SITUATING **OPEN DATA**

GLOBAL TRENDS IN LOCAL CONTEXTS

Edited by Danny Lämmerhirt, Ana Brandusescu, Natalia Domagala & Patrick Enaholo

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AFRICAN
MINDS

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4 Eccleston Place, Somerset West 7130, Cape Town, South Africa
info@africanminds.org.za
www.africanminds.org.za

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Using open data for public services

*Miranda Marcus, Ed Parkes, Therese Karger-Lerchl,
Jack Hardinges & Roza Vasileva*

Many public services in the UK are expected to deliver efficiency savings along with improved outcomes for citizens. At the same time, public service delivery is increasingly interconnected with many organisations from the public, private and charitable sectors. To ensure effective and efficient delivery, we need to understand these links and interdependencies. The changing nature of data presents new possibilities – data is moving from being scarce and difficult to process to being abundant and easy to use. There are increasing opportunities to harness its value for economic and social benefits. Open data is data that anyone can access, use or share (ODI 2017). It drives innovation by and for governments, individuals, businesses, start-ups and communities. We can see the potential open data has for transparency, economic growth and productivity in international open data for accountability initiatives (OGP n.d.), open data start-ups (ODI n.d.) and businesses improving processes with open data (Shadbolt 2015).

Open data is already being used to provide public services. For example, the release of travel and mapping information by Transport for London reduced the need for the public sector to build services for end-users and helped build a new market of digital mapping and travel services to meet people's needs. The government created space in the market for the private sector to innovate while monitoring the market to ensure that it was fair, equitable and so that the public sector could meet user needs where the market had not. This resulted in reducing public sector costs, improving services, creating jobs and increasing economic growth. Despite this success, there are still many cases where the government is building new services that could be delivered by the market. Open Data Institute (ODI) has been researching existing examples of open data helping deliver policies and public services with an aim to understand how they were

built; what were the lessons learnt, as well as the economic and social benefits produced. ODI has engaged with public sector service design teams to test the outputs and produce training materials for public sector staff to encourage the use of this service delivery model and provide funding for organisations inspired by the training to experiment with new delivery models.

This chapter explores the use of open data in public service delivery and its potential for collaboration, joint problem-solving and open innovation. It highlights where open data has been released by public sector institutions and what effects it had on delivering public services. This chapter has drawn on the existing research from Nesta, including their *Wise Councils* report (2016), which explores case studies of councils using data in innovative ways. Additionally, they have developed tools for others to redesign services, such as the *DIY Toolkit*,¹ or more recently, their *Data Analytics in the Public Sector* (Copeland, Dragicevic et al. n.d.) draft guidance.

Additionally, the Organisation for Economic Co-operation and Development (OECD n.d.) released a comparative study looking at how open data can drive innovation in public service delivery. The study is focused on the potential benefits of open data, but it signals a need for tools to support people working in public service design and delivery to use open data more effectively.

The research questions considered in this chapter are:

- Where has open data helped deliver policies and public services?
- What are the commonalities in how they were built; the lessons that were learnt; and what were the economic and social benefits produced?
- Can the design of services be improved by creating and influencing tools that address the barriers to open and shared data public service delivery?

The research surfaces three high-level patterns of open data use in public services:

- Pattern 1 uses open data to increase access to services for citizens or organisations.
- Pattern 2 uses open data to plan public service delivery and make service delivery chains more efficient; direct beneficiaries are commissioners, managers and frontline public service workers.
- Pattern 3 uses open data to inform policy-making; direct beneficiaries are elected representatives, policymakers and citizens who want to influence policy.

In this chapter, we identify examples of each pattern and draw insights from their similarities. We go on to develop practical recommendations for a range of actors to support greater use of open data to deliver public services.

1 <http://diytoolkit.org/>

Methodology

Defining public services

Developing a working definition of public services helped us identify appropriate examples to examine in more detail. The definition used in this chapter is: *a public service helps groups of people to fulfil a need, the fulfilment of which is viewed to be in the public interest, and which public sector organisations recognise the need to provide.*

We developed and settled on this definition through workshops with public service delivery managers and the research team for several reasons. We wanted to recognise a definition of public service which was as broad as possible, so we could capture the wider effects of open data, for instance, where data collected and published in one part of the system was used by another part of the system at another place and time.

Our current definition focuses on the needs that individuals or groups of people have, as suggested by Cassie Robinson (2017), as we did not want to align our definition too closely with the legal responsibilities that public sector organisations have. We wanted to recognise that – particularly in relation to services that rely on external organisations for their delivery and are not necessarily totally funded by the government – there would not always be a distinct legal requirement for provision to a particular group.

