REFORM

Big Data in government: challenges and opportunities

BT Tower
45 Maple Street
London
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Tuesday 21 February 2017
08.20 – 12.40

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Contents

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Programme

08.00 – 08.20	Registration and breakfast	
08.20 – 08.30	Welcome and introduction	**Andrew Haldenby, Director, *Reform*** **Graham Sutherland, Chief Executive Officer, Business and Public Sector Line of Business, BT**
08.30 – 09.00	Keynote speech	**John Manzoni, Chief Executive Officer, UK Civil Service and Permanent Secretary, Cabinet Office**
09.00 – 10.00	Panel one: Big Data and the knotty issue of public trust and attitudes	A recent report commissioned by the Royal Statistical Society found that both public and private institutions suffer from a 'data trust deficit'. People have lower levels of trust in the way institutions might use their data than the trust people have in these institutions in general. Sciencewise point out that there is a "significant discrepancy" between the public's stated reticence towards the use of personal data by government and private companies and their actual behaviour. Private companies suffer more greatly from a 'data trust deficit', but seem to be met by less opposition when it comes to actually using people's 'digital footprint' than government. These sorts of challenges need to be overcome by both government and private companies in order to unleash the full potential of Big Data. **Hetan Shah, Executive Director, Royal Statistical Society** **Laura Citron, Managing Director, Government and Public Sector Practice, WPP** **Dr Mark Thompson, Group Strategy Director, Methods Group and Senior Lecturer in Information Systems, Judge Business School, University of Cambridge** **Pete Cummings, Director, Partners and Government, EMEA, Adobe** **Chair: Eleonora Harwich, Researcher, *Reform***
10.00 – 10.20	Coffee	
10.20 – 11.30	Panel two: Big Data in healthcare	The use of Big Data in healthcare allows for interventions to be tailored to citizen's need, increasing the efficiency and effectiveness of the health system. Applications of Big Data in health are endless and can drastically increase people's wellbeing. Initiatives such as the 100,000 Genomes Project have changed the lives of families by giving them a clear diagnosis for their children's mystery conditions. Google's DeepMind partnerships with Moorfields Eye Hospital and University College London Hospitals are paving the way in the use of machine learning to fight blindness and radiotherapy planning for head and neck cancer. Despite these initiatives, specialists have argued that needless harm and sometimes deaths are occurring too often in the UK because data is not being analysed. Recent initiatives like 'care.data' have halted the speed at which data sharing and the use of data analytics have occurred in the sector. These barriers need to be addressed in order to unleash the full potential of Big Data. **Daniel Ray, Data Science Director, NHS Digital** **Dr Lydia Drumright, University Lecturer in Clinical Informatics, University of Cambridge** **Dr Nasrin Hafezparast, Co-Founder and Chief Technology Officer, Outcomes Based Healthcare** **Jeremy Atkins, Big Data Consulting Sales Manager, EMEA, Hewlett Packard Enterprise** **Chair: Andrew Haldenby, Director, *Reform***
11.30 – 12.30	Panel three: Big Data in criminal justice	The use of Big Data in criminal justice varies from fraud detection to the identification of crime hotspots and targeted interventions. Curbing tax evasion and other types of fraud through the use of Big Data has enabled the government to avoid significant financial losses. Big Data and cyber-security analytics have proved to be valuable tools in combating cybercrime. In other areas of criminal justice, the use of Big Data and analytics has been more limited. Hot-spot policing seems to be an effective way to reduce and prevent crime, however, the evidence is yet too limited to be able to assess the full impact of such practices. In addition, criminal justice services still face the tough task of changing organisational culture in order to incorporate the benefits of Big Data analytics. Data silos have also limited innovation in criminal justice analytics. Overcoming these barriers is necessary if the full value of Big Data is to be realised. **Andy Hill, Detective Chief Superintendent, West Midlands Police** **Dr Peter Langmead-Jones, Head of Better Inspection, Her Majesty's Inspectorate of Constabulary** **James Slessor, Managing Director, Global Public Safety, Accenture** **Chair: Emilie Sundorph, Researcher, *Reform***
12.30	Closing remarks	**Andrew Haldenby, Director, *Reform***
12.40	Lunch and networking	
14.00	End	

The *Reform* team: setting the agenda

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In the latest edition of *Civil Service Quarterly*, John Manzoni, Chief Executive of the Civil Service, said government needed to change if it is to unleash the potential of the "massive amounts of data" it holds. This was previously argued by the Science and Technology Committee who described the use of Big Data in government as having "huge unrealised potential".

