisational measures as requiring a senior manager to sign off on transfers of data, which was the HMRC's initial response. Indeed, the episode highlights that it is organisations and not systems that must respond to the challenges of big data, that such a response must be holistic, and that these challenges are particularly thorny for government.

Box 1

Liberating the NHS or transforming health care?

The NHS has been an early adopter and investor in intelligent data use, and may be most reliant on data-driven services in the future. The way in which the NHS has adapted to big data is notable for its problem-oriented approach, and how it has attempted to balance focusing on the service user with organisational transformation.

Among the most prominent concerns of the NHS is a rapidly ageing population: by 2024 it is predicted that there will be a two-thirds increase in the number of people over 80 years of age in the UK population. Chronic disease is significantly more prevalent among the elderly. For example, one in 35 people aged between 65 and 74 suffer from diabetes, and this figure rises to one in 15 for people aged between 75 and 84, and over one in seven for those aged 85 and above. This will put significant strain on NHS budgets, time and space. There is also a rapidly increasing rate of obesity, which is linked to other chronic diseases: by 2050 it is predicted that 50 per cent of the population will be clinically obese. There is also a rising level of emergency and unplanned admissions to hospitals. Structurally speaking, the NHS will need to increase its productivity and efficiency to cope with this extra strain against a background of rising costs of care and a radically reduced budget.

Underpinning these challenges are low levels of patient engagement in decision-making around health care. Last year's white paper Equity and Excellence: Liberating the NHS called for an 'information revolution' to be fuelled by 'data that are meaningful to patients and clinicians'. It argued strongly that 'information, combined with the right support, is

the key to better care, better outcomes and reduced costs' in the NHS.⁷

One way in which the intelligent use of data might advance this agenda is through predictive modelling techniques, used by risk management systems in other areas, such as property investment. By employing such forms of data analysis, currently prevalent and prospective health risks within certain demographics can be highlighted and made visible to clinicians. Specifically, this could find ground in the improvement of workforce health and well-being. By analysing where the risks are, an organisation can adjust its practice accordingly, as well as target health care advice or provision in order to mitigate potentially harmful effects. This pertains to physical as well as mental health, the idea being that downstream outcomes such as depression or alcoholism can be avoided early on if the risk indicators are visible.

However, the problems of data overload are also particularly pressing in health care, where potential gains for embracing big data may be greatest. This is because many of the advances in data use have been oriented towards enhancing the professional capacity of health care providers. Subsequently, the ways in which providers and policymakers interpret data may not always align with the ways in which patients do. Information relevant to a group of clinicians for improving the quality of cardiac surgery, for instance, may not be relevant to patients trying to take charge of their own personal health. Indeed, this is a key issue of the patient-centred approach, which shifts responsibility for the maintenance of health away from experts alone, towards the individual.

Patients will be encouraged to manage their health actively through making healthier choices in their personal lives. This will impact directly on the role of professionals, drawing them into dialogue with patients and potentially challenging the balance of authority in the provider–user relationship.⁸ Therefore, the issue of targeted data use is important. Information needs to be made relevant and accessible to the right groups in order to be used effectively. The

NHS has recognised that the organisation and implementation of the technology is a vital aspect of successful restructuring, more so than the technology itself.⁹ Indeed the shift that it envisages to a 'patient-led NHS' is a more long-term one, which requires a cultural shift in patients' attitudes.

This is partially acknowledged in the government white paper, which argues that greater access to records improves relationships between doctors and patients, encouraging discussion and involvement in an individual's health care. But this kind of involvement requires knowledge of how to use the data, as well as the motivation and above all the confidence to do so effectively. A more intelligent approach to the use and sharing of real-time data needs to be developed in this regard. A 2010 report from UCL argues that the multiple stakeholders who are involved need more than just digital engagement. They need to be helped to foster 'productive partnerships in which they work towards a shared understanding of the programme and the goal of accommodation (though not necessarily consensus) between their respective "worlds"'.¹⁰

In the NHS, these questions about what data are used for dovetail with issues surrounding how data are integrated into the service's mode of operation. Last July's white paper on health called for central targets to be scrapped and for the 260,000 information returns received by the Department of Health to be drastically reduced.¹¹ However, the Local Public Data Panel, a group of experts championing the release of data and information sharing under the Prime Minister's 'Smarter Government' initiative, argued:

The policy to remove targets and focus on outcomes should not form the basis of decisions about what data should be collected and published – these are two different questions which must be addressed from different perspectives.¹²

This is because data and information about outcomes have the potential to improve choice for service users and accountability in the service, but do not reveal the causes of these outcomes. The mode of operation of and inputs

into a service are equally important from the perspective of accountability.

However, there are signs in the NHS that service provision and the business model can be brought into convergence through data use. The same analytic techniques used to predict future needs can also drive organisational response in areas such as research and workforce development. The use of economic techniques in auditing and quantifying data may help in following up effective lines of medical research and care by analysing outcomes on the basis of ‘cost-effectiveness’, adjusted to fit outcomes in health improvement. Different health services and methods can be indexed and assessed to show their effectiveness by quantifying the improvements in health relative to inputs, potentially strengthening the decision-making processes behind investments in health.¹³ A report from Deloitte LLP, noting the amount of time needed to train medical professionals, drew attention to the use of predictive modelling to anticipate workforce needs.¹⁴ The significance of these techniques, already being piloted by leading NHS divisions, is that more intensive data use can take into account not only the full range of factors affecting the NHS workforce, but also the effects of policy decisions on cost, outcomes and quality.

Data, information and knowledge

In 2007 the Audit Commission made clear what the broad risks of poor quality data are: ‘Information may be misleading, decision-making may be flawed, resources may be wasted, poor service may not be improved, and policy may be ill-founded. There is also a danger that good performance may not be recognised and rewarded.’¹⁵ The Audit Commission has found it necessary to clarify, first, the difference between data, information and knowledge. The definitions it set out are reproduced in table 1. The continued calls for clarity in the literature reflect the fact that these important differences have not yet been taken into account fully in policy.¹⁶ As a result ‘some bodies continue to view data quality and information

Table 1 **The Audit Commission's definitions of data, information and knowledge**

Data	Data are numbers, words or images that have yet to be organised or analysed to answer a specific question.
Information	Produced through processing, manipulating and organising data to answer questions, adding to the knowledge of the receiver.
Knowledge	What is known by a person or persons. Involves interpreting information received, adding relevance and context to clarify the insights the information contains.

Source: Audit Commission¹⁷

management as information technology (IT) issues¹⁸ when it is clear that the pressing issues of adaptation to a data-driven environment for public services are strategic in nature, as successful adaptors in the private sector and increasingly in the public sector have recognised.

The difference between data, information and knowledge is significant because the need to embrace big data coincides with the drive to reinvent relationships between service providers and users. Changes in private sector business models are instructive here, but for unexpected reasons. Put simply, the private sector has so far preferred to use low-quality, high-volume data, distilling large data sets to provide real-time insights for business. Meanwhile, the public sector is looking towards using high-quality data to provide insights and target interventions into intractable social and economic issues, such as neighbourhood crime rates and ageing populations. For companies, failures in data governance are reflected in the balance sheet: for government, such failures are expressed in declining public trust in its competence in solving social problems.

While many new organisational forms and practices in the private sector are enabled by data, information is less important. As participants at the Aspen Institute conference noted, Amazon

doesn't have to make the right recommendations to users of which books to buy. Instead, it can simply preserve the status quo – people are more *likely* to buy books – and whole companies have been built on imprecise data models when trying to follow Amazon's example.¹⁹ Similarly, commentators have argued that the great expansion of data in local government is yet to be accompanied by a corresponding increase in information, and so 'the much-heralded transformation in the use of information to drive improvements in services has seemingly failed to materialize'.²⁰

Systems and organisations

One reason why our thinking on big data should shift from a narrow focus on IT to organisational strategy is that the infrastructure to support a move towards data-driven services is in many ways exemplary in the UK. The UK leads the world in adoption of technology, with 70 per cent of households connected to the internet in 2009, and rapid gains in the use of online e-government services in the last decade.²¹ The UK Government spends a considerably higher amount on IT than the USA and many major European countries per capita, and accounts for 22 per cent of overall public sector IT spending in Europe.²²

However, this is not to say that this capacity is always used effectively, or that money is spent wisely. Indeed, an investigation carried out by the *Independent* found that the previous government spent £26 billion on projects that have been scrapped, run over budget by millions of pounds, or suffered chronic delays in delivery.²³ Research has shown that the pattern of organisational adaptation and IT adoption follows countervailing centralising and decentralising dynamics.²⁴ The same dynamics are also in play in government IT management. The current Chief Information Officer Council, responsible for juggling 'IT-enabled business change' and 'the transformation of government',²⁵ exerts only informal central power over the IT planning and management activities of departments.²⁶ This means that central government is not able to make savings on

the infrastructure supporting a shift towards big data, where there are clear economies of scale. However, this year's government IT strategy showed encouraging signs of alignment between procurement of systems and adoption of data. It signalled that the 'oligopoly of large suppliers that monopolise its IT provision' will be broken down to make room for the involvement of SMEs.²⁷

The language of this new approach bears the hallmarks of an approach that combines two different strands of thinking on IT systems: combining an infrastructural 'platform' with an 'agile' approach. For government, developing such infrastructural platforms is nothing new: open-source pioneer Tim O'Reilly has described the interstate highway system in the USA created after the 1956 Federal-Aid Highway Act as a platform investment that was subsequently built on by corporate and citizen users to develop, for example, inter-state logistics.²⁸ The term 'IT platform' is used to describe a general-purpose technology that provides particular capabilities. A new field of research has grown around the fact that 'the adoption of an innovative IT platform is essentially an investment in a new organizational capability, and such investments are largely irreversible due to the tight coupling of technology and organization'.²⁹ An 'agile approach' to IT development is one that embraces changing requirements, continuous delivery and collaboration.³⁰ The Institute for Government has extrapolated these concepts into principles for government IT procurement, which are worth reviewing (table 2).