Previous work on open data in public services

The focus of this chapter and the conceptual framework is primarily the UK public sector. During our research, we identified blog posts, reports and previous analyses on the use of open data in public services. There is a wide literature on the use of data in central and local government (Nesta 2016) and the impacts of open data on economic growth and innovation, but a relatively limited range focused specifically on open data and public services.

This chapter builds on Davies' work on open data and public sector reform specifically addressing his finding that open data can 'reduce friction in co-production of services between different levels of the state' to highlight and analyse its underlying models (2010: 5). The work of Susha et al. (2017) on data collaboratives points to a similar set of patterns to those identified in this chapter as outcomes of the use of data collaboratives. These are characterised as 'prediction and alerts (i.e. using data insights as early warning signals), needs-based planning (i.e. using data to learn about people's needs for aid planning), capacity building (i.e. using data to identify areas to improve government response), and monitoring (i.e. using data to track compliance with policies)' (Susha et al. 2017: 2695). This chapter develops these outcomes within a UK local public sector context, without focusing on the mechanism of data access.

Pia Waugh (2016), who has worked for both the Australian and New Zealand governments, has outlined some effects of open data on public services in a number of blog posts and presentations, including this summary:

Efficiency: proactively publishing data that is commonly asked for in an automated way frees up resources;

Innovation: once data is published, so long as it is published well and kept up to date, other people and organisations will use the data to create new information, analysis and services. This innovation can be adopted by the agency, but it also takes the pressure off the agency to deliver all things to all people, by enabling others to scratch their own itch; and

Improved services: by publishing data in a programmatically accessible way, agencies found cheaper and more modular service delivery was possible through reusable data sources. Open data is often the first step for agencies on the path to a more modular and API-driven way of doing things (which the private sector embraced a decade ago). I believe if we could get government data, content and services API enabled by default, we would see dramatically cheaper and better services across all governments, with the opportunity for a public ecosystem of cross-jurisdictional service and information delivery to emerge. (Waugh 2016)

In the UK, the ODI's work with the Environment Agency (ODI 2015a) has captured the benefits of releasing open data since the Environment Agency made their organisation-wide commitment in 2010. The impacts the Environment Agency identified at that point were:

- Helping the Environment Agency to achieve its core objective;
- Saving time and resources;
- Building external relationships and getting the user-voice heard;
- Improving data quality and public perception;
- Better understanding and managing risks around data use and publication;
- Bringing diverse teams together;
- Working more easily and efficiently with external partners; and
- Harnessing the power of the tech industry to make useful applications.

Another sector-focused study by GovLab (2014) examined the opportunity for open data use in the UK's National Health Service (NHS) in 2014. Along with exploring potential impacts of open data on the system, it set out a conceptual framework which could be used to help measure the impact of open data in the NHS. The report developed a logic model for open data in the NHS, described as: 'the use of certain kinds of inputs and data, by certain kinds of users, for certain kinds of activities, will achieve certain outputs and outcomes that indicate impact. Specific methodologies will be used to collect and measure

indicators, helping to assess impact' (GovLab 2014). The report also made recommendations for taking the agenda forward in the NHS, including to 'develop an open health data ecology map, possibly using crowdsourcing, with a dictionary of all open health datasets used along with the variety of uses and users' (ibid.).

In summary, previous research has begun to explore impact areas experienced by the public sector in releasing open data. This chapter expands on this previous work by identifying particular examples and their shared characteristics to enable a more detailed knowledge of how the release of open data will make public service delivery better.

Approach

The project employed a combination of traditional qualitative techniques such as interviews and desk research, alongside the technique of visualising public services as ecosystems. Due to the complexity and non-linearity of the public service delivery process, identifying impacts and beneficiaries is not straightforward. Impacts might be indirect, hard to capture, or might take time to materialise. Visualising a public service as an ecosystem allows to identify and be explicit about the impacts and who is affected and helps understand different types of value exchanged within networks of data publishers and users. Therefore, these impacts become clear to the public sector and data holders, encouraging the further release and use of open data.

Visualisation brings sense to complex systems and issues across business and government. Government departments have created visualisations of ecosystems to help convey the overarching strategy and vision for an organisation (DWP Digital 2015). Maps of business processes and data collection help understand opportunities in government data collection (Rose 2010). Visualising and drawing are core approaches in service design and the UK Cabinet Office Policy Lab and academics such as Lucy Kimbell have pushed their use forward in a government context. Kimbell (2015) has provided a number of useful approaches to thinking about service design in the public sector and her methodologies have inspired the way in which we have conducted research for this project. There are a number of academic disciplines that visualise ecosystems and networks to bring insight to complex systems. In particular, a soft-systems methodology can be helpful in capturing people's involvement in a system – it is an approach to business-process modelling which is useful for general problem-solving and managing change. The system was developed to deal with 'soft problems' – those where there are divergent views and where organisations and people are key parts – with lots of similarities with public sector systems. In addition, value network analysis uses visualisation to understand complex economic systems.

