National Audit Office

Auditing in a changing world: How can audit respond to change

Charles Nancarrow
Director – UK NAO

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Auditing in a changing world: How can audit respond to change

1. The changing landscape of performance audit
2. Building an analysis function in the audit institution
3. Case study examples of innovative methods and their impact

1: The changing landscape of performance audit

Performance audit – the changing landscape

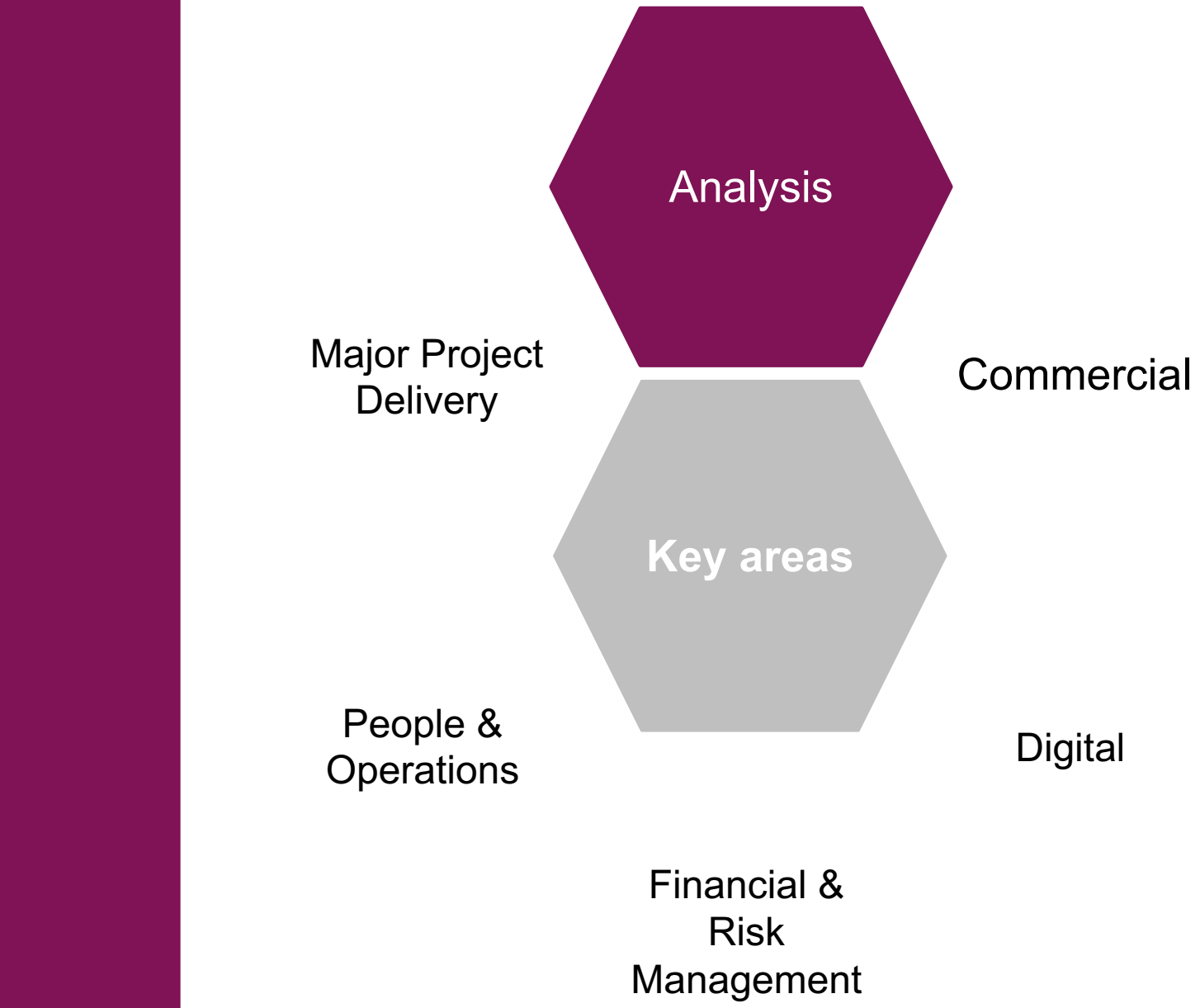
- Historically, performance audit has relied heavily on interviews, and file review
- Over recent years, there has been a huge increase in the volume of data and information that governments collect, process, and store to deliver public services
- There has also been a big shift to online and digitalization of public service delivery

