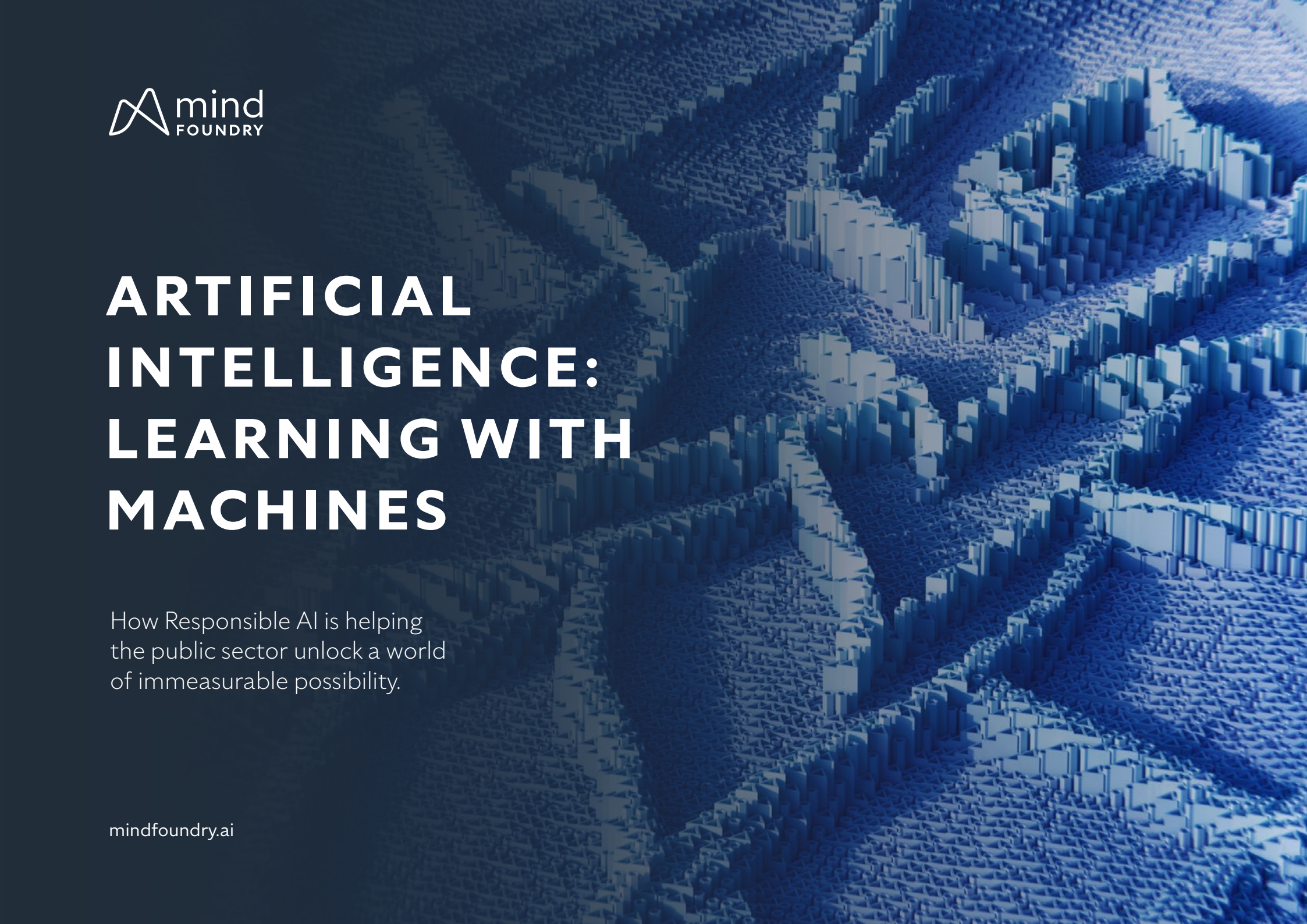
mind FOUNDRY

ARTIFICIAL INTELLIGENCE: LEARNING WITH MACHINES

How Responsible AI is helping the public sector unlock a world of immeasurable possibility.



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CONTENTS

INTRODUCTION

Artificial Intelligence (AI) is here. No longer merely a nebulous concept to occupy the minds of those in rarefied academic circles, AI is changing the way we live and work right now.

Today, AI is one of the fastest growing technologies on the planet. Venture capital is flowing into the sector, across the globe, as new and innovative ways of harnessing its power are emerging as fast as they can be imagined. According to the World Economic Forum: "Artificial intelligence can transform government services, from preventing traffic congestion and providing speedy customer service to predicting crime and infrastructure failure."[1]

The UK is home to some of the world's foremost research establishments in the field and is already a leader on the global stage. Determined to capitalise on this advantage, the Government has taken steps to ensure the regulatory and business environment is in place to allow the sector to thrive, and for the enormous benefits AI can bring to make a positive impact across the entire country.

> Government sees AI as a truly transformative set of technologies with the power to drive growth and prosperity around the country so everyone can benefit.
>
> **Parliamentary Under Secretary of State (Minister for Tech and the Digital Economy)[2]**

AI will drive true transformation throughout the public sector. It will enable organisations to make rapid gains in efficiency, improvements in the workplace and ultimately allow for enhanced delivery of services and a better citizen experience. There remains, however, a degree of misunderstanding around AI and Machine Learning and its place in the public sector landscape. The technology, which is often misunderstood and confused for automation, is intended to support the workforce, not to replace it. Properly deployed, AI enables humans and machines to collaborate, working together to maximise its potential and achieve the best possible outcomes.