In our research, we experimented with a technique from the soft-systems methodology called rich picturing. When exploring an issue, we ran workshops

with public sector groups working with open data, to visualise the relationships between organisations, technologies and datasets.

Participant selection

The examples of open data-enabled public services came from three sources. First, there were those which were already known to members of the ODI through its global work with the public and private sector. A second source was a broad internet search and screening research organisations that had similarly been focusing on the open data agenda. This included organisations such as Open Knowledge, GovLab, the Knight Foundation and Sunlight Foundation, amongst others. In addition, we looked at open data portals with listed examples of use. Finally, we undertook a search of reports and other documents published on the topic of data use within the UK government, with a specific focus on open data.

This secondary research was supported by interviews with experts from the community. The interviews highlighted examples and helped to develop and expand our approach and explanatory framework for the rest of the project. The details of the examples were mostly captured in workshops with individuals who had a close working knowledge of the area. We spent the majority of the workshop time working with the participants to draw a rich picture of the example identified. In the process of developing the illustrations and drafting the descriptions of the examples, we reconfirmed the details with relevant individuals and, where appropriate, omitted commercially sensitive or otherwise confidential information at their request.

Findings

We propose that open data can be used in the public sector to help deliver services in three ways. We call these ‘patterns’ and have used them to group the examples in this work.

Figure 1 shows that the patterns occur at different points of the public service delivery, moving from direct impacts for the user (on the left) towards indirect impacts through better delivery and policy-making (on the right).

High-level patterns of open data use:

- Pattern 1 uses open data to increase access to services for citizens or organisations;
- Pattern 2 uses open data to plan public service delivery and make service delivery chains more efficient; direct beneficiaries are commissioners, managers and frontline public service workers;
- Pattern 3 uses open data to inform policy-making; direct beneficiaries are elected representatives, policymakers and citizens who want to influence policy.

Figure 1. Open data for public services taxonomy

Open data for...			
	1 Better access to public services	2 More efficient service delivery chains	3 More informed policy development
Direct beneficiaries	Citizens Businesses	Commissioners Managers Frontline staff	Public sector workers Elected representatives
Decisions/ actions taken	How and where to access public services	Where to prioritise operational resources	Where to target policy interventions
Information produced	Targeted service information	Insight and patterns	Data visualisations and analyses
Types of data	Open real-time service data	Open performance data	Open data about a policy area

Figure 1 shows how these patterns vary in terms of direct beneficiaries and differ in the types of open data currently released and used. For instance, in Pattern 1, we find more examples of rapidly changing data being used – such as that released by Transport for London (TfL) – than in the patterns targeted at civil servants (Pattern 3).

The impact is not limited to direct beneficiaries. It can extend to many, if not all, of those who deliver and receive public services. This report focuses on the benefits generated from open data. We recognise that open data can also create risks or feedback loops that have negative impacts and that potential outcomes should be carefully assessed on a case-by-case basis. The following sections look at the dynamics of the patterns in more detail. In presenting the ecosystems, we also explain how each was developed. This offers insight into how these arrangements came to be and highlights important aspects of how open data supports particular services that are not explicit when analysing the ecosystem drawings in a fixed state.

Pattern 1: Open data for increasing access to public services

The first is perhaps the most well-rehearsed pattern, since it clearly sets out an open data ‘start-up’ story where organisations delivering public services release data and start-ups use it to develop products or services. These examples tend to be of customer-focused, personalised public services.

Example 1a. Transport for London release of transport data

Transport for London (TfL) is a local government body responsible for the transport system in Greater London. TfL has the responsibility for London's network of principal road routes, for various rail networks including the London Underground, London Overground, Docklands Light Railway and TfL Rail, for London's trams, buses and taxis, for cycling provision, and for river services.

Figure 2. Transport for London data ecosystem

TfL is one of the UK's leading open data publishers. With over 31 million journeys made in London every day (TfL n.d.), it has long recognised the need to make travel information readily available to passengers. Publishing open data is a central part of TfL's customer information strategy of providing real-time data such as service locations, routes and delays to passengers far beyond their own online and offline channels.

Towards the end of the 2000s, TfL found that developers were scraping information about its services from its website. In an attempt to enable others to more easily display this information on their own websites and desktops, in 2007 TfL launched embeddable widgets – including maps of its network and

live travel news. While TfL still makes a set of widgets available, the launch represented the beginning of a process in which the organisation would publish increasing amounts of data for others to access, use and share.