It should be noted that both concepts emerged from software development. With respect to agile, some have raised concerns about the translation of project management philosophies for software into a means for the procurement and implementation of IT systems. Indeed, corporate IT lawyer Alistair Maughan has recently argued flatly that agile:

*won't work in government. Departmental budgets are managed very tightly, and they must be approved. Agile implies that charges for time and materials should be open ended. Government departments won't accept that.*³¹

Table 2 **The Institute for Government's definitions of platform and agile**

Platform	A system-wide approach to standardising and simplifying shared elements of government IT. The aim here is to get the basics right by bearing down on costs, reducing duplication and providing some standards and rules to support interoperability.
Agile	An approach to IT that emphasises flexibility, responsiveness to change and innovation. This is achieved through modular and iterative development based on user involvement and feedback.

Source: adapted from J Stephen et al³²

To hold such a view, however, is to swim against the tide. There is evidence of both 'platform' and 'agile' elements in this year's ICT strategy. A standards-based platform will allow for contractors to contribute to government-owned systems on the basis of a common, interoperable 'language', rather than provide complete solutions. This approach will be supported by 'the application of lean and agile methodologies that will reduce waste, be more responsive to changing requirements and reduce the risk of project failure'.³³ Considering the Government's poor track record in managing IT projects, hostility towards the agile approach may simply reflect a culture of risk aversion to be overcome.

Indeed, evidence from Public Administration Select Committee investigations into government IT suggest that the failures of IT are rarely due to technological difficulties; instead the policy driving IT adoption, or its implementation, was usually to blame. Ian Watmore, the UK's first chief information officer, contested the very concept of an 'IT project' – for him, IT is simply one of several ways to 'improve the operation of government' and so most failures can be traced to 'policy problems, business change problems or big-bang implementation'.³⁴

Control and value

Considering the resistance faced by government in its attempts to open up IT procurement and implementation, adapting to big data faces great institutional obstacles because of the combination of technological and organisational disruption it entails. In public services, data pose ‘a political challenge because [they are] the basis on which decisions about interventions from institutions are made’.³⁵ The interaction between the ‘operation of government’ and politics currently plays out at the wrong level for data. The electoral cycle is incompatible with the speed of technological evolution and data-driven processes: the time needed to gain public support is too great, while the window for governance reform which would permit adaptation is too limited.³⁶ Indeed, data-driven initiatives require placing disruption at the heart of the ‘operation of government’, and this requires a shift from management to governance.

These terms are often used interchangeably within the IT industry, but the latter first gained currency in the social sciences in the 1990s, describing the ‘rights, rules, preferences and resources that structure political outcomes’.³⁷ This view emerged from a shift in the social sciences in the 1990s, in which processes gained emphasis over institutions and networks over singular actors³⁸ – a response to the same increase in societal complexity which makes big data a significant force.

Reconfiguring the relationships between service providers and service users through the intelligent use of data poses challenges that cannot be met by management. As departments know their customers better than central government, ‘it makes sense for departments to have a great deal of agency’ with regards to procurement of customer-facing IT systems.³⁹ The centre is also unlikely to be successful in delivering IT projects to support joined-up services. As the Select Committee report argues:

*The failure to re-use and adapt existing systems, the overcapacity in data centres and a lack of interoperability appear symptomatic of more fundamental problems; a lack of effective cross-departmental working and IT governance across Whitehall.*⁴⁰

Moreover, the open-ended nature of data-driven change is antithetical to a management approach. Evaluating and accounting for the benefits of technology has always been notoriously difficult. As economist and Nobel prize winner Robert Solow remarked as early as 1987, ‘You can see computers everywhere but in the productivity statistics.’⁴¹ However, the ‘productivity paradox’ identified by Solow has increasingly shown the ineffectiveness not of technology but of simplistic approaches to measuring productivity – itself a simple measure of outputs per inputs. Standard productivity measures have since adapted to take into account not just the amount of things produced, but the value that is created: with value encompassing ‘quality, timeliness, customization, convenience and other intangibles’.⁴² These measurement issues have meant that government’s own information about IT spending is ‘woefully inadequate’, so that it cannot establish benchmarks for the cost of projects.⁴³

Perhaps the real paradox for intelligent use of data in the public sector is more efficiency and effectiveness has been shown to result from less control over the outcomes of IT initiatives. A recent study of e-government found that transformational projects – those concerned not just to change how services operate but to transform the service itself – begin to pay back twice as quickly because the investment in IT was coupled with organisational changes. Indeed, the more government focused on adapting the IT-enabled service to its users, the greater the benefits to government.⁴⁴ This should at first glance seem obvious – data have a role to play in overcoming an ‘economics of public services’ that the Innovation Unit has described as ‘based on mass consumption, a Fordist approach to production and limited choice’.⁴⁵

Box 2

Control, value and data use in the welfare system

At first glance, the welfare system appears to exemplify the risks of government data initiatives. A 2009 report by the Joseph Rowntree Foundation highlighted the centralisation and automation of the citizen-facing aspects of the welfare system as

a serious issue. Placing the claimant at the mercy of an automated system where they are required to feed in more and more information, the report claims, heightens the risks that abound when privacy is compromised or mistakes are made. There are further potential risks to privacy in how sensitive data are shared with other agencies or private sector bodies.⁴⁶ More broadly, users of and applicants to services are largely unaware of where their data go and how they are used once they are in the system. Further, they are not made aware when a check has been carried out on them, its nature and purpose, who has authorised it, and the extent to which their personal data may have been compromised.

A recent case, in which a woman's records were changed without consent by three different agencies provided an early caution to data-sharing initiatives when it was investigated by the Parliamentary Ombudsman this year. The Ombudsman's report found that not only a single inputting error was compounded across agencies, and each agency blamed the system, but also 'the network of computer systems could not then always locate the source of any errors made'.⁴⁷ Further concerns have been raised about DirectGov, run by the Department for Work and Pensions (DWP) since 2008, which would appear to channel welfare data into a single channel to support both supportive and punitive actions towards claimants.

However the DWP's stewardship of DirectGov is seen to be highly successful. It is held up as a model for data systems that support shared services, providing such services as accounting, debt management, payment resolution, purchase to pay and employee services to other bodies including the Cabinet Office, the Department for Education and the Child Maintenance Enforcement Commission.⁴⁸ Indeed, it provides an example of how giving departments the the autonomy to fit IT systems to the requirements of data governance can work.

More significantly, the paradox in which a focus on users benefits government also seems to be in evidence in the welfare system. At first glance, this seems improbable: much of the

Government's plans in this area focus on curtailing waste and error in the provision of benefits and welfare to work schemes. The £190 billion that is paid out in benefits and tax credits is under severe scrutiny, and the emphasis of accountability is on the issue of overspend, administrative cost, fraudulent claims and other forms of waste.⁴⁹ However, data relating to these issues are to be routinely made available, so that errors are uncovered. While this will increase pressure on claimants, it will also enable them to take control of the records held about them, mitigating the kind of errors that led to the Parliamentary Ombudsman's investigation this year. Meanwhile, performance measurement systems link together different types of performance data in order to present the relationship between inputs and outputs for contracted services. In this way the effectiveness (or lack thereof) of providers and their models can be presented and assessed. In this form, data become information that can enhance accountability, on the condition that it is complete, accurate and open to scrutiny.

How much service providers will give such information to the public, and how much the public will use this information to hold providers to account, requires establishing a framework in which open data are the norm. Such a framework will be explored in the next section.

2 Data, knowledge and co-production

Participation

How technologically-enabled government and democracy might work together is an area of significant scholarly interest. The greatest potential democratic advantage of data use is that when the relationships between citizen and state are reframed through open processes, themselves catalysed through open data, they can become pragmatic and problem-oriented.⁵⁰ Wikipedia is a highly visible example of how discussion can generate action. In both its content-creation and editorial components, ‘consensus gradually forms from a mass of divergent views and agendas with minimal central control’.⁵¹ This process is paralleled in the deliberative aspects of democratic life. In his stark predictions about the impact of technology on democracy, sociologist Jurgen Habermas was comforted by the observation that, unlike technological systems, democratic societies were still concerned with the practices of communication rather than the technologies of control.⁵² Habermas insisted that people could not be treated as things, as the communicative processes used by people to coordinate their actions require understanding rather than manipulation – and the *achievement* of shared norms is what gives democracy the productive (and ultimately legally binding) force to solve social problems.⁵³ As the Greater London Authority’s Director of Digital Projects Emer Coleman has recognised, Habermas’ ideal view of how public deliberation should work bears a striking similarity to some of the grander ambitions of e-government initiatives in the past decade:

Virtually as many people express opinions as receive them. Public communications are so organized that there is a chance immediately and effectively to reply to any opinion expressed in public. Authoritative

*institutions do not penetrate the public, which is thus more or less autonomous in its operations.*⁵⁴

Similar themes emerge from the recommendations of Nesta's report *Radical Efficiency*. It suggests that service providers must cultivate 'empathy' with users. Having a manifest understanding of what users need incentivises accountability among service providers, and the resulting effectiveness of interventions by public services incentivises engagement among users.⁵⁵

However, governance is a question of where and how engagement with users is built in to the system. As the Work Foundation has argued, 'Discerning public preferences is notoriously difficult and there are dangers in relying on what uninformed public states about what it wants provided.'⁵⁶ Data can be a profoundly undemocratic force when they do not translate into information and knowledge. The sheer volume of data, and their varying quality, has led democratic theorists to recognise that individuals tune in to 'a few gatherers and transmitters of information and mould them into a personal information-acquisition system'.⁵⁷ In public services, meanwhile, public preferences must be met in the light of the 'sheer technical difficulty of what we are trying to do in the public sphere', with increasing 'boundary problems' over who is responsible for multifaceted social problems.⁵⁸ Increased complexity – and the mass of data that results from it – therefore points towards a more cooperative relationship between the governed and the governing. Neither party can be assumed to have perfect knowledge about the needs of society. Beth Noveck, who led President Barack Obama's Open Government Initiative and has recently been recruited to share her expertise with the UK government,⁵⁹ urges that governance models that concentrate decision-making in the hands of a few – creating a 'single point of failure' – cannot adapt to the fact that 'professionals do not have a monopoly on skills and expertise'.⁶⁰