Performance audit – the changing landscape

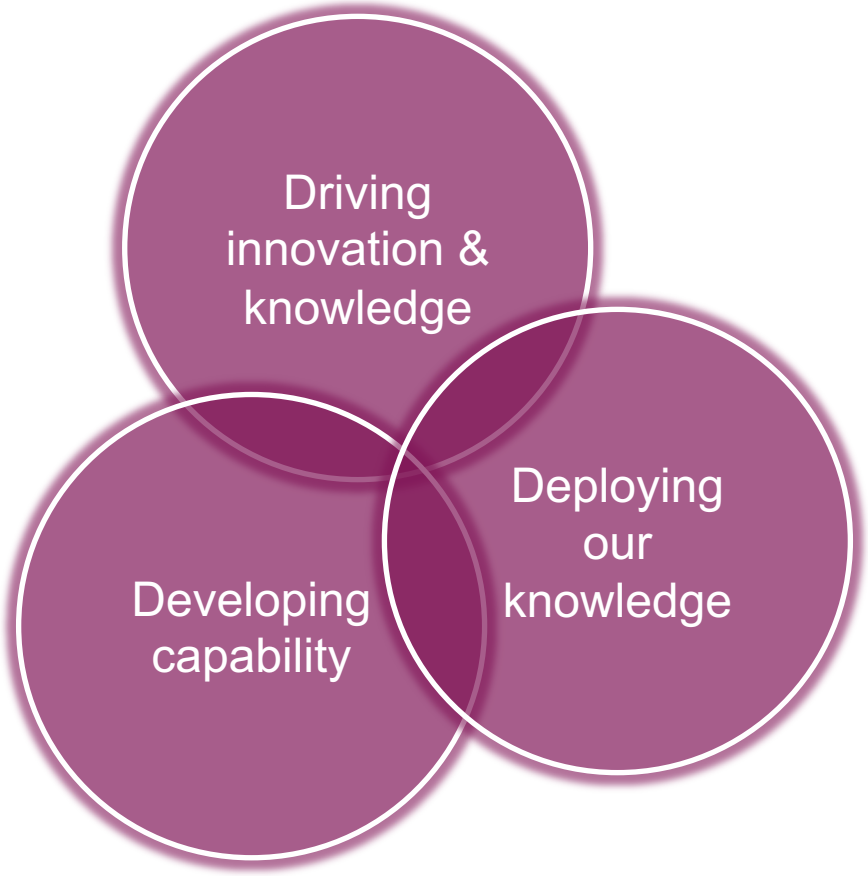
- The recent pandemic accelerated a lot of the trends that were already in place
- Public service user expectations have also been driven by increasing digitalization of private sector services
- This has increased expectations on performance audit – quality and timeliness of insight and audit opinion
- Data and digitalization provide opportunities for much better data use in delivery of public services, but also the audit and analysis of them