Between 2007 and 2011, TfL introduced an area for developers on its website and openly published real-time transit data via a range of feeds and downloads.² This helped to satisfy a growing demand for its data among developers, who used it to create user-facing journey planners and other applications. The anticipated influx of visitors to London during the 2012 Olympic Games was a stimulus for the introduction of live bus arrivals data, which led to a number of successful bus-only transport applications. Shortly after this came the launch of a new unified Application Programming Interface (API) for TfL's website.

The development of TfL's unified API in 2014 and the decision to open it up to external users was an important step in the organisation's open data journey.³ Historically, the data it had published on different transport modes was made available in a variety of formats and structures, which made it difficult for developers to stitch together and develop multimodal applications (such as those that enable users to plan a journey using both buses and the London Underground). The unified API presented the data in common formats (XML and JSON) and, for the first time, consistent structures.

TfL's open data now covers timetables, routes and lines, embarkation points and facilities, transit status, disruptions and works, and fares.⁴ According to recent research by Deloitte (2017), in total there are over 80 TfL data feeds (75% of which are available via the unified API) and over 13,000 registered developers.⁵ Data users range from multinational technology companies to individual developers. The research has shown that TfL's approach to open data is improving journeys, saving people's time, supporting innovation and creating jobs.

According to Deloitte (2017), TfL open data is now used in over 600 apps (including journey planners, mapping tools, booking and scheduling tools, and analytics engines). 42% of Londoners use an app powered by TfL data and passengers benefit from between GBP 70 million and GBP 90 million per year in time saved from using open data-powered applications to plan journeys more accurately. Up to GBP 20 million additional revenue is generated from increased journeys per year, driven by access to travel information, and GBP 1 million is saved per year by enabling external development of new customer-facing

2 TfL also publishes open data related to transparency and accountability, such as details of its expenditure; this case study focuses on the organisation's transit data.

3 TfL, Unified API: <https://tfl.gov.uk/info-for/open-data-users/unified-api?intcmp=29422#on-this-page-0>

4 TfL Website (n.d.), 'Our open data', <https://tfl.gov.uk/info-for/open-data-users/our-open-data?intcmp=3671>

5 Note that TfL still supports the use of some data feeds and bulk downloads that preceded its unified API. In some cases, these contain additional data not yet available via the unified API.

apps, rather than producing campaigns, systems and apps in-house. TfL save GBP 2 million annually by moving away from SMS passenger alerts and TfL open data currently supports 730 jobs, including those in new companies made viable through its availability.

Insights

Clearly describing the benefits of open data in relation to TfL's wider organisational objectives has established a strong, ongoing case for its publication. Providing accurate and timely information to passengers is central to TfL's ability to deliver its physical services – open data enables developers and other organisations to develop customer-facing tools that do this on a scale that TfL could not do alone. Efforts to establish the value of the benefits of TfL's open data approach were documented in the Shakespeare Review (Gov.uk 2013) and the Deloitte (2017) research commissioned by TfL that has estimated the total value of open data to the organisation and customers to be of GBP 130 million per year.

Engaging with developers and other users has helped to build a vibrant ecosystem around TfL's open data. Having begun with creating an area dedicated to developers on its website in 2007, TfL continues to engage with and provide support to users of its open data through hackathons, blog posts on its website, and other channels. In 2017, it launched the TfL Tech Forum and ran a consultation focused on understanding how it could improve its open data publication. Publishing open data has supported conversations and partnerships between TfL and other organisations who hold valuable transit data. By making data available to others, TfL has benefited from engagement with companies such as Waze, Apple and CityMapper – some of which provide TfL with access to the data they collect. This includes data related to transport modes and areas for which it does not itself collect data (e.g. crowdsourced traffic incident data), giving TfL access to a rich source of data enabling them to better manage traffic in London.

A number of intermediary users combine TfL open data with data from other sources to create their own products and services. Organisations like ITO World, TransportAPI, Tom Tom and Elgin gather data from different sources to provide aggregated data feeds and additional services to developers and other organisations. This type of use demonstrates the need for transport data standards that allow interoperability – part of the value currently added by these intermediary users is to harmonise the data published by different transport operators and other organisations to make it easier to use and to develop new products and services.⁶ As well as using open data published by TfL to increase access to the organisation's physical transport network, some

6 The ODI is currently working with a wide range of stakeholders to support the development of open data standards (<http://standards.theodi.org>). This includes producing a case study focused on the General Transit Feed Specification (GTFS), which is a widely adopted standard for public transportation data. <https://docs.google.com/document/d/1m3jjR741VcE6ouyPITWgh6HmASQG2jhflMCddPAva8U/edit#heading=h.fzurpmmkvjtj4>

users are developing their own transport services. For example, CityMapper helps users make decisions about how to get from A to B in London using different modes of transport, which are managed and run by providers including TfL, Uber and Arriva. In 2017, CityMapper trialled the SmartBus, which uses data it collects on how users of its service move around the city to create the routes and timetables for the new SmartBus service.