These problems have proved especially trying for the health service, which in many ways has embraced big data most readily. From a democratic point of view, it is understandable why the National Institute for Clinical Excellence (NICE) is considered

exemplary among other medical systems, but is the subject of frequent clinical and public criticism. In its role appraising the clinical effectiveness and cost of medical technologies, NICE's democratic responsibilities are to hold the NHS to account for the use of public funds in subsequent investment and use. Criticisms often arise from its inability to respond adequately to health issues of public concern; its decisions on breast cancer, for example, were pre-empted by former Health Secretary Patricia Hewitt in 2005⁶¹ and criticised extensively by a select committee in 2009.⁶² It is charged to act *on behalf* of user interest, and so much of its work is guided by an 'attempt to aggregate and respond to national priorities'.⁶³ In an attempt to make universal and equitable decisions, therefore, it can overlook the local and particular. From the perspective of data, the findings of a 2007/08 Health Committee are more troubling for a body that is also responsible for providing guidance to the medical profession. Appraisal processes were found often to be under-informed in their comprehensiveness, analysis of potential benefits to society and access to information.⁶⁴

Harnessing the democratic potential of data therefore requires two types of governance, reflecting the simultaneous centralising and decentralising dynamics of change brought about by data. First, co-production requires a negotiated relationship between the data that can be collected and how they are used to represent the identity of service users. With the exception of some encouraging new policy initiatives, this 'relationship tips in favour of the data holder, who often has the means of coercion to exploit our desire for convenience and the benefits sharing data afford'.⁶⁵ For this reason, the ways in which data are collected and stored set the terms for how much they can generate co-production, not the usefulness of the data for achieving agreed social goals. Second, the Government must create a structure for the involvement of users or, as open-source visionary Tim O'Reilly has described it, an 'architecture of participation'.⁶⁶ This is vital because – as the recent history of NICE shows – the information needed to provide a public service, and the capabilities to put this information to use, are shared between providers and users.

Identity

The private sector's use of data also demonstrates how the use of data creates a 'proxy' identity for individuals, which has so far been significantly determined by how the technology has been used. As a Demos report has identified, the logging of consumer behaviour through the use of customer loyalty cards, information on online behaviour, and tracked responses to marketing campaigns 'builds trust and business by emphasising choice and consent' by explicitly emphasising that data collection is an optional means of providing enhanced products and services to the customer.⁶⁷ The simultaneous process of categorisation of customers is the implicit benefit to the business, and this categorisation has been hard-wired into the business model, perhaps most successfully by Tesco. The trade-off between business and consumer is essentially consent to collect data in exchange for convenience, mediated through a reconstructed picture of the consumer accurate enough to make recommendations on products and services, but not so accurate as to threaten the consumer's sense of identity. As participants at the Aspen Conference noted, this technology-driven approach tends to yield around 2 per cent of useable data, but also generates a market for intermediaries to 'prune' the data collected. Stefaan Verhulst, chief of research at the technology and public policy-oriented Markle Foundation, commented, 'the more abundance, the more need for mediation'.⁶⁸

In the public sector, the incentive structures around data collection are different. The broader gains drawn from data use must be explicit because of performance measurement and public opinion. As the introduction to this section has detailed, furthermore, digital identities cannot afford to be approximate when the purpose of data use is to address needs. Polling by Ipsos MORI found that citizens prefer to connect with public services through a mix of new and traditional 'channels'.⁶⁹

This kind of behaviour is unique neither to public services – as the same patterns are found in the private sector – nor merely to data-driven services. We should expect that the diversity of contacts between service users and providers matches the variety of public services offered and the complexity of everyday life. However, in a data-rich environment, such

channels are as likely to be human as they are to be technological. Service users' employers, family and friends acting on their behalf are almost as likely to use e-government services as users themselves.⁷⁰ There are also examples of service providers successfully reaching out to users through intermediaries – and such initiatives are placed to deliver the greatest gains of data-driven services. The increasing strain placed on the health service by an ageing population, noted above, is not limited to the UK. In deprived areas of Berlin, civil servants have increasingly used portable devices connected to database records when visiting care homes for the elderly and hospitals.⁷¹ With an ageing population placing increasing strain on the resources of the health service, data therefore enable commonsense organisational adaptations, which would otherwise be too costly to implement.

Modularity

If data governance takes into account the rights of individuals to represent their identities, the exchanges underlying this process, and the fact that individual identities are mediated through systems and other people, the question remains of determining the principles by which individuals are drawn into data systems. Noveck argues, 'When a policy problem is divided into smaller parts, so that it can be worked on by collaborative teams, the drive towards openness and innovation begins.'⁷² This is the essence of crowd-sourcing, which, as Noveck carefully puts it, has been proven to 'extend the capacity' of employees in private sector firms.

A modular approach to involving the public in the improvement of public service outcomes is also made possible by data. The dynamics of service improvement through data use draw equally from technological and democratic sources. From the technological perspective, identifying problems in service delivery can be seen as a similar process to debugging software. Finding errors in code is a highly labour-intensive and costly process. However, as open-source advocate Eric S Raymond set down in 'Linus' Law', named after the lead developer of the

open-source operating system Linux, ‘given enough eyeballs, all bugs are shallow’.⁷³ Eric von Hippel takes this to mean that finding a problem

*can be greatly reduced in cost and also made faster and more effective when it is opened up to a large community of software users that each may have the information needed to identify and fix some bugs.*⁷⁴

In the health service, for example, the independent feedback service Patient Opinion has taken advantage of the fact that the internet has made it cheap ‘to identify people who are “thoughtfully passionate” about local services’.⁷⁵ While the cost of finding such ‘expert users’ through traditional means such as surveys and focus groups often derails attempts to include service users, up to 40 per cent of those using Patient Opinion have been willing to be contacted for their insights.⁷⁶ Harnessing this willingness to contribute to service improvement, however, requires building in mechanisms for improving the inward flow of data into public services. The NHS’ Connecting for Health technology programme aimed to support local communities in providing care for older people. However, the single assessment process used did not allow for input by communities or those receiving care themselves. In this way, ‘the assessment process comes to be seen primarily as an external imposition associated with surveillance and control, rather than something to support and aid management planning and professional practice’.⁷⁷

Government will not be able to encourage responsibility in public data use by restricting available data, but by including the public in those decisions where its perspective can drive improvements. For example, releasing budgetary information on local councils, as the Department for Communities and Local Government (DCLG) has recently proposed to do partially,⁷⁸ can ‘enable a dialogue to begin in the local community about council budgeting and what the council can and cannot do’.⁷⁹

Framework

Participants at the Aspen Institute conference on big data agreed on the need for ‘a set of architectural principles for how data will be handled and how that handling will be disclosed’.⁸⁰ We have argued that the role of government in data-driven services should shift towards governance. This requires two transitions that correspond to the issues of control and value outlined in the section ‘Control and value’ in chapter 1. First, government should shift focus from enforcing a freedom of information regime to encouraging open, data-enabled processes. Second, it should move from managing data to regulating its quality.

From freedom of information to open data

We have taken some steps backwards in the use of data to support open processes in the UK. If the ethos of the white paper on freedom of information of 1998 had been preserved in the Freedom of Information Act, the latter may ‘have heralded one of the most expansive freedom of information regimes in the world’.⁸¹ However, the substance of the act meant that it did not create the ‘culture of routine, proactive and substantially increased openness’ that Information Commissioner Richard Thomas continued to press for as late as 2009.⁸² The Information Commissioner took the role of champion for freedom of information⁸³ – and by extension open data – instead of the government as a whole: something the UCL Constitution Unit had warned about in 1998.⁸⁴

Overall, the ICO’s last review of the freedom of information regime – in 2008 – found that despite positive attitudes towards the act among departments (74 per cent of survey respondents) and an increased sense that the Freedom of Information Act had changed attitudes towards releasing information (62 per cent), the public were demanding slightly less information year on year.⁸⁵ These results suggest that despite some culture change around how much information was to be released, departments did not yet understand *why* it was to be released.

Two sections of the Freedom of Information Act itself stand in the way of including the public in improving government

decision-making. Section 36 exempts information from release if, ‘in the reasonable opinion of a qualified person’, disclosing it would ‘otherwise prejudice, or would be likely otherwise to prejudice, the effective conduct of public affairs’.⁸⁶ This means that as a point of principle the opinion of a government official over whether disclosure would have such a prejudicial effect is final. The dependence on a ‘qualified person’ suggests that even with regards to data, the freedom of information regime still creates a single point of failure, as described by Beth Noveck.⁸⁷ It also rules out informed consideration by the public of the actions of government for the indeterminate period in which public affairs may be prejudiced.