This white paper will consider the frameworks put in place by Government to promote the adoption and use of these exciting and innovative technologies. It will look at how AI can be deployed responsibly across an organisation and the enormous potential it can release. Stressing the importance of such responsible implementation, it will demonstrate how choosing the right partner for the AI journey will ensure that systems are explainable and transparent, placing considerations for ethics at the core.

Complementary to the workforce, AI that is properly designed and deployed enables data-driven decisions to be optimised, improving outcomes for numerous stakeholders throughout society.

PREPARING THE GROUND

HOW THE GOVERNMENT IS SOWING THE SEEDS FOR AI TO BOOST GROWTH

Through a series of highly publicised reports, plans, and strategies, the UK Government has been very clear in signalling its intention to encourage a digital culture to flourish. The UK is home to more than 1,300 AI companies, an increase of some 600 per cent over the last decade[3]. The public sector is ideally placed to reap the transformational benefits this innovation brings. Reaffirming its long-held desire to ensure Digital, Data, and Technology (DDaT) solutions are widely adopted and valued, the Government has outlined a series of ambitious initiatives to lay the foundations upon which a new, creative architecture can be built.

Beginning in September 2020, the findings of a far-reaching independent report into the Government's DDaT function were presented by the Digital Economy Council, an examination of the challenges faced and ways to address them. Published as Organising for Digital Delivery, the report offers recommendations relevant to the whole of the public sector[4].

Outlining some of the barriers to realising the Government's digital ambitions, it highlighted the problems associated with the maintenance of legacy IT systems, quantifying a cost of £2.3 billion per annum "just to keep the lights on".

The report was taken seriously and informed several key strategies and policy decisions. In 2021, the Secretary of State for Digital, Culture, Media and Sport (DCMS) set out the Government's 10 tech priorities[5]. The announcement echoed plans to place DDaT at the forefront of the pandemic recovery, aligning with the Build Back Better agenda, levelling up the country and enabling the drive towards a regenerated economy: stronger, fairer, greener and with built-in resilience to unforeseen shocks.

Special emphasis was placed on supporting the development and rollout of AI solutions. Heralding September's National AI Strategy, the Digital Secretary explained, "Unleashing the power of AI is a top priority in our plan to be the most pro-tech

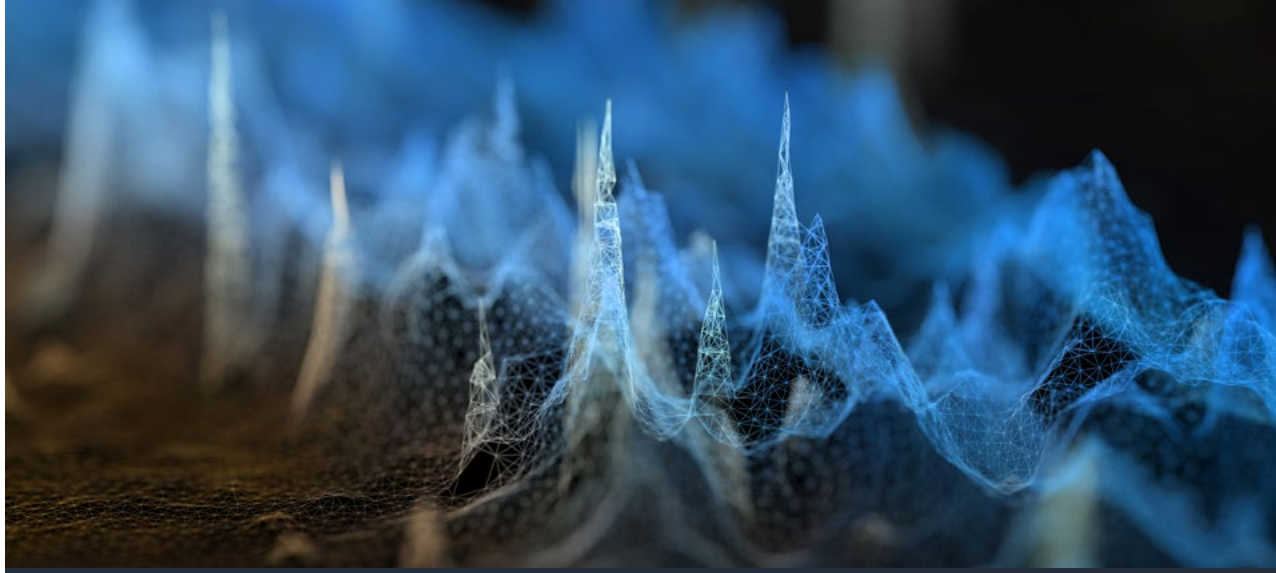
The UK is home to more than **1,300 AI companies,** an increase of some 600 per cent over the last decade[3].