Example 1b. Leeds release of data in relation to bin collection

The Leeds Bins app is a mobile application that tells people who live in Leeds when their green, brown and black bins are due to be collected, and adds reminders to their calendars. Open data on bin collection routes and times is used to inform people living in Leeds when their bins are collected. The application reminds the users to put their bins out the night before and includes links to what to put in which bin and where to take items that cannot be put into any of the bins. The reminders make the rubbish collection more convenient for citizens, and publishing open data instead of sending out letters saves the council approximately GBP 100 000 per year based on estimations by imactivate.⁷

Leeds has long seen open data as a means of supporting local economic growth while dealing with substantial reductions in local government spending power. In 2014, Leeds Council decided to invest significantly in making open data work for the city. Leeds has a lot of digital talent and the city leadership saw the potential to showcase the city's strengths to potential investors. In setting out the open data initiative, the council asked city departments what challenges they faced to consider how open data could help and assigned funding to encourage the release and use of open data. The Urban Sustainable Development Lab⁸ set up to generate and pilot ideas was one of the programmes, with additional funding from the UK's national 'Release of Data' fund (Data.gov.uk 2014). Leeds' open data platform Data Mill North⁹ hosted an event at ODI Leeds¹⁰, an ODI Node, with developers working with council departments, including office staff, frontline workers, and elected members, to consider how open data could be used for better service delivery. People working in waste management shared the problems they faced in their work, one being that people did not know when their bins were collected and, as a result, were unhappy with the service. Furthermore, the council had to mail out bin collection timetables either annually or bi-annually, an expense that they increasingly could not afford. Open data on bin collection and other issues was made available for the ODI Leeds event and developers built prototypes to address the identified problems. Imactivate, a small software company in Leeds and a partner organisation of

7 <https://www.imactivate.com/>

8 <http://sustainabledevelopmentlab.com>

9 <https://datamillnorth.org/>

10 <http://leeds.theodi.org/>

ODI Leeds, developed a Leeds Bins prototype website. Four ideas in total were presented to the waste management department and the winning Leeds Bins team received the funding to develop what later became a mobile application.

Bartec Auto ID¹¹ has software that manages bin routes in Leeds and sends and receives live updates. Data Mill North worked with Bartec Auto ID to release household bin collection data openly, and the council included the open release of the bin collection schedule in its contract with the company (Data Mill North n.d.). The Ministry of Housing, Communities and Local Government (MHCLG) had previously developed a standard for publishing bin collection routing data with Bartec Auto ID, and other stakeholders, in their Local Waste Service Standards Project. Imactivate developed the Leeds Bins mobile application¹² using the open bin route data and the uptake of the application has been fast and widespread (Data Mill North n.d.). The council uses open data on app usage to identify areas of low uptake, and has launched targeted initiatives to increase awareness of the application and promote other ways of informing people when their bins are collected, to reduce the risk of people without smartphones not receiving information about collection times. These targeted initiatives are more cost-effective than regular mail-outs and the open data on uptake allowed Leeds City Council to choose which channels to prioritise. Data can inform these decisions yet, ultimately, the council needs to make them democratically.

Insights

Starting with the problem – in this case, people not knowing when to put out which bin – and working closely with the local authority on solving it with open data, has proven to be instrumental in delivering a better public service. The ongoing cost to Leeds City Council for this solution is about GBP 1 500 per year, significantly lower than the costs of mail-out.¹³ Imactivate and Bartech Auto ID are now selling the app to other councils, powered by open data where possible and by direct data-sharing between imactivate and Bartech Auto ID where open data is not preferred by the local government, or where opening the data would result in unacceptable costs (e.g. PAF licensing).

Pattern 2: Open data for more efficient service delivery chains and planning

In this second pattern, we identify examples of open data release supporting service planning and delivery. The direct beneficiaries are likely to be those in public sector organisations, commissioning services and those in external organisations involved in service delivery.

11 <https://www.bartecautoid.com/>

12 <https://datamillnorth.org/products/leeds-bins/>

13 Numbers are based on estimations by imactivate.

These examples highlight the role open data can play in better coordination between the public and private or third sector organisations involved and make the delivery of public services more effective and efficient.

Example 2a. Local authority publication of spend data

Spend Network¹⁴ pulls together spend, contract and tender data published by local authorities and other organisations in the UK. The organisation then provides insight and consultancy services to potential service providers to public sector organisations and provides similar services back to the government. Open data published by government organisations is analysed and repurposed by Spend Network to provide analysis, which can help make delivery chains and relationships between suppliers and buyers more efficient. The same (closed) data is used to save public money and improve the quality of services delivered to citizens.

