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# Creating Data Services for Citizens and Communities

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EIT Trusted Cloud Project Final Report

Author: EIT Digital and Digital Catapult

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This paper is the final report of the EIT HII Trusted Cloud project being conducted by the Digital Catapult in collaboration with EIT Digital. The project aims to understand how digital services are improving interactions between citizens and government using cloud platforms and improving data access, and whether it is possible to establish common themes across successful cloud projects and share best practice between government teams and departments.

The interim report from this project is available separately. It dealt with use of personal and other data for service development, success stories from the public sector in the UK, models for public sector data services, enabling technologies and options, and barriers to development and delivery of data services.

This final report brings together the key findings of the interim report and the outputs of a Pit Stop held at Digital Catapult Centre in London on 14-15 September 2016 as well as touching on broader publicly available research.

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## 1. Private innovators and public providers have an opportunity to collaborate to create valuable new services

The use of data to underpin services for individuals and businesses is well established in the private sector, and increasingly in the public sector. There is a focus on releasing the value in data, including personal data, for the improved delivery of public services. Examples from around the UK are given throughout this and the project's interim report: they cover areas including social care, policing, waste collection, citizen engagement, planning, transportation, alcohol licensing, health, community safety and flood management, among others.

Advanced approaches such as predictive analytics and machine learning, coupled with the use of efficiently delivered IT and data platforms, can help make existing services and processes more effective (reducing the cost of delivery and waiting times, and improving quality) and support the creation of new approaches and new services of many kinds, focused on both individual citizens and businesses.

An exercise at the Pit Stop quickly identified over 30 separate touchpoints (see Annex) where data was exchanged between citizens and public authorities; a subsequent exercise (considering the needs of a number of typical service users) generated an illustrative set of opportunities for service improvement and innovation:

- Using **energy consumption data from smart meters to support elderly citizens better**. Local authorities can identify locations of at-risk individuals (and those individuals themselves) through analysis of energy consumption data. There are multiple levels of authorization for the use of personal data needed in order to achieve this: individuals must know how their data may be used, and allow this to happen, and utilities must be prepared to share such data with local authorities.
- Using existing non-personal datasets to identify and predict problems so that interventions can be more quickly and better targeted. For instance, **housing repair data may identify locations with high levels of domestic violence and abuse**; and **bus use and school attendance data may help predict where citizens need support services**. Creativity in data analysis and use could extend to third-party data sets such as shopping habits
- Better **sharing of personal data on patients between relevant agencies to improve the processes around discharge of patients from hospital** through better-informed consultants and discharge teams, reduced readmission and recurrence of problems, reduced disruption to health and social care services, and better public health policy-making.
- Combining **data sets from multiple sources can improve efficiency of validation and verification processes**, for instance for disabled persons' Blue Badge schemes. This requires an opt-in for citizens to allow their data held by multiple agencies to be accessed automatically in support of their application, but the validation time and cost can be significantly reduced.

These examples show that there are clear potential benefits, but participants in workshops throughout the project identified a number of reasons why public authorities often find it hard to unlock the value in data:

- **Financial:** many public authorities have limited budgets and projects to put in place technology for using data better. They need to make a strong business case with rapid payback and seek additional funding that may be available for specific strategic projects.
- **Knowledge:** there is variation in the level of expertise in the use of data within public bodies, and a skills shortage relating to the application of data analysis.
- **Technology:** there are many technology components needed to support effective collection, sharing, analysis and use of data for public services; assessment of the alternatives, specification, and procurement of these technologies are complex tasks.
- **Culture:** staff in local authorities and government departments and agencies can resist change, and it is not easy to overcome this inertia.
- **Legal:** legitimate – and not legitimate – legal concerns about the use of data are raised when projects are proposed; these relate to both statutory laws and contracts governing privacy and data sharing. It can take time to address these concerns.
- **Political:** local authorities are very varied in terms of their composition, remit, demographics and priorities. In addition, the cycle of elections and the support of individual champions within public bodies play a large part in the sustainability of IT and data initiatives.