There is a consensus that Big Data and analytics have the power to transform the way in which government designs and delivers public services. As highlighted by the Royal Statistical Society, it can change the type of evidence available for policymakers and allow for better evidence-based decision-making. Big Data analytics can help deliver better services for citizens and realise savings.

Despite this potential, its expansion faces several challenges. Sciencewise has found that public perception and understanding of the use of personal data by private companies and government is limited. There are legitimate ethical concerns surrounding privacy, consent, transparency and ownership of information, but research has shown that most of the reticence surrounding data collection and sharing originates from a lack of understanding of how it is being used. Government needs to address this data trust issue – and articulate the benefits – if it is to unleash the full potential of Big Data. This will be the subject of the first panel.

The second panel will focus on the challenges and opportunities offered by the application of Big Data analytics in healthcare. It is the area of public services which has seen the greatest expansion and application of analytics, with initiatives such as such as the 100,000 Genomes Project, the largest national sequencing project of its kind. This type of project will allow for better diagnosing, treatment and prevention, thus improving people's wellbeing.

The third panel will explore how Big Data and analytics have been applied in criminal justice. The benefits of using Big Data for fraud detection are well established. Kent Police has been a pioneer with the use of Predpol software for predictive policing. However, crime prevention and predictive policing are still relatively nascent fields. The panel will identify the barriers and opportunities lying ahead for Big Data analytics in criminal justice.

Reform is thrilled to welcome expert speakers and attendees to this conference. Big Data and analytics have the power to transform the way public services are designed, commissioned and delivered, making them more efficient through reducing costs but most importantly though the delivery of improved outcomes for citizens. To achieve this potential, the government must adapt. *Reform* will continue to be a strong advocate for the application of new analytical tools to promote evidence-based policy that delivers more efficient and improved public services.

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Big Data: challenges and opportunities for government

John Manzoni

We often hear that this is the "age of data" or that data is the raw material of a new industrial revolution. There is truth in this, and there is opportunity. Data can be a catalyst for a society, an economy and a country that works for everyone.

The government holds huge amounts of data. This is not new, but the recent advances in digital technology and data analysis now offer significant new opportunities to improve the experience of the citizen, make government more efficient and boost business and the wider economy. Getting data right is the next phase of public-service reform and the transformation of government; and data analytics has the potential to drive this transformation at scale and at speed.

After all, understanding what works and what doesn't means we can make better decisions, better policy and better services built on reliable data. It's about identifying more efficient ways of working; listening to what our customers say and delivering smarter services. Whether that's work to tackle child abuse through image-matching technology, the use of Land Registry data to provide a single house-price index or the ground-breaking medical research which is revolutionising the detection of eye conditions.

Government open data can also fuel an open economy based on more easily accessible information to which entrepreneurs, data start-ups and the public can add value and from which innovative products can be created. To date, government data releases have been turned into over 400 different apps, including services for finding the best dentists, general practitioners, schools and universities.

But government data is public data, so we have a duty to use it well and to open it up where possible.

Public trust in the secure, responsible, appropriate and effective use of data is absolutely critical to a data-driven government. The Government Digital Service and the Office for National Statistics have produced guidelines for data science in government, based on shared key principles including data security, openness, and taking user need and public benefit as the starting point.

Meanwhile, the Digital Economy Bill provides a legal framework for sharing data and applying the powerful digital tools at our disposal. It will allow limited data sharing between public authorities where there is a clear public need and benefit.

There is also a link between public trust and government data capability. That's why government is modernising its data infrastructure to make data easier to work with. We are introducing developer-friendly open registers of trusted core data; and better tools to find and access personal data, where appropriate, through application programming interfaces – also known as APIs – for transformative digital services.

We also need people with the right skills. We are growing the specialist data science community across government in a variety of ways, from direct recruitment to training to defining new career pathways. And we're developing a data literacy programme for non-data specialists.

Data is now the lifeblood of twenty-first century government, driving policy and service development and powering decisions on the frontline. It is transforming the face of government and public services – and we intend to make the most of it.

John Manzoni
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Big Data and the knotty issue of public trust and attitudes

Reform comment

Both private and public-service institutions face issues in securing the public's trust in the use of their data, as was revealed by a report commissioned by the Royal Statistical Society. Despite people's low levels of trust, their actual behaviour seems to signal something different. Private companies, who suffer from higher levels of distrust than public institutions on how they use people's data, seem to be met by less opposition when it comes to actually using people's 'digital footprint'. Amazon, Google and Facebook, for example, regularly use people's data to inform their algorithms. Is this simply because in the era of lengthy terms and conditions it has become impossible to give informed consent?