Figure 3. Spend Network data ecosystem

14 <https://www.spendnetwork.com/>

Inspired by the Windsor and Maidenhead Council¹⁵ which had started to release details of their spending in 2008, the UK government, as a part of the transparency drive in the previous coalition government, set out expectations (Gov.uk 2015) of the spend and transparency data it needed the local authorities in the UK to publish (Rogers 2010). For instance, all UK Local Authorities are obliged to publish all spending transactions over GBP 500 and all Government Procurement Card spending and contracts valued over GBP 5 000. The policy motivation for these commitments was to ensure that taxpayers could gain insight into how public authorities were spending money. Supported by guidance produced by the Local Government Association (2015), some local governments began to publish this data in open formats and made data on let contracts available in addition. The councils were required to publish the data on their websites and Spend Network began to pick up the data and aggregate it across many different UK local authorities. The Network was launched in November 2013 using open data to create the first comprehensive and publicly available repository for government transaction data, a market worth in excess of GBP 130 billion per annum. Since then, it has published over 100 million transactions worth in excess of GBP 3 trillion. The company has grown out of Ticon, a small consultancy firm focused on government procurement and payments, founded by Ian Makgill.

Spend Network provides services such as procurement intelligence to both small and large businesses who are providers of services to local government. It is also involved in a data reseller market to large consulting firms who then offer services back to the public sector. Spend Network data is standardised and linked and can be used to compare between bodies, regions or sectors. The ability to compare can help with spotting patterns and anomalies, which can then be addressed to improve the delivery process. The data can also be used to compare between suppliers; for example, comparing prices can inform spending decisions and lead to more effective allocation of resources. In addition, Spend Network re-publishes the open government data made available according to the Open Contracting Data Standard (OCDS),¹⁶ a standard created by the Open Contracting Partnership¹⁷ and used in many countries around the world. The team behind Spend Network are now using the standard and their experience gained in the UK to expand their tender-finding services worldwide using the name OpenOpps¹⁸ and their site is currently being used by Financial Times Stock Exchange (FTSE 100) companies and the government.

Insights

Despite the guidance from central government on the publication of data by local

15 <https://www3.rbwm.gov.uk/>

16 <http://standard.open-contracting.org/latest/en/#>

17 <https://www.open-contracting.org/>

18 <https://www.openopps.com/>

authorities, Spend Network devotes a lot of time and effort identifying, cleaning and analysing data. In this ecosystem they work as an aggregator – they curate the data, push for its publication when it is not available, query quality issues and suggest improvements. They also lobby for data with copyrights to be published openly. However, despite a large amount of activity from Spend Network and public sector organisations, we are yet to identify specific examples of where the data has been used to improve procurement in a public sector organisation.

Example 2b. NHS publication of open data

The NHS spends over GBP 110 billion a year delivering health services in England and has a complex arrangement for providing these services at a local level, with many organisations that support and oversee the design and provision of services. They often collect data which is used to analyse performance and improve quality and access to health services for citizens. The ODI undertook a workshop with members of NHS England and NHS Digital to begin mapping out some of the key open data use cases in the NHS. Nevertheless, the NHS is a vast network of organisations and understanding the full position of use of open data would take considerable further research and expert knowledge. The majority of data use within the NHS is individual-level data used for the delivery of direct care or, in pseudonymised or anonymised form, for research and planning. The data is made available to NHS organisations through the NHS Digital Secondary Uses Service¹⁹ and to outside organisations through other means with appropriate controls in place. Some healthcare trusts have data-sharing arrangements with private, voluntary or academic sector organisations that can provide analytical insight and services to organisations at various levels within the NHS. Performance improvement organisations in the NHS such as clinical audits and the Commissioning Support Units (CSUs)²⁰ also use data and analysis in their work with healthcare trusts and Clinical Commissioning Groups.

We identified the key examples of open data use, including a number of crucial open datasets published (ODI 2015b). A relatively well-known example of the potential of open data in the NHS is the open prescribing data. NHS Digital publishes practice-level prescribing data²¹ every month – this entails a list of all medicines, dressings and appliances prescribed by all practices in England, including GP practices. In 2012, Mastodon C and the Open Data Institute used this data to demonstrate the type of analysis that open data could provide. They issued a report highlighting the savings the NHS could make if they shifted from branded drugs to generic ones using the open prescribing dataset. Subsequently, an organisation called Open Prescribing²² has been using the data

19 <http://content.digital.nhs.uk/sus>

20 <https://www.england.nhs.uk/commissioning/comm-supply/csu/>

21 <https://digital.nhs.uk/practice-level-prescribing-summary>

22 <https://openprescribing.net/>

to provide the ongoing analysis of the health service. There are further examples of open data publication within the NHS being associated with clinical impacts. For instance, when MRSA (meticillin-resistant *Staphylococcus aureus*, a type of bacteria resistant to several widely used antibiotics) instances were published as open data, there was an 85% reduction in the number of cases. However, it is difficult to disaggregate the impact that publication had from the influence of the media and quality and safety improvement work.