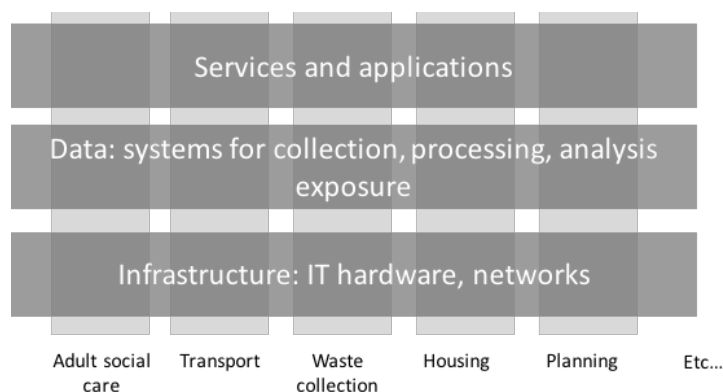
Given these multiple barriers, the over-arching issue to be resolved is how best to demonstrate the benefits of greater use of personal and other data in public services, and how it can be achieved in practice. This is what we look at in the following sections.

## 2. Innovative public sector use of data can be grouped in several ways

Public bodies have used a number of approaches to building data services; we have developed two ways of characterizing these. First, and based on examples of relevant deployments, we identified in our interim report the following factors that influence the way in which projects are conceived and implemented:

- **Scope** – tactical or strategic; focused on a single issue or supporting multiple challenges.
- **Service innovation** – for enhancing *existing services* or creating *new services* and processes.
- **What data is used, and how** – exposure of own and others' data for multiple parties to use, or pulling in data from others but keeping it in a controlled, internal environment.
- **Deployment process** – led by IT department, external contractor partner, special internal team or departmental team.

Second, analysis of the structures and layers of authority procurement and delivery processes shows multiple points at which public sector value can be created, and where private sector innovators may help. At a high level, it is useful to consider public sector organisations' structures as shown in the figure below, with departmental structures supporting specific services, and horizontal layers enabling those services – generally across departments, but at the higher layers, often more department-specific.



### 3. Public data service deployments can be grouped into a number of types

Based on the two frameworks outlined above, and our subsequent engagements with local authorities and central government, we have identified a small number of models for the provision of public data services. While these models are not mutually exclusive – a project may fit more than one – they are distinct, and they have specific characteristics that help public bodies to overcome some specific difficulties they may face in unlocking value from data.

- **Digital hit team** – a specialist internal team manage entire projects and are given responsibility to develop new or improved services, working cross departmentally and using external partners where necessary.
- **Strategic platform** – An approach based on the expectation that a new platform (at IT or data layers) will underpin a series of projects that could each be department-specific, or function-specific and involving multiple departments, these projects tend to target cross organisational change.
- **Externally funded** – a project where funding is secured from a third party (e.g., City Challenge, EU, LEPs); such projects can be small and focused, or large and strategic, but would probably not proceed without the external funding.
- **Outreach** – a project where an organisation needs to, or intends to, expand the geographic or functional scope of their data services project to other parties.

Departmental-silo-based development of a digital service may also occur. However, such services generally involve little sharing of data (personal or non-personal) and are not considered further in this report. The examples we cite all involve data sharing and the use of common IT and data infrastructure, and are outside “business as usual”.

## 4. And there are many examples of services these approaches can enable

Workshops have identified a number of projects generating new and improved services. The table below, adapted from one in the interim report, identifies a few illustrative examples, showing how they fit with the models described above. (For further example projects, see the interim report.)

Service and organization	Departments and / or layers involved	Details	Models
Digital market platform for “Choice and Control” in adult social care <i>Greenwich Borough Council</i>	Adult Social Care (ASC) Service / application layer	Improve efficiency and sustainability of ASC generally, and specifically in the use of personal care budgets including direct payments; 10% admin savings targeted; potential to extend to health systems	Digital hit team
Leeds Data Mill (to be renamed Northern Data Mill) <i>Leeds City Council and other local authorities in Yorkshire</i>	Multiple departments Data layer	A cloud-based hub for datasets from Leeds council and from third parties and a platform for third parties to use to develop apps	Outreach Strategic platform
“One Transport” <i>Oxfordshire County Council</i>	Transport department Infrastructure and data layers	Opening up real-time transport data through a data exchange hub for others to use for multiple applications within the council, in other neighbouring councils and to commercialize data for private-sector partners	Outreach
Intelligence Hub <i>Sunderland City Council</i>	Multiple departments All layers	Pooling data and applying intelligence across multiple use cases; a specialist team works with departments and third	Strategic platform Digital hit team

		parties to develop solutions using the strategic data hub	
Comoodle.com <i>Kirklees Council</i>	Multiple departments Data and service /application layers	A community portal, underpinned by a data platform, promoting and enabling community asset and service sharing; council assets are included	Externally funded (Bloomberg Philanthropies)
EU VITAL project <i>Camden Borough Council</i>	Camden Town Unlimited Business Improvement District Data and application layers	Provision of timely, relevant data on 'collective' workspace attributes and availability to optimise occupancy of co-working hub spaces in the borough, by providing data to users that better matches the type of data they need	Externally funded (EU)

Note – the interim report details further examples of data services in the public sector identified during the research (and these are listed in the Annex).