2020	Organising for Digital Delivery (report)
DEC	National Data Strategy
2021	10 tech priorities[5].
SEP	National AI strategy
2022	AI Standards Hub[8]

government ever. The UK is already a world leader in this revolutionary technology and the new AI Strategy will help us seize its full potential - from creating new jobs and improving productivity to tackling climate change and delivering better public services."[6]

As a ten-year plan, the National AI Strategy aims to ensure Britain will retain its place at the top table of technological innovation and goes forward to become a global AI superpower. In publishing the strategy, the Government recognised that the widespread and expeditious deployment of AI throughout the entire economy was not merely preferable, but essential to the future success of UKPLC.

In early 2022, the DCMS and Office for Artificial Intelligence announced an initiative to shape global technical standards for AI. Piloted by the Alan Turing Institute, the AI Standards Hub[8] will bring the AI community together to learn and benefit from shared global standards, ensuring the UK maintains its position as a world leader in the field. At its launch, the DCMS Minister for Technology and the Digital Economy said, "[It] marks the first step in delivering our new National AI Strategy and will develop the tools needed so organisations and consumers can benefit from all the opportunities of AI. We want the UK to lead the world in developing AI standards."



"The National AI Strategy builds on the UK's current strengths and represents the start of a step-change for AI in the UK, recognising that maximising the potential of AI will increase resilience, productivity, growth and innovation across the private and public sectors. Building on our strengths in AI will take a whole-of-society effort that will span the next decade. This is a top-level economic, security, health and wellbeing priority. The UK government sees being competitive in AI as vital to our national ambitions on regional prosperity and for shared global challenges such as net zero, health resilience and environmental sustainability. AI capability is therefore vital for the UK's international influence as a global science superpower."

THE NATIONAL AI STRATEGY[7]

The implicit message at the heart of these and other announcements is a call for the public sector to embrace the Government's DDaT policies and strategies. In committing to substantial investment, the budget laid firm foundations. Leaders and key stakeholders are encouraged to experiment with, and adopt emergent and evolving technologies, to innovate, seek new creative solutions and explore the art of the possible.

The public sector stands at the edge of great change. Widespread adoption of AI will scale at the speed of trust and bring efficiency, resilience and previously unimaginable improvements in performance. In order that trust can be built in from the outset, it is crucial that ethical considerations are placed at the forefront of any AI deployment. Leaders must ensure that any AI that is deployed must be powerful enough to operate reliably, but also be explainable, so that the people using it as well as those who are affected by it can understand how and why it works in the way that it does. Their choice of AI partner should reflect this, recognising its importance and clearly signalling their understanding that such power brings with it the utmost necessity for responsibility and transparency to the citizens they serve.

> New discoveries and methods for harnessing the capacity of machines to learn, aid and assist us in new ways emerge every day from our universities and businesses.
>
> **Secretary of State for Business, Energy and Industrial Strategy**

THINKING AI: THE ART OF THE POSSIBLE

> What we want is a machine that can learn from experience... ...Letting the machine alter its own instructions provides the mechanism for this.
>
> **Alan Turing OBE FRS, London, 1947**

In the decades that followed Turing's foundational work on theoretical computer science, the progress of AI could be described as slow but steady. A number of landmark achievements signalled the direction of travel but the pace of development was limited by two key factors: how much data was available and access to the computational power required to learn from it. It is only relatively recently that advances in computing power and the vast accumulation of data driven by the internet economy have enabled significant gains to be made simultaneously on both fronts. Once depicting shallow growth, the development curve has rapidly steepened in recent years.

For much of the public sector, the AI journey is in its early stages. Organisations are tentatively starting to experiment with and to consider how the technology fits – where and in what ways it can be deployed to maximise potential. In a wide-ranging survey of public sector leaders conducted by leading AI provider Mind Foundry, in collaboration with GovNews, it was found that 39 per cent of responders have at least one project running with another 17 per cent actively trialling solutions. There remains, however, a considerable knowledge gap. The survey also found that 64 per cent had been unable to make a business case for AI. This indicates that many have yet to fully grasp its potential, evidenced by a startlingly high figure of 77 per cent who stated a need to upskill their teams to understand how the technology works. Despite this skills gap, AI applications are already having measurably profound impacts where they are deployed. By reframing the art of the possible, innovative organisations are harnessing the immense power of AI today.

At this stage, to clear up what may be a fundamental misunderstanding, it is perhaps valuable to consider a definition of the term. The Central Data and Digital Office (CDDO), in its document, "A guide to using artificial intelligence in the public sector", defines AI as:

"The use of digital technology to create systems capable of performing tasks commonly thought to require intelligence."[9]

Further demystifying the subject, the guidance from CDDO goes on to explain that although the technology is evolving, the potential of AI technology is applicable in finding previously undiscovered/ underlying patterns from large volumes of data.

The public sector is increasingly driven by data. The sheer volume accrued is barely credible. Thanks to the exponential growth of digitalisation, the ever-increasing demands of an "always on" culture and the determination of the Government to pursue "digital by default" strategies, citizens are accessing services at a time and place of their choosing, via a growing multiplicity of devices. Each and every interaction adds to the data landscape, enabling an immense yet hugely detailed picture to be built.

The quantity is simply too vast to be processed by the human mind, but it provides the fuel to power seemingly innumerable AI solutions which enables data-driven decision making. A scenario emerges in which a best-of-both-worlds outcome becomes possible.