Insights

Although data is used routinely throughout the NHS, our initial research discovered that its potential is not fully realised. The few examples of open data publication are yet to demonstrate sufficient impacts on services. The NHS open data agenda could perhaps learn from the tactics and approaches used in ecosystems that we have explored elsewhere, where connections have been made between the potential uses of open data and its publication, and feedback loops established. We recognise that this is a more complicated undertaking given the complexity of the NHS systems and data.

Pattern 3: Open data for policy development

Finally, examples below centre around open data informing policy development and strategic direction. Here, the direct beneficiaries are involved in policy and strategy for the development of public services. Openness improves access to data across different branches of government and beyond, which can then be used to inform policy decisions.

Example 3a. The Department for Work and Pensions development of Churchill

Figure 4. Churchill

Churchill is a working title for a digital data service being developed by the Department for Work and Pensions (DWP) that is run entirely on open data APIs and data published in CSVs from UK government sources. The service is aimed at enabling DWP to understand their customer and claimant base better, through visualising trends within the UK over time such as pensions, labour markets, disability and health. It is a combination of a data visualisation tool built on D3 javascript libraries and a Mongo DB backend. Churchill helps policy and delivery officials in DWP to develop more evidence-driven policy and services with data visualisations pulled from open data across government.

Figure 5. Churchill data ecosystem

The DWP has a history of making its statistical data available to the public through publications and more recently through the online portal Stats-Xplore.²³ There was a renewed expectation that the department would become more digital and data driven (DWP 2017b), which resulted in organisational restructuring to bring data and digital teams together. The new Director General, Mayank

²³ <https://stat-xplore.dwp.gov.uk/webapi/jsf/login.xhtml>

Prakash, made a commitment to ‘driving hard for visualised analytics to be the norm, not the exception’ (Prakash 2017).

One of the data science teams based in Newcastle began exploring the user needs of policy colleagues in DWP who use data to inform policy and design services. They undertook extensive user research with policy colleagues at Grades 6/7, developed a persona and elaborated the user needs for a new data-driven product. This work captured the level of data literacy as well as the current workflows and packages being used.

They also considered other products and services that could be used by policy professionals and analysts in DWP, such as LGInform²⁴ developed by the Local Government Association,²⁵ which pulls together data from DWP as well as data published by local authorities. The approach to the product was inspired by the world of data journalism and visualisations, including the ONS visuals site²⁶ which creates a number of statistical visualisations based on user research. DWP developed a prototype of the software drawing on data available from open data APIs across government, that is subsequently copied into a database and updated regularly. A key part of the development was to ensure that the platform satisfied DWP security protocols – the system was set up from scratch. The front-end visualisation is run on the D3 javascript library²⁷ and the product has been developed working in the open (DWP 2017a).

There were several reasons for using open data to power the service. First, in some instances, open data is easier to access than shared data.²⁸ Second, some of the interviewees perceived open data as more trusted as it had gone through a process of quality assurance prior to publication. The product was launched internally to demonstrate the possibilities to colleagues. Subsequently, Churchill has attracted interest from other departments and governments (Australia, Canada) and has been profiled externally (Darabi 2017). The main potential impact of the use of open data in the development of Churchill is likely to be the reduced amount of time that policy colleagues and analysts in DWP spend accessing, cleaning and analysing data. This may also support more iterative and agile policy development as issues can be investigated more quickly. Potentially, the tool could help release the resource of an analyst. Quicker data access and analysis can free up resources to better focus on policy and strategy decision-making. Besides, better data quality and visualisation enable to spot dependencies and relationships that can support more informed policy and strategy decisions, for instance, a more effective job seeker allowance policy. This is in line with the government’s aspirations set out in the recent Government Transformation

24 <http://lginform.local.gov.uk/>

25 <https://www.local.gov.uk/>

26 <https://visual.ons.gov.uk/>

27 <https://d3js.org/>

28 ODI’s Data Spectrum demonstrates the spectrum of data access between open and closed data, much of which is ‘shared’ data. <https://theodi.org/about-the-odi/the-data-spectrum/>

Strategy (HMG 2017) to make better use of data by making it available for internal uses through APIs.

Sharing the tool across the government would reduce the costs of each department procuring individual solutions. In a longer run, it could support greater standardisation of geographical data across the government as civil servants would be able to identify datasets that need standardisation through using the tool. It would also highlight anomalies or inconsistencies, which could help improve the quality of government open data and create a greater connection between data collection and use.