2. Building an analysis function in the audit institution

Key areas of cross-cutting expertise



The role of the Analysis Hub

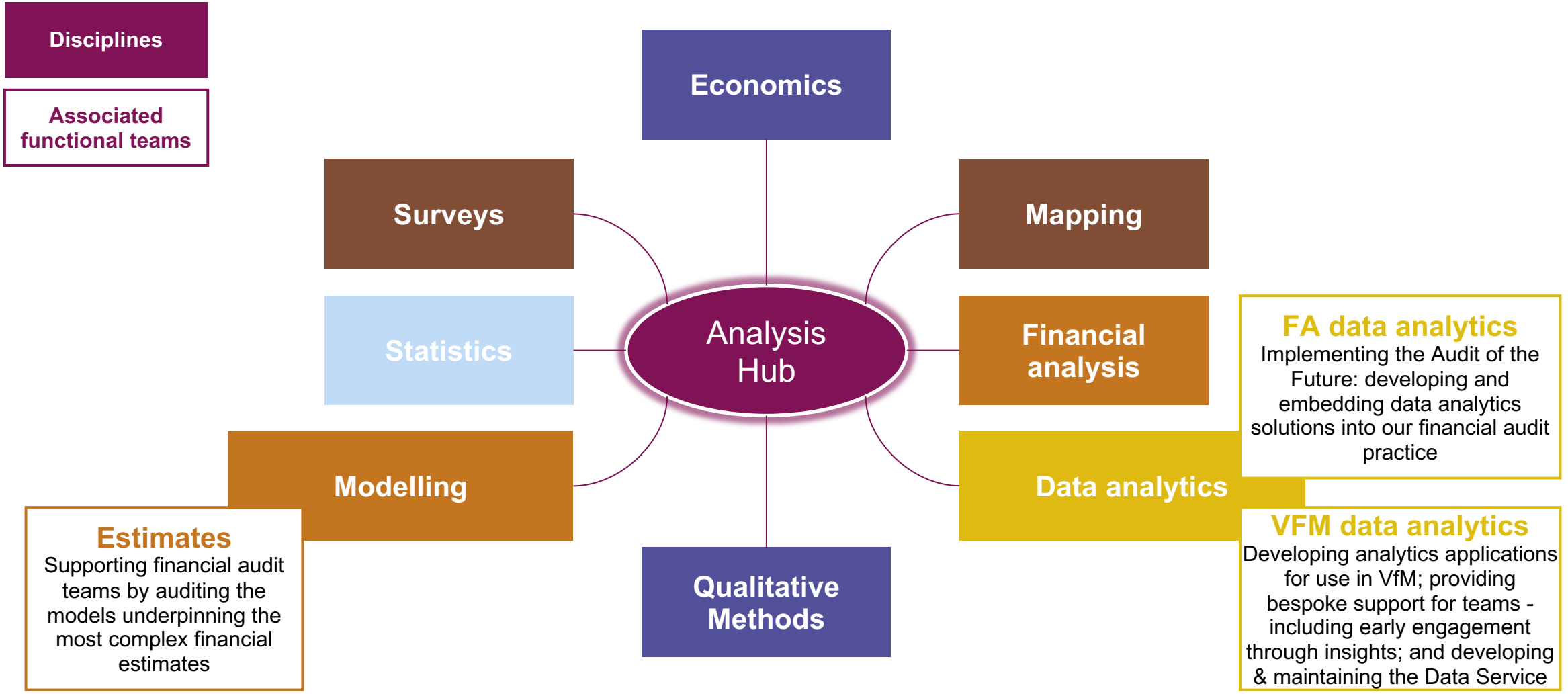


Drive innovation: ensure we remain at the forefront of analytical developments, so as to inspire innovation and build our knowledge base. We strive to be aware of the best analytical methods to support our audit work and to be able to audit anything our clients can do.

Deploying our knowledge: provide advice and expertise to teams on analytical methods, to support high quality, evidence-led and impactful audit work that enhances the scrutiny of public spending

Developing capability: identify the analytical capability we need and drive the development of our capability. Provide opportunities for specialists to flourish and for all staff to enhance their expertise

The Analysis Hub brings together eight discipline areas and several functional analytical teams



The Analysis Hub disciplines provide a range of services to support the office

- Formal classroom and on-the-job training to develop expertise
- Discipline network events & seminars on recent work/ latest developments
- **Analyst Pathways** – Year 1 curriculum with later years under development

- Advice on the best choice of method for VfM, FA and running the business
- **MESH+** scoping workshops to provide bespoke advice on methods
- **Methods Recommender** app for suggestions based on our back catalogue

- Commissioning: matching supply and demand of expertise for complex work
- Advisory: expert partner to support teams conducting their own analysis

- Apps and tools that automate and standardise FA and VFM processes (e.g. automate financial audit testing procedures; webscraping; text mining)
- Toolkits, frameworks, and access to cleansed data through **Data Service**

- Quality assurance on analysis carried out elsewhere in the office, to ensure confidence in findings
- Model reviews of estimates underpinning financial accounts

- **Analytical Insights** that investigate data-rich areas of interest to derive new insights and support teams' development of new study ideas
- Thematic Lessons Learned reports (e.g. Modelling & Evaluation)

