Special feature: How GAD uses data science to enhance our service offering

Data science is the combination of programming code and statistical knowledge to extract understanding and insight from data.

Data has always been a key part of the work of actuaries, and harnessing data science techniques enables GAD to work more efficiently and maximise the value of data for departments across government.

For example, the use of data science techniques allows us to use reproducible analytical pipelines to handle repeatable tasks effectively, and the use of modern coding languages allows us to create 'self service' dashboards for clients.

GAD recognises the important part that data science can play in how we process, analyse and gain insights into the high volume of data used in actuarial work.

As part of the GAD 2025 Strategy, we have committed to investing in data science expertise for our actuaries and analysts to ensure that GAD's clients the highest quality of advice possible. In the rest of this article, we set out how our clients have already begun to experience the benefits of this commitment.

Pensions dashboards

Building on the increased programming expertise required for data science, we have developed several dashboards which are used internally to automate processes which are repeated regularly. We have 3 main dashboards that we use for the public sector schemes that we manage.

We have created the dashboards using the open-source programming language Python. The dashboards use centralised code, so any changes to the model only need to be made once (rather than for each individual scheme). This saves a significant amount of time and ensures that our approach to all schemes is consistent.

1. Valuation calculations dashboard

By building these calculation routines into a structured model, we are able to ensure consistency of quality across all of the public service pension valuation calculations, rapidly update results for changing assumptions and instantly generate visual representations of the actuarial calculations.

This is brought together in our easy to use valuation calculations dashboard. It consists of drop-down menus and inputs which allow the user to select

which scheme they wish to work on and what kind of analysis they want to carry out.

2. Analysis of experience dashboard

The analysis of experience dashboard is used to analyse changes in membership between valuations. It looks at how many members have exited the scheme and how that compares with what was assumed. This analysis allows us to adjust our assumptions going forward to reflect changing membership characteristics and ensure that appropriate contribution levels remain in place.

3. Retirement calculator

The McCloud legal ruling gives some pension scheme members the choice between benefits in two different types of pension scheme.

GAD's retirement calculator has recently been upgraded by our data science specialists to improve the user experience. It uses Python to project the benefits that people will get at retirement in both schemes. This allows members to view what their own personal benefits will be and make an informed decision on which benefits they choose.

National Situation Centre

In addition to our in-house dashboards that have been developed, we have seconded staff to the National Situation Centre (SitCen). SitCen predict and manage developing crises in the UK. Our staff have used actuarial and data science skills to develop dashboards which support their analysis. Read more about the secondment experience of one GAD member of staff in a blog by Sean Laird.

Heat decarbonisation plans

The UK government has committed to reaching net zero carbon emissions by 2050 or earlier if possible. Heat decarbonisation involves reducing the amount of carbon produced by central heating systems. Given the cold weather that we experience in winter, reducing the carbon footprint of our heating systems will be key in our move towards net zero.

The Department for Education (DfE) commissioned external consultants to produce plans for 205 schools to help with the decarbonisation of school estates. The heat decarbonisation plans received for each school contained a variety of Word, PDF and Excel files.

DfE asked GAD to help support its work by:

- creating a database to collate information contained in the heat decarbonisation plans
- extracting the relevant information from the set of documents
- designing a set of criteria to identify which schools to target
- assessing the project against the government's levelling-up policies

GAD worked closely with DfE to agree the scope of our work and the timeline for delivery of each project stage.

We met several issues when extracting and processing the data from the heat decarbonisation plans provided, such as:

- report formats which varied by school
- documents that were not searchable
- different names being used for the same school across different documents
- figures not always reconciling across documents

To address some of these issues, we used data science techniques to extract and manipulate data.

A ‘fuzzy matching’ technique was used to map school names that were not identical but were likely to refer to the same school.

Fuzzy matching: A technique for determining how similar 2 character-strings are to each other. It is usually based on on the number of multi-letter chunks that they share. For example, ‘washing’ is highly similar to ‘wasting’ because the two words share the chunks ‘was’ and ‘ing’.

It is often used to link datasets where identifying labels may have minor spelling mistakes, so relying on a perfect match would lead to errors.