The rise of Big Data and analytics has changed the terms of debate surrounding consent, data ownership, privacy and trust. Some of the principles underpinning the UK's data protection law – such as purpose specification and data minimisation – conflict with the requirements of Big Data analytics. These presuppose large amounts of data and, according to the Royal Society, "finding purposes for that data in ways not originally anticipated". Maximising the benefits of Big Data means building in flexibility and adaptation. There is a fundamental tension between the legislation in place and how Big Data analytics operate.

Research shows that people express higher levels of support for data sharing and linkage if the benefits and processes are made clear and that there are proper safeguards. Government should focus on this and embark on an open conversation with the public about what Big Data means in practice.

These tensions and questions need to be addressed if Government is to harness the full potential offered by Big Data analytics.

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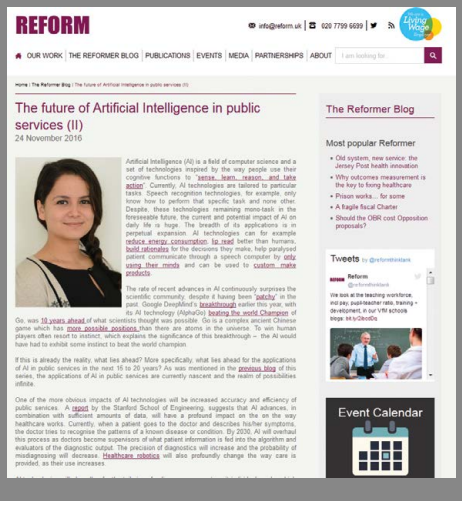
Through a series of blogs, *Reform* has been exploring how cutting edge technology such as artificial intelligence and blockchain can be applied to transform the public sector.

"Using blockchain in healthcare makes personal data more secure. Government must take heed: citizens are rightly suspicious of new technology, particularly when private information is in play."
Alexander Hitchcock, *The Reformer,* September 2016



Hetan Shah

We are in a fast-changing landscape of digital data inhabiting daily life, policy and business in the form of algorithms, Big Data, data science, machine learning, the Internet of Things, and smart cities, to cite just the most recent trends. Not a day goes by without news coverage relating to ethical dilemmas that are thrown up by this data innovation. Old notions such as privacy and consent, which have governed ethics around data, are being stretched to breaking point. New questions have arisen such as how we can hold algorithms to account or whose fault is an accident in a driverless car. The Royal Statistical Society (RSS) has made the case in its Data Manifesto that we must harness data for the good of society, but in a way that maintains public trust.

A survey by Ipsos MORI for the RSS in 2014 suggests that there is a general 'data trust deficit', whereby trust in institutions to use our data appropriately is lower than trust in them in general. Public support for sharing personal data depends very much on who it is being shared with – and for what reason.

The research indicates that when a case for public benefit is clearly stated and when there are safeguards in place, more of the public take a positive view in favour of data use and sharing than disagree due to privacy risks. The addition of safeguards, such as anonymisation of data or punishment for data misuse, significantly improves the level of support from 33 per cent to around 51 per cent.

One message for policymakers therefore is that they need to clearly communicate the value of any data sharing they wish to gain support for, and they need to put safeguards in place. It is also noteworthy that there is considerable opposition to sharing data for commercial purposes, and so this is an area where policymakers must tread very carefully.

We should remember, however, that what underpins trust is trustworthiness. The Government must therefore consider how it can ensure that its usage of personal data is trustworthy. This means ensuring security, privacy, good governance and equitable treatment. This has been lacking in some high-profile initiatives, such as 'care.data'.

If we do not stop to think about these issues and address them proactively, data innovation will not wait for us, and we may end up in a position where public trust is (rightly) lost. This could seriously set back innovation for public good – we have seen this before, for example with genetically modified food and more recently with the sharing of health records.

The RSS has argued that the time is right for a new independent institution to step back and consider the ethical implications of the data technologies that are evolving. Such a body – a Council for Data Ethics – would have the space to develop new frameworks and norms which in turn lead to institutions and data governance which are in the public interest.

Hetan Shah
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Dr Mark Thompson

UK public services face two behavioural paradoxes in relation to data sharing. First, on the demand side, as citizens we happily share data, largely unthinkingly, with private companies that we would be wary of sharing with the state. Whilst 'Zuckerberg's law' claims that the amount of data we gladly share with companies increases exponentially year-on-year, there is little evidence that the state-citizen 'data discussion' has progressed much, if at all.

