Engineering and Physical Sciences Research Council

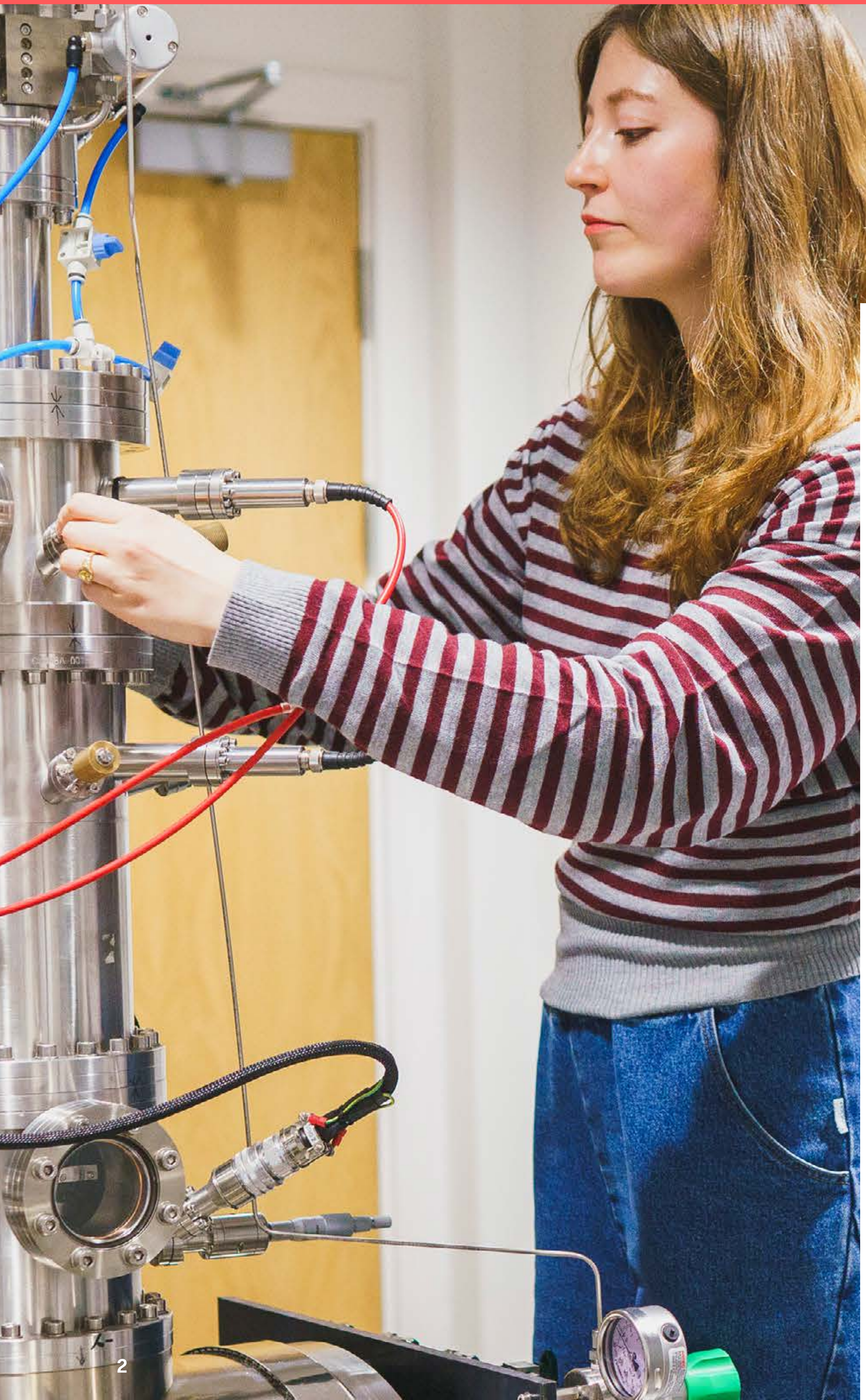
2025–26

Economic impacts from EPSRC’s investments in curiosity-driven research

Executive summary

Economic impacts from EPSRC's investments in curiosity-driven research

Professor Charlotte Deane,
EPSRC Executive Chair



Engineering and physical sciences are fundamental drivers of the UK's economic growth. They underpin innovation and progress across every pillar of the UK's industrial strategy, from advanced manufacturing and clean energy to digital technologies, healthcare and defence.

The impacts are broad and profound: these disciplines help make our lives

- more prosperous by enabling new industries and high-value jobs
- more secure by strengthening our national resilience and technological sovereignty
- healthier by powering breakthroughs in medical diagnostics, treatments and sustainable living

The UK is a powerhouse in these fields. EPSRC-funded research and innovation have delivered world-leading successes, from pioneering quantum technologies to transforming materials science and artificial intelligence (AI).

EPSRC is an intelligent investor, driving impact through active management of our research portfolio, identifying and nurturing strategically important research.

Industry collaboration is central to our approach with over a 46% of grants including non-academic partners. Many programmes, including our flagship Prosperity Partnerships, have been co-created with industrial partners, to drive sustainable economic growth for the benefit of all UK citizens.

EPSRC also helps drive the creation of new companies: over 1,033 active spin-out companies currently operate in the UK as a direct result of EPSRC investments, employing over 31,000 people with a combined annual turnover of over £8 billion.

To maintain this trajectory and maximise our impact, we must focus on robust evidence of what works. The UK's recent slow economic growth, buffeted by world forces and facing global headwinds, makes this task all the more urgent.

The government's renewed focus on growth, alongside the ambition to harness emerging technologies, demands a strategic, evidence-led approach. We must ensure that public investment is targeted, outcomes are measured, and the benefits are felt across society and the economy. In this report we focus on a number of case studies to reveal how curiosity-driven research has enabled economic impact and explore the mechanisms that led to this success.

Surrey Ion Beam, University of Surrey

Key lessons learned

Long-term value of curiosity-driven research

Curiosity-driven research can lead to unexpected and transformative impacts, often emerging years after the initial discovery. Novel research outcomes often have the capacity to drive innovation across multiple industrial sectors, not just the one initially targeted.