## 5. There are multiple technologies that help deliver these services, and different ways of using them

Many technologies enable the creation of data services at each of the layers identified in the figure in section 2. At *all* layers, technologies may

- reside within a public body’s own premises and be owned and run by that public body
- be outsourced (with the technology residing either in the public body’s premises or remotely at the outsourcing provider’s premises)
- be delivered from the cloud (i.e., technology delivered from virtualized computing hardware, in possibly multiple locations) and typically with an “as-a-service” business model.

The workshops for this project indicated that there was acceptance of cloud delivery of some technologies, but there are concerns over security of data (see the interim report for more detail). The table below shows where some core technologies are being used in selected example public sector data service projects.

Technology area	Layer	Description and example uses
IT resources	Infrastructure	This includes the computing and data storage resources to underpin data analysis and digital services development as well as existing council internal systems. Data centres can be developed and run either in-house (e.g., Solihull MBC) or on an outsourced basis

		(e.g., Oxford City Council). The Crown Hosting Service is an example of quasi-public-sector provision of data centre resources; this project's survey also indicated there is use of cloud infrastructure-as-a-service providers such as Amazon Web Services for development of some services and applications.
<b>Connectivity</b>	Infrastructure	As well as existing communications networks used for voice and data across local authorities, and by government departments (such as the Government Secure Internet), data services are being developed to make use of new networks such as those to manage smart street lighting (such networks have been deployed in several UK cities, for instance in Bristol <sup>1</sup> ). These networks can involve fixed or wireless links, using multiple technologies including open standard or proprietary protocols, and can be owned by the public body, or network services of many kinds may be provided by third parties.
<b>Data aggregation and sharing</b>	Data	A critical enabler, data aggregation platforms can accept data from multiple sources, and in multiple formats, including both static data sets, and dynamic data feeds, and both structured and unstructured data sets. They are often combined with data analysis tools. Platforms may be off-the-shelf and then customised (such as the Palantir Gotham platform used in Sunderland) or the Socrata platform that is used by the Bristol is Open project among others, or created on a bespoke basis (as in the case of Smart:MK or the Leeds Data Mill).
<b>Data analysis</b>	Data	These tools are often coupled with data aggregation platforms. There are also many stand-alone tools, developed for generic business intelligence use from large IT providers such as IBM, HP and Dell/EMC. There are also smaller specialist companies including start-ups, focusing on analysis of structured and unstructured data. This field is one of the most active in terms of R&D, and is being actively researched in universities. One example is the machine learning work at UCL's Department of Computer Science, which helps city authorities around the world to understand how to use data better.
<b>Personal identity and data management</b>	Data	An emerging technology area, personal identity and data management tools are aimed at individual owners of data and allow specific data to be shared in a controlled way for specific purposes and with specific partners (and sometimes to be traded). Examples include Yoti and Meeco. Data aggregation platforms can also have this functionality built-in: for instance, the MK:Smart platform built by BT can handle licensing, permissions and trading aspects of the data sets it uses.
<b>Application enablement</b>	Service and application	These platforms make it easier for application developers to create new apps and services by providing a programming environment for software development and handling interfaces to the data layer. Several platforms have emerged to support machine-to-machine communication, from vendors such as Cisco and PTC (ThingWorx).
<b>Security</b>	All layers	Not a single technology, but an essential aspect of data service development, security tools and approaches are deployed in multiple ways. Specific technology solutions will have security as an integral part; examples include data encryption in networks and for data storage, use of firewalls and other hardware appliances, and use of managed security solutions.

<sup>1</sup> <http://www.silverspringnet.com/article/press-release/silver-spring-networks-accelerates-innovation-and-economic-competitiveness-through-bristol-is-open-smart-city-programme/#.VP8wJyIvI94>



Applications themselves are not included in the table above: while they can be generic, they are often developed to suit a specific public authority's requirements, or provided independently to citizens by third parties, making use of data opened up by public authorities. Section 3 gives some examples of specific applications developed by public bodies, either through their own IT and digital teams, or using contractors and partners. In addition, start-up and established companies develop applications for data services used by citizens, for instance in areas such as transport information and journey planning.