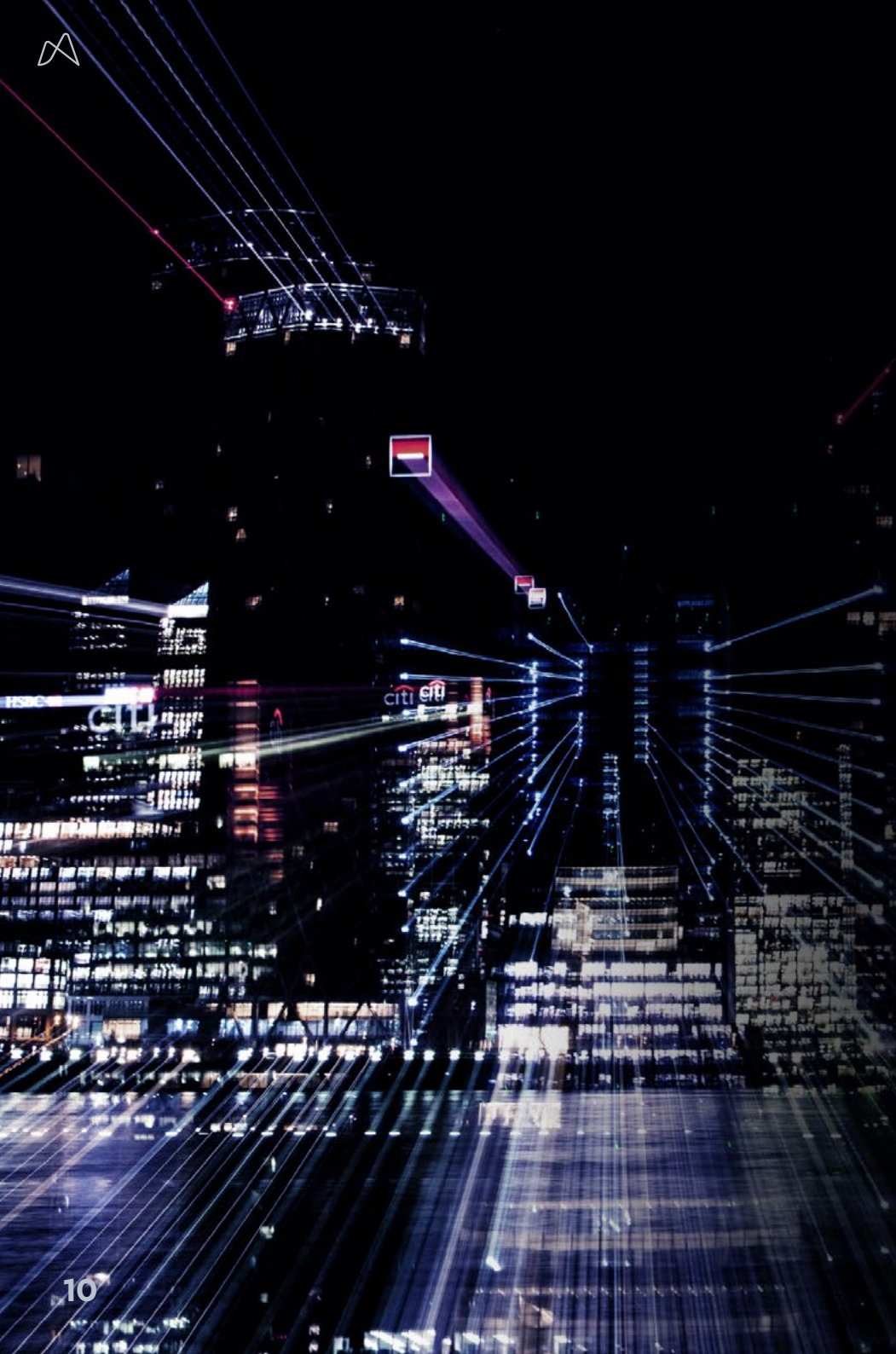
Human-AI collaboration allows for empathy and ethics in decision making while working to eliminate inherent biases. In tandem with other emerging technologies, the possibilities appear almost endless, limited only by what uses can be imagined.

AI enables highly accurate modelling and forecasting, allowing for changing requirements to be predicted and optimised outcomes.

Complex simulations can be provided ahead of trialling policy options, identifying unintended consequences and helping to build in resilience prior to committing to a measure.

Able to provide a high level of data granularity, AI can personalise public services and adapt to an individual's circumstances. Ultimately, an enhanced service is provided at a cost that would once not have been feasible.

Back-office processes become automated increasing efficiency. Staff members are freed to concentrate on more interesting, value-added tasks, improving workplace morale and unleashing creativity.



Research suggests the public is already generally onside. In a report published in March 2022, the Centre for Data Ethics and Innovation (CDEI) tracked how attitudes to data and AI have changed over time. Perhaps driven by pandemic-related increases in online interactions, the figures show a majority of 62 per cent are comfortable providing personal data to access public services, a number which rises to 81 per cent when information is shared with health and care providers[10].