Multiple pathways to success

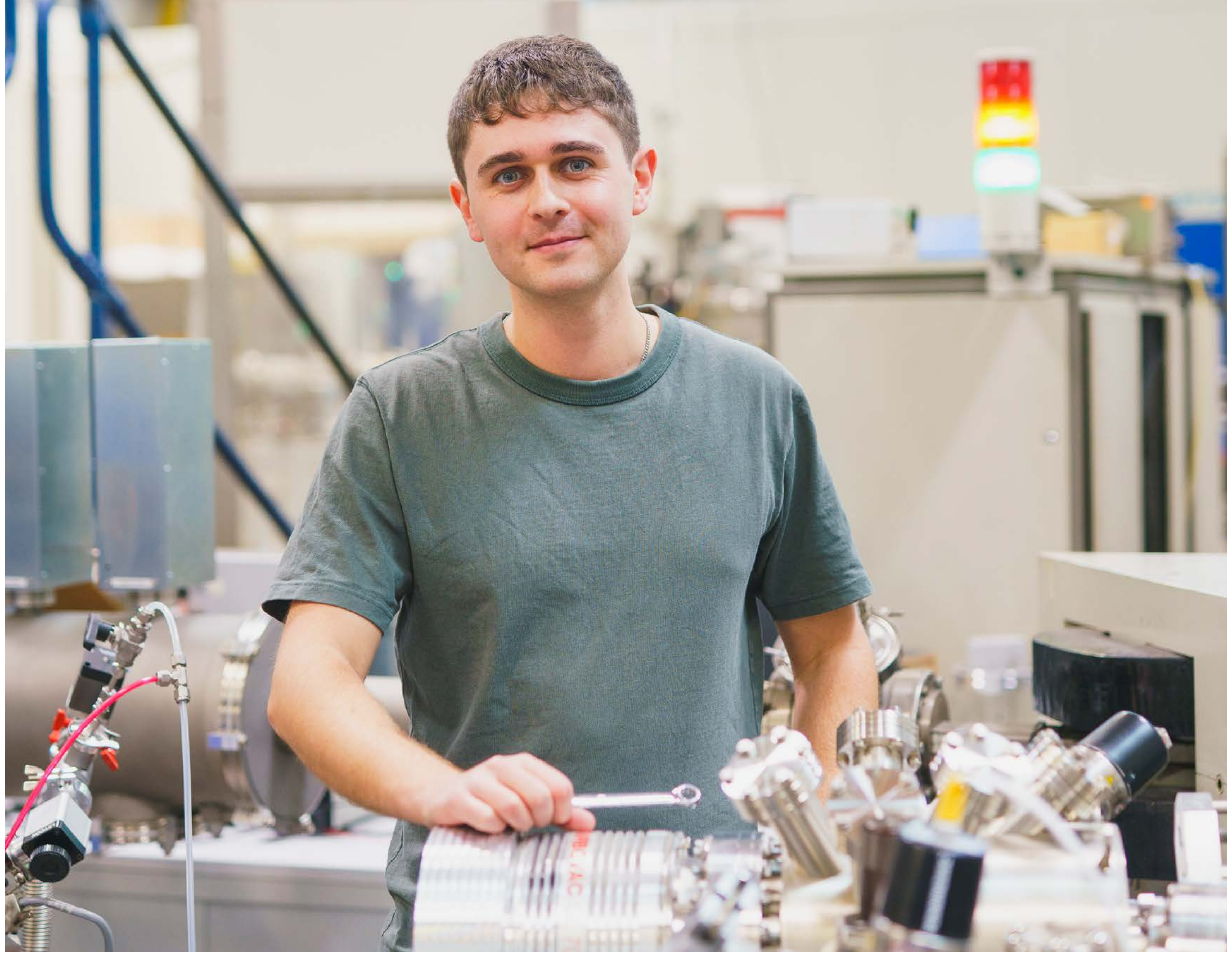
Innovation journeys vary widely. In some cases, agile spin-outs offer the most effective route, in others long-term partnerships with established companies are key. Progression can be linear, with intellectual property developed in academic settings and then transferred to industry. However, it can also be circular, requiring ongoing iterative cycles between applied and fundamental research. Where broader systemic change is needed, a more holistic approach is essential.

Collaborative ecosystems drive impact

Successful innovation frequently involves interdisciplinary collaboration across a diverse network of partners, including industry and academia. Strong relationships between key individuals are frequently the foundation of effective and enduring collaborations.

Importance of sustained support

Many success stories were underpinned by patient, consistent investment deployed to deliver real-world impacts on people's lives and livelihoods. Tailored support throughout the lifecycle of innovation is essential to achieving long-term economic impact and retaining value within the UK economy. The type of support required depends on both the stage within the innovation cycle and the market structures within which the technology will be commercialised.



Surrey Ion Beam, University of Surrey

Future opportunities are emerging

There are many exciting areas for future innovation, including quantum technologies, artificial intelligence (AI), cybersecurity, life sciences, and engineering net zero solutions.

The government's ambition, through its mission to kickstart economic growth, is to raise living standards in every part of the UK. As part of UKRI, EPSRC plays a vital role in delivering this ambition. Our three key areas of focus are:

- Future-proof the Science, Technology, Engineering, and Mathematics (STEM) workforce for the productivity of the UK
- Build a sustainable and vibrant national capability in curiosity-driven research and infrastructure for science- and technology-driven growth
- Catalyse the research and innovation the UK needs to deliver the government's industrial strategy.

EPSRC's commitment to learning from evidence and deepening its understanding of what works ensures that it continues to evolve as an intelligent investor; targeting resources where they will have the greatest impact and supporting our expert-led, portfolio management approach. By working collaboratively, EPSRC helps to maximise the collective contribution of UK research and innovation to the nation's economic success. We hope you will find these case studies as inspiring as we do.

Charlotte Deane, *EPSRC Executive Chair*

Introduction

EPSRC invests in research that generates many different types of impact through new knowledge and innovation. These include:

- opening up new fields of scientific research
- enabling new industries
- increasing the effectiveness of public services
- enhancing people's quality of life
- training and developing people

All of these are crucial determinants of economic growth and prosperity.

This report is focused on economic impact and the mechanisms through which our investments in curiosity-driven research have led to positive economic outcomes.

Figure 1 provides a high-level overview of how EPSRC's investments in research activities, infrastructure and skills enable specific outcomes that lead to economic growth. By analysing case studies of curiosity-driven research, we have identified the following main types of economic impacts from EPSRC investment:

- developing new products, processes and services and creating new markets
- creating jobs and improving livelihoods
- developing and growing innovative companies including start-ups and spin-outs
- increasing business investment in research and development (R&D) and inward investment
- increasing the productivity of UK companies
- developing the places we live and improving our environment
- improving health and quality of life