Our team also used a ‘data scraping’ algorithm to automatically cycle through the documents received to extract specific information.

Data scraping: Extracts information from a document or web site and exports it into a spreadsheet or other file. For example, wording from PDF documents can be automatically placed into a spreadsheet so that it can be manipulated and analysed. It can also be used to to extract information held on web sites for investigation.

Not all the required information was available at the start of the project. Having a process that was robust and easy to reproduce and iterate was crucial. We were able to re-run the exercise quickly when more information came to light.

None of this would have been possible without the expertise of GAD’s data scientists.

We provided the client with a clean, centralised database of key data fields from the heat decarbonisation plans. We also produced a ranking of all schools based on decarbonisation priorities. This information allowed DfE to make efficient decisions on funding allocation to schools.

Collaboration with universities

GAD has been working with UK universities this year to suggest data science projects being carried out by students. The projects contribute towards the students' Masters degrees.

Each project challenged the student to use data science techniques to analyse real world data. Students use techniques such as linear regression and machine learning to analyse the data and derive insights. Actuarial staff from GAD provide oversight and feedback on their work throughout.

The University of Manchester, City University and University College London have taken part this year. The projects we proposed were based around public service pension scheme data collected by GAD during recent projects in this sector.

Unprocessed data from the 2016 and 2020 valuations of the cost of providing public sector pensions is used by students as the basis of some of the analysis.

Areas of focus included:

- Geographic analysis – do the characteristics of schemes different between different UK regions? For example, do salaries and member behaviours vary in practice between regions? What factors might explain any patterns found?
- Workforce changes – how do members progress between different job roles or decide to leave over time? Can we predict the demographics of the scheme in 2024 based on this?

The results of this analysis have been used to support workforce planning and recruitment.

Our relationships with universities are ongoing and we continue to support the development of data science experts.

Moving forward

Data science is a growing area of GAD's expertise. Whether it is Python, R, R Shiny or JavaScript – the list of programming languages is a long one. At the same time we are deploying advanced statistical methods to improve our understanding of the issues faced by our clients, enabling more impactful advice, and ultimately better outcomes for the UK.

Firms fined for fixing prices fans pay

for Rangers FC merchandise

The Competition and Markets Authority (CMA) has found that Elite Sports and JD Sports broke competition law by fixing the retail prices of a number of Rangers-branded replica kits and other clothing products from September 2018 until July 2019. Rangers FC also took part in the collusion but only to the extent of fixing the retail price of adult home short-sleeved replica shirts from September 2018 to mid-November 2018. All 3 firms colluded to stop JD Sports undercutting the retail price of the shirt on Elite's Gers Online store.

Elite Sports has been fined £459,000, JD Sports £1,485,000 and Rangers £225,000. The penalties include a settlement discount, reflecting resource savings to the CMA as a result of all 3 parties admitting to acting illegally and helping bring a swifter resolution to the CMA's investigation. Elite Sports' and JD Sports' penalties also include a discount for coming forward with information about their participation in the illegal conduct and cooperating with the investigation under the CMA's Leniency Programme.

Michael Grenfell, Executive Director of Enforcement at the CMA, said:

> At a time when many people are worried about the rising cost of living, it is important that football fans are able to benefit from competitively priced merchandise.
>
> Instead, Elite, JD Sports and, to some extent, Rangers, worked together to keep prices high.
>
> Today's decision sends a clear message to football clubs and other businesses that illegal anti-competitive collusion will not be tolerated.

During the time of the infringement, Elite was the manufacturer of Rangers-branded clothing and also sold Rangers-branded products directly through its Gers Online store and later in bricks-and-mortar shops in Glasgow and Belfast. The only UK-wide major retailer selling those products at the time was JD Sports.

The CMA's investigation found that Rangers FC became concerned about the fact that, at the start of the 2018 to 2019 football season, JD Sports was selling the Rangers replica top at a lower price than Elite, which was seen at the time as the club's 'retail partner'. This resulted in an understanding between the 3 parties that JD Sports would increase its retail price of the Rangers adult short-sleeved home replica shirt by nearly 10%, from £55 to £60, to bring it in line with the prices being charged by Elite on Gers Online.