## 6. Public sector organisations don't have to build all-encompassing, vertically integrated technology stacks to launch services

There are examples of UK public bodies that have adopted a horizontal platform-based approach to digital services development, in some cases bringing in a strategic partner to help. This platform then underpins multiple data service projects, and builds up a store of data that can be used across future projects. Among the most developed examples of this kind are:

- Sunderland City Council, which alongside strategic partner Palantir Technologies, has developed a strategic data platform that has supported a series of data services for different departments, and which can support the integration of data from multiple internal and external departments and organisations. As well as providing a horizontal technology layer, Sunderland's approach involves developing a process that is applicable to multiple individual departmental data service challenges and opportunities.
- Bristol Is Open, a venture involving Bristol City Council and partners including NEC and InterDigital, that aims to create a "programmable city" that opens up not only data but also infrastructure layers to third parties so that novel services and applications can be developed.
- Milton Keynes's MK:Smart project, with the MK Data Hub as a key technology enabler. Citizens are encouraged to participate in application development on the platforms through a "Citizen Lab"; and a developer portal gives access to the MK Data Hub, which provides a streaming API for timeline and sensor data from the city, and an entity API that aggregates data on places, buildings and topics from across the data sets in the hub.
- Leeds City Council has developed the Leeds Data Mill, a cloud-based data hub into which multiple City Council departments can add static transactional and real-time data feeds. Other neighbouring authorities are also using the hub. Multiple internal departments make use of the data (for instance to answer Freedom of Information requests or meet the Council's strategic transparency agenda). In addition, services and applications using the data can be delivered by internal departments or external third parties.

Note that in some cases these large, platform-based projects have attracted external funding – for instance the MK:Smart project is in receipt of finance from the Higher Education Funding Council for England (it has the Open University as a partner). Bristol is Open is a joint development involving the University of Bristol and receives funding from national and European sources as well as from local authorities (academic research grants contribute to some of this).

## 7. And they don't have to do it all themselves

Private enterprises can play a key role in enabling public bodies to provide data services to citizens. Large companies as well as SMEs have the opportunity to assist public service organisations.

Some of the projects mentioned earlier have been co-developed with the help of strategic large-enterprise partners/ examples include MK:Smart and BT (among others); Sunderland Intelligence Hub and Palantir Technologies; Bristol is Open and NEC (among others); Peterborough City Council and salesforce.com (for development of a horizontal CRM platform).

Such arrangements help to overcome public bodies' skills shortages and bridge knowledge gaps that might exist. They also bring access to proven or cutting-edge technologies that would otherwise take significant investment for public bodies to develop themselves, and they can help secure access to finance – either directly from the technology partner itself, or through joint or consortium-based applications to funding sources.

Attendees at the Pit Stop represented a number of companies whose products and services can be used; the table below characterizes them, and adds some technology players that are already supporting public sector data service projects mentioned in our interim report. This table is illustrative, not exhaustive.

Company	Relevant offers	Brief description (and example projects)
<b>BT</b>	Network and IT services; data and application enablement platforms	Major telecoms and IT services provider (Milton Keynes and Manchester Data Hub projects – BT acting as data platform provider and technology partner)
<b>Cisco</b>	US tech giant offers a range of networking and data centre technology solutions to public sector and enterprise customers	British Innovation Gateway and National Virtual Incubator (UK-wide tech start-up incubator services)
<b>Cognitiv+</b>	Data analysis platform	Platforms for contract, legal and regulatory compliance analysis and audit
<b>Digi.me</b>	Digi.me platform – a personal data sharing platform and monetisation tools	Start-up developing a platform to allow individuals to control access to their personal data from the web, and share it or sell it
<b>IN2</b>	Digital media management, publishing and search platform	Project-based development of digital media publishing (digital tourist pinboard for Schladming in Austria)