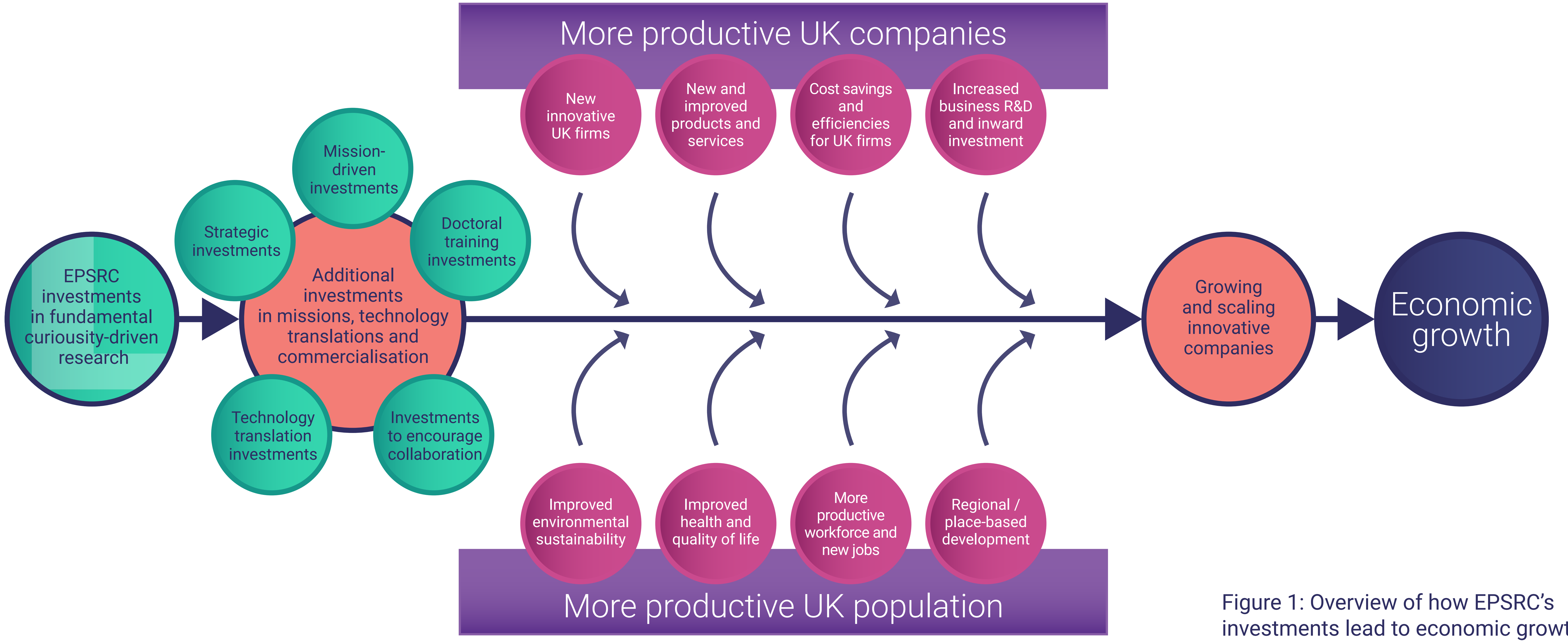


Figure 1: Overview of how EPSRC's investments lead to economic growth

Each of the case studies in this report contributes to different types of these economic impacts. For example, the technology developed by Tracsis has created a successful UK business and also enabled more available and efficient public transport, which improves the wellbeing of the travelling public. Novel motion capture techniques used at CAMERA are supporting businesses to speed up their visual effects workflows and supporting the NHS to deliver new treatments, improving people's health. Investments ranging from fundamental nuclear materials science to critical mass investments in energy research have played a key role in reducing the use of fossil fuels in the energy mix, improving our environment and contributing to future sustainability and net zero goals.

This is not intended to be a comprehensive review, rather it seeks to highlight examples from different Industrial Strategy growth-driving sectors (IS-8 sectors) and discuss the different pathways that have been taken.

How EPSRC actively manages its portfolio for impact

EPSRC aligns its investments with strategic priorities and contributes to UK economic and societal goals, such as supporting the government's industrial strategy. We do this by working closely with stakeholders to understand opportunities and threats in different research areas to help us target resource as effectively as possible.

EPSRC invests in curiosity-driven research through a range of funding mechanisms including:

- standard research grants
- new investigator awards
- programme grants
- institutes
- infrastructures
- postgraduate training

Each of these schemes aims to fund excellent quality research in areas of engineering and physical sciences as set out in UKRI's remit, programmes and priorities[1]. Applicants are required to maximise translation of research outputs into outcomes and impacts. They can consider how their research contributes to strategic priorities in areas of potential economic, societal and environmental impact for the UK, as well as how their research generates academic impacts: new knowledge or capability that enables further research and the development of skilled people.

EPSRC's investments in postgraduate training produce outstanding new knowledge and technology, and skilled people who can lead STEM research and innovation in the future. Without these skills it would be impossible for many industries to commercialise the technology developed.

Other funds are available to help build new collaborations and capability, including network grants, which researchers can use to create new interdisciplinary communities and topics. In strategically important areas, EPSRC invests in research and partnership hubs to establish large-scale multidisciplinary research capability.

Where projects have produced benefits that could be commercialised, we have supported the translation of new technology into impacts through:

Impact acceleration accounts (including place-based impact acceleration accounts)

EPSRC's Impact Acceleration Accounts (IAAs) provide universities with flexible funding to help translate cutting-edge research into real-world impact. These strategic awards create opportunities to form new collaboration, commercialise innovations, and accelerate technology development. Some of these are place-based and are held by a research and innovation cluster to enhance capabilities and drive regional growth. Delivering impact from our research

Prosperity Partnerships

Prosperity Partnerships are collaborative research partnerships that focus on important industry challenges. They are funded jointly by UK businesses and EPSRC. These projects create long-term prosperity for the UK, bringing jobs and revenue growth, and addressing broader societal and sustainability issues. Bringing together business and academia

Innovation and Knowledge Centres

Innovation and Knowledge Centres (IKCs) support the commercialisation of emerging technologies by creating early-stage critical mass in an area of disruptive technology. Led by an expert entrepreneurial team, they advance the research agenda while also supporting growth and revenue generation for the business partners. An independent review of IKCs concluded that they have been successful in developing translational ecosystems between academia and industry and supporting regional development. Innovation and Knowledge Centre programme review report – UKRI

Follow-on funding

Follow-on funding is used in targeted areas to help researchers maximise the economic, societal, policy and environmental benefits of their research. The funded projects must build upon past EPSRC research outputs. It enables activation of impact of those research outputs and outcomes. Activities will propel ideas to the next level, exploiting an identified market or impact opportunity through outcomes-focused, integrative, incremental research.

Another source of follow-on investment is the cross-UKRI proof of concept fund which supports the commercialisation of research to enable spin-outs or social ventures, licensing or other commercialisation pathways Proof of concept – UKRI.

Researchers in residence

Researchers in residence are small-scale awards designed to enable academic staff to spend time working in catapult centres. These secondments boost knowledge exchange between academia and industry partners, helping businesses and public sector partners to adopt new technologies, systems and processes, explore new commercial opportunities, and help make the catapults more effective. These awards are administered by the Innovation Launchpad Network+, website here: https://innovationlaunchpad.group.shef.ac.uk/researchers-in-residence/. To learn more about Catapult network, visit https://catapult.org.uk/.

Innovate UK Translational Funding Mechanisms

As described in many case studies below, to achieve their commercial potential, ideas generated through EPSRC investments have frequently been supported through Innovate UK programmes. Whilst the

1 Remit, programmes and priorities – EPSRC – UKRI

breadth of Innovate UK programmes and business support they provide is outside the scope of this report, readers are encouraged to find out more at Innovate UK – UKRI and Home – Innovate UK Business Connect.

Across UKRI, our approach in recent years has been to strategically draw together programmes that span research and innovation, allowing for a more seamless journey for innovators and faster routes to market. A key example of this is UKRI's Technology missions fund UKRI Technology Missions Fund – UKRI.

EPSRC actively manages its investments and works with many stakeholders including industry and academics to understand and support emerging opportunities and maximise the impacts of our investment portfolio. The case studies in this report illustrate how this support has worked in practice.

Next steps

This exercise has raised awareness of the challenges in tracking the long-term economic impacts of our investments. The EPSRC Performance and Evaluation team are working with stakeholders to look at ways we can work together to improve future evaluations.

The case studies presented here are simplified. We have not captured all the contributions, particularly from collaborators, and members of wider teams, including other funders, who have played vital roles in both the initial research and its later development.

University of Sheffield

Understanding, quantifying and evaluating research and innovation in a complex system remains a challenge. This is an important area of future investigation. We hope these examples raise questions and promote discussion about economic impacts from curiosity-driven research. We look forward to working with our research community to showcase further case studies and working with colleagues across UKRI to consider how we can further maximise the impacts of our investments.

Summary of case studies and the industrial strategy growth-driving sectors they can support and enable

Case study 01	Wind and solar energy contributions to net zero goals	Clean Energy Industries
Case study 02	Automating the discovery of new materials	Advanced Manufacturing; Clean Energy Industries
Case study 03	Driving innovation by tackling real-world challenges with quantum technology	Defence; Digital and Technologies; Financial Services; Life Sciences
Case study 04	Fundamental materials science helps extend the lifetimes of the UK's nuclear reactors	Clean Energy Industries
Case study 05	EPSRC and the UK's graphene innovation ecosystem	Advanced Manufacturing
Case study 06	Tracsis: from academic research to transport industry leader	Digital and Technologies
Case study 07	Kromek: innovations in crystal manufacturing pave the way for new semiconductor devices for national security	Advanced Manufacturing; Defence; Life Sciences
Case study 08	Innovative cybersecurity technologies deliver security and growth	Defence; Digital and Technologies; Financial Services
Case study 09	Ixico: development of a market leader in managing and analysing neurological clinical trials	Digital and Technologies; Life Sciences
Case study 10	CAMERA: motion tracking and image capture for the creative industries, healthcare and biomechanics	Creative Industries; Life Sciences

Economic impacts

Spin-out turnover and value

Total turnover of active spin-outs £8.4 billion

Turnover in top three industrial sectors:

