

**Make better decisions  
with forecasting,  
optimisation and AI**

**Smith**institute

# We're Smith Institute

We're a team of experienced mathematics, analytics and AI consultants. We partner with you to design, build and review your mission-critical systems, helping you achieve your organisational goals.

You can rely on our team of experts to deliver a tailored solution that meets your needs:



Optimisation engines



Forecasting models



Explainable AI decision tools



Digital twins



Model monitoring, verification and validation



Future systems research and design



Quantum readiness

# Who do we partner with?

We have worked with clients in a wide variety of industries, and have a strong track record in energy, transport, fast-moving consumer goods and security & defence.

We understand that two problems are rarely the same. Depending on your industry and business goals, the issues you need to solve will differ, and with it, the technology and tools you need to get there. That's why we work with you to understand your business and create a custom solution that's right for you.

## What will we cover in this guide?

Want to learn more about what we can achieve together? Then this is the guide for you. We'll take you through our capabilities, the industries we work with and the common challenges we solve.

<a href="#">How we work together</a>	<a href="#">4</a>
<a href="#">Working with the energy sector</a>	<a href="#">8</a>
<a href="#">Working with the transport sector</a>	<a href="#">13</a>
<a href="#">Working with the FMCG sector</a>	<a href="#">18</a>
<a href="#">Let's get started</a>	<a href="#">24</a>



# How we work together

## A partner you can trust



ULTRA



nationalgridESO

NATS

THALES

Whether your main challenge is transitioning to a low carbon system, meeting changing consumer needs or battling rising costs, we can help you form bespoke solutions to navigate uncertainties.

We'll work with your teams to give them the expertise they need to make decisions confidently. That's why some of the biggest names around the world trust us to design, build and assure their high-value systems.



# Our expertise

We combine our deep knowledge of mathematical modelling, statistics and operations research with expertise in data and AI to help you achieve your goals.

**The results?** Smarter decisions. Improved services. Deeper insights. New innovations. Operational efficiency. Greater confidence for the future.

EXPLORE THE POSSIBILITIES

We help our clients find efficiencies and optimisations in their operations and key decision-making. Greater process effectiveness is not just good for your business, but also for the planet. Working with us can help you progress toward specific UN Sustainable Development Goals.





## The power is in the data

Your data holds immense value. We utilise analytics and AI to discover the context you need to make confident decisions that lead to real-world results.



## Timing is key

Time to value is crucial in many sectors, particularly those serving the end customer. We work quickly and efficiently to prove the concept and ensure our solutions are ready for integration into your real-time operations.



## Systems and operations you can rely on

We use our leading independent verification and validation skills to review your models, algorithms and AI-driven systems, as well as put them to the test.



## An extension of your team

We'll work with your teams to achieve success. As we keep your projects moving, we'll share our knowledge and develop your team's skills so they're ready for the future.



## Mathematical thinking at the core

Our dedicated and experienced team of mathematicians makes Smith Institute stand out from the rest. We combine the right mix of statistics, optimisation and machine learning to create best-in-class systems that work for you.

# Our process

Using our proven process, we work with you to define the problem you're facing, design the approach and prove the concept. We then ready your models for production, help you integrate them into your processes and offer to monitor them over time.

We'll start by understanding what you need and are trying to achieve, involving key stakeholders along the way. We'll then formulate and design the best solution for you, providing a proof of concept. Finally, we'll work with you to build, validate and integrate the models and tools into your processes, so you can start capitalising on the advantages.



## Prepare



## Design



## Build



## Deliver



## Partnership

Conducting workshops and data exploration to help set your bespoke requirements

Crafting the right models and tailoring algorithms to achieve your specific goals.

Developing and evaluating model performance through iterative testing and software design

Delivering productionised and verified solutions to solve your future challenges

Upskilling internal teams, assisting recruitment processes and providing data science-led strategic business intelligence

## Support

Providing ongoing support and guidance throughout the process, including custom dashboards and UI visualisations





# Working with the energy sector

In a period of uncertainty and rapid change, we help energy companies transform their systems and make the best use of their data to generate invaluable insights.