Second, the possible sanctions under the existing Data Protection Act (DPA) mean that, on the supply-side, public servants often have a deep-seated reluctance to share the data they have with their peers. Despite being confronted with early evidence of the conspicuous social benefits of data sharing, fear and culture-based reluctance still hamper the attempts to join up our siloed and digitally inefficient services.

The good news is that there is increasing awareness within government of the currently immature state of the 'public data conversation'. The definitions and protections for both the demand – and supply – side sides enshrined within the DPA require updating. Does 'my data' mean 'data about me' or 'data that I control'? The scenarios it addresses also need to be revised. For example, how do we collect open or non-sensitive data whilst respecting the right to privacy and personal space within the context of the growing expansion of the Internet of Things? Excellent work is being carried out by the British Academy and the Cabinet Office to address aspects of these definitional issues.

This is welcome, since the current Digital Economy Bill has attracted criticism for its relative lack of depth in these areas. For example, many financial transactions generate around 70 data items with many different owners (consumer, intermediary, software, supplier, etc.), whose relationships in data law remain largely undefined. Citizens can use the NHS but opt out of sharing data generated through the delivery of healthcare (in some areas of the country over 10 per cent of the population has done so), meaning related national statistics must be treated with extreme caution. An urgent public discussion around objectives, definitions, good practice and governance that addresses what people gain, as well as give up, by sharing data within an era of evolving micro-services might help to

position the state as 'little', rather than 'big brother' – and help public servants, private and third sectors, and citizens alike to view informed data sharing with the state as the norm, rather than exception.

The less good news is that public conversation and literacy in this area is already well behind the curve of accelerating technological developments. We are on the verge of adding to existing complexity with new abilities to process unstructured data, such as images and natural language, that offer previously untapped prospects, for both commercial exploitation and surveillance, that may well realise Clive Humby's dictum that 'data is the new oil'. How can we prepare culturally for the data rush that is surely coming?

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Pete Cummings

As a global leader in digital experiences and real-time data analytics to the private sector, we see enormous potential for better use of data to help improve public services, manage cost, reduce fraud and better meet the expectations of citizens.

We recognise that it is for policy makers to construct the appropriate regulatory framework to ensure necessary safeguards are in place for the use of public data. But, the power of data and its improvement of citizen interaction with the state, plus the benefit to delivery, means this is an issue to be grasped to ensure we have public services fit for the twenty-first century. Use of data in the public sector and protecting citizens' privacy are sensitive issues that must be taken seriously, and ones that are also recognised in the private sector. Using data in the delivery of public services is nothing to fear. Digital data can improve the service, experience and satisfaction of citizens in a number of different ways.

Online processes such as filling in tax returns must be designed in a way that encourages citizens to transact digitally 'by default'. However, this is not where digital transformation begins and ends. Once you have a digital experience, there is a great opportunity to improve it. Successful e-commerce sites never stop improving their customer experience for two reasons: one, customer expectations for easy-to-use websites are always growing (and customers have a short attention span for bad websites); and two, they see demonstrable improvement in revenue growth by improving the experience.

For example, most people like that Amazon remembers what you've purchased, your payment details and suggests relevant products. Wouldn't it be good if you didn't have to repeat your issues with HMRC or Job Centre Plus every time you called? Or if relevant services were suggested when you completed a transaction?

To improve a digital experience, the underlying key to everything is data and insight. To better serve citizens, public-sector agencies need to make better data-driven decisions. Insight can give transparency to how someone is interacting with a public service and provide the evidence base to reform a service or transaction. For example, it can show where in a process citizens are dropping out of doing something online and contacting the call centre. Data can help agencies to address these bottlenecks and deliver the right experience to the right citizen at the right time, without compromising on individual privacy or changing the whole process.

Concerns around data privacy are understood and tackled in the private sector through established practices and safeguards. The public sector can draw from this experience to address common concerns of citizens related to data sharing. Data sharing in the public sector is an important step in the journey to bring true digital transformation to our public services. The private sector has powerful tools to help deliver this ambition. Collaboration between the public and private sector will help to deliver the best digital experience for UK citizens. With the pace of change in technology and citizens' expectations there is no time to delay.

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Big Data in healthcare

Reform comment

Since its earliest days, the NHS has embraced technology with patients reaping the benefits. Cutting-edge research into drugs and diagnostic techniques has seen patients receive world-class care. With Big Data however, healthcare has entered a new era.