Advanced manufacturing **£2.9 billion**
Digital and technologies **£2.7 billion**
Life sciences **£2.2 billion**

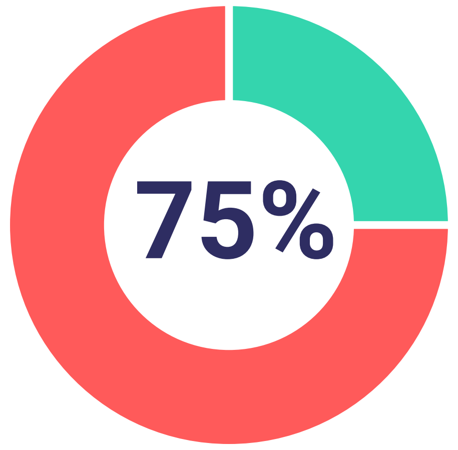
Value of spin-outs

All spin-outs valued at **£16.2 billion** with two classed as unicorns valued at over $1 billion each

Spin-out investments

1,033
active spin-outs

Funds raised
£8.1 billion
equity investment



75% of investment into spin-outs was for continued research and development

Spin-out jobs

31,300 employees in current active spin-outs

Spin-out intellectual property

4,512 patents granted to active spin-outs

Cost savings and efficiencies for UK firms

Scheduling software used by Virgin West Coast for a **30% increase** in train services, with only a 0.37% crew increase

Automated chemistry and co-location with a university has enabled Unilever industrial scientists to **double** their productivity

Supporting the UK's ambitions for green growth

Achieving UK's strategic ambitions for net zero and delivering economic growth

Accelerating UK transition to net zero £1.1 billion investment in UKRI energy programme leveraging **£2 billion** co-funding from partners

11,600 project partners increased UK revenues by 115% to £500 billion from 2005-2018

Employees in project partners doubled to **2.2 million people** from 2005-2018
Driven by onshore & offshore wind, bionergy and solar

Rapid growth of low-carbon sources in UK electricity mix to **52%** total energy generation in 2019

Transformative innovation and growth in advanced manufacturing

Long-term productivity gains and transformative innovation in advanced manufacturing

1,300 researchers strengthening UK manufacturing

Capabilities in:

- 3D printing
- advanced materials
- robotics & automation
- sustainable manufacturing

Impact model indicates **£41 RoI** to the UK economy for every £1 spent by EPSRC

Clean Energy Industries

case study 01

Wind and solar energy contributions to net zero goals

In 2023, wind provided **29%** of the UK's total electricity generation and solar contributed **4.9%**. This energy now provides over a third of the UK's total electricity requirement.[2]

EPSRC investment has been crucial for the UK's transition away from energy generated from fossil fuels, supporting the UK's ambitions to reach its 2050 greenhouse gas emission targets.

EPSRC has been investing in solar and wind energy since the early 1990s, when solar and wind energy in the UK was limited to about 3,000 homes using solar thermal systems for heating water. There were virtually no connections to the national grid until 1991 when the UK's first onshore wind farm was commissioned with 10 turbines producing enough electricity for 2,700 homes.

In 2024, wind provided 58% of all UK renewable electricity and solar provided 5%. Energy generated from solar and wind technology now provides over a third of the UK's total energy requirement.

What we did

Overall EPSRC investment in energy research is closely aligned to policy objectives on climate change across 12 areas including demand- and supply-side priorities such as:

- end-use energy demand
- nuclear fission
- solar technology
- offshore renewables
- carbon capture and storage

EPSRC has invested £1.1 billion in energy research since 2004 via 1,233 grants led by 695 principal investigators across 84 research organisations.

EPSRC created the SUPERGEN networks in 2004 to enhance the UK's international standing in energy and decarbonisation research. The SUPERGEN Future Network is a consortium of over 22 commercial and academic organisations, undertaking research to search for engineering solutions, leveraging additional funding of £2 billion from industry and a range of academic, charity, public and private funders.

Investment in wind energy at the University of Strathclyde commenced in 1989 and through the SUPERGEN Wind networks invested in research into:

- materials for constructing wind turbines
- blade control to improve efficiency
- potential effects on radar safety which enabled construction of the first offshore wind turbines in the UK

2 How much of the UK's energy is renewable? National Grid, accessed 21/10/25

Pilot Manufacturing Resource Centre, Swansea University

The UK has also built an international reputation for creating leading-edge technology for solar panels. Our contributions have included:

- new solar cell using perovskite that converts a record 29.52% of sunlight into electrical power – much higher than the 15-20% conversion rate of standard silicon cells
- development of thin-film solar cells and excitonic solar cells, delivering lightweight, flexible materials that can be sprayed onto surfaces.

EPSRC has invested in doctoral training programmes to build research skills and networks across wind and solar energy. Investments in collaboration with the Natural Environment Research Council (NERC) include five centres for doctoral training (CDT). Additional co-investment leveraged from industry partners for doctoral research projects provides increased capacity and stronger engagement with companies.

Impacts

EPSRC's support of fundamental research for solar and wind energy has led to commercial success including new spin-out companies and commercialising of new products and services by existing companies.

Reaching net zero targets through more efficient wind turbines

EPSRC investment into potential effects on radar safety allowed the construction of some of the first offshore wind turbines in the UK. Further investment led to the development of open-source software, helping wind farm operators to balance increased output with reduced turbine fatigue and extended asset lifespans.

Offshore wind turbines

Research into individual blade control to reduce stress on wind turbine blades has been commercialised by spin-out SgurrEnergy. Birmingham spin-out, Evophase, has teamed up with metal fabricators to produce a bespoke AI-designed wind turbine that is uniquely tailored for the geographical location it is placed in.

Reaching net zero targets through more efficient photovoltaic technology

Spin-out Oxford PV commercialises a perovskite-based, low-cost, transparent solar cell coating that can be used on commercial buildings to convert sunlight into electricity. Using perovskite-on-silicon tandem solar cells enables the Oxford PV technology to reach the theoretical maximum efficiency of 43%, a significant increase compared to silicon-only cells which are reaching their physical limits around 20%.

Future talent pipeline, skills and networks

Building capacity through skills and networks is important to enable future economic impacts to be delivered in the UK. EPSRC investment in CDT students allows the skills gained in their PhDs to be taken directly into employment; most-commonly in industry.

Outlook

Offshore wind power is of substantial interest to the UK government and industry and will have significant impact on the UK's ability to reach its 2050 greenhouse gas emission targets. Generating electricity from renewable sources is critical to the decarbonisation of the UK energy system.

The UK currently has the world's largest pipeline of floating offshore wind projects, based on confirmed seabed exclusivity. Floating offshore wind currently has a domestic gross value added (GVA) of £12 billion to £30 billion[3]. Studies suggest that this could rise to between £21 billion to £86 billion by 2050, depending on supply chain competitiveness and further development of innovative technology. EPSRC's solar energy research has a key role to play in emerging research areas including:

- flexible PV and the utilisation of new materials (offering increased power conversion efficiencies better stability, lower costs)
- transferable skills from other topics within the research area (such as crystalline silicon, dye-sensitised cells)
- broadening the clean energy ecosystem by harnessing solar energy using solar fuels, solar thermal and floating solar technologies

3 What is the value of innovative offshore renewable energy deployment to the UK – Policy and innovation Group, accessed 30/09/25

Automating the discovery of new materials

Clean Energy Industries

Advanced Manufacturing

case study 02

“This collaboration has transformed the productivity of Unilever staff and helped to establish Port Sunlight as one of the most innovative labs in the organisation.”