At a time when the energy sector is at a crossroads, with new energy sources needing to be integrated into the grid to meet environmental and sustainability targets, optimising your processes may be more important now than ever.

## Common issues in energy

- Transitioning the energy system to reach the net-zero goal
- Safeguarding the security of supply
- Identifying and supporting vulnerable customers
- Increasing margin without mounting costs
- Making effective use of decentralised electricity inputs
- Digitalising analog or legacy systems
- Delivering a better service
- Decreasing dispatchability and operability networks

# How we help solve them

Our expert mathematicians provide a bespoke solution to design and assure your mission-critical systems.

We'll give you the support you need to make some of your most significant decisions. Suppose you're trying to ensure that the grid is balanced to provide sufficient energy without wasteful surplus or looking to deliver a better service and increase margins. In that case, we have the mathematical expertise you need.



## Optimisation engines

Making the most efficient use of your resources is one of the main factors contributing to your core goals. We use our skills to review and improve your existing optimisers, as well as build bespoke versions for you to progress in areas such as dispatch, optimisations on the network, trading and asset operations. With the rise of new sustainable energy sources, optimisation can manage these assets and ensure they're used the most effectively.



## Forecasting models

Forecasting is crucial for energy companies, from predicting demand to anticipating adverse weather and quantifying errors and risks in your existing forecasting tools. Our forecasting models can help you navigate decisions with a higher level of certainty.



## Explainable AI decision tools

Help your human operators make decisions with confidence. We design AI and machine learning tools with a focus on explainability, allowing you to identify patterns and uncover insights within your data. That way, we can increase confidence that the outcomes are transparent and trustworthy.



## Model monitoring, verification and validation

We use our deep experience in verification and validation to ensure your models are working as they should be by independently testing and verifying the results. We'll also monitor your models, assumptions, parameters, design and implementation for drift to provide you with the confidence and certainty you need to ensure the essential national infrastructure.

# How we've made a difference

See how we've significantly impacted our clients and their operations.



## Helping EDF safely deliver low carbon energy to the UK



**The challenge:** Predicting graphite cracking at the core of 14 advanced gas-cooled reactors (AGRs).

**The solution:** Smith Institute's bespoke CrackSmith software uses forecasting to predict the future degradation of graphite bricks.

**The results:** Security of supply is maintained. Future work and improvements can be accounted for. EDF can continue their delivery of low carbon energy to the UK.

[READ THE FULL CASE STUDY](#)





## Managing uncertainty to forecast supply and demand for National Grid ESO

nationalgridESO

**The challenge:** Making accurate balancing decisions in the face of increased uncertainty due to renewable and embedded generation. Reducing the costs of balancing the grid.

**The solution:** Project REACT used forecasting and mathematical modelling to identify and quantify inaccuracies in existing forecasts and harness opportunities for performance improvements.

**The results:** Engineers have a simple yet effective visual representation of forecasts so they can make crucial decisions with confidence.

[READ THE FULL CASE STUDY](#)



## Modernising optimisation algorithms for the National Grid ESO control room

nationalgridESO

**The challenge:** Improving dispatch algorithms to help real-time balancing decisions.

**The solution:** Smith Institute worked collaboratively with NGENSO teams to implement a modernised dispatch algorithm based on the proof of concept.

**The results:** Accurate balancing and the advancement of the transition to zero carbon electricity network operation.

[READ THE FULL CASE STUDY](#)



# Working with the FMCG sector

Navigating the route to business success in the FMCG sector has become increasingly difficult, particularly in a post-pandemic world. Large scale events like Brexit and political unrest across Europe, plus added time pressures mean that complexities and challenges rapidly begin to mount.

You need to make smart yet rapid decisions to address these challenges and drive business success. So, we harness the power of advanced analytics, mathematical modelling and AI to help you evolve and grow in the future.