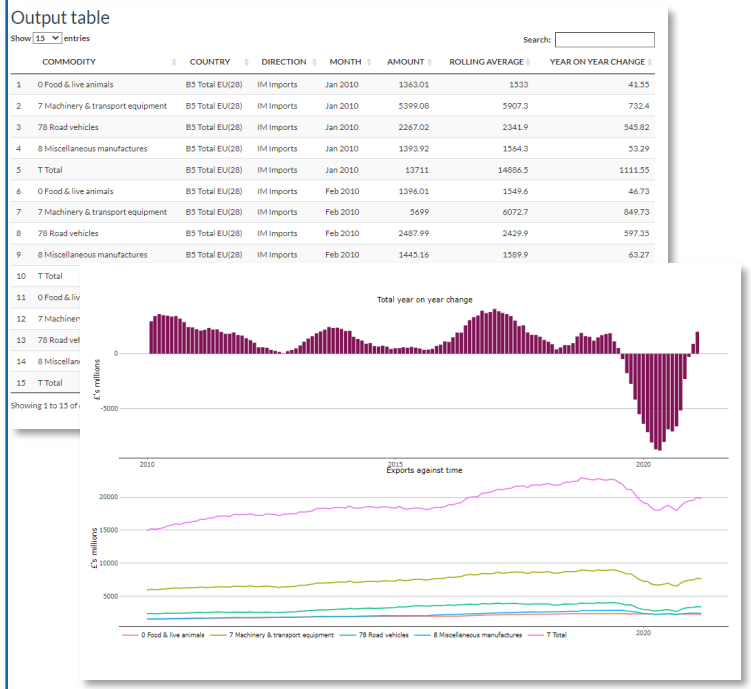
Demonstration of Analysis hub intranet

3. Case study examples of innovative methods and their impact

I want to… understand complex data sets by visualising them

Exploring complex data sets

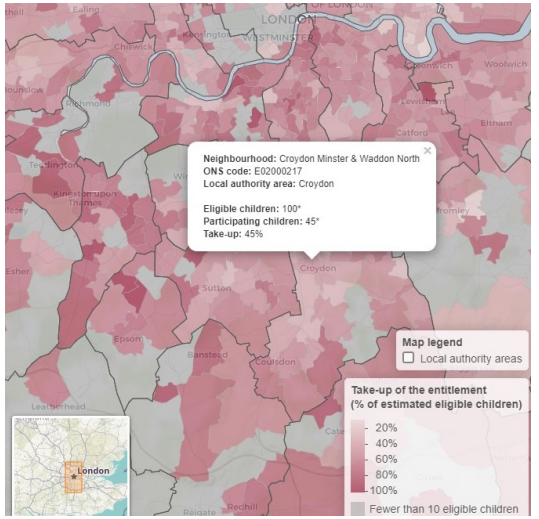
For the DIT trade negotiations study, we created a trade data explorer to **instantly visualise what is happening to UK trade flows** with other countries, by commodity. This sped up the process of looking at the massive 'trade x commodity x country x direction' dataset that ONS produce each month.



Visualisations to give local insights to our audience

To support the report on Early Education and Childcare Entitlements, we produced **an interactive data visualisation** that allows users to access data about take-up and provision of the free entitlements across England and allows them to compare take-up and provision between more and less deprived areas.

The app will help local authorities to **identify gaps in take-up and provision**, but it will also help the DfE to investigate **variations in take-up** of the entitlements and availability of provision.



I want insights…on a process

Process mining provides **greater insights into how schemes operate** than purely descriptive statistics.

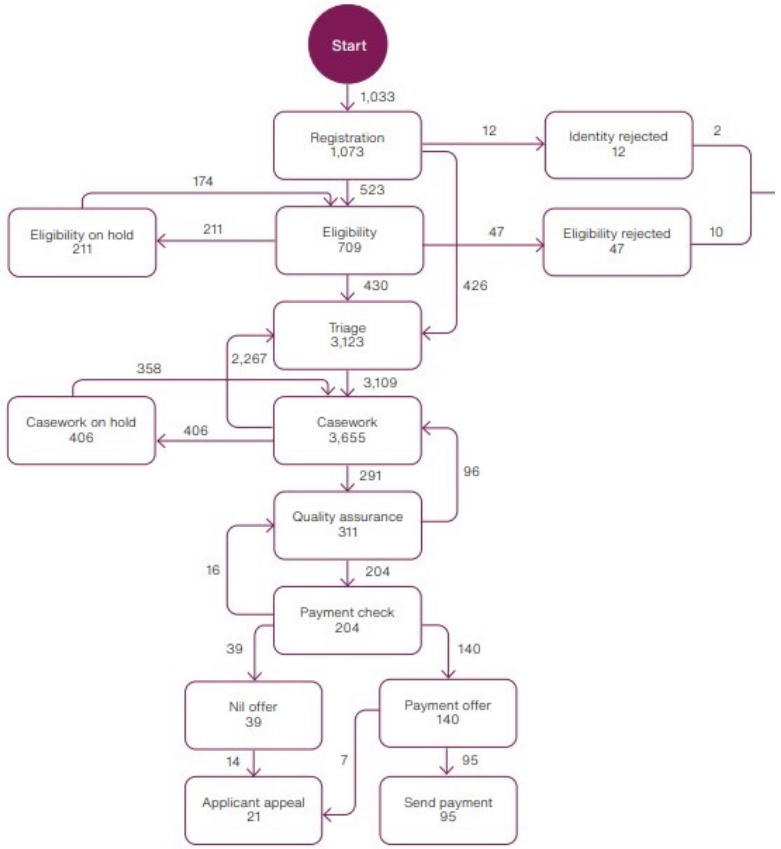
We used process mining to better understand how applications to the **Windrush compensation scheme flow through the system**