Matt Reed, Strategic Director, MIF

University of Liverpool researchers at the Materials Innovation Factory (MIF) have used innovative digital technology to help discover novel materials for clean energy and manufacturing technology. This site has also enabled one industrial partner to develop new polymers that have increased their revenue by over €500 million per year in addition to supporting 70 small and medium sized enterprises (SMEs).

Sustained EPSRC investment in fundamental research of high-throughput synthesis and analysis of new materials has enabled the development of advanced automation techniques for materials discovery. From 2007 this research was located largely at the University of Liverpool Centre for Materials Discovery (CMD) and, from 2017, at the MIF.

Strong collaboration with a wide range of industrial partners has been a key factor in the success of this team over the past 20 years. Unilever, who have a research and development laboratory in nearby Port Sunlight, are a long-established collaborator and were a key partner in the establishment of the MIF, contributing £22 million in funding and locating 100 Unilever staff on one floor of the building. This co-location has enabled Unilever to quickly translate and develop new technology, including robotic technology to automate lab processes.

The team's research means that robots can be programmed to run a series of complex experiments, within frameworks set by researchers, to efficiently search for materials with specific properties.

Current research projects include collaborations with computational chemists, including researchers at several other UK universities, to predict crystal structures and crystal properties. Experimental researchers are then using these predictions to identify materials which they expect to have desired properties which they then try to synthesise in the lab. Computer science researchers are also collaborating with this team, to develop AI tools that not only make predictions but also provide the reasoning behind the predictions. This 'explainable' or 'glass-box' (rather than 'black box') AI, could enable scientists to discover materials that would be difficult and very slow to find without AI, and do so in a manner that enhances human understanding.

What we did

Key research grants were funded by EPSRC, including a grant in 2003 looking at high-throughput synthesis and measurement of polymers, which

Materials Innovation Factory, University of Liverpool paved the way for further progress in automation. Since then, EPSRC has invested in significant further research on materials discovery as well as:

- a Prosperity Partnership award to foster long-term collaboration with an industrial partner (developing catalytic approaches to make polymers from waste)
- a Centre for Doctoral Training
- research funding for the development of technologies to enable automation, such as novel image analysis (using mathematical techniques to model shapes) and robotics (including novel sensor technology)
- an AI for Science research hub, AIchemy, focused on building collaborations to advance and apply AI methodology to scientific research, as part of EPSRC's AI for Science strategic funding

The MIF has also benefitted from significant funding from Research England and Innovate UK. "EPSRC's sustained investment in quality research was the foundation of the Materials Innovation Factory." Matt Reed, Strategic Director, MIF

Impacts

Increased UK company productivity and revenues through automation

Automation significantly improved the productivity of staff located at the MIF who work closely with staff at Unilever's Port Sunlight laboratory (employing 850 staff) nearby. Unilever reported an overall doubling in the productivity of their industrial scientists who were embedded in the CMD[4]. In one example, they were able to speed up analysis of alternative vegan pigments for red lipstick from six months to a few hours – a 1,000 times speed-up[5].

Qi Jie Yeow, PhD student (left) and Francisco Munguia-Galeano, Postdoctoral Researcher (right) with mobile robot, Materials Innovation Factory, University of Liverpool

New polymers for use as additives for laundry liquids were also developed which enabled three significant product launches for Unilever. Annual revenue from one of these products exceeded €500 million. Unilever has also filed a further 200 patents attributable to work at the MIF, which could be commercialised into more products. "This collaboration has transformed the productivity of Unilever staff and helped to establish Port Sunlight as one of the most innovative labs in the organisation." Matt Reed, Strategic Director, MIF

New materials for achieving net zero targets

High-throughput methodology has enabled the discovery of many new porous liquids[6]. These materials are as fluid as a liquid but contain microscopic cavities that can capture small molecules like carbon dioxide. This technology is being commercialised by the spin-out Porous Liquid Technologies and could enable efficient carbon capture, removal of gas impurities during biogas production and the capture of valuable noble gases from air.

New routes to sustainable hydrogen production using solar-powered biotechnology

New solar-powered biotechnology has been developed in which light is absorbed and transferred into energy that enzymes can use to make hydrogen. This system also includes a way to encapsulate the enzymes so that they do not deactivate and is a route to clean hydrogen without relying on rare metals.

This breakthrough paves the way for sustainable hydrogen production, supporting the transition to net-zero energy systems.

Outlook

The use of automated materials discovery has wide-ranging potential, including technology to enable sustainable manufacturing and routes to clean energy.

These techniques are being applied to address significant societal challenges. For example, current research programmes include finding new materials that could help remove carbon dioxide from chimney flues and transform it into valuable chemicals and research into materials for more sustainable batteries that open up new understanding of how ions move in solids.

Researchers at the MIF are playing a leading role in the AIchemy Hub. This interdisciplinary collaboration bring researchers from several universities together and aims to advance AI and accelerate the integration of AI in experimental and computational chemistry. Future plans include building an approach for sharing UK chemistry research data to facilitate further collaboration and data-sharing as well as using new technology to discover chemical reactions that are relevant to pharmaceutical drug synthesis.

4 Impact case study submitted to the Research Excellence Framework of 2021 from the University of Liverpool, accessed 07/10/25

5 Beauty bots drive R&D at Unilever's £68 million facility, Vogue Business, accessed 18/09/25

6 High throughput robotics score big in hunt for new porous liquids, Research, Chemistry World, accessed 15/10/25

Defence | Digital and Technologies | Financial Services | Life Sciences

case study 03

Driving innovation by tackling real-world challenges with quantum technology

Over **70** companies are engaged in quantum technology research with the EPSRC quantum hubs as part of the hubs' objective to build a wider technology and innovation ecosystem.

Sustained investment has created a dynamic ecosystem of quantum technology research and innovation in the UK.

Investment in fundamental research studying atoms at temperatures close to absolute zero opened the way for advances in quantum technology. Research at several UK universities to develop new laser technology and explore the strange behaviour of particles when cooled to temperatures near absolute zero uncovered new ways to control quantum information. This raised hopes that quantum computing (originally proposed in 1982 by Richard Feynman) might be realisable.

In 2004 an interdisciplinary research collaboration was established to explore different options for transferring quantum information from one form to another. This work revealed further applications of quantum physics beyond computing, including technology which achieves functionality and performance that would have been impossible using classical physics.

What we did

EPSRC invested in fundamental physics of laser technology, photonics and cold atom physics over many years. In 2004 EPSRC invested in an interdisciplinary research collaboration in quantum information processing. This was the first major strategic investment of its kind in the UK, bringing together all the relevant strands of fundamental physics, and would eventually pave the way for the UK government's National Quantum Technologies Programme.

In 2014, EPSRC investment in four quantum hubs brought together wider collaborations, as part of the National Quantum Technologies Programme, to develop technology for different applications. The hubs were established with partners across universities, national laboratories, business and industry to steer proposed development in areas of strategic importance.

These investments have been sustained and extended since, each time with increasing emphasis on commercialisation of new technology, and there are now five quantum hubs in:

- quantum computing
- sensing, imaging and timing
- secure quantum networking for communications
- quantum-enabled position, navigation and timing systems
- biomedical sensing

Wearable brain scanner developed at University of Nottingham with neuroscientists at University College London, Credit: University of Nottingham

Impacts

UK company growth and development

Over 70 companies are engaged in quantum technology research with the EPSRC quantum hubs as part of their objective to build a wider technology and innovation ecosystem. For example, 30 companies have invested £25 million in projects collaborating with the Sensing, Imaging and Timing hub. To collaborate more effectively with the hub, three of these companies have set up offices nearby.

The UK has 51 high-growth quantum start-ups, around half spun out from universities[7]. Some highlights of the diverse developing applications of quantum technology are provided below, focusing on the more developed commercial applications in areas such as quantum computing and quantum sensing.