Insights

The release of open data has brought innovation within the government. In the case of Churchill, digital transformation tools and approaches supported the development of a data product. One of the key drivers was incorporating the system within a broader digital transformation agenda within DWP. However, further analysis is required to understand the potential improvements in the policy-making process following the release of Churchill, and how elected representatives and citizens could influence policy through this tool.

Discussion

This section will elaborate on the similarities identified across the examples discussed in previous sections.

Organisational collaboration

Each ecosystem analysed in this chapter is made up of organisations that all play a discrete role in the delivery of public services, as opposed to one organisation being responsible for the end-to-end process. Services in each ecosystem can only be delivered if a number of organisations and individuals have the resources and appropriate knowledge to do their jobs correctly. When working across organisations, the need for easy access and the use of data becomes even more important. Here, open data can be a key ingredient in ensuring greater coordination, more efficiency and a better end-user experience.

Technology infrastructure, digital skills and literacy

Another cross-cutting aspect of the ecosystems is the importance of technology. There is a minimum level of digital infrastructure, skills, literacy, and capability needed for organisations to make the most of open data in their public service delivery model. This relates not only to the technology within the public sector but also to the wider ecosystem of the private sector and civil society.

Foundational data infrastructure

Data infrastructure consists of data assets, the organisations that operate and maintain them, and the technologies and processes required to use the data (ODI n.d.). Strong data infrastructure creates new opportunities such as creating new products and services, developing new insights, and supporting diverse data ecosystems.

Often, data infrastructure includes foundational datasets that support a broad range of uses, particularly if made available as open data. There are several key types of datasets that support the different ecosystems we have identified. Given the nature of the interviews and workshops we held, we are unable to confirm whether the most important datasets were identified. Nevertheless, geospatial data such as maps, addresses and boundaries were of particular importance in at least half of the ecosystems. In the TfL example, data describing the location of stations is often used to help people access the most relevant transport options nearby. In the Churchill example, administrative geography data is crucial to understand relationships with other open datasets.

Open standards for data

Data standards were used in open data releases across most of the ecosystems. For instance, a data standard was developed following the development of the Leeds Bins app. In the example of local authority spending, two international standards have been central to reducing the additional data preparation and increasing the value of the data released.

Senior-level championing

In many of the examples, we found that systems matured best when the open approach was championed at the senior level, such as a councillor, minister or a senior official, depending on the type of the organisation. These senior leaders highlight the strategic opportunity that the organisation has in releasing open data, prioritise resources, and work to overcome any internal resistance within the organisation. In the Leeds City Council example, the City Council officials' drive and initiative were key success factors leading to articulating the problems, developing solutions, opening up the data, and finally creating the Leeds Bins app.

Intermediaries

Data intermediaries, organisations that have a specific role of ensuring that the available public sector open data is usable, are key actors within many of ecosystems analysed. These intermediaries take data published openly or shared

by the public and private sector and, depending on the needs, aggregate and standardise it. It is crucial to acknowledge their role in the process of open data being used to deliver services. The exact form of the intermediary and the activities they undertake depends on the maturity of the particular ecosystem.

Problem focus

Successful integration of open data in service delivery often derives from seeking solutions to a particular problem that the organisation is focused on, rather than publishing open data for the sake of it. In the DWP example, the team developing Churchill took a user-centred design approach to understand how government policy officials used data and then sought out relevant open data to incorporate into the product. Similarly, in the Leeds City Council example, the app came out of an acceleration programme to identify service issues that could be tackled through the use of data and identified a specific problem of citizens not knowing when their bins will be collected. Although alternative approaches might also succeed in identifying how open data can support the delivery of public services, having a problem focus facilitates identifying opportunities. In the examples of Spend Network and the NHS, the focus is on the publication of open data rather than on a problem. This might explain why these ecosystems are less mature in their development than others and why there are fewer use cases.

Open innovation

Early releases of open data seem to have helped push forward and identify further possibilities for improvement. For instance, in the case of TfL, the release of a small number of datasets as feeds eventually led to the development of a more open API system – a development which might not have happened in closed data-sharing agreements. In addition, in most ecosystems, choosing an open approach to data publication attracted more external interest and involvement. For example, more than 14 000 developers are using the TfL data – this would have been difficult if there were access barriers.

Peer networks

In most of the ecosystems, peer networks across organisations emerged to encourage development. In the case of these open data ecosystems, influential networks use open channels and approaches – for instance, connections through Twitter, blogging, and unconferences such as Open Data Camp, LocalGovCamp, etc. This is currently anecdotal, and further research could further examine whether there is clearer evidence that processes and opportunities like these have made a difference in the approach that some of these open data ecosystems have taken.

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