## Common issues in FMCG

- Changing consumer preferences
- Increased demand for sustainability
- Weaknesses in the supply chain
- Inflationary price increases
- Labour shortages
- Capacity constraints
- Increased competition and disruption from eCommerce giants, direct-to-consumer brands and discounters
- Tracing product origin for sustainability visibility
- Keeping up to date with new technologies



# How we help solve them

We build the tools, models and algorithms so you can address sustainability head-on, improve customer experience, enhance supply chain and process efficiency, control costs, gain competitive advantage and adapt logistics.



## Optimisation engines

The industry's dynamic nature means your business needs to be agile and adapt to new situations. We'll design bespoke mathematical optimisation models to enhance your operations in all areas, so you can make better supply and demand decisions quickly and confidently. Our optimisation capabilities will also help you reach your sustainability goals by finding the most efficient processes, resulting in less waste.



## Forecasting models

Forecasting forms the backbone of how you operate on a daily basis. Various contributing factors fluctuate and gathering insight is essential. As a result, we'll analyse the data and design, build and deploy the bespoke models you need to predict demand, forecast sales, improve customer experience and control costs. We also incorporate uncertainty in our forecasting models to enable more comprehensive risk management.



## Explainable AI decision tools

Discover the hidden details in your data with our AI and machine learning tools. By analysing your data, you can answer the questions that matter and reveal the factors that drive behaviours and trends. Together, we'll uncover critical insights that improve the customer experience, enhance and adapt your supply chain, and allow you to automate your core processes.