- The different routes that individual cases can take through a process
- The time taken to complete different stages of a process and where bottlenecks occur
- The presence of circular iterations between stages, indicating possible inefficiencies
- How resources (such as staff) are utilised within a process and single points of failure

- Can also be used to test how well processes conform to expectations or operational documentation.

- We **boosted post-study client engagement** by presenting our analytical work to the Home Office, in order to demonstrate how they could better leverage their data. This helped the Windrush Investigation team demonstrate to the Home Office how the NAO's work could contribute to their day to day operations

Example of process map derived through process mining (Windrush compensation scheme)



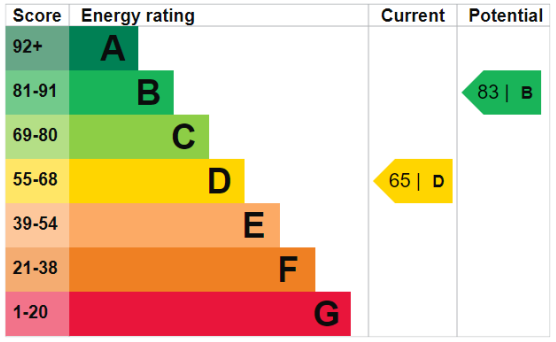
I want to… combine and draw out insights from large datasets

Relationships between variables

We carried out **regression analysis** for the regulation of private renting study, to look for **relationships between regulatory approaches between local authorities with several outcome indicators**.

We used the Energy Performance Certificate database and found a positive correlation between higher inspection levels and better improvement in compliance with minimum requirements.

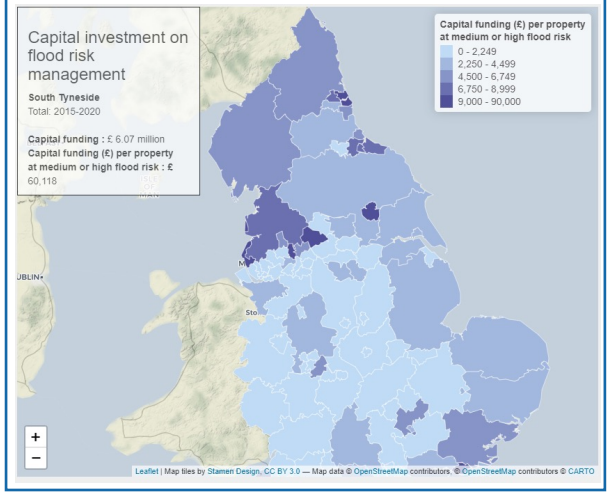
The **size of the raw data set** (1.8bn data points) meant this work would not have been possible in Excel



Combining multiple datasets

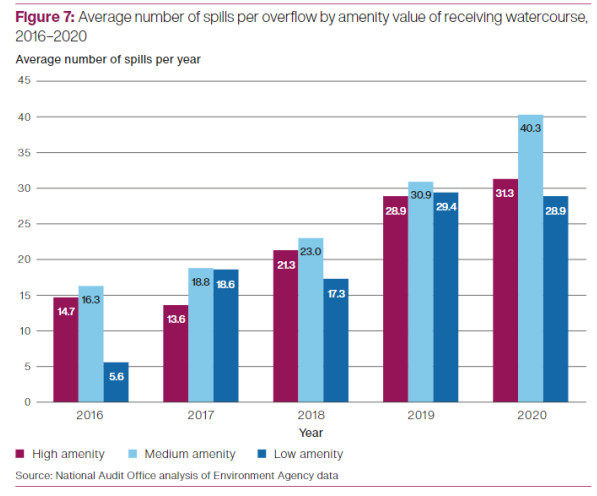
For the Managing Flood Risk report, we combined public and custom EA datasets covering data on investment on flood defences, condition of flood defences and properties at risk of flooding.