Data-driven innovation is currently being used to improve population health and support patient-centred care, health-system management and research. The 100,000 Genomes Project has fuelled the discovery of more than 1,800 disease genes. Today's researchers can find a gene suspected of causing an inherited disease in a matter of days. The project has given families a diagnosis for their children's mystery conditions. The hope is that mapping genomes will lead to a powerful form of preventive, personalised and pre-emptive medicine as clinicians tailor care to an individual's DNA.

Equally exciting are computer programmes capable of digesting and analysing information for medical diagnostics. IBM's Watson can read 40 million documents in 15 seconds. Watson has been taught how to understand and accumulate medical knowledge relating to oncology. Its creators believe it is better at diagnosing lung cancer than humans.

The *Five Year Forward View* aimed to digitise all health records by 2020. This time scale is optimistic, but bringing together different health systems that share information would create the world's largest health database. It could provide a golden opportunity for researchers to understand patterns of population health and disease.

If the NHS is to fully embrace the potential Big Data has to offer it must focus on protecting patient data and communicating change to the public. Patients have an expectation that their information is private and may not appreciate that it is possible to share data whilst protecting confidentiality.

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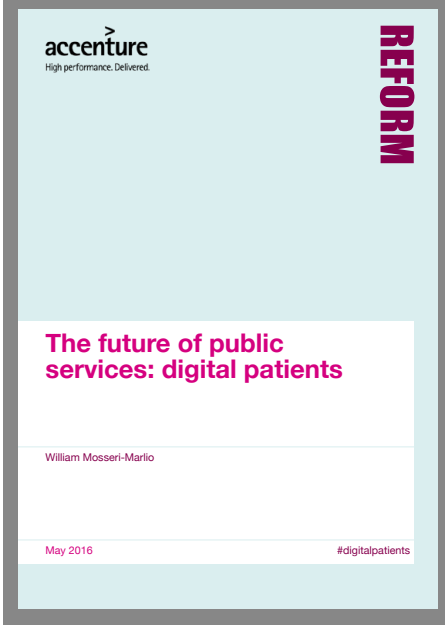

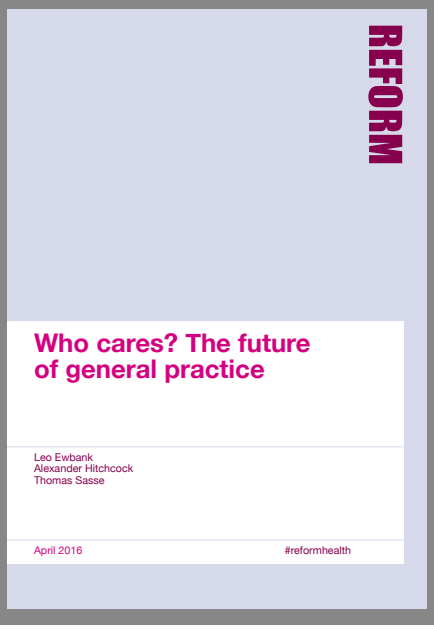

"To fully capture the rewards of digital health products, consumers need to share the data they are generating with their care teams." ***The future of public services: digital patients,*** **May 2016**

"Technological advances such as data analytics…have the potential to change how healthcare functions – this would bring considerable benefits to providers and patients alike." ***Who cares? The future of general practice,*** **April 2016**

Daniel Ray

NHS Digital is privileged to be guardian of some of the best data sets available to any health-and-social-care system in the world. We are building on the foundations we have laid to advance into a position to transform information and technology to benefit frontline clinical staff, the public and system leaders.

Better information is the key to a more intelligent health-and-social-care system and to achieving major breakthroughs which will support the health-and-care system through a time of stretched resources and increased demand for services.

Data and information play a crucial role in the efficiency and effectiveness of the health-and-care system. We will build, co-develop and facilitate with our system partners, the creation of a further digitally enabled health-and-care system which supports the aims of the National Information Board.

We are also changing how we link data by following the patient journey through the health-and-social-care system. Data will be organised around the patient pathway which will give us the opportunity to transform our understanding of how health and social care is working. This will be done securely, and within a framework that respects people's privacy and data sharing preferences. We want to explore how we can utilise data – from sources like apps and wearables – to develop pictures of the experiences and outcomes of patients.

The analytical tools we are developing for clinicians and managers are intuitive, flexible and more accurate at interpreting the information they need. These interactive analysis tools will provide the baseline for innovation, save time, resources and put new data-science techniques and tools at clinicians' and health-system leaders' fingertips. We are also developing remote research data access environments that will allow researchers and others with the right permissions, to interrogate the specific data they have access to, without receiving entire datasets.