Early advice on how the act should be implemented noted that it relied heavily on the attitude of senior managers, but also that it should be embraced as an ‘opportunity for authorities to engage more fully with stakeholders and win greater support and understanding for their plans and policies’.⁸⁸ Section 36 of the Freedom of Information Act may indeed be the first time the concept of ‘government policy’ gained legislative force – but it did so in order to exempt information used in formulating and developing such policy.⁸⁹ As UCL’s report for the Information Commissioner’s Office shows, ‘government policy’ includes in practical terms ‘the setting out by Government of a coherent overview approach to a key area or sector of society’, ‘a set of initiatives or interventions aimed at bringing about specific goals’, ‘one-off initiatives in the normal course of events’, ‘continuing political debate’, ‘a reaction to external events’, ‘operational issues requiring political judgement’ and general statements of government positions.⁹⁰

Recent developments in UK policy, however, show positive movements towards openness. In July 2010 the Prime Minister promised ‘the most ambitious open data agenda of any government in the world’.⁹¹ In January 2011 the Government announced plans to extend the Freedom of Information Act by increasing the number of organisations to which freedom of information requests can be made.⁹² However, it will do so by adding such bodies as the Association of Chief Police Officers, the Financial Services Ombudsman, and the University and

Colleges Admissions Service to the list of those subject to the act, rather than opening up the definition of what constitutes a public body.⁹³ The Government has also carried out an impressively broad effort to identify best practice for open government data through new government bodies such as the Public Data Corporation, the Local Public Data Panel and the Public Sector Transparency Board. The former explicitly intends to lead by example in data governance, pioneering an approach to open access which can set best practice for the use of public sector information. The language of its remit indicates that it is very much a ‘platform’ investment, with the Government hoping that it will attract both interest and investment in data use.⁹⁴

From data management to data quality regulation

The Audit Commission provided sound advice about data governance in 2007 when stating that data ‘should be collected and reported once only, on the principle of “getting it right first time”’.⁹⁵ This principle was elaborated further that year by a review of the Department for Culture, Media and Sport by the Lifting the Burdens Task Force. The review echoed the Audit Commission’s concern about the effects of poor data mentioned in the section ‘Data, information and knowledge’ in chapter 1 of this paper, but framed these concerns squarely in the context of the business of government – in other words, in the blind-spots of the freedom of information regime. The poor quality of performance data in the cultural sector was linked to poor ways of analysing the data available: if specialised and joined-up services in particular ‘are not included within particular indicator sets and national performance measures, the service area will be undervalued and there will be insufficient pressure locally to allocate time and resources to them’.⁹⁶ It should be noted here that, as in the case of NICE, the system has an inbuilt tendency to prejudice considerations of universality and fairness over local and particular concerns.

Data quality poses different challenges from data availability when preserving the particularity of individuals and their needs. The IT infrastructure supporting joined-up services

on the local level included the DCLG's Data Interchange Hub. Launched in pilot in April 2008, the hub aimed 'to reduce the burden on collecting data for local authorities, and to ensure that local authorities have all the information that they need to gauge their own performance'.⁹⁷ Its effectiveness was underpinned by a recognisable link between data quality and outcomes: it supported the Audit Commission's principle of 'getting it right first time' by reducing multiple data entries, and used XML as a standardised data format. However, the Coalition Government cancelled the programme shortly after election.⁹⁸

The DCLG has recently taken very positive steps towards open data with a recent Draft Code of Recommended Practice for Local Authorities on Data Transparency, which emphasises a 'demand-led' system, in which local authorities 'understand what data they hold, what their communities want and then release it in a way that allows the public, developers or the media to present it in new ways'.⁹⁹ The implicit recognition that data openness should be user-led is a decisive step away from the compliance-based Freedom of Information Act framework. The proposed code also calls local authorities to use open formats in order to 'maximise value to the public', drawing on Berners-Lee's one-to-five star rating for the usefulness of linked data.¹⁰⁰ This is also a positive step, as experience with the open government data released on data.gov.uk shows that 'users frequently convert OGD into the formats they are most comfortable with, often sharing this derived data, or the source code to generate it'.¹⁰¹ Very simply, making data easy to use makes it more likely to be used.

However, in *Data, Transparency and Openness* Hammond commented, 'This is clearly an approach led by technology, with technology seen as the key means to ensure enhanced accountability'.¹⁰² Strikingly, although the code includes a minimum requirement for data sets to be released – mainly relating to large expenditures and the formal democratic processes of local authorities – it falls under the discretion of the authority whether other data fall under the exemptions of the Freedom of Information Act.¹⁰³ The 'single point of failure', therefore, persists.

In this sense, from the perspective of the public seeking to hold local government to account, DCLG initiatives appear to privilege the usability of data from a technological perspective over their value from a democratic one. Good data do not necessarily imply ‘pure’ data. Certainly, well-publicised and enforced data quality standards are essential. A key recommendation of the Government’s Communications-Electronic Security Group after the 2007 data breach was that mandatory standards were needed across government. However, it also called for these standards to be constantly updated by ‘business experts, technical experts, and independent input from others’.¹⁰⁴ With regards to data governance, then, such standards would share and so mitigate the risks of poor quality data. Data should also be standardised to highlight subjective bias, and allow for comparison across time and space.¹⁰⁵

However, when releasing uniform data is the object of policy, and such impartial data are expected to generate engagement in their own right, adaptations by public services will miss the difference between data and information adhered to so strictly by technologists themselves. This is because when data are collected with a view to analysis as opposed to service outcomes, the loss of contextual information may ultimately make analysis of the ‘cleansed’ data less useful. Data are ‘entangled’ with the conditions from which they arise, and ‘bring with them a history or provenance which must be taken into account when interpretations are made’.¹⁰⁶

Box 3

Welfare, control and governance

Practical examples from the welfare system illustrate how relinquishing control in data-driven services can actually serve the data governance needs of public services, and subsequently improve outcomes. Recent reforms in the UK towards introducing the Universal Credit and Work Programme demonstrate that aligning incentives to work and improving welfare to work are key policy goals. However, it is not necessarily the case that these outcomes result from increased centralisation in either data systems or service provision. An

emphasis on savings and using data to prevent overspend and fraudulent claims steers reform away from a local, personalised and citizen-focused orientation. The Institute for Public Policy Research (IPPR) argues that a sector-specific approach, which focuses on the needs of employers and retention of employees through training, is more sustainable and beneficial than a work-first approach, the main goal of which is to reduce use and abuse of the service itself. A sector-specific alternative would rely on local knowledge and expertise as well as the sharing of this information among employers, commissioners and users.¹⁰⁷

Moreover, the intelligent use of data in welfare provision can bring more benefits than improved fraud detection alone. Three initiatives in the USA and Australia have focused data-driven innovation on the service user's interaction with the frontline. The Wisconsin scheme W2 Welfare Works has employed a barrier screening tool, which provides commissioners with coherent and relevant information to develop personalised employability plans. Information is gathered from welfare users through an automated system, which is responsive to individual answers and produces an overview of the potential barriers that may prevent an individual from finding employment. These can range from alcohol and drug abuse, to mental and physical health problems, to psychological traumas and domestic abuse. Where barriers are identified, the information is forwarded to parties with the relevant expertise in order to advise and assist the individual.¹⁰⁸ The data gathered through the barrier screening tool are merged with the case management administrative database, to produce a coherent and wide-ranging data set relating to the case history and the needs of individual service users. Finally, the Growing To Work Enterprise scheme in Michigan gives clients control of their own digital participation logs so that they can personally monitor their progress and identify barriers to finding employment for themselves. This pilot is part of the state's welfare-to-work programme and helps to develop computer literacy as an important skill in itself for enhancing employability.¹⁰⁹

Three underlying themes emerge from these examples:

- *Data collection and use are aligned with service outcomes. Building up an accurate, real-time picture of the barriers to employment is an essential element of helping individuals to surmount those barriers.*
- *Data are used to provide mutual benefit. The scheme W2 Wisconsin Works benefits the welfare system by reducing time spent in evaluation and cutting duplicated effort from different parts of the system, and benefits users by directing them to the most appropriate service more efficiently.*
- *The mutual benefits to service providers and users incentivise each to provide and maintain good quality data.*

3 Data governance and transformation

Models of data governance

Of all the potential uses of data, the sharing of data between agencies and providers still attracts the most vocal expressions of public concern. The Government provided perhaps its most detailed response to these concerns in the recent national support framework for data sharing in support of community safety.¹¹⁰ However, recognising the institutional determinants of good data governance requires that we consider a more holistic institutional response. Demos put forward three models of data governance following the high profile data breaches of 2007, set out in table 3.

Regulation and compliance

The UK was relatively quick to adopt legal instruments to support data protection, passing two acts of parliament in 1984 and 1998 for this purpose. Alongside policy inherited from the Organisation for Economic Co-operation and Development, the Council of Europe and the European Union, the UK's data protection framework can be expressed in eight principles. Data relating to individuals must:

- be obtained and processed fairly and lawfully, and subject to general conditions, either under consent, or under necessity for a limited number of general reasons
- be used only for the specified and lawful purpose(s) for which the data are collected and used
- be adequate, relevant and not excessive for the specified purpose(s)
- be accurate and, where necessary, kept up to date

- be retained no longer than necessary for the specified purpose(s);
- be processed in ways that respect the data subject's rights, include the right of subject access (the right of the individual to see information held about him or her);
- be subject to appropriate technical and organisational measures to prevent unauthorised and unlawful processing, accidental loss of, destruction of, or damage to the information; and
- not be transferred outside the European Economic Area, except to countries where levels of data protection are deemed adequate.¹¹¹

However, there remains considerable confusion over the exact parameters of information sharing between departments and agencies, including the level of access granted to different parties.¹¹² This is partly because there is ambiguity over how first two principles interact – if individuals consent to government data collection and use, for how long do they consent to these data being used, by which arm of government, and for which purposes in particular? These concerns were the prerogative of the data protection regulator, empowered by the original 1984 act, a role that has been modified and renamed over time. With the addition of freedom of information responsibilities in 2000, the Information Commissioner became the institutional arbiter of data protection.