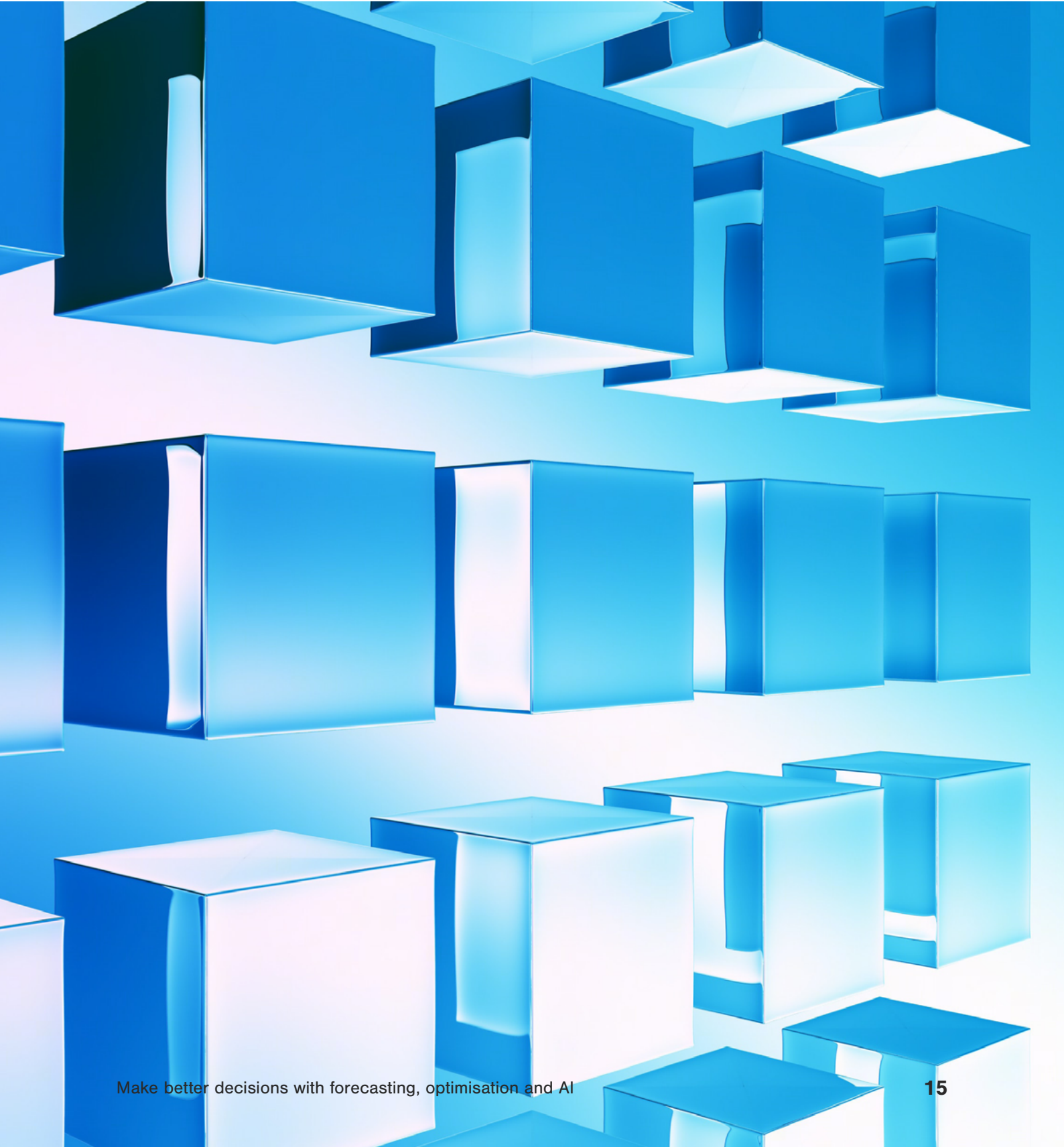
## Digital twins

Explore real-life situations in a safe environment with a digital representation of your processes. Our expert team creates the models, algorithms and simulations that drive your digital twins to explore new scenarios such as increased sustainability. This will enhance your supply chain resilience and visibility, allowing you to adapt your warehousing and logistics to support new models of consumption.



## **Model monitoring, verification and validation**

As your business evolves to meet changing needs and challenges, you'll need to verify your analytics, AI and digital twins models. We test, validate and improve your models so you can trust that they're performing as they should. You can then rely on the insights and use them as part of your decision process while having total faith in your data and results.



# How we've made a difference

## Predicting the weather's impact on demand for Coca-Cola European Partners (CCEP)



**The challenge:** Predicting and understanding how the weather influences customers' choices is key to analysing product performance.

**The solution:** Smith Institute worked closely with the CCEP business intelligence team to elicit factors they believe are most important to consider in weather and sales data. From this, mathematical models were developed to capture changes in consumer trends.

**The results:** Due to the sensitivity analysis conducted by Smith Institute, CCEP could validate their beliefs about the effect of multiple factors on consumers' buying behaviour.

[READ THE FULL CASE STUDY](#)



It's been great working with the Smith Institute team on this project. From the outset, they have been open and collaborative, bringing technical expertise and passion to the table, delivering the bespoke solution we were looking for.

– Dan Hibbs

Senior Business Intelligence Manager  
at European Commercial Development, CCEP.





## Optimising lettuce growth for G's Growers



**The challenge:** Create a user-friendly and fast-acting tool that predicts the weather and crop readiness, provides an optimal schedule for sowing, planting and harvesting, and allows the exploration of multiple scenarios to perform a 'what if' analysis.

**The solution:** Smith Institute used an advanced statistical growth model to show how the available choice of crops and weather forecast affect the profitability of under- and over-supplying. The methodology of large-scale linear programming was also used to devise optimal plans for sowing, planting and harvesting.

**The results:** This tool will help quantify the outcomes of different scenarios, optimising planting and supply programmes, as well as minimising overproduction.

[READ THE FULL CASE STUDY](#)



# Working with the transport sector

There's more pressure on the transport sector than ever before. Navigating the route to success proves a complex task. Our partnership can help you.

We harness our deep mathematical expertise to build accurate and explainable models that drive performance, gain efficiency and deliver better services.

## Common issues in transport

- Rising customer expectations, including increased personalisation
- Driver and labour shortages
- Capacity constraints
- Rising costs due to inflation
- Meeting net-zero targets and transitioning to low-carbon services
- Increased risk from extreme weather as a result of climate change
- Digitalisation of services
- The need to manage and use data effectively

# How we help solve them

Challenges don't always have to be negative. You can use the opportunity to transform how you operate, paving the way for future achievements.

Our partnership will allow you to realise your business' potential. We're here to help you incorporate data, analytics and AI to gain and sustain an advantage within the transport sector.