Underpinning everything we do is ensuring the public is confident that their personal health and care data are used and stored appropriately and securely. We look forward to implementing the National Data Guardian's recommendations for managing patients' data sharing preferences and make it easier for them to make informed decisions about how their data are used. We are leading cyber security across health and social care, to ensure that data are held securely on local systems and guiding, training and supporting others to do the same.

All of this work is complemented by the technology programmes at NHS Digital which are developing innovative ways to deliver care models that respond to and are shaped by distinct local needs. It is a collective effort to re-invent how we use data and technology and realise the transformation of delivery of care.

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Dr Nasrin Hafezparast

With increasing amounts of data, coupled with increasing computing and technology power, many organisations are now looking for trends that can help them predict future events and provide enhanced competitive offerings for their customers. As an example, Amazon's 'anticipatory shipping' capability, predicts future buying preferences and ships customer orders before they are even bought.

Can we apply these same approaches to healthcare? Imagine a future where as well as 'pre-shipping' packages, we are also able to precisely anticipate and 'pre-treat' adverse health events before they occur.

Health datasets are large in volume (and are growing rapidly), complex, cover very heterogeneous populations, contain undiscovered relationships and are growing exponentially, in real time.

However, our organisational structures and silos, coupled with governance and regulatory challenges, make the processing and use of data more complex than other industries. Even in research, relatively small datasets with few dimensions are used to investigate predetermined hypotheses, rather than data-driven hypotheses generated from analysis of vast datasets. Relatively small sample results are applied to whole populations.

Within individual care settings, Big Data is now being used to generate operational insights. Visensia uses patients' vital signs to enable early warning detection of deterioration in people admitted to hospital. Using machine learning as a diagnostic or prediction tool in specific care settings or wards obviously limits us to only improving outcomes for those treated in that setting.

To gain any sort of insight and predict events, with the point of focus being an individual or population (rather than an individual care setting), we need large datasets, which tend to be spread across multiple provider organisations, over an individual's lifetime and over all of their care (not just related to an intervention). The same silos of care, budgets and accountability also apply to data. Analysing outcomes data, and predicting them, at whole population level, or even for a population segment, is new territory, with potential to deliver significant value to entire health systems.

In parallel with the growth of health datasets, in both volume and scope,

non-health datasets are capturing growing amounts of data rich in characteristics that define peoples' demographics, lifestyles and the environments in which they live. Approaching health through this lens requires a fundamental shift in how health systems understand their populations. This idea is not new: outside of healthcare, marketers are experts at population segmentation. Even within healthcare, to quote Hippocrates, "It is far more important to know what person the disease has, than what disease a person has."

When obtaining datasets from other organisations, information governance can become a significant hurdle and limitation. We are yet to reach the point of widespread understanding that the opportunity cost to individual patients of not linking and fully understanding health data is likely to be significantly greater than risks to patient confidentiality, which may be managed by robust and proportionate safeguards.

Any new innovation has hurdles to overcome and this area is no different. There are ethical problems to answer, data-access rights to successfully regulate, and person-centred outcomes to rigorously define. What is clear is that the technology is available, as demonstrated by what is being achieved in other sectors. The potential upside in terms of value to otherwise unsustainable health economies and individual outcomes is too significant to neglect any longer.

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Jeremy Atkins

Healthcare organisations around the world are under increasing amounts of pressure from ageing populations, growing number of complex medical conditions, shrinking tax bases and skills shortages. The convergence of these realities along with the emergence of new technologies has led to innovative thinking about how we respond to these pressures on services and continue to deliver better-quality care to the citizen.

In the UK, the health-sector ecosystem is making real strides through the use of predictive analytics, remote monitoring, telemedicine solutions and data-sharing initiatives to improve healthcare outcomes for the citizen but there is more to come. As 'the things' around us are becoming increasingly connected, we are able to extract more and more value from data we generate. The ecosystem of the Internet of Things (IoT) data-collecting devices, such as wearables and sensors, will continue to expand and as patients increasingly track their own health, they'll expect their care provider to incorporate the data into care plans. In addition, the increasing use of artificial intelligence in healthcare will be profound. As we progress in our ability to use Big Data algorithms at the point of care to influence when and how decisions can be made the potential to detect complications, while a patient is still in the hospital, or discover trends in medical cases, is an invaluable game-changer for future of medicine. As a result, we are seeing fundamental changes to healthcare delivery away from caring for sick patients on a case-by-case basis to providing holistic, proactive, and personalised long-term accountable health management.