WORKING WITH LEGACY TECH

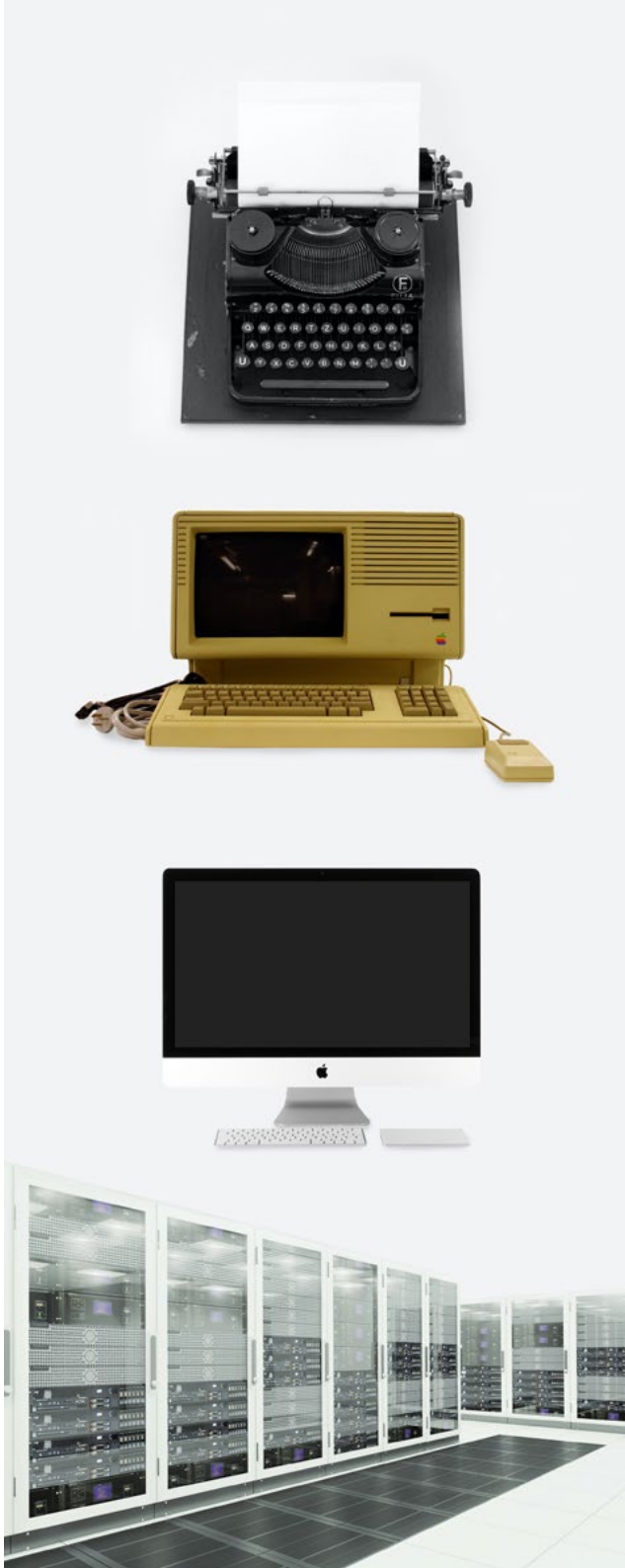
The public sector IT estate is vast and complex. Divergent solutions have evolved over a period of many decades and, as we have seen, legacy systems are a natural weak point in many organisations.

The Organising for Digital Delivery report stated that half of the £4.7 billion annual spend on Government IT is required to maintain obsolete systems, some of which are three decades old. It is, of course, unrealistic to consider a wholesale replacement, the cost of which would be prohibitive.

Legacy systems do not, however, present a barrier to the deployment of AI. Integrated AI solutions can sit in front of and alongside existing data platforms and work to eliminate silos, actually enhancing performance and reliability. AI software can bridge existing tech with common interfaces, simplifying the process for users and reducing the need for support services.

Due to the sheer size of the public sector, it is an inevitability that AI will have to be deployed alongside legacy systems. This does not present a roadblock. Large-scale investment in system replacement is not necessary for proof-of-concept trials and further rollout. There is no need for teams to reinvent the wheel. Transformation through AI is achieved through an evolutionary process, with systems deployed incrementally and able to scale to meet changing requirements. AI grows organically, becoming a component part of the existing infrastructure.

By working in collaboration with the right partner, organisations are able to experience significant gains without the necessity to rebuild the existing IT architecture.



CONCLUSION

A fast-moving technology, AI remains at its core a way of using machines to find patterns in large amounts of data. It can perform tasks, highlight important insights and improve our ability to make sense of the world. It is not a set-and-forget technology, but can be developed to continuously learn and improve actively from human input or changes in data. It can increase our productivity, empower unimagined service enhancements, and help citizens to access a wider range of services more quickly than they have ever been able to. Such power, however, must be wielded with great care to ensure that it remains aligned with its defining principles and the greater goals and values of the people who are most affected by it. In partnering with a provider that holds ethics and responsibility paramount, organisations can deploy AI responsibly in the public sector to improve human outcomes.

AI delivers the future. By making the right digital choices today, the power of this truly innovative technology is unleashed for tomorrow and beyond. A world of immeasurable possibility is presented, bringing continuing gains in efficiency, productivity, workplace morale and delivery of services to UK citizens.