We can support you and help you take advantage of your data, interpreting the results and guiding you towards smarter decisions, optimisations and efficiencies – essential when complex decisions need to be made quickly to meet customer expectations.



## Optimisation engines

The increased number of variables within the transport sector means optimisations are vital to ensure services run as smoothly as possible. We improve existing optimisation tools and build bespoke versions to gain greater certainty in your decision-making. What does this achieve? Increased efficiency. Enhanced customer satisfaction. Greater predictability.



## Forecasting models

Predicting possible outcomes can be the reassurance you need when making your decisions. We design forecasting models that incorporate uncertainty, so you have the best-in-class information you need when determining what the future might bring – particularly when faced with unpredictable factors such as weather and degradation.



## Explainable AI decision tools

You can often find the answers to the most crucial questions in your data. We use AI and machine learning tools to analyse and uncover critical insights, creating efficiencies that benefit you and your customers. To ensure you have a holistic understanding of what factors influence your decisions, we discover the context that drives you towards improved services, consumer habits and reduced capacity constraints.





## Digital twins

Enhance efficiency and performance with your digital twins. Our team creates the models, algorithms and simulations that power your digital twins for traffic management, emergency services, disaster readiness, supply chain resilience and more. In turn, this will make your supply chains, processes and customer experiences more robust by testing different scenarios in a safe environment.



## Model monitoring, verification and validation

Your models should never stay static. To help your models perform as they should, we independently verify and validate your systems, so you can be sure everything is performing effectively, accurately and ethically.





# How we've made a difference



## Modelling the degradation of earthworks for Network Rail



**The challenge:** Understanding the degradation of earthworks to ensure the longevity of transport networks for future generations.

**The solution:** Smith Institute critiqued Network Rail's existing statistical methodology, before developing a refined algorithmic approach using a Markovian framework. In addition, we proposed a method for measuring the effectiveness of interventions using historical data.

**The results:** Using existing mathematics, models and codes, we could quickly deliver recommendations for improving the earthworks degradation methodology.

[READ THE FULL CASE STUDY](#)





## Evaluating railway performance for Resonate



**The challenge:** Analysing and understanding the impact of Resonate's Luminate solution on railway performance, being trialled by Network Rail.

**The solution:** Smith Institute was crucial in preparing for this trial. We helped create a methodology by developing bespoke statistical models for predicting a baseline railway performance and identifying the level of improvement through data analysis.

**The results:** Our analysis and statistical models have played a key role in measuring Luminate's impact. Because of this, Resonate has obtained independent quantitative evidence for Luminate's impact.

[READ THE FULL CASE STUDY](#)



The Smith Institute brought rigour and independence to a challenging technical and commercial environment. Sometimes, years of experience in a particular field can limit the way that problems are perceived and you need to let the data tell its own story. Through their data analysis, the Smith Institute team have brought a fresh perspective to the complex area of rail operations and performance, with a novel approach to assessing the impact of investment in the industry.

– Daren Wood

Vision Director at Resonate





## Evaluating variability in train driving for RSSB



**The challenge:** Understanding train driving variability in different adhesion conditions, allowing drivers to take power and manage train speed and braking applications.

**The solution:** We created a database and conducted the statistical analysis required to test RSSB's hypothesis about the correlation between driving variability and adhesion conditions.

**The results:** Our analysis gives meaningful insight into the rail industry and will enable RSSB to plan future research programmes focused on improving performance and safety.

[READ THE FULL CASE STUDY](#)

# Let's get started

Are you ready to start exploring the possibilities? It's time to take action and begin preparing for the future. Start the conversation to see how we can achieve your transformation goals together.

We'll assess the problem you face, work with you to devise a bespoke solution and then implement it into your real-time operations. That way, you can start reaping the benefits immediately.

[SPEAK WITH OUR EXPERTS](#)

[+44 \(0\) 1865 244011](tel:+441865244011)  
[hello@smithinst.co.uk](mailto:hello@smithinst.co.uk)

**Smith**institute