This let us examine regional differences in investment on a per property at flood risk basis, providing the team with useful context around spend data.



In our analytical insight into combined sewer overflows we used a spatial joining technique to combine data on sewer outflow locations and amenity value of nearby waterbodies.

This allowed us to challenge a statement from the department suggesting high amenity sites received less spills by demonstrating this was not the case.



I want to… understand spatial and other patterns in data

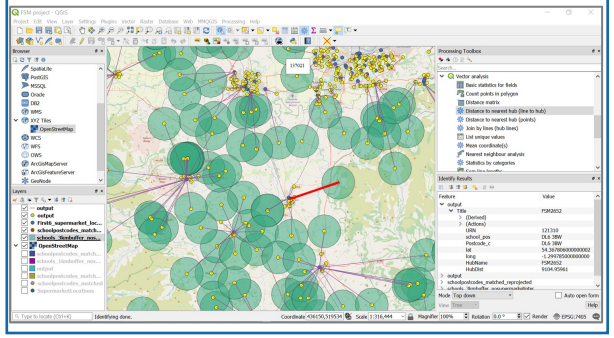
Variation in local delivery & outcomes

For the **COVID-19 free school meals voucher scheme,** we found that DfE did limited work to map the coverage of the supermarkets to ensure families could access the scheme.

We ran our own analysis to clean, filter and geocode the data before creating a distance matrix between schools and supermarkets.

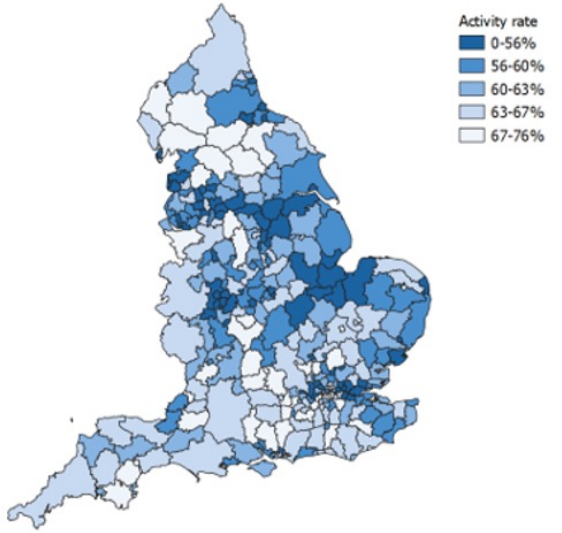
Result and impact:

- 11.2% of schools were > 5 km from nearest participating store
- Limited choice for a further 6.0% of schools
- 3 PAC questions directly referenced the work



Understanding local patterns

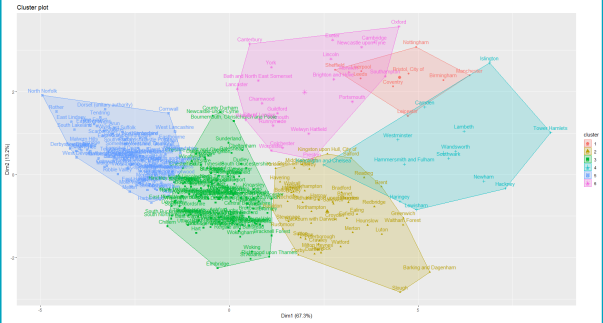
For the Sports Participation Study, we analysed data about sports facility sites and grants awarded to these. By cross tabulating this information against area-based deprivation, population and area type, we supported the team in better understand local patterns.



Cluster analysis

We used clustering techniques to detect hidden patterns in the data, and use this to group local authorities to aid case study selection or support comparative analysis within studies.

Clustering looks at the “distances” between points in a multi-dimensional plane, and provides a lens to look at the data.