Development of quantum computing with applications across all sectors including pharmaceuticals, defence and aerospace

Oxford Ionics, a spin-out from the Computing and Simulation hub, valued at over $1 billion, exemplifies the UK's position at the forefront of quantum technology development, advancing trapped-ion quantum computing through its scalable Electronic Qubit Control system.

Such firms demonstrate the UK's potential to lead in quantum technologies, with implications for productivity, sustainability and long-term economic competitiveness. In 2025, Oxford Ionics was acquired by US-owned IonQ and the company has plans to expand its workforce in Oxford, further developing the UK's position as a leader in quantum computing[8].

Ray Dolby Centre, University of Cambridge

Cost savings for UK utilities and construction from underground sensing

Delta.g, a spin-out company from the Sensing, Imaging and Timing hub, demonstrated the first practical quantum sensor for gravity gradiometry, using it to detect underground infrastructure.

Delta.g's ultra-sensitive gradiometers can help utilities and construction firms avoid costly errors such as striking underground assets. Such strikes cost the UK over £2.4 billion annually[9] and Delta.g's technology offers an effective solution to avoid costs and generate smarter growth.

In 2025 Delta.g raised £4.6 million to accelerate the development and deployment of its gravity-sensing platform to deliver real-world impact in subsurface imaging, navigation and environmental monitoring. This has the potential to reduce the UK's reliance on GPS, boosting national resilience.

Improved health and quality of life from quantum brain imaging

Another spin-out from the Sensing, Imaging and Timing hub, Cerca Magnetics, has developed the first wearable brain scanner using quantum sensors to measure brain activity while subjects are in motion, an advance over traditional imaging.

With potential to track and assess brain function in real time, this new technology will deepen our understanding of how the brain works while patients respond to different cognitive demands, rather than lying still during the scan. This could enable more accurate understanding and better management of conditions like epilepsy, dementia and Parkinson's.

Early adopters include leading research institutions around the world, where the technology expands access to younger patients. Its uptake illustrates how quantum innovation could enhance healthcare delivery and broaden diagnostic capabilities.

Increased business investment in R&D

New quantum technologies including products, services and manufacturing components are attracting increasing private sector investment in R&D and helping to grow innovative UK companies, for example investments in demonstrators of quantum computers and communications technologies by companies such as HSBC, Rolls-Royce and BT.

Outlook

Addressing fundamental technical challenges to enable commercialisation of quantum technologies requires effective co-creation between multidisciplinary teams of academic and industrial partners. The UK's coordinated way of investing in quantum technology hubs is a pragmatic, high-potential approach.

McKinsey's Quantum Technology Monitor suggests that quantum computing, communication and sensing together could generate up to £80 billion global revenues by 2035[10]. The UK quantum computing sector is projected to directly contribute between £1.7 billion and £3.8 billion to UK GDP by 2045[11]. The UK government has recently committed to 10 years, funding for the National Quantum Computing Centre (NQCC)[11]. The NQCC aims to build and scale quantum computing capabilities in the UK, focusing on emerging application areas including energy grid optimisation, drug development, climate modelling, and AI enhancement.

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7 A Summary of the UK's High-Growth computing Technology Companies – Beauhurst, accessed 07/10/25

8 IonQ Announces Agreement to Acquire Oxford Ionics, Accelerating Path to Pioneering Breakthroughs in Quantum Computing, Oxford Ionics, accessed 08/10/25

9 National Underground Asset Register (NUAR) – Economic Case Summary – GOV.UK, accessed 07/10/25

10 https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/steady-progress-in-approaching-the-quantum-advantage, accessed 21/10/25

11 Ensuring that the UK can capture the benefits of quantum computing, Oxford Economics, accessed 23/10/25.

Clean Energy Industries

case study 04

Fundamental materials science helps extend the lifetimes of the UK's nuclear reactors

On average eight more years have been added to the operational lifetimes of the UK's advanced gas-cooled nuclear reactors, corresponding to around **£40 billion** of additional electricity generated.[12]

Electricity pylons in Leeds

Fundamental materials science research has helped to extend the working lifetime of the UK's nuclear reactors, producing billions of pounds worth of electricity and reducing the use of carbon-based fuel sources in the energy mix. The understanding gained will inform future nuclear fission and fusion power technologies as well as aerospace engine design.

The vast majority of the UK's nuclear reactor fleet was built in the 1960s, 1970s and 1980s, when our understanding of the long-term effects of nuclear bombardment on reactor materials was more limited. Defects in nuclear reactor materials build up slowly over decades but can suddenly accelerate and lead to failure. Scientists working in this area aim to recreate these systems in the lab so that their behaviour can be studied and their performance predicted.

Fundamental materials science has enabled researchers to learn more about how metal structures move and deform when under high pressure or at high temperatures. Such changes can be highly localised within the metal and occur very slowly.

EPSRC invested in research led by the Open University to develop novel equipment to apply large forces to metals at high temperatures. Advanced imaging techniques were then used to observe nano-sized changes within these materials. This data revealed new insights including how local chemical changes affect behaviour, and this has enabled researchers to improve their models and better predict how structures behave.

This research has provided evidence to validate safety cases to extend the operating period of eight advanced gas-cooled reactors (AGR). This work has also benefitted from earlier EPSRC investments in strategic research equipment including atom probe tomography and electron microscopy.

What we did

EPSRC has invested in fundamental research into materials science and how metals deform under different conditions. We have also supported investments in strategic equipment including focused ion beam microscopy, atom probe tomography and X-ray photoelectron spectroscopy.

Targeted calls on fundamental science underpinning nuclear reactor physics built the UK science capability in this strategically important area and in 2013 EPSRC made a major investment in the National Nuclear User Facility (NNUF). The NNUF provides state-of-the-art experimental facilities for research and development in nuclear science and technology with 30 facilities housed in 12 universities, the UK Atomic Energy Authority, the National Nuclear Laboratory and Diamond Light Source.