The CMA also found that Elite and JD Sports – without involvement from Rangers – colluded to fix the retail prices of Rangers-branded clothing,

including training wear and replica kit, over a longer period. This included aligning the level and timing of discounts towards the end of the football season in 2019, to avoid competition between them and protect their profit margins.

More information can be found on the case page: Suspected anti-competitive behaviour in relation to the pricing of Rangers FC-branded replica football kit.

1. For media enquiries, contact the CMA press office on 020 3738 6460 or press@cma.gov.uk.
2. The Chapter I prohibition in the Competition Act 1998 prohibits agreements and concerted practices between businesses which have as their object or effect the prevention, restriction or distortion of competition within the UK.
3. Any business found to have infringed the prohibitions in the Competition Act 1998 can be fined up to 10% of its annual worldwide group turnover.
4. The infringement decision is addressed to the following parties: Elite Sports Group Limited and its parent company Elite Corporation Limited; JD Sports Fashion Plc; and The Rangers Football Club Limited and its parent company Rangers International Football Club Plc.
5. A non-confidential version of the infringement decision will be published shortly.
6. On 7 June 2022, the CMA issued a statement of objections setting out its provisional findings that Elite Sports, JD Sports and Rangers Football Club broke competition law by fixing the retail prices of certain Rangers-branded clothing products.
7. Under the CMA's leniency policy, a business that has been involved in a cartel may be granted immunity from penalties or a significant reduction in penalty in return for reporting cartel activity and assisting the CMA with its investigation. Individuals involved in cartel activity may also in certain defined circumstances be granted immunity from criminal prosecution for the cartel offence under the Enterprise Act 2002 and from competition disqualification proceedings. The CMA also operates a rewards policy under which it may pay a financial reward of up to £100,000 in return for information which helps it to identify and take action against cartels. For more information on the CMA's leniency and informant reward policies, go to leniency and rewards.
8. Anyone who has information about a cartel is encouraged to call the CMA cartels hotline on 020 3738 6888 or email cartelshotline@cma.gov.uk.

FOREIGN SECRETARY VISITS REPUBLIC OF KOREA

UK FOREIGN SECRETARY VISITS REPUBLIC OF KOREA

The United Kingdom’s Foreign Secretary, James Cleverly, is in the Republic of Korea today to meet senior government figures and visit the Demilitarized Zone.

His visit will focus on boosting trade, increasing security and strengthening the ties of friendship between the UK and Korea. It is his first trip to Korea since his appointment as Foreign Secretary earlier this month.

Speaking from Seoul, Foreign Secretary James Cleverly said:

“South Korea is a trusted friend in the region and important trading partner for the UK. We have a shared understanding of global threats and a commitment to work together to increase security and prosperity across the Indo-Pacific.

“The bilateral framework sets our ambition to elevate our relationship to a new level on our shared values and mutual interests, benefiting both countries”

During his visit, the Foreign Secretary will meet President Yoon Suk-yeol, reaffirming the close ties of friendship between the UK and Korea. He is expected to express thanks on behalf of the British people for the recent attendance of the President and First Lady at the funeral of Her Late Majesty Queen Elizabeth II.

As part of the existing bilateral framework, Cleverly will engage in a Strategic Dialogue with Foreign Minister Park Jin covering UK-Republic of Korea cooperation on global security and economic issues including Ukraine, Russia and China.

The Foreign Secretary will also tour the Joint Security Area of the Demilitarized Zone with Lt Gen Andy Harrison, Deputy Commander of UN Command in Korea.

After concluding his visit to Korea, the Foreign Secretary will travel to Singapore for the final leg of his trip.

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1. 27 September 2022

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Boost for innovative heat pump projects to drive cleaner heating

- More than £15 million awarded by government across 24 innovation projects to make low carbon heating like heat pumps cheaper and easier to install
- accelerating heat pump rollout will help households move away from using costly fossil fuels and supports target of installing 600,000 heat pumps a year by 2028
- funding will create more than 300 jobs and comes alongside government's Boiler Upgrade Scheme which provides grants of £5000 towards cost of installing a heat pump

Innovations to make heat pumps cheaper and easier to install have been backed by more than £15 million in government funding, helping accelerate the UK's move away from fossil fuels.