But we must not stop there. There are profound gains and cost savings still to be realised in the community and across the care services delivered by local authorities today. Data-sharing with the relevant stakeholders at the right time and securely will be a crucial element to enabling our hospitals and community-care providers to adapt, integrate and deliver multiple levels of care and wellbeing for the future.

Hewlett Packard Enterprise has been at the forefront of medical innovation for many years. Our data scientists are working with local authorities, police services, GPs and trusts to federate their data to understand how, when and where citizens enter the care system, their route through the different agencies and the outcomes and experience. This allows earlier intervention to modify the patient pathway and improve outcomes. Our partnership with research institutes is driving research deeper and faster into genome sequencing making bespoke treatment plans a reality and driving new therapies through to licencing safer and faster.

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Big Data in criminal justice

Reform comment

Her Majesty's Inspectorate of Constabulary recently found that 40 per cent of the time, police community support officers are not in the places where they are most needed. How do they know? They use Big Data. By analysing police records from 14 different forces over seven years, and matching this with more than 1,200 variables from the corresponding ONS Output Areas, the project has created a model able to explain the variance in crime with an accuracy of more than 80 per cent. This was matched with officer locations to evaluate if they could be deployed to greater effect.

'Predictive policing' has been implemented widely, especially in the US. More independent analyses need to be undertaken, but early results indicate that it has sped up crime reduction. So far, focus has largely been on property crime, but data analytics have also been used to inform who the most likely victims of cybercrime are, and where and when women are at high risk of domestic abuse.

In addition to more efficient resource-allocation, predictive policing has the potential to allow for more autonomous working practices in the police. With access to data on where crimes are most likely to occur officers can make informed decisions on how to deploy their efforts.

However, not all responses to predictive policing have been positive. Given that certain crime types are more likely to be reported than others, one fear is that prevention efforts based on Big Data will only focus on these kinds of crimes. But this is no reason to scale back. Firstly, this is a dilemma police must already grapple with – how do you prevent, or even respond to, crimes that you are given no timely information about? Secondly, making traditional policing more efficient will, if anything, free up more resources for strategies addressing this issue.

As the face of public authority, policing has high-stakes consequences if it isn't working well. Given the recent changes to police funding, it is as important as ever that police forces operate in the smartest way possible.

Emilie Sundorph
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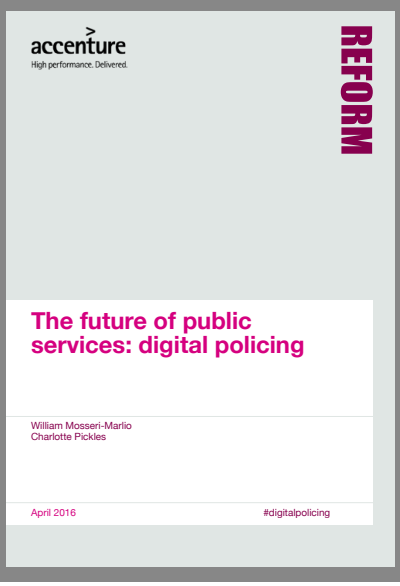
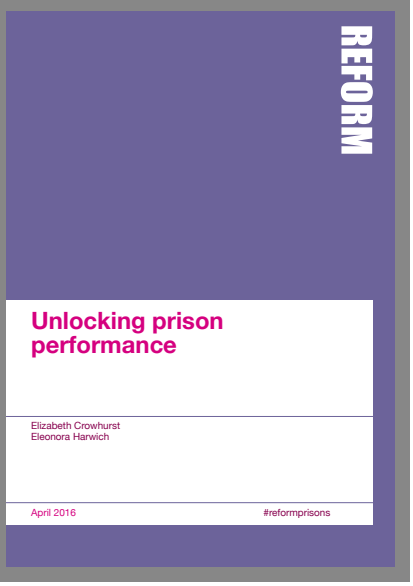
"Creating a system that gives analysts access to multiple and differently formatted data sources is West Midland Police (WMP)'s goal. Success could fundamentally change the police's existing approach to data – whereby analysts reactively search for information on a target – to one in which risks are identified in advance and then acted upon."
The future of public services: digital policing, **April 2016**

"There is, however, a significant need for improved data availability and quality. The success of any performance model hinges on the integrity of the data used and as this report argues, current data is both lacking and poor quality."
Unlocking prison performance, **April 2016**





James Slessor

Citizens' expectations often exceed the reality of what public-safety agencies can deliver. As agencies struggle to keep pace with technological innovation and digital disruption, the gap between expectation and reality is widening. An Accenture survey of more than 774 information technology (IT) leaders in the public service across nine different countries showed that nearly one-third of agencies believed that citizens are better informed about technology than they were. Yet with the ability to refine, predict and present, analytics and Big Data could hold the key to success.