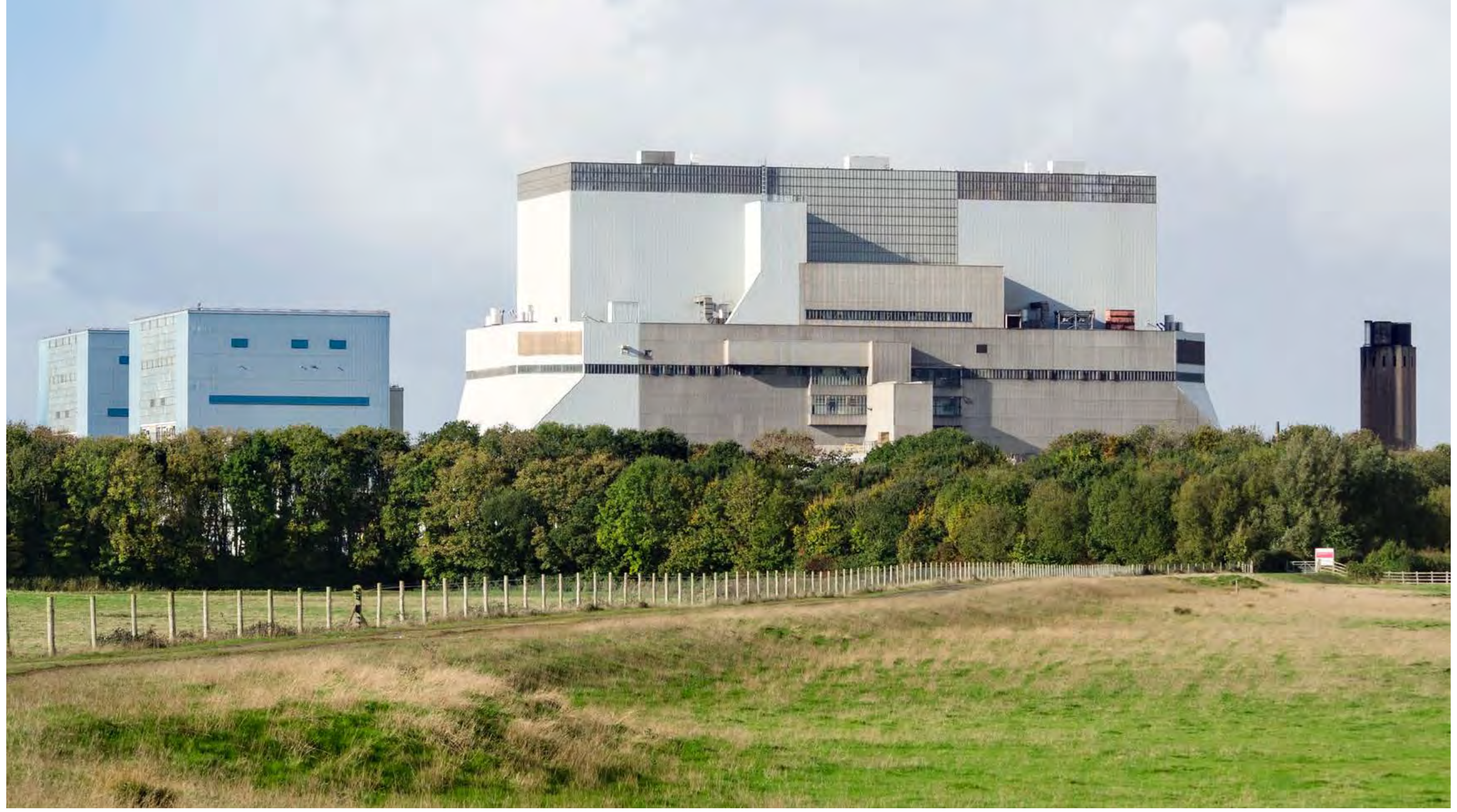
Through the NNUF, EPSRC has invested in research applying these and other findings to the assessment of the safety of the UK's AGRs.

Collaborations with industry were facilitated using EPSRC's Prosperity Partnership model, pairing academic expertise with industry challenges and supported with co-funding from industry partners. For example, the SINDRI Partnership with EDF and lead partners from:

- University of Bristol
- University of Manchester
- Imperial College London
- STFC

The partnership aims to accelerate innovation in nuclear engineering by exploiting digitally enabled materials, enabling virtual environments for design and testing and reducing human intervention in complex engineering workflows.

Innovate UK investment has been aimed at supporting translation of new technologies for nuclear fission and fusion.



Hinkley Point nuclear power stations, Somerset

Impacts

Reducing overall costs of low-carbon energy from existing reactors, avoiding decommission and new build costs

University of Bristol research has provided robust scientific evidence that enabled EDF to extend the lifespan of the UK's fleet of advanced gas-cooled nuclear reactors (AGRs). EDF, the operators of the AGRs, commented: "the research performed by Bristol feeds directly to help underwrite the safety cases for lifetime extension made by EDF Energy to the Office of Nuclear Regulation."[12]

On average eight more years have been added to the expected closure date of the AGRs. Operating lifetime extensions to date correspond to around £40 billion of additional electricity generated[12].

Research as part of the SINDRI project is also informing the extension programme for the UK's pressurised water reactors including regulatory approval for the long-term operation of the Sizewell B nuclear station.[13]

Increased efficiency in modelling low-carbon energy generation infrastructure

Digital twins developed as part of the SINDRI award have improved simulations of material behaviour of materials over the lifetime of a nuclear power plant. This allows engineers to optimise the reliability of structural integrity analysis, increasing safety and driving down costs.

Avoided greenhouse gas emissions from alternative mixed-source electricity generation

Longer lifespans of these low-carbon power sources reduce our reliance on high-carbon sources of energy, resulting in an overall reduction in CO2 emissions.

Outlook

The UK government is putting nuclear energy at the heart of its plan for net zero baseline energy supply. To support this ambition, EPSRC launched a £16.25 million strategic investment opportunity in 2025, inviting large multidisciplinary consortia to address nuclear fission challenges.

EPSRC is investing in consortia that adopt a whole-systems approach to:

- nuclear energy generation
- integrating reactor design
- fuel cycles
- decommissioning
- waste management
- materials science
- modelling
- socio-economic impacts.

The goal is to the inform policy, drive innovation and deliver significant impact across the nuclear energy lifecycle.

12 Impact case study submitted to the Research Excellence Framework of 2021 from the University of Bristol, accessed 21/10/25

13 Gateway to research page, the impact summary can be accessed by selecting 'outcomes' and then 'impact summary'

Advanced Manufacturing

case study 05

EPSRC and the UK's graphene innovation ecosystem

EPSRC research investments have led to the creation of **15** currently active graphene spin-outs, employing a total of **300** people and with turnover of £1.75 million in the most recent financial year.

Graphene, a material first isolated at the University of Manchester, has become a cornerstone of advanced materials research and product development. EPSRC has been instrumental in positioning the UK as a global leader in both graphene science and its commercialisation into a wide range of applications.

The term graphene was introduced in 1986 with its origins dating back to 1947 when the theoretical properties were explored. Developments in Europe attempted to extract graphene, and in the 1960s and 70s single layers of graphene were grown on top of other materials.

Development continued, but nothing thinner than 50 to 100 layers was produced. In 2001 Professor Andre Geim and Professor Kostya Novoselov received funding from EPSRC to carry out basic research in Manchester, which led to the isolation of a single layer of graphene in 2004.

Graphene is a form of carbon that is only one atom thick and is referred to as a 2D material. It is a flexible and transparent material that is tougher than diamond and a better conductor of heat and electricity than copper.