The funding is part of the government's £60 million Heat Pump Ready programme, which is developing innovative solutions for reducing barriers to the rollout of low carbon technology in homes and businesses across the UK.

A total of 24 projects in England and Scotland have won funding in the second round of the Heat Pump Ready programme.

This funding comes alongside the government's £450 million Boiler Upgrade Scheme, that provides £5,000 grants to homeowners towards the cost of a heat pump, and a zero rate of VAT for installing clean heating measures and will make it an even more affordable option for people looking to replace a gas or oil boiler in their property.

Heat pumps are already a proven technology that is much more efficient than traditional fossil fuel boilers and provide a reliable, low carbon heating solution for households.

Business and Energy Minister Lord Callanan said:

> In light of rising global gas and oil prices, getting low-carbon

> heating technology into homes is a priority for this government as it will help households ditch the costly fossil fuels that are driving up bills.
>
> Heat pumps are a proven, reliable technology that uses cheaper renewable energy produced in the UK. We are already bringing costs down through the Boiler Upgrade Scheme and slashing VAT to zero, but by finding innovative ways to make them even cheaper and easier to install, we will help more homes see the benefits even quicker.

The key objectives of Heat Pump Ready are to reduce costs and increase the performance of domestic heat pumps, minimise disruption in homes during the process of heat pump installation and develop financial models that support an increase in heat pump deployment.

Innovation support is one part of the government's strategy to help bring low-carbon heating technology to the mass-market and supports the target of installing 600,000 heat pumps a year by 2028.

Industry estimates that the UK heat pump market grew nearly 50% last year and along with the Boiler Upgrade Scheme, Heat Pump Ready is part of a wider package of policies the government is introducing to scale up deployment and support industry to reduce the costs of heat pumps.

Projects being supported by this stream 2 funding include one in Harrogate in North Yorkshire that is using data from smart meters to help optimise the running of a heat pump in a household energy system, a scheme in Truro in Cornwall that is looking to develop efficient and ecological refrigerants that are used in heat pumps and a project in Thame in Oxfordshire looking at ways to reduce the costs of installing and running a heat pump.

The £15 million stream 2 funding supports 37 small and medium enterprises across the 24 projects in England and Scotland, will support the creation of more than 300 jobs and will leverage £6.5 million of private investment.

Stream 2 of the Heat Pump Ready programme comes alongside streams 1 and 3. Stream 1 is providing over £2 million of funding across 11 projects developing feasibility studies for innovative ways to increase the deployment of domestic heat pumps within their local area. In their applications for Phase 1, project teams have estimated a potential cost reduction of at least 20% could be achieved through coordinated deployment.

Heat Pump Ready is part of the £1 billion Net Zero Innovation Portfolio (NZIP) and funding was announced in October 2021 alongside the Heat and Building Strategy.

As a result of the strategy and with help from projects receiving funding through the Heat Pump Ready programme, the government is confident that, as the market for low carbon heating grows, the cost of technology will fall rapidly. Working with industry, the government is aiming for heat pumps to cost the same as fossil fuel boilers to buy and run by 2030 at the latest with big reductions of at least 25-50% by 2025.

The 24 projects receiving funding through Stream 2 of the Heat Pump Ready programme.

Stream 1 of Heat Pump Ready is providing over £2 million of funding across 11 projects in Newcastle, Sunderland, Leeds, Oxford, Greenwich, Bristol, Teignbridge, Fenland, Perth, Cherwell and Bridgend. These projects are working to develop feasibility studies for innovative ways to increase the deployment of domestic heat pumps within their local area. Projects will then use their project findings to apply for up to £9 million for Stream 1, Phase 2, to trial the solutions they have developed.