CASE STUDY

DELIVERING NET ZERO: HOW OXFORDSHIRE COUNTY COUNCIL IS OPTIMISING EV PLANNING WITH AI

In 2019, the UK became the first major world economy to sign into law a commitment to reduce greenhouse gas emissions to net zero and end its contribution to global warming by 2050[11].

A series of policy decisions followed, including plans to reduce transport emissions by ending the widespread use of internal combustion powered vehicles. In order to accelerate the transition to electric vehicles (EVs), the Government has confirmed it will no longer be possible to buy a new petrol or diesel car in the UK from 2030[12].

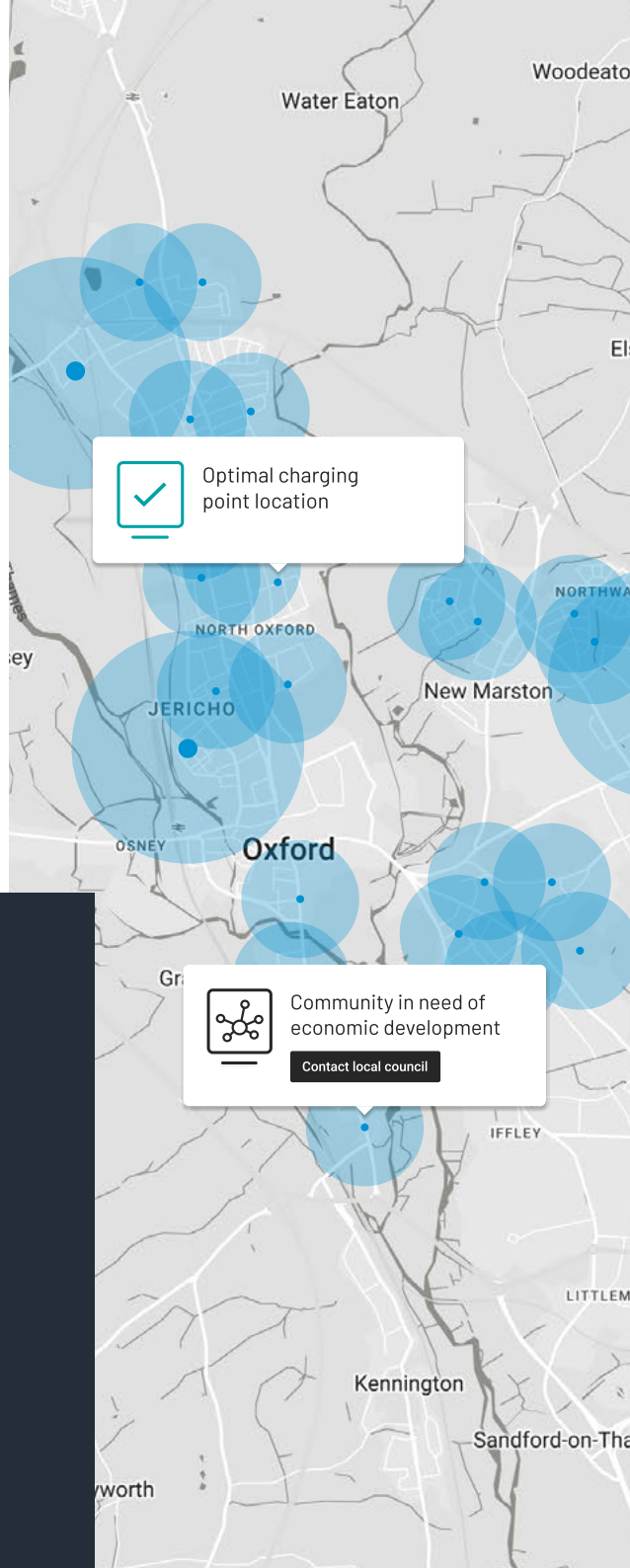
Supportive of these aims, leaders at Oxfordshire County Council have prioritised its own response, working with a number of other local authorities and partners to contribute to a wide-ranging study researching ways to meet the challenge[13].