This very brief history of the data protection regime does not just demonstrate that controls over the collection, use and sharing of data have been institutional, rather than legal concerns. It also points to underlying flexibility of the UK framework, which has been 'largely characterized by voluntary self-control, in which the relationship between public-service coordination and privacy is arbitrated through local practices and in which the official regulator adopts a largely tutelary role.'¹¹³ The compliance-based approach of the data protection limits the scope of data governance to regulatory intervention. The Institute for Public Policy Research has gone as far as to argue that 'data protection tends to act as much as a code of best practice as an enforced law'.¹¹⁴ At best, it may allow for a system

Table 3 **Three models of data governance**

Paternalistic	Collective rules and decision-making about personal information use that provide security, for example, legislation granting security services access to communications data, or decisions about using information about children's diet to intervene in family life.
Deregulatory	Lack of collective rules on use, allowing the market and individuals to decide the rules of how personal information is used, for example, the Conservative party's Redwood policy review suggestion that the Data Protection Act should be repealed as a piece of expensive bureaucracy. Using this model, good practice and consumer interests would be served by market forces.
Democratic	Collective rules that create the possibility of individual negotiation. When institutions, public or private, make decisions based on personal information there is an assumption about what sort of people can make decisions about particular types of behaviour, and what the consequences of those judgements should be. That ranges from whether a security service can access someone's phone records, to allowing the music industry to use information from internet service providers about what their customers do online to prevent file-sharing.

Source: Bradwell and Gallagher¹¹⁵

of 'peer and public scrutiny, under which providers and professionals – motivated by reputation – self-regulate the accuracy of their data'.¹¹⁶ The same principles may extend from data governance to the outcomes of data-driven services. The Centre for Public Scrutiny, for example, has argued that the release of spending data from local councils will motivate staff and the public to draw comparisons with other authorities.¹¹⁷ However, scrutiny is only one mechanism by which public bodies can be held to account, and is in several ways incompatible with the speed at which data-driven processes operate, and the pace of reform in public services for which data are the catalyst.

Markets and Incentives

Certainly, a market-based approach to data governance has its benefits, and draws on a history of practice that will be outlined in the section ‘Data and informed governance’, below. The allure of a market-based approach is, first, that controls on data use could be harmonised with the purposes for which data are collected. As Joseph Stiglitz has argued, the availability of accurate and relevant information at the right time is crucial to market efficiency.¹¹⁸ A second advantage to market-based data governance is the alignment of incentives over data collection, use and sharing that results from deregulation itself. For example, ‘personal data stores’ are currently under development, which allow individuals to take charge of their own non-essential data. In this way, individual interest in both the maintenance of good quality information and control over how these data are used generates self-regulation by individuals of their data footprint. Proponents of the Mydex system urge that such initiatives may require ‘minor policy revisions’ but do not ‘need significant new legislation or major infrastructural investment’.¹¹⁹ More sweeping measures towards a deregulatory framework include the suggestion that responsible data use by public bodies could be linked to other performance measures – creating a ‘payment by results’ approach to open data.¹²⁰

Democratic data governance

However, a first step towards democratic data governance is to reframe the debate. As Demos has argued, ‘problems of data protection, privacy, technology and identity are inseparable from the benefits we enjoy from the open information society we live in’.¹²¹ Two key steps towards reinforcing trust over data use are the publication of information charters by government departments, and publication of the data assets held by each department. This was first recommended by the Cabinet Office Performance and Innovation Unit in 2002 in its landmark report *Privacy and Data-sharing*.¹²² That both moves were still being demanded by the Communications-Electronics Security Group (CESG) in 2008 points to the severe delays in implementing an adequate public engagement strategy for data.¹²³ While most

public bodies now have information charters in place, public awareness of departmental data assets still depends on voluntary disclosures (such as those currently being mandated by the DCLG) and the use of freedom of information requests by individuals. While the disclosure of data sets is encouraged by recent coalition policy, the basic compliance-based structure may yet undermine the effectiveness of proposed ‘right to data’ as outlined in the recent white paper on open public services. This new right, which will gain statutory force if the Protection of Freedoms Bill is passed, ‘will ensure that public authorities publish data sets for re-use in an open and standardised format’. However, these data sets will be published by government bodies only ‘in response to requests or through their own publication schemes’.¹²⁴

An adequate institutional response to the challenges of big data also requires attention to the human capabilities of government bodies themselves. A report from the McKinsey Global Institute highlights a lack of qualified data analysts in government.¹²⁵ This concern is echoed in the Institute for Government’s suggestion that to address implementation issues in government IT, the Government needs to attract IT professionals.¹²⁶ It is suggested that improving operational understanding of IT initiatives in central government would enable more effective oversight of delivery partners. However, such pragmatic steps do not undermine the fact that managing the transition to open data depends on culture change among departments. An element of the democratic approach to data governance is also suggested by the CESG’s recommendation that data should be seen as ‘a key corporate asset and employees [should] consider themselves “trusted stewards” of sensitive data with an obligation to protect it’.¹²⁷

Most significantly, the results of an Ipsos MORI survey conducted on behalf of the 2020 Public Services Trust demonstrate that while public confidence in the Government’s use of data suffered a blow after 2007, the public nonetheless considers public services to be more reliable stewards of data (65 per cent of respondents) than private companies (6 per cent) and charities and voluntary organisations (5 per cent).¹²⁸ These

findings show both the limitations of a regulatory approach to data and the advantages of a democratically informed governance approach. This is because establishing public trust is not just a matter of gaining a democratic mandate for data-driven initiatives; such initiatives depend on the trust of the public for their operational effectiveness and subsequently for the efficiency gains they are expected to generate.

Box 4

Data mining, institutions and accountability in the police

Data mining applications are increasingly useful to policing activities such as tactical crime analysis, risk and threat assessment, behavioural analysis of violent crime, analysis of records, and targeted strategies of deployment and prevention. Such applications have been used widely by US police forces and have been shown to make increasingly wide-ranging and voluminous data accessible and useable to analysts and operational personnel alike, to increase the speed and depth at which data analysis can be driven, and ultimately to encourage effective dialogue between individual officers, their commissioners and expert advisers.¹²⁹ More recently, data mining has been adopted by UK forces, and since 2005 the Serious Organised Crime Agency has used data mining techniques to analyse patterns of criminal activity and unearth far-reaching criminal networks.¹³⁰ The Police National Database (PND) is a new tool, which draws together data and intelligence relayed by local forces and makes it easily accessible at the national level, as well as for other local forces. It is argued that the database will help streamline police work and allow for targeted protection of children and vulnerable adults, prevention of terrorist activity, and interventions against serious and organised crime.¹³¹

Extending data mining powers brings with it privacy issues, which the data protection legislation in the UK may not satisfactorily address. Often legislation is brought into effect after searches have taken place. These searches can often be wide ranging and largely speculative, taking into account public and private information, aside from health records. Instead of targeting a data search based on particular evidence

or suspicion, records can be accessed to search for anomalies, which may then form the basis for suspicion, and this can take place within the bounds of data protection law. This is particularly concerning when undertaken by more secretive bodies such as the Serious Organised Crime Agency (SOCA).¹³² Other concerns over accountability arise from the institutional structure of the police. Responsibility for the key databases held by police forces in the UK falls to the National Policing Improvement Agency (NPIA), an arms-length body funded by the Home Office and made up of police commissioners, police authority executives, representatives from the Home Office, and independent members.

The NPIA has worked to design and implement the Police National Database, which became operational in June 2011. It replaces the IMPACT Nominal Index (INI), which had allowed forces to find out if data are held on any individual around the country in the area of intelligence, custody, crime, domestic violence and firearms licensing. The Joseph Rowntree Reform Trust reported that the former included ‘soft intelligence’ – such as opinion, hearsay and tips – concluding that ‘letting such things leak from the world of intelligence into that of routine police operations is dangerous, and some intelligence officers think it a mistake’.¹³³ Carrying out its mandate to provide information infrastructure to support frontline policing, the NPIA has encouraged forces to make full use of its databases including information gathered by controversial Automatic Number Plate Recognition systems. Moreover, the number of agencies that have also taken advantage of NPIA data – including the Ministry of Defence and HMRC – has drawn criticism.¹³⁴

It is unclear at this point what accountability mechanisms will be in place for the National Crime Agency (NCA), which will replace the SOCA, and will be ultimately responsible for central databases.¹³⁵ A more detailed plan for the NCA suggests that alongside other ‘machinery of government’ reforms, and ‘with the objectives of minimising disruption and securing the best value for money’ it will ‘seek to use or adapt existing systems rather than designing new

*ones’.*¹³⁶ *It is worrying from the perspective of data security, furthermore, that experts have warned of integration issues that may result in merging NPIA systems with those of the SOCA, which will also form part of the new agency.*¹³⁷ *However, it should be noted that the code of practice for use of the Police National Database clearly states that it falls to chief officers to take responsibility for ‘what information to place on the system, what information to withhold from the system, and what restrictions to apply on access to and use of the information’.*¹³⁸

Data and transformational services

In the section ‘Control and value’ in chapter 1 we reviewed empirical research indicating that technological adoption supporting a transformation in how a service is provided was more effective than when it was geared solely towards the functioning of a service itself. These results indicated that technological change influenced service outcomes most when ‘technology investment is coupled with other complementary investments, such as organizational re-engineering, restructuring and redesign’.¹³⁹ As we have indicated in previous sections, data-driven initiatives under the previous government have often proved ineffective when government has sought to incentivise good practice in data collection, use or sharing without connecting such outcomes to the requirements of service improvements. In the worst cases – such as the assessment processes in Connecting for Health –the Government has ‘reincorporated disruptive technologies into its established ways of doing business, neutering much of their potential’.¹⁴⁰

The transition to ‘open public services’ through a sector-neutral approach to commissioning and delivery represents a drastic transformational change: here the responsibility of government is in maintaining an ‘open framework within which people have the power to make the choices that are best for them’.¹⁴¹ To borrow Tim O’Reilly’s phrase, the Government will provide a ‘platform’ for the delivery of efficient, decentralised and accountable services. But how much do these

transformational aims draw on the transformational potential of data?