Stream 3 of Heat Pump Ready is providing up to £5 million of funding to support learning across the Heat Pump Ready Programme so evidence can be shared across participants and with external heat pump stakeholders. The £450 million Boiler Upgrade Scheme (BUS), which opened to voucher applications in May 2022, aims to incentivise people by offering grants of £5,000 toward the upfront cost of the installation of an air source heat pump, and £6,000 for a ground source heat pump.

The government has launched an online service to help households make informed choices on installing low carbon heating, including heat pumps, and upgrading the energy efficiency of their homes, as part of its 'Help to Heat' support.

Green heating consumer protection to come under scrutiny

The Competition and Markets Authority (CMA) has launched a call for information looking at consumer experiences and business practices in the green heating and insulation sectors. It will explore whether action is needed to help ensure consumers are treated fairly and businesses are supported to meet their obligations under consumer protection law.

Heating millions of homes across the country accounts for about 17% of the UK's carbon emissions. With this in mind, more people are taking steps to switch to greener forms of heating, and to insulate their homes, to help reduce their carbon footprint. With better insulation, many are also seeking to reduce household energy bills.

The CMA is concerned about the potential for poor practices, such as making misleading claims about potential cost savings, product performance and suitability – particularly when selling newer, next generation technologies. Consumer groups have already raised concerns, including that consumers have a limited understanding of some newer green heating products and the process for buying them can be complicated and confusing.

It is crucial that the many businesses stepping up to offer homeowners green solutions are clear on their obligations under consumer protection law, as they support the UK's aim to hit net zero by 2050.

The CMA wants to hear about consumer and business experiences of buying or selling home insulation (including wall, loft and spray foam), as well as existing and newer next-generation green home heating technology:

- Home solar – systems that are typically installed on roofs to generate electricity or heat water
- Heat pumps – draws heat from the outside air or from pipes buried in the ground and increase it to a higher temperature for use in the home
- Biomass boilers – boilers that use renewable sources (for example, wood pellets), as fuel to heat homes
- Hydrogen-ready boilers – boilers that use natural gas when initially installed but are specifically designed to be simply converted later to use 100% hydrogen instead

Sarah Cardell, the CMA's Interim Chief Executive, said:

> Reducing energy use is at the top of everyone's agenda – be that because of rising bills, climate change or both.
>
> To help more people move to green heating and better insulate their homes, it's essential that businesses understand and follow their legal obligations when selling and installing. That way, consumers can be confident they are being treated fairly.
>
> That's why we want to hear from consumers, businesses and other key groups about their experience now, so we can root out any problems early on and avoid them in future.

Gillian Cooper, Head of Energy Policy for Citizens Advice, added:

> Making our homes greener is key for us to reduce dependency on expensive gas and bring down our energy bills in the long-run. But people need to feel confident about installing new technology, like heat pumps and solar panels.
>
> Strong consumer protections must be in place in case the installation goes wrong. It's essential to find out about any challenges people are facing, so that problems can be fixed.

Consumers, businesses and other interested groups are invited to share their views through a questionnaire by 1 November 2022.

All updates on the CMA's work in this area can be found on the Green Heating and Insulation case page.

Separately, the CMA has an ongoing investigation into misleading environmental claims and is currently prioritising the fashion sector.

1. The figure relating to home heating representing about 17% of all UK carbon emissions is from BEIS (2021) Heat and Buildings Strategy (CP388).

2. The CMA carries out calls for information under its general review function in section 5 of the Enterprise Act 2002. This call for information is open from 8:30am on Tuesday 27 September for responses until 1 November 2022. The CMA expects to report on its findings in Spring 2023.

3. The CMA will look at the feedback from consumers, businesses, and other interested parties to inform its outputs and assess next steps. This could include for example, issuing guidance for businesses in the green heating and insulation sector to help ensure compliance with consumer protection law.

4. The call for information focuses on the promotion, sale and installation of 4 home heating technologies which are particularly relevant to Net Zero and expected to become more common in households over time. It is also looking at home insulation, which is an important way of making homes more energy efficient and may be necessary in some homes before installing a heat pump. This does not include other heating or energy efficiency products such as heat networks, or double and triple window glazing.

5. Media queries should be directed to: press@cma.gov.uk or 020 3738 6460.