OXFORDSHIRE COUNTY COUNCIL

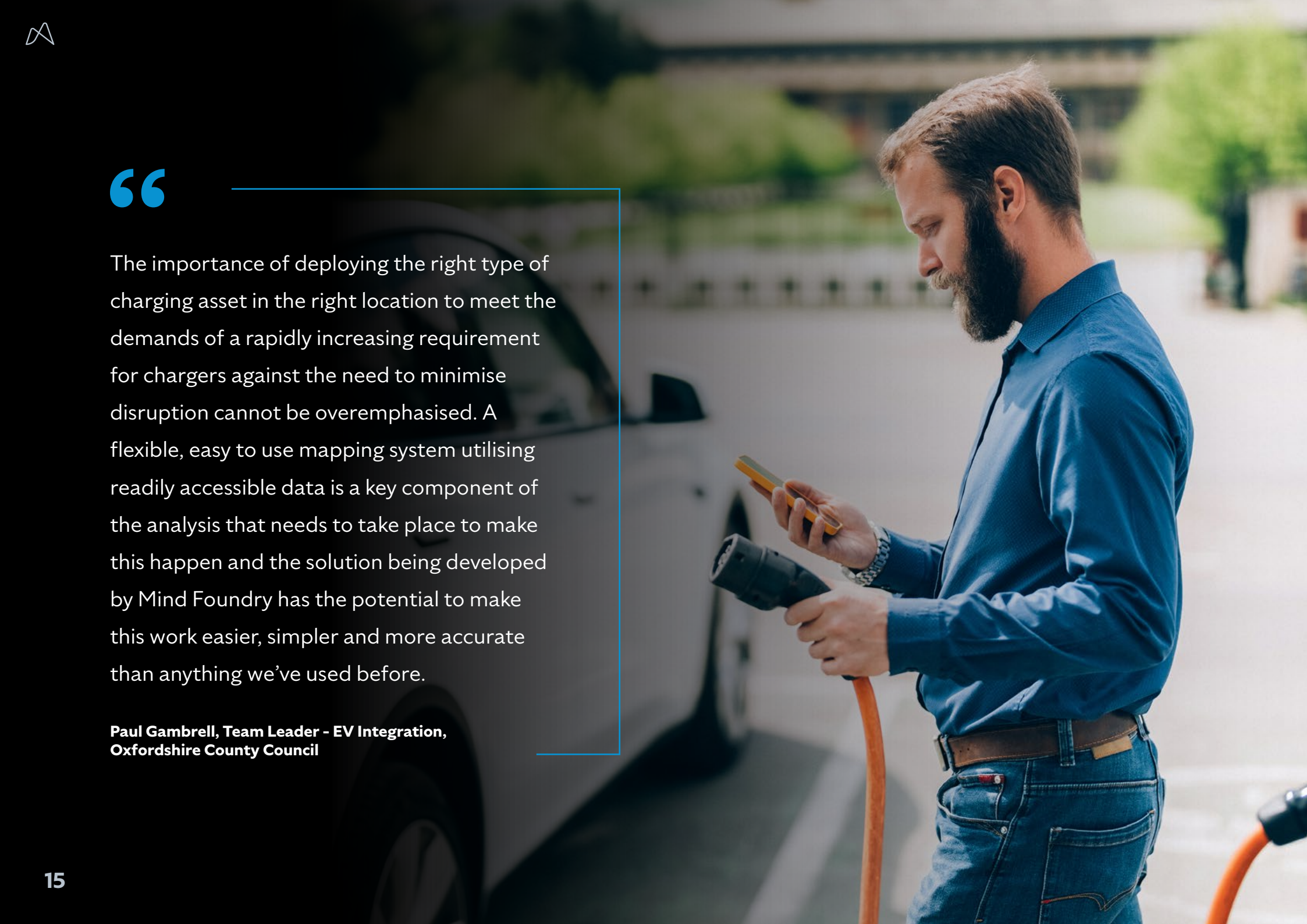
The county already boasts an above-average uptake of EVs, with registrations of zero-emissions vehicles growing by 50 per cent each year. The overall number, however, remains low, with “range anxiety” and concerns over charging significant factors.

To try to allay some of these concerns and further promote the use of EVs, the council looked at ways to optimise its charging infrastructure. Working in collaboration with Mind Foundry, the council undertook a project using geospatial modelling in tandem with a variety of data sources to optimise infrastructure budgets and ensure ethical considerations for local communities.

By using the Mind Foundry Platform with a variety of data sources, new scenarios can be visualised to give the council a valuable insight into potential problems before they have a chance to develop. Resource deployment is optimised and strategies informed.



No longer considered as a “nice to have”, AI has become a mission critical element in the effective planning and management of resource deployment. Flexible, agile and cost-effective, the Mind Foundry platform is a real-world solution that is bringing widespread benefits to the county, helping Oxfordshire and other local authorities across the UK to achieve their net zero goals.



> The importance of deploying the right type of charging asset in the right location to meet the demands of a rapidly increasing requirement for chargers against the need to minimise disruption cannot be overemphasised. A flexible, easy to use mapping system utilising readily accessible data is a key component of the analysis that needs to take place to make this happen and the solution being developed by Mind Foundry has the potential to make this work easier, simpler and more accurate than anything we've used before.