Data and collaboration

Institutional arrangements to deliver local and personalised services currently emphasise connecting particular local entrepreneurial activities and volunteers with the delivery of services through multi-agency partnerships.¹⁴² This adapts longer-term government strategy to include the voluntary and community sector (VCS) in new forms of service provision, practically and ‘as advisers influencing the design of services and as innovators from which the public sector can learn’.¹⁴³

The white paper on open public services sets out that ‘the primary purpose of open data in public services is to give people the information they need to make informed decisions and drive up standards’. The Government data review, echoing the task force *Lifting the Burdens* of 2007, will ‘audit all major data collections and identify opportunities to reduce burdens while improving the quality, value and availability of data’.¹⁴⁴ This suggests in practice that the Government will require the VCSE sector – the VCS alongside social enterprise – to provide more information to government bodies in pursuit of coordination at the service delivery level, while reducing its own responsibilities for data collection. This is because increasing the role of the VCSE in service delivery is combined with a strong accountability framework for performance, not merely through ‘payment by results’ for commissioned services but by collecting quality data based on user behaviour and feedback. Finally, the Government is carrying out ongoing consultations on ‘publishing information that would assist either consumers, commissioners or providers of public services to develop better quality or value for money in public services’.¹⁴⁵

The comprehensive data requirements of each aspect of the ‘open public services’ paradigm are striking. However, there is an underlying connection between allowing for increased diversity in service provision and harnessing the transformational potential of data. An influential recent study on outsourcing of

Table 4 **The evolutionary process in the relationship between IT providers and their clients**

	Cost focus	Quality focus	Innovation focus
Client concerns	IT as commodity	IT underpins business Critical activity	IT is potential enabler
Supplier concerns	Contract profitability	Platform development	Partnership development
Relationship focus	Constant negotiation	Best practice IT	Exploration and ideas
Target outcomes	Cheaper IT	Better IT	Better business

Source: Weeks and Feeny¹⁴⁶

IT projects notes there is an evolutionary process or learning curve in the relationship between IT providers and their clients, as reproduced in table 4.

This not only echoes findings on the effectiveness of e-government, but also suggests that the potential of disruptive technologies is crucially affected by relationships through which they are implemented. Further research from Logica and the London School of Economics has suggested that the three forms of trust suggested by Weeks and Feeny – personal confidence in partners, mutual perceptions of competence and perception of joint goals¹⁴⁷ – must be in place for the success of IT-driven initiatives at all three of the stages of client–provider relationships outlined above.¹⁴⁸

Data and accountability

We have noted in the section ‘Models of data governance’, above, that there is a lack of public confidence in government competence over data sharing, underpinned by weak institutional safeguards over data protection. However, public opinion nonetheless holds public services to be more responsible

stewards of personal data than other sectors. Sectoral differences suggest that public trust over data collection, use and sharing depends on what data are used *for* – but can this be integrated into structures for data governance?

On the level of data, the focus of current policy on localised service delivery and strong accountability mechanisms may lead to contradictions. First, it is not clear whether performance data will relate to aggregated outcomes for individuals or overall outcomes for demographic groups, although the Government clearly intends to incentivise providers focusing on disadvantaged sections of the population. The National Council for Voluntary Associations has also expressed concern that under a sector-neutral approach with a focus on individual users ‘only outcomes that can be directly attributed to users are captured’, disregarding such ‘secondary outcomes’ as the representation of service users.¹⁴⁹

The problem faced by current policy-makers is that policy must address the distinct challenges of implementing data-driven innovations at the same time as delineating a new relationship with service providers. From the perspective of service delivery, government agencies currently carry responsibility for such threats as:

- compromised delivery following new policy requirements resulting from inadequate innovation
- diminished perceptions of competency resulting from poor quality provision
- patchy service provision resulting from poor cooperation and inadequate information sharing¹⁵⁰

These correspond to the three elements of trust required for collaborative implementation of technology suggested by Weeks and Feeny above – personal confidence in partners, mutual perceptions of competence and perception of joint goals. This suggests that under current proposals the threats to public service outcomes are the same as the threats to effective use of data – both are potential failures of trust. However, longer-term damage to trust relationships between the VCS and

the public sector may stand in the way of data-driven improvements to outcomes.

Data and informed governance

Risk, regulation and design

We have argued that establishing frameworks for the collection, use and sharing of data requires attention to the design of institutions. This gains some support from the fact that a framework for regulating extremely large-scale, complex and information-driven systems has been in place for over 80 years: financial regulation. There are three reasons why parallels between financial regulation and data governance are instructive:

- the relationship between trust and effectiveness that underpins the financial systems' ability to create value (as expressed in investor confidence) and the ability of data to solve social problems
- the importance of systematised controls on data in both systems
- the need for iterative development of governance mechanisms in financial regulation and data governance

Mary Graham has noted that following the stock market crash of 1929, President Franklin D Roosevelt's efforts to reduce financial risks centred on the routine disclosure of information about corporate structure and financial practices in standard formats.¹⁵¹ This drew inspiration, she suggests, from Supreme Court Justice Louis D Brandeis' quip that 'publicity is justly commended as a remedy for social and industrial diseases. Sunlight is said to be the best of disinfectants.'¹⁵² The remarkably durable approach established under the US Securities and Exchange Acts of 1933 and 1934 contains five key elements:

- Mandatory disclosure
- Standardized information
- Identification of sources of risks
- Reporting at regular intervals
- A primary purpose of reducing risks.¹⁵³

Clearly, there have been significant structural failures of financial regulation in recent years. Yet following the 2008 financial crisis regulators such as the US Securities and Exchange Commission have been pursuing data-driven reforms to disclosure.¹⁵⁴ This will include a wholesale shift from document-based reporting to the use of manipulable data in a standardised format –the eXtensible Business Reporting Language (XLBR). The limitations of document-based reporting echo many of the concerns of those advocating the pressing need for linked data. Moreover, the difference between data and information we have presented reappears in financial reporting. As leading IT consultancy Gartner Inc has commented, under document-based systems ‘most of the meaningful information that provides context for the balance sheet and income statement numbers is buried in the notes section of required disclosures’.¹⁵⁵

Graham argues that systems for regulating risks must be adaptable, as all regulation ‘can lock in incentives for action that become counterproductive as public priorities, scientific knowledge, and markets change’.¹⁵⁶ What financial regulation provides is a model for adaptation in the regulatory regime itself. Charles Leadbeater, in a recent think piece on big data for Demos, has argued that ‘the public sector is too risk averse; so we need to create spaces in which risk taking, putting things out in beta, becomes possible’.¹⁵⁷ A first step in this direction is to create space for innovation. Current policy perhaps ‘goes with the grain of innovation’ by envisioning a centrally mandated standards-based framework within which localised interventions can be designed and evaluated on their own terms.¹⁵⁸ The DCLG has taken proactive steps in this direction, jettisoning 4,700 central targets for local government, alongside other data-reporting requirements.¹⁵⁹ Without attention to the regulatory controls on organisations of whatever sector and their effects on their operation, however, there is little to stop standards from behaving like targets. There needs to be an informed and open discussion about how new standards for outcomes are to be developed and systematised, in order for innovation actually to emerge.

Box 5

Information-driven service design: drilling down and scaling up

In Sunderland, where by 2007 a quarter of the working age population was not in work, service design firm Livework used ethnographic research to uncover the difficult journeys made by individuals back to the workplace. There are two clear dimensions in which knowledge, as opposed to data or information, was essential to the success of a programme that ultimately delivered over £250,000 in savings to Sunderland Council¹⁶⁰ and led 276 people into employment in the initial pilot.¹⁶¹

First, the use of ethnographic research into the personal and employment histories of 12 individuals in particular gave Livework an understanding not only of their needs but also the mix of services they engaged with. This highly contextualised information provided a holistic picture of the individual, rather than a fragmentary record of a user of several services. This multi-dimensional and longitudinal knowledge provided models of service use, which could then form the basis for engaging nine specialist partners, addressing issues from mental health to vocational training. Second, therefore, the Make It Work programme integrated contextual knowledge into commissioning decisions. The Sunderland City Council was able to provide ‘clear articulation of the employment needs in Sunderland and a shared working framework’ in exchange for commitment to the service delivery model by suppliers.¹⁶²

Nesta notes that the Make It Work programme designed in response ‘was experimental but it was informed by rigorous evidence and was tested by iterative prototyping’.¹⁶³ Data-driven services cannot promise to access highly contextualised knowledge for every individual intervention or commissioning decision. However, data can support more focused efforts to identify a social problem, experiment towards a solution and scale up what works.

Information, engagement and trust

A risk-based framework for data governance should also take into account that individuals may ‘assign disproportionate

importance to risks of events that are easily brought to mind, ignore evidence that contradicts current beliefs, and tune out when confronted with information overload'.¹⁶⁴ As noted in the section 'Participation' in chapter 2, democratic theorists have recognised the selectivity with which individuals 'tune in' to particular sources of information. This prevents the development of common knowledge necessary for democratic decision-making, and the 'possibilities for individuals to craft highly personalized information environments around themselves increases'¹⁶⁵ as a result of big data.

To this extent, the 2020 Public Services Trust has argued for a 'public good test' for data: in some cases the public benefit may so significantly outweigh individual considerations of privacy that they 'lose the right to opt-out'¹⁶⁶ of data collection, use and sharing. However, this proposal stands in contradiction to the very dynamics that give rise to big data: the increasing number of information exchanges that result from the increased complexity of contemporary lived experience. This complexity means that individuals must be engaged to help *make sense* of the often contradictory data that are captured and held about them. Banks holding increasing amounts of identification data has not stopped the rise of 'first party fraud', the deliberate use of false details, which 'now accounts for slightly more than half of fraud attempts against credit card companies, insurers and banks'.¹⁶⁷ Recognising that there is 'no information without representation'¹⁶⁸ is vital to the data-driven system as much as it is to the individual.