Public-safety agencies must identify harm, risk and threats out of a growing volume of data. While 89 per cent of agency respondents say that Big Data will revolutionise operations the same way that the internet did – opening enormous opportunities for public-safety agencies to be more informed and improve decision making – the approach must form part of an integrated public safety or policing operating model that is supported by citizens and strengthens police legitimacy. In Singapore, the Government's Safe City program uses advanced analytics to deliver meaningful insights in real time and across agencies, for a fast, informed response that better serves citizens.

Big Data in the context of the accelerating pace of change is also a threat. Greater investment in new technologies and work practices, policies and processes helps to deliver personalised services and reassure citizens wary of data misuse. The majority of leaders are ready and willing to invest. Seventy-one per cent of public-safety leaders aware of digital technologies, such as analytics and predictive modelling, are piloting or implementing them.

Police forces are marrying increasing data volume, new real-time analytical technology and strategic thinking to develop innovative solutions:

- London's Metropolitan Police Service piloted predictive-analytics technologies to target gang crime across the city.
- West Midlands Police is using analytics to understand criminal networks and provide data-driven insight into police operations.
- The Seattle Police Department developed a data-analytics platform to bring reliable, rapidly accessible data to meet its management and governance objectives. It supports insight-led policing, addresses issues such as use of force, and helps police leaders make data-driven decisions.

To make the best use of Big Data, public-safety agencies must consider:

- **The human user:** the combination of analytics, visualisation and common sense must deliver actionable information to the right person in the right way, at the right time.
- **The proactive switch:** process and cultural change are important aspects of moving to a proactive data-driven and analytical environment.
- **The legitimacy lever:** transformation stems from a holistic operating model that is properly planned, timed and implemented — with the engagement and support of the public being critical.

Big Data analytics help the criminal-justice system move further towards being data driven and prevention focused. With clear guidance underpinning its use, legitimacy and security, public-safety agencies can use Big Data to emerge from disruption stronger and be better able to protect those they serve.

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Big Data in government: the opportunities and challenges it faces

Dr Simon Thompson

The public-sector, like the very biggest private-sector organisations, hold huge volumes of data – from an individual's tax returns and health records, to the most secret of global intelligence. However without the ability to turn that raw data into information, knowledge and insight, it is nothing more than a massive overhead. Like other forward-thinking organisations, the UK public sector is realising that knowledge and insight gleaned from raw data has the ability to transform the lives of UK citizens, businesses and visitors. Providing that data can be turned into usable information it will:

- be the glue that joins citizens and businesses to government services, to communities, and to each other;
- transform the way work is undertaken across government and industry, breaking down boundaries and hierarchies, and enabling a data-driven organisation;
- enable unparalleled levels of defence and security for the country from international or domestic threats; and
- provide citizens with better education, healthcare and quality of life.

Tools and techniques already exist to turn 'dumb data' into meaningful information that changes peoples' lives for the better, but the biggest challenge is not the analytics. It comes way before that – at the start of the journey.

Unpicking and unpacking the right datasets to digitise across government is hard enough. But when every department has multiple data repositories in different formats – many still paper-based, the need for an interoperable solution is inescapable.

And ensuring security, privacy and data recovery is paramount. Neither government nor industry is immune from the threat of cyber-attacks as was proven frequently in 2016.

At BT we've been on a long journey towards digitisation, to make us more agile, to save costs, and provide better services to our customers – from blocking nuisance calls to providing robust cyber defence for some of the biggest organisations across the world. We have learnt many things on that journey. For instance, we know that the skills required to analyse and make sense of Big Data are in short supply and that government will need to compete for these in the open market. Critically, they will also need to create substantial internal training programs to enable people to adopt and use the technologies, including for senior IT leaders. Otherwise it will find itself heavily reliant on expensive bought-in services and capability.

Data mobility and platform access are essential to combine data assets and derive value from them – wherever and whenever it is needed. Digitising information but restricting its availability delivers little benefit, only additional cost.

Source data quality must be beyond question. If macro-decisions impacting whole cities, regions or sections of the community are to be made, government will be under intense scrutiny to demonstrate the accuracy of its data.

So the challenge for government and the public sector is to manage the complexity, cost and risk of fully digitising data in order to deliver the benefits promised from Big Data analytics.

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