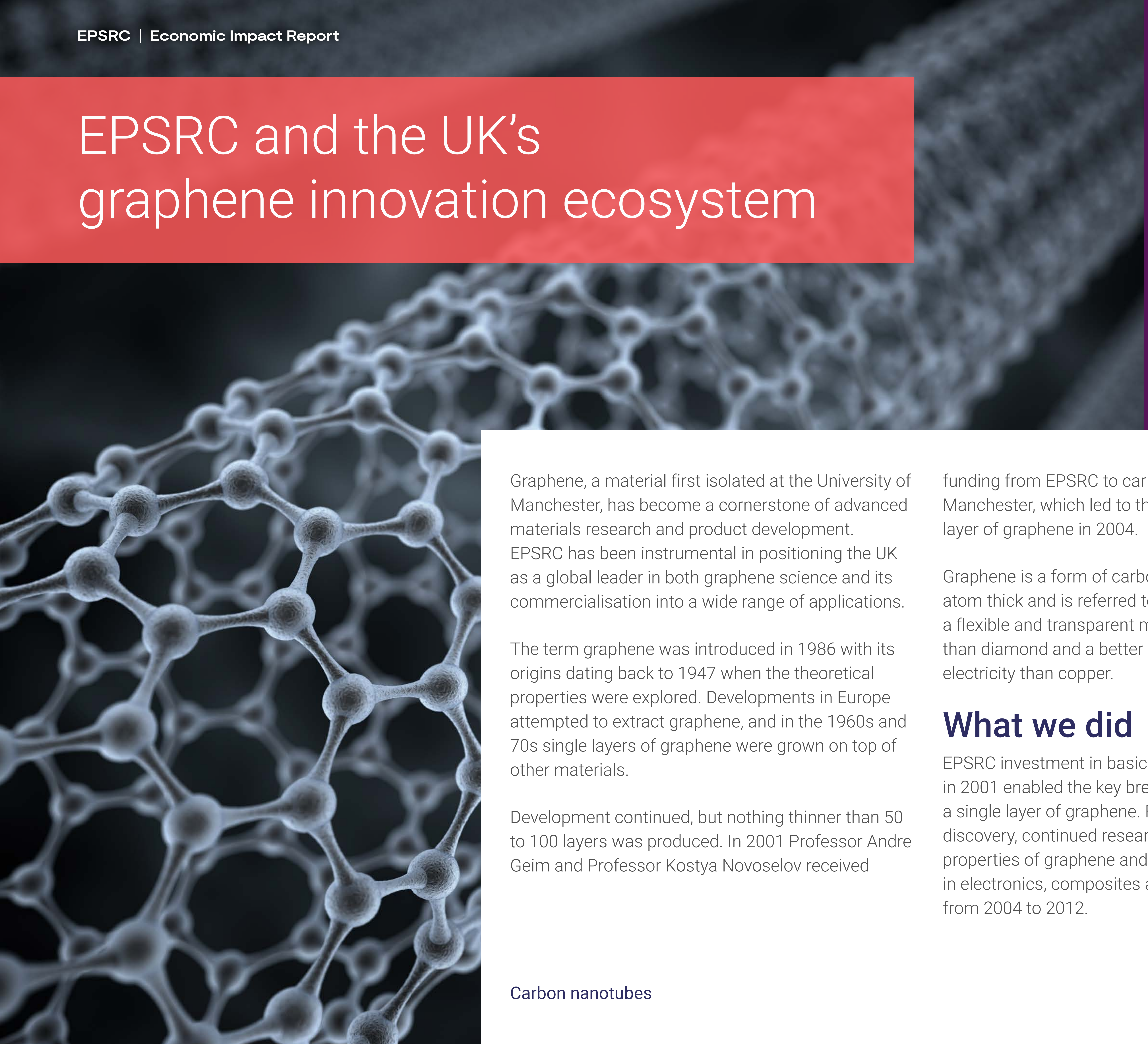
What we did

EPSRC investment in basic, curiosity-driven research in 2001 enabled the key breakthrough of isolating a single layer of graphene. Following the initial discovery, continued research investment into the properties of graphene and its potential applications in electronics, composites and coatings was funded from 2004 to 2012.

Investment continued in further research and innovation, infrastructure and training provision to position the UK as a lead in the commercial development of graphene.

Between 2012 and 2015, EPSRC and Innovate UK launched multiple investment strands to develop and commercialise graphene with over £70 million invested in a National Graphene Institute (NGI), research equipment and a business-focused Graphene Innovation Centre.

Between 2014 and 2018 additional investments included a Graphene Engineering Innovation Centre and an Applications Innovation Centre. EPSRC investment into graphene has continued from 2018 to today including research grants, capital and equipment, and training, supporting over 55 projects and 70 companies.



Carbon nanotubes

Impacts

Supporting the UK to reach its net zero targets

Graphene-enhanced asphalt increases the lifespan of road surfaces made from high percentages of recycled asphalt[14], supporting the UK to move towards a more circular economy for asphalt. Graphene-enhanced low-carbon concrete developed by Cemex UK, Galliford Try, Sika and Northumbrian Water, in collaboration with the University of Manchester, has a 49% reduction in CO2 per cubic metre compared to traditional concrete[15].

Improved products and services across UK industries

Graphene's unique properties and versatility are reflected in its wide-ranging industrial uses, including enhancing battery performance, improving lightweight composites and coatings such as antimicrobial coatings, membranes in water purification and gas separation, and electronic applications, adding value to products and services and increasing UK's competitive advantage across industrial sectors.

UK company growth and development

Graphene is generating significant economic benefits in its early commercial phase, with long-term potential comparable to existing materials like silicon or carbon fibre. EPSRC research investments have led to the creation of 15 currently active graphene spin-outs, employing a total of 300 people and with turnover of £1.75 million in the most recent financial year.

Graphene Engineering Innovation Centre, The University of Manchester

14 https://www.highwaysmagazine.co.uk/Graphene-hits-the-public-road-in-the-North-East/14397, accessed 23/09/25

Outlook

Funding of the EPSRC Centre for Doctoral Training in 2D Materials of Tomorrow (2DMoT) aims to build on the development of graphene by nurturing the next generation of highly skilled scientists and engineers to be able to secure the country's position as the global leader in the science and technology of two-dimensional materials.

A major initiative, Graphene Innovation Manchester (GIM), is expected to create over 1,000 skilled jobs in Greater Manchester. This includes roles in graphene-enriched carbon fibre production and hydrogen technologies, as part of a £250 million UK-Saudi partnership[16].

The global graphene market is expected to reach £5.7 billion by 2032 and the UK is establishing leading companies in the graphene-based technologies market such as:

- Universal Matter GBR LTD focused on graphene dispersion for coatings and adhesives
- Paragraf developing the mass production of graphene-based electronics
- Levidian Nanosystems with its patented LOOP technology, capturing the carbon from methane gas before it is burned and converting it into graphene and hydrogen

14 https://www.highwaysmagazine.co.uk/Graphene-hits-the-public-road-in-the-North-East/14397, accessed 23/09/25

15 https://www.manchester.ac.uk/about/news/graphene-enhanced-low-carbon-concrete-successfully-laid-at-northumbrian-water-site/, accessed 23/09/25

16 https://www.gov.uk/government/news/thousands-of-british-jobs-to-be-created-through-closer-uk-saudi-cooperation, accessed 23/09/25

Digital and Technologies

case study 06

Tracsis: from academic research to transport industry leader

Between 2013 and 2020 Tracsis software saved a minimum of

£320 million

in UK rail costs.

University of Leeds spin-out, Tracsis, is commercialising research and expertise in modelling complex transport problems, supported by long-term investment from EPSRC. Today, 90% of UK passenger train services use the company's scheduling methods to increase efficiency and improve travel services.

Since the 1960s, EPSRC has invested in research into computerised logistics and transport scheduling problems: optimising the movement of people, goods and trade. These problems are highly complex, often involving too many variables for traditional mathematical solutions. EPSRC-supported work by Anthony Wren and others resulted in new heuristic methods; using practical experience and intuition to simplify scheduling challenges.

Early breakthroughs in bus crew scheduling evolved into advanced data-driven analytics for rail and road transport. In 2004, research from the University of Leeds was spun out into Tracsis to commercialise this expertise. Today, EPSRC's continued investment underpins software and hardware innovations that improve transport efficiency across the UK.

What we did

EPSRC investment in computerised transport scheduling research in the 1960s and 70s supported the pioneering work of Anthony Wren on bus crew scheduling. Continued research investment, including EPSRC grants, led to the development of a scheduling technology for public transport, delivering an integrated software system for optimisation of both the use of vehicles and human resources (bus driver time).

In 1994 EPSRC investment included two grants to explore the more complex challenge of train crew scheduling. This led to the early development of TRACS II software that was further advanced with EPSRC investment between 1996 and 2003.

Since spinning out from the University of Leeds in 2004, Tracsis has continued to work with UKRI, leveraging Innovate UK investment for research and development projects and as a project partner on EPSRC grants.

Impacts

UK company growth and development

The success of Tracsis' innovation in scheduling software has driven its growth over 20 years, expanding its services internationally and beyond rail to include:

- remote monitoring
- smart ticketing
- traffic analytics
- event management
- Earth observation mapping

Tracsis has grown from a university spin-out in 2004 to a large company with 2024 turnover of £81 million, over 1,000 employees and capital value of £112 million.

Cost savings and efficiencies from improved modelling

Tracsis' offerings allow transport operators to solve complex logistics problems to maximise efficiency, and reduce cost and risk. Additional benefits