Moreover, such a view misunderstands the importance of public engagement to managing risks. A clear differentiation must be made between 'global' risks and risks to systems. As Beth Noveck has argued strongly, the 'single point of failure' that results from concentrating decision-making power both impairs the quality of decisions and precludes creative problem-solving.¹⁶⁹ It should also be recognised, as governance scholars have done, that the drive towards co-production of services and 'joined-up' government under the last Labour Government attempted in part to address the increasing fragmentation inherent to complex societies and the need for governance by

‘wiring the system back up together again’.¹⁷⁰ In other words, the transfer of responsibility for operational aspects of public service provision allowed government to assume greater powers of governance through regulation. This led to a well-documented crisis in professional authority as a result of the ‘power of managers over professionals, the loss of autonomy, poor pay and the burdens of audit and inspection’.¹⁷¹

Even more dispersed responsibility for the functioning of public services makes it more necessary than ever to build the capacity of services users to engage professionals – especially when data are the means with which new, collaborative ways of addressing social problems are being articulated. Certainly, engaging the public with the design and delivery of public services implies a degree of risk in itself:

*The service user has to trust the advice and support of the professional, but the professional also has to be prepared to trust the decisions and behaviours of service users, and the communities in which they live, rather than dictate to them.*¹⁷²

But trust built up through participation in the design of systems is indispensable when these systems must address global risks.

The internal dynamics of technological change, meanwhile, pose their own challenges. A paper for the Foresight Programme of the erstwhile Office of Science and Technology highlighted as early as 2004 the need to take emergence into account in development of IT systems. Emergence is the evolution of complex macro-level behaviour from simple micro-level behaviours: the report’s authors drew parallels with financial markets, in which overall market dynamics cannot be traced back directly to the ‘underlying simple interactions of the traders’.¹⁷³ Early work from the IPPR on the social implications of ubiquitous IT argued that emergent properties of systems cannot be ‘improved or controlled purely through unleashing further technological modernisation. Only political intervention can restore appropriate collective control.’¹⁷⁴ Graham notes that risk management regimes can too often lead to a ‘culture of

blame’, which ‘may not serve lasting interests in risk reduction’.¹⁷⁵ Similarly, despite strong moves in British policy-making towards risk-based strategy, service delivery and outcome evaluation,¹⁷⁶ accounting for the effects of policy interventions is rarely an opportunity for reflection and learning: in ‘the real world of politics, it is always at risk of degrading into a hollow ritual or a blame game that obstructs rather than enhances the search for better governance’.¹⁷⁷ The Institute for Government has suggested real-time evaluation of policy interventions can generate ‘messages sent back to policy designers that violate their assumptions and show how the policy is being realised compared to the intended design’.¹⁷⁸ The designers of the Substance Project Reporting System, meanwhile, suggest scaling down the focus of evaluation as a whole: it ‘should not be based on information that is disjointed from daily operations but rather that it should build on data that the organisation collects anyway as part of its functions’.¹⁷⁹ The new relationships and capacities enabled by data, we have argued, now enable policy-makers to open up the conversation on outcomes in a more substantial and radical way.

Box 6

Engineering complex data systems to fit complex lives

When the risks of data sharing are coupled with the need to serve individuals at risk, finding a match between operational practices and a holistic approach to good data governance is imperative and full of complexity. Instructively, Wilson et al outline how reconciling real-world identity with its data representation can strain relationships between a service user, in this case Mary (a pseudonym), a large VCS organisation and the social care system.¹⁸⁰

Mary was 17 years old and a single mother. The VCS organisation was commissioned to manage a Sure Start centre, which provided support, advice and various services for babies and infants including Mary’s six-month-old child. Mary’s situation was complicated by her interaction with the Prostitution Response Programme, which connected her with rehabilitation services also run by the same VCS

organisation. Mary was clear that she would only discuss her previous experiences with an individual counsellor at the rehabilitation service.

Unfortunately, the leader of the prostitution ring, Derek (a pseudonym) was released 12 months after the intervention of the Prostitution Response Programme on the condition that he would attend group counselling provided by the same VCS organisation addressing Mary's necessarily distinct needs.

There are two dimensions to the risks involved for Mary. The first is organisational: three social workers held responsibility for Mary's interests – including the caseworker for Derek. From the perspective of the state in its roles as service commissioner and data holder, the pursuit of effective services and the preservation of privacy were both questions of database design. However, the VCS organisation must not only use the resulting database to identify vulnerable individuals, but also make decisions about whether or not to link records for people such as Mary on the basis of its relationships with them. The second is more distinctly technological. The drive towards integration of databases by government to support a 'joined up' response to Mary's needs is in direct conflict with an equally important need for Mary to have 'real and dependable boundaries around her trusted relationships'¹⁸¹ and represented by partitioning of the identity information she shared with the VCS organisation.

For her interests to be truly served, then, Mary's preferences must be taken into account not only in the decisions of the VCS organisation's employees. Mary must also play a role in the decision to link together their service roles and finally in the design of the database that the VCS organisation depends on to do its work. Technological developments such as the spread of mark-up language (used to link data by connecting them to other data) and relational databases makes it now possible for different information about Mary to be held in the same database but separately by the service that has captured it. This means that online identity can function as 'a separate service', which would hold Mary's preferences and consents.¹⁸² Negotiated relationships form the basis of

cooperation towards co-produced outcomes. However, data collection, use and sharing to support such outcomes must equally depend on informed negotiation between service provider and user.

4 Recommendations

Collection

We have seen both the potential and the challenges of government's adaption to big data and increased expectations of data transparency. The potential to deliver transformation – in methods of delivery and the relationship that public bodies have with their public – is clear. But the dangers of overloading the public with data, of using data in a way that serves to erode trust rather than increase it, and of using data to make inappropriate decisions remain.

Government has no choice but to engage proactively with big data. To choose instead to bury its head in the sand, to continue operating as though the expectations, norms and tools of government have not changed, would be suicidal. And so, while it is vital that the Government entrenches the particular expectations and needs of democratic accountability, the public sector will have to find a way to cope with big data.

The key to doing so is, fundamentally, one of attitude. Of course the technologies matter. But far more important, in the end, is the intent and the policy framework. As has been noted above, the failure of so many government IT projects has led to an erosion of trust in IT among public servants and their political masters – but the reality is that government IT fails because of the Government's attitude to IT. In order to make big data work for the public sector, the public sector has to expect more from them. Big data should not be accommodated as a means to finessing delivery – they should be viewed as a transformative agent that has the potential to revitalise, reinvigorate and renew public services.

Thus the public sector needs to get to grips with the big data chain. The collection of data is, in and of itself, the single most important factor in the long-term usefulness of those data.

They must be easy to collect (or people will avoid doing so), easy to understand and easy to publish and use.

Innovations in the collection of data – the small, everyday acts that lead to big data’s existence – can be found both in the private sector and in public services overseas. The likes of Tesco, Amazon and Facebook do not routinely demand added effort on the part of their customers in producing the data on which they build their businesses. Rather, their knowledge of us as individuals is built as we navigate our way through their systems for our own gain – be it to buy groceries and books or to remain in contact with our friends. This approach should be key to the Government’s attempts to ensure the quality, timeliness and usability of data. Platforms that citizens use to access the services they want or need – from local authority portals to NHS Direct – should be equipped with the most up to date and insightful analytics, to generate the kind of everyday data about citizens that companies produce about customers. The automatic collection of data in this way relieves both a real burden and a fearful perception among public servants – that data collection (form-filling in common parlance) becomes the end to which they work. Nurses want to nurse; the public wants them to nurse; the key is to allow data to be seamlessly generated as they do so rather than to place new tasks on them in relation to its capture.

That is not to say that we do not want, or do not need, public servants to continue acting as data collectors and generators themselves. The truth is that while a revolution in in-home technology has driven up levels of online engagement, many of the relationships that exist between state and citizen will continue to be between people for the foreseeable future. Not everyone will use online pathways that allow us to know them well without additional effort – and, unlike Amazon, the Government cannot choose to ignore those of its customers who are unwilling or unable to use the internet to service their needs.

Data generation must be made significantly easier and less burdensome for frontline public servants. An example of how this might work in practice comes from Germany where, in deprived areas of Berlin, civil servants are increasingly using portable devices – connected to a holistic database of medical

and social care records – when visiting care homes for the elderly and hospitals.¹⁸³ This allows for quick, real-time updates to patient records – removing the dread of follow-up paperwork and making it easy and relatively painless to ensure that the database used to allocate resource and predict problems is as up to date as the on-the-ground knowledge of care staff.

Furthermore, it serves to utilise big data and harness them in the service of delivery. Staff are able to check immediately a person's history, needs and circumstances. The service that is provided to the individual – stripped of the need to re-ask questions and re-interrogate needs – is improved and the professional sees, in real time, the fruits of big data.

The Government should look at the potential of investing in similar technology for frontline staff in the UK – particularly for social workers and others dealing with citizens who have complex needs and multiple points of entry into public services. It would streamline the service offered, help to stamp out service and provision overlap, improve the quality of data stored, improve the professional–citizen relationship, and make clear to frontline staff the benefits of having accurate, up-to-date data as they carry out their daily work.

Make it modular

Modularity will be key to ensuring that big data are harnessed properly by government. The platforms that government uses to collate, store and make accessible its data are integral to how public servants ultimately use those data. What is more, a modular approach to involving the public in the improvement of public service outcomes is also made possible by data. The dynamics of service improvement through data use draw equally from technological and democratic sources. From the technological perspective, identifying problems in service delivery can be seen as a similar process to debugging software.

Finding errors in code is a highly labour-intensive and costly process. However, as open source advocate Eric S Raymond set down in 'Linus' Law', named after the lead developer of the open-source operating system Linux, 'given

enough eyeballs, all bugs are shallow'.¹⁸⁴ Eric von Hippel translates this to mean that finding problems 'can be greatly reduced in cost and also made faster and more effective when it is opened up to a large community of software users that each may have the information needed to identify and fix some bugs'.¹⁸⁵

Thus modularity becomes part of the process of big data use but also part of the democratisation of public services. Rather than working against accountability and involvement – as the critics of big data often warn – this provides an opportunity for heightened and positive engagement and co-production.