<b>Meeco</b>	Cloud-based personal data management service for individuals; Meeco Labs programme for companies and public sector	Company with offices in Sydney and London that develops personal data management systems and services. Platform is offered to public bodies to help them develop applications using data sets from consenting participants
<b>MegaNexus</b>	NEO secure web-based data-sharing platform	Platforms and services to enable secure sharing of data between and across agencies (multiple local authorities and government departments in the UK)
<b>Palantir Technologies</b>	Gotham and Metropolis – data management platform and applications	US-based data analysis software specialist (platform is used by Sunderland to underpin multiple data services)
<b>Pinro Technologies</b>	Bespoke web / mobile apps	London-based web / mobile app development start-up
<b>Sodermann Radgivning A/S</b>	Digital services research and advisory services	Small Norway-based consultancy focusing on public sector clients, especially in health
<b>The Rain Gods</b>	Public sector digital services consultancy and premises / incubator services provider	London-based tech consultancy start-up (The Rain Cloud Victoria, Loughborough University London campus, Nesta sandbox for data sharing for banks)
<b>Trilateral Research</b>	Data science and technology assessment services (including issues around privacy and security), policy and regulatory advice	Multidisciplinary socio-economic strategy consultancy (developing the European catalogue of ICT standards)
<b>Yoti</b>	Yoti digital identity platform and smartphone app	Start-up developing a personal and business trusted digital identity management platform

The government’s G-Cloud digital marketplace also provides access for public bodies to specialist service providers that can help them in the development of digital services, as well as providing additional digital service enablement support.

## 8. Issues in using personal data can be resolved, and external parties can help

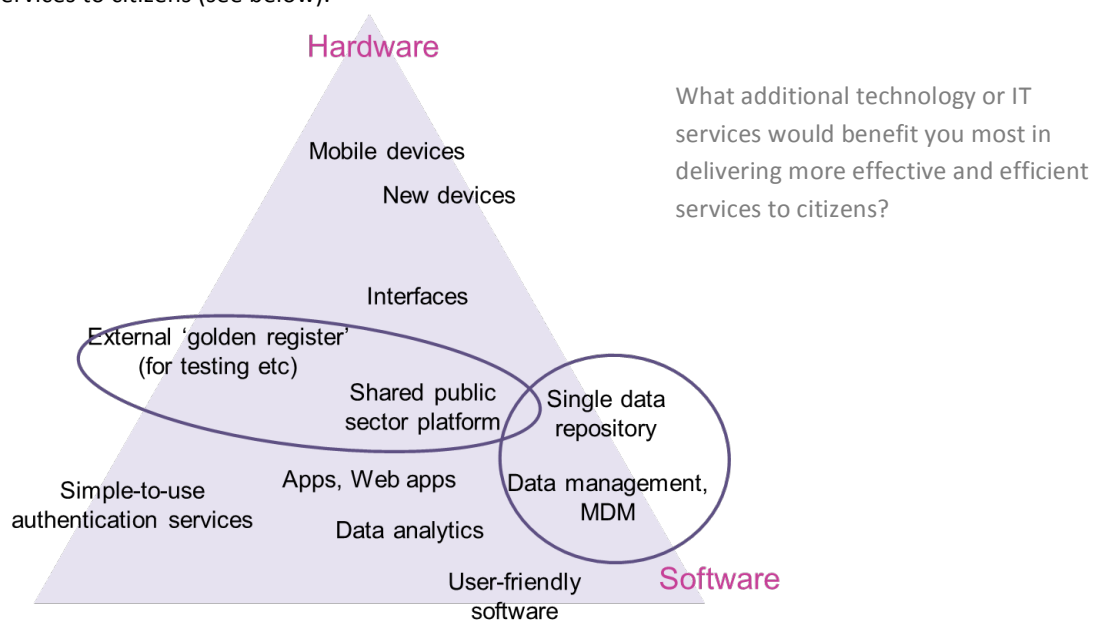
Just because a project might involve private data, does not mean it is out of bounds. There are examples where public bodies have carefully designed data services that seek permission from citizens to reuse personal data given for one purpose in order to deliver a second service more efficiently. Two examples are

- Online renewal of passports requires submission of personal data including a photograph of the applicant. HM Passport Office allows applicants to re-use the photograph already held by DVLA for driving licenses – a passport renewal can only be completed online if this previously accredited DVLA photograph is used. The applicant must agree to the sharing of data between government agencies,

and the result is a more efficient process for both the Passport Office and the applicant

- A digital, online service for Blue Badge (disabled persons' parking permit) application and validation has been developed by Warwickshire County Council, in partnership with two central government departments (DWP and DfT) and the Open Identity Exchange. The approach has significantly cut the waiting time for applicants as the validity of applications can be checked instantly.