Paul Gambrell, Team Leader - EV Integration, Oxfordshire County Council

CASE STUDY

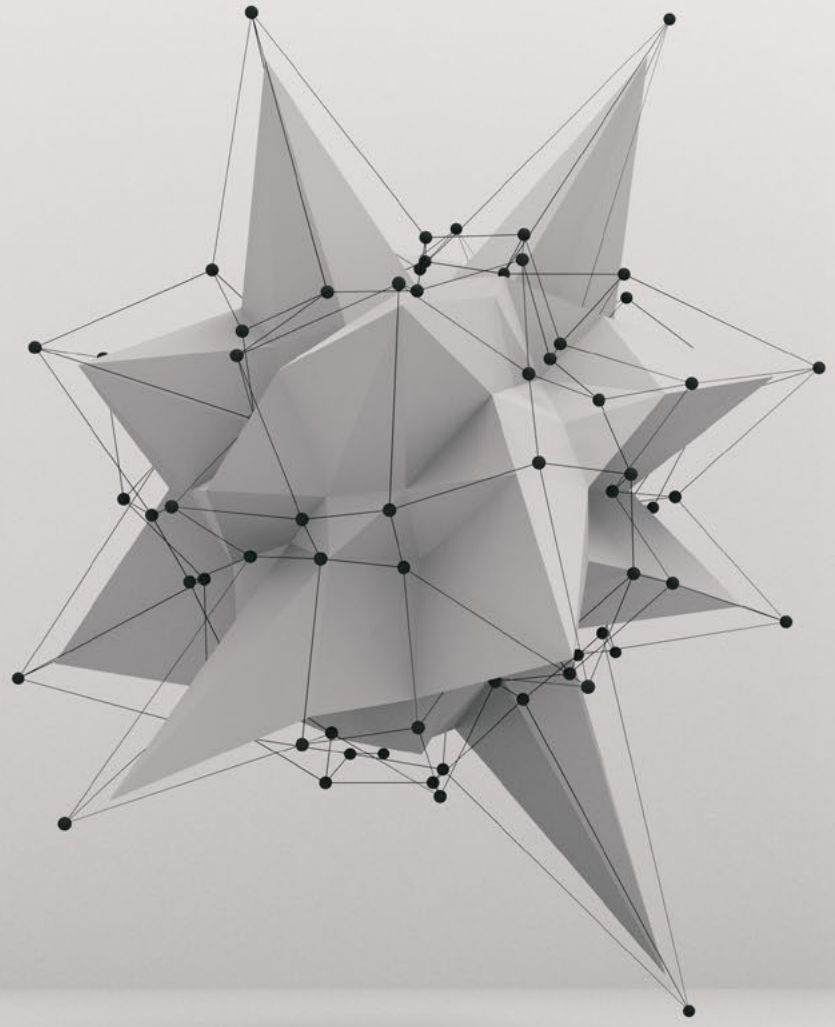
EXPLAINABILITY: HOW MIND FOUNDRY PARTNERED WITH THE SCOTTISH GOVERNMENT TO BUILD AN EXPLAINABLE AI THAT ALIGNS WITH SCOTLAND'S AI STRATEGY

When the Scottish Government outlined its AI strategy[14], it was guided by the values-based standards laid out by the OECD for the "responsible stewardship of trustworthy AI."[15]. In her foreword to the document, Kate Forbes MSP, Cabinet Secretary for Finance and Chair of Scotland's AI Strategy Steering Committee recognised the immense potential benefits AI would bring to the country. Forbes also highlighted however, the importance of proceeding in a trustworthy, ethical and inclusive manner; the defining principles behind the strategy.

Decisions taken across the public sector both AI enabled and not, have effects on the lives of large numbers of citizens. It is therefore imperative that these decisions are taken not only fairly, but in a way that is transparent and easily explainable.

Scottish Government
Riaghaltas na h-Alba
gov.scot

> "There's no doubt [AI] can have a positive impact on society, however, we must be clear about the kind of AI we want to see in our country. We must acknowledge the risks if we don't do this well, take action to address them and build the foundation for public trust – this is essential if we are to realise AI's potential benefits.
>
> **Kate Forbes MSP, Cabinet Secretary for Finance**
> **Chair, Scotland's AI Strategy Steering Committee**



The Scottish Government partnered with Mind Foundry to ensure appropriate consideration for ethics and responsibility in algorithmic decision-making. The result is an AI solution that aligns with and embodies the principles of Scotland's AI strategy. Particularly, the system enables users of varying technical experience and ability to interrogate and understand how and why AI is used in, and impacts decision-making. This enables them to feedback to the AI, ultimately resulting in improved performance and outcomes over time.

With a long-established reputation for its ethical approach, Mind Foundry built a framework powered by its intelligent decision architecture to allow users to gain an understanding into the decisions the AI was making and how results were impacted. The system promotes human-AI collaboration and can be expanded to bring benefits to numerous fields including education, health and care provision and planning. It will enable users to gain valuable insight into the power and value of AI while retaining control, oversight and understanding.

The Mind Foundry solution provides flexibility, discipline and safety. It will free workers throughout Scotland's public sector organisations to concentrate on higher value tasks, building a better, safer nation with benefits for all.

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14 SCOTLAND'S AI STRATEGY

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ABOUT

A spinout of the University of Oxford, Mind Foundry's international team of engineers, scientists and design thinkers has drawn together some of the foremost Artificial Intelligence experts in the world.

The Mind Foundry Platform is the manifestation of decades of cutting edge thinking and research into the fields of machine learning and AI, created specifically for high stakes applications. Designed with responsibility at the core, it provides technological solutions that allow AI to become a trusted partner in even the most demanding applications.

Keeping the responsible use of AI at the forefront of every consideration, Mind Foundry technology is underpinned by three pillars, each equal in importance.

FIRST PRINCIPLES TRANSPARENCY

From first principles, models are developed to be understood in a way that goes beyond a surface level of explainability to provide a fundamental understanding of how a system operates*.

HUMAN-AI COLLABORATION

The future of artificial intelligence is the orchestration of multi-agent systems where humans and synthetic intelligence work together to solve the most important problems.

CONTINUOUS METALEARNING

The world is constantly evolving, your AI must adapt with it. Metalearning allows systems to utilise their own agency to optimise the learning process and adapt to changes in the real world.

*In March 2022, Mind Foundry took first place in the "Best Innovation in Explainable AI" category at the prestigious CogX awards ceremony[16].

GOVNEWSDIRECT

This paper was built in partnership with GovNewsDirect. GovNewsDirect specialise in facilitating innovative and engaging partnerships between the private and public sector.

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