An example of what this modularity means in practice can be found here in the UK, in a public service often derided for its lack of responsiveness. Patient Opinion has used the comparative low-costs, low-risk and high-density of online forums 'to identify people who are "thoughtfully passionate" about local services'.¹⁸⁶ Classic models of user-engagement, from polling to focus groups and deliberative 'citizens juries', are often prohibitively expensive, onerous to organise and participate in, and can be damagingly one-way, and it is difficult to ensure they have adequate representative participation. Asking respondents to a survey to give you answers means you are setting the questions, missing insight and engaging in the kind of 'one-off' conversation that can undermine attempts at genuine engagement.¹⁸⁷

Using online methods, sharing and generating data, is cheaper, more efficient and provides for an ongoing conversation with service users. Around 40 per cent of those approached by Patient Opinion have been prepared to engage, creating a vast and more accurate pool of data than most survey data or deliberative engagement could muster while costing less to manage.

Harnessing this willingness to contribute to service improvement, however, requires building in mechanisms for improving the inward flow of data into public services. The NHS' Connecting for Health technology programme aimed to support local communities in providing care for older people. However, the single assessment process used did not allow for input by communities or those receiving care themselves. In this

way, ‘the assessment process comes to be seen primarily as an external imposition associated with surveillance and control, rather than something to support and aid management planning and professional practice’.¹⁸⁸

Government will not be able to encourage responsibility in public data use by restricting available data, but by including the public in those decisions where its perspective can drive improvements. For example, releasing budgetary information on local councils, as the DCLG has recently proposed to do partially,¹⁸⁹ can ‘enable a dialogue to begin in the local community about council budgeting and what the council can and cannot do’.¹⁹⁰

Transparency and outputs

Much has been made of transparency as a transformative mechanism in public policy. It is certainly true that making big data available as a matter of course could aid innovation and promote radical change in how public services are run, how they deliver and what they set out to do. Civil society organisations, charities and entrepreneurs can use government data to develop innovative services while the public can use it to spot anomalies, to give context to their anxieties and to demand a higher level of service. But transparency is also a moral good. Data that are generated in the name of the public should, on the whole, be available to the public. Big data – formed as they are by the massive machinery of government – must be as available as possible to the public as a matter of course.

But transformation – and the benefits of public insight – will only come on a significant scale if the public at large are competent, capable and confident in handling big data. There is little point expecting armchair auditors to oversee the public sector’s work if there are no armchair analysts with the skills to decipher the information available. The oversight and transformation ends of data transparency depend on those skills – the success of the Government’s ‘transparency revolution’ will be premised on the success of the public in making use of the data that are newly accessible to them.

The answer to this dilemma is two-fold. First, there are practical and necessary steps that public bodies must (indeed, in many instances, already are) take in how they release their data. As with our recommendations about the collection of data – ensuring that it is easy for public servants to collect and record information in readily useable formats – so simplicity and adaptability are key to the publishing of data. Ideally, public bodies will streamline the process from generation to publishing to such an extent that the manner in which data are recorded makes them instantly useable to public servants in the first instance and to the public in the event of publication – cutting out both the cost of reformatting and the oft-used excuse that the time and effort required are disproportionate.

An example of how this might work in practice can be found in the London Data Store (LDS). This was set up to provide a portal through which citizens, researchers, businesses, policy-makers and charities could access data being generated by the Greater London Assembly and by public bodies operating within Greater London. It provides a platform, essentially, which is open to the public and where big data are available in dynamic formats that allow them to be used. As an example to the wider public sector, the LDS has many advantages:

- It provides a single point of entry for those looking for big data on London. This streamlines the process of identifying repositories of information and makes it easier to quickly assess what data are, and are not, available.
- All of the data are presented in useable, dynamic formats, so they can be downloaded for use straightaway. What is more, because there is a combination of a single point of entry and a single template format, using multiple big data sets becomes much easier. This allows innovators to combine data from multiple services, giving added value to public bodies that may not be aware of the potential their data holds once they are used alongside data from alternate sources.
- It is easy to use from the public servant's perspective. The single platform and templates for publishing make the LDS less onerous and easier to use than would be multiple publishing points.

The LDS model should be replicated by local authorities in other areas of the country. The bringing together of data from multiple public bodies – enabling citizens and innovators to see quickly what is available and to cross-reference data – is key to ensuring that the transformative potential of big data is realised. What is more, the LDS model provides an easy-to-use infrastructure for multiple agencies, lowering the cost of publication and providing guidance for agencies and bodies that have not hitherto sought to publish data in the most useable and useful format.

By replicating the LDS model for super-output areas elsewhere in the country, government can set in motion proactive transparency on data that it seeks. The LDS works with public bodies to encourage publication and to reduce the barriers to transparency, while helping to ensure that when big data are released it is useful and dynamic. The benefits to the public come in the forms of innovations built using data and of new insights generated within public bodies from newly shared data. To public bodies, improvements in service and efficiency can be found using the multiple data sets available through the LDS while resentment, cost and fear have been minimised by the provision of a central infrastructure and framework. This is a model that – if replicated across the public sector – could be both inexpensive and transformational. LDS leaders claim that the start-up costs of their project amounted to less than £20,000. To set up similar platforms for all 152 unitary authorities in England and Wales – top tier local authorities – could cost as little £3 million.

Important as the infrastructure of transparency is, however, it will not solve the problem of skills. It is true that making data useable and dynamic as they are published will aide engagement with those data, but it is also vital that we build analytical capacity in the population at large. As the Secretary of State for Education, Michael Gove, has pointed out, far too many British children do not acquire the numerical reasoning skills that are needed to enable them to engage with data in a meaningful way.¹⁹¹

Programmes like the SAS Curriculum Pathway, which aims to build data-handling skills in young people, must be rolled out

in schools in order to build competence and confidence in the UK population. This is important for our economic productivity and the competitiveness of our workforce in a global context, but it is (at a much more basic level) also key to ensuring that British citizens are equipped to hold the Government to account.

The Curriculum Pathway uses an online portal to deliver interactive learning modules that are integrated into the curriculum in order to train young people in higher-order thinking skills and data analysis. Britain needs to learn from programmes such as the Pathway in order to roll out data analysis skills as part of the broad curriculum rather than as simply a module in the maths curriculum. In doing so, we can both up-skill the population and teach young people that data analysis is useful and pertinent to the broadest possible range of subjects.

Governance and regulation

How we govern big data will determine how we are able to use it and how we are able to gain from it. The Government has placed much store in governance as a means to ensuring transparency, and will look to ensure that governance is directional in changing the presumption over big data from one of privacy to one of openness. But transparency, while important, is not the be all and end all of big data governance.

The issue of private sector service delivery is at the nub of this problem. Many argue that if the private sector is contracted to deliver a public service, and through the course of that delivery it generates data, those data ought to be made public in the same way we hope public sector data to be published. There is a strong case for an approach that balances the duty to transparency between public and private delivery – but there are also particular sensitivities that must be acknowledged. Private companies providing public services may use the data they produce to reduce their costs, making them more efficient and eventually saving the public money – the commercial sensitivity of data generated by private companies delivering public work is the very thing that may benefit the public.

Transparency, then, may be difficult to achieve swiftly for private companies that deliver public services. But the sharing of those big data should be a matter of course. The very least that public bodies should expect from their contractors is that all data generated in the course of their work with them are shared with public servants. The good news is that this is something local authorities, primary care trusts and other public bodies can achieve without relying on central government intervention – it is perfectly possible to write such a requirement into commissioning guidelines and contracts, and to build data sharing into their ongoing relationships with contractors. But a backstop expectation of data sharing should also be built into central government guidance for commissioners and, indeed, into central government’s commissioning processes themselves.

Transformation and big data

The Government is right to herald the transformative potential of both big data and greater openness. Together, these are powerful trends that should drive the Government to provide better services, to develop a new understanding of need and – perhaps most importantly of all – to have more mature relationships with citizens.

But we must also be careful. Transparency alone will not deliver on these potential shifts – it is the age of big data that makes transparency both necessary and practically desirable. Big data – in an age of complicated and complex lives which are both multi-faceted and multi-relational – is key to understanding who citizens are, what citizens want and how citizens are in need. The Government must capitalise on that understanding – found in everything from the data sets the Government itself produces to the data generated by Twitter and Facebook – if it is to play a useful and up-to-date role in its citizens’ lives.

Big data can make Government better – better at doing its job, better at saving money, better at predicting need. But in order for these benefits to come, the Government must truly embrace data as a means to success. That means better training for civil servants in how to use, understand, gather and analyse

big data. It means greater openness so that data can be innovated with and experimented on by civil society. It means seeing the value of data and ensuring that when the taxpayer is footing the bill the data generated are available to our servants. It means investing in young people's data skills to ensure we don't lag behind the developed world and that they can play their role as active citizens and 'armchair auditors'. All of these things must be in place if the Government is going to get serious about big data – it is the platform on which the age of big data must be built.

Without these changes big data become a big disappointment. They will fail to live up to expectations. They might finesse but will never transform. The antagonism of the British public to their collection – which they see as both sinister and pointless – will increase. Big data can make our lives better, but they require transformation not simply transparency.

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Transparency and access to public data are key priorities for this Government, which has pledged to be the most transparent and accountable government in the world. The belief, as put forward by the Government's open data and transparency tsar Tim Kelsey, is that freeing up big data could improve public services and lead to better government. But deriving such benefits from big data is not straightforward and, although its importance is broadly recognised, the route to take is not.

The Data Dividend identifies the major opportunities presented by big data and the obstacles that must be overcome to realise them. Big data can play a crucial role in holding public servants to account, but public servants themselves must also be part of the story, incorporating big data into the way they work. While it has been widely assumed that the rise of big data would lead to an increase in public participation in government through 'armchair auditing', a further stumbling block is that much of the public presently lacks the requisite skills to do this.

The report recommends a radical change to the way government collects and collates data. The benefits of big data cannot be attained merely by improving existing methods: the approach must be transformative rather than evolutionary.

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