In a Catapult survey examining data service development, public organisation respondents identified technology solutions and IT services that would benefit them in delivering more effective and efficient services to citizens (see below).



The highlighted responses show that the area of platforms and tools, including external platforms for testing application development, and shared data platforms, would be helpful.

Partnering with some of the specialist players providing personal data management platforms (listed in section 6) may offer a way forward – Meeco for instance, has developed a consent management approach that is designed to ensure compliance with the European GDPR data protection regulations, and through its Meeco Labs programme is hoping to work with public authorities as well as enterprises. The use of personal data management platforms may also help address concerns that public bodies may have about developing data services that use personal data, or about sharing their own data.

## 9. Recommendations

On the basis of work throughout the programme of research, including the workshops and Pit Stop, the Digital Catapult recommends the following:

- Central government departments and local authorities should review in depth the successes of their peers in developing digital services, and consider which aspects of those projects can be transferred to their own situations
  - While all departments, agencies and authorities have different priorities, issues such as attitudes to data sharing, access to funding, use of strategic partners, choices on technology provision and education of internal and external stakeholders are common, and many of these issues have been tackled and resolved by innovative authorities

There are many providers of technologies and services – large and small – that can help with multiple aspects of data service creation and operation, and central and local government bodies should ensure they have cast their net widely when considering how to bring in expertise to complement their own resources

- Providers of critical enabling technologies – both large corporations, established SMEs and start-ups – should ensure they understand the particular needs of public bodies in respect of:
  - Political priorities and strategic aims (they vary from organisation to organisation)
  - Funding and procurement processes – including long contracting lead times, the benefit of consortium and partnership approaches, and the risk of change in the light of evolving strategic priorities.
- All parties should aim to build systems that are not only vertically integrated to solve a particular challenge, but as far as possible put in place reusable, horizontal platforms and processes that will enable stepwise introduction of further data services.

## 10. Annex

### Data exchange touchpoints (in no order) identified at the PitStop

*This list is not exhaustive; rather it stimulated thinking about the potential for service improvement driven by better use of data. Participants considered the frequency of engagement with these data exchange touchpoints to guide their thinking.*

Road condition reporting	Utilities (water, electricity, gas)	Leisure / sport centres
Parking permits	Emergency services	DVLA
HMRC	Library service	Electoral register
Council tax	GP	Company registration
Council call centre	Social care services	Meals on Wheels
Housing department	Planning department	Hospitals
Public transport (bus, train)	Health & safety department	Waste collection
Trading standards	In-work benefits	Unemployment benefits
Passport office	Courts	Schools
Education department	Adult education	Motability
TV Licensing	Transport advice / information	GP
Dentist	Pharmacy	

Previous examples projects discussed at workshops (see interim report for more detail)

- Bradford City Council: “The Bradford App”; a customisable mobile app for citizen use
- Camden Town Unlimited Business Improvement District: EU VITAL project: provision of timely, relevant data on ‘Collective’ workspace attributes and availability
- Greater London Authority, KiWi Power, Hubbub Foundation, Imperial College: SME and citizen energy data usage collection and notifications to facilitate demand aggregation
- Greenwich Borough Council: Digital market platform for “Choice and Control” in adult social care (ASC)
- Kirklees Council: Comoodle.com; part-funded by Bloomberg Philanthropies. A sharing exchange platform and community portal
- Kirklees Council : Kirklees Business Hub; a platform and portal for data sharing between local businesses and the council
- Leeds City Council: “Leeds Data Mill” (to be renamed “Northern Data mill”); a cloud-based hub for datasets from Leeds council and from third parties and a platform for third parties to use to develop apps
- Oxfordshire County Council, Interdigital, Arup, Buckinghamshire County Council and Northamptonshire County Council, local SMEs: “One Transport” – opening real-time transport data from local urban traffic control centres through a data exchange hub upon which products can be built
- Peterborough City Council, salesforce.com: Citizen-centric digital platform

- Sunderland City Council, Palantir, Northumbria Police, Northumbria Water, others: Intelligence Hub supporting multiple separate data services
- Warwickshire County Council, DWP, DfT, Open Identity Exchange: Online Blue Badge scheme eligibility checker for disabled drivers

Bristol wireless network overlay

<http://www.silverspringnet.com/article/press-release/silver-spring-networks-accelerates-innovation-and-economic-competitiveness-through-bristol-is-open-smart-city-programme/#.VP8wJyvl94>