Observations, grouped by cluster, plotted against the principal components of the clustering analysis (population, population density, median age, % in age bands)

Tackling problem debt – NAO study

8.3m

estimated number of over-indebted people in the UK

40%

proportion of reported debt problems in 2017-18 relating to debts owed to government, up from 21% in 2011-12

£248m

our estimate of the minimum annual cost to the public purse of the direct impact of problem debt on a person's likelihood to experience anxiety or depression or be in state-subsidised housing

Figure 7
Modelling the effects of problem debt

Problem debt increases the likelihood of mental health problems and use of state-subsidised housing

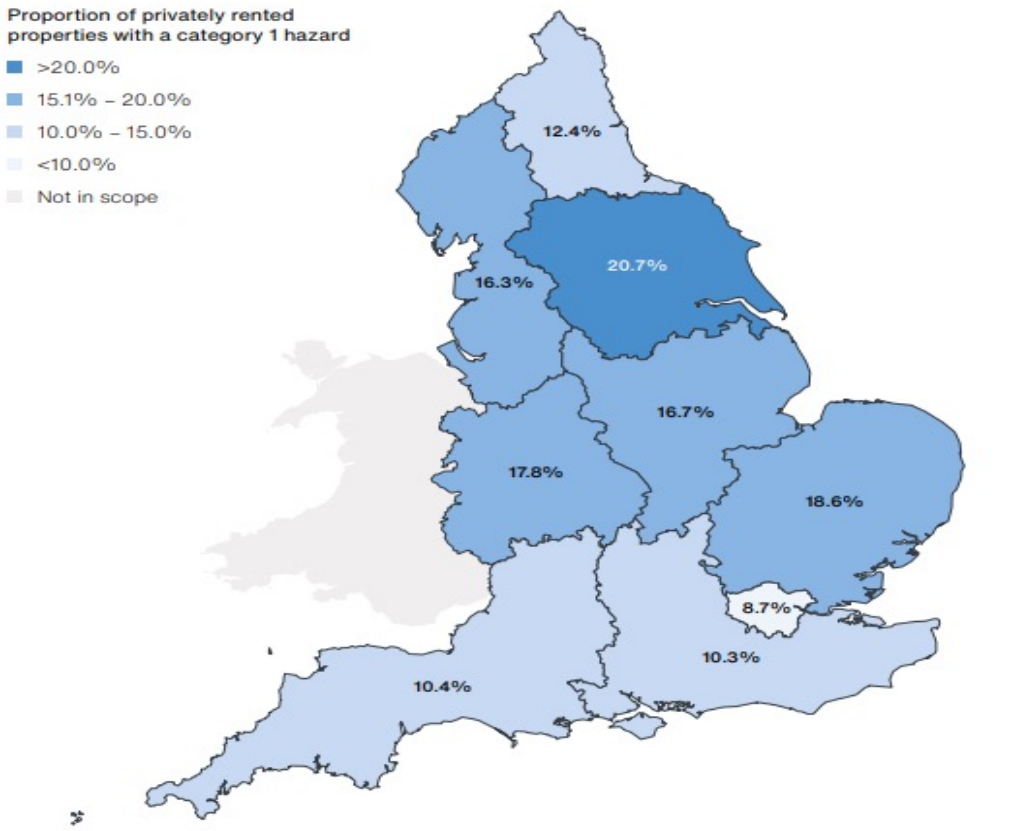
Modelled effect of being in problem debt	Increased likelihood[1]	Estimated number of people this translates to[2]	Estimated annual taxpayer costs identified[3]	Estimated annual cost to the overall UK economy[4]
Model 1: More likely to experience anxiety or depression	7.76%	81,000	£24 million Cost to health services, based on estimate that 39% of those with common mental health disorders seek treatment	£900 million Based on academic estimates of the economic costs of anxiety and depression, including use of various public services, informal care, and lost employment
Model 2: More likely to move into, or remain in, state-subsidised housing	2.85%	23,000	£224 million Comprises cost of maintaining and administering state-subsidised housing (£83 million) and opportunity cost from not charging market rates to private renters (£141 million)	N/A State-subsidised housing is considered economically beneficial by addressing other problems
Total estimated financial impact in these areas			**£248 million**	**£900 million**

Regulation of private renting

Figure 6

Proportion of privately rented properties in each English region with at least one category 1 hazard, 2019

The proportion of properties in different regions with category 1 hazards in 2019 ranged from 9% to 21%



Note

1 Category 1 hazards are defined as a serious and immediate risk to a person's health and safety, and landlords are legally obliged to resolve them.

Source: National Audit Office analysis of English Housing Survey data from the Department for Levelling Up, Housing & Communities; and Office for National Statistics licensed under the Open Government Licence v.3.0 Contains OS data ©Crown copyright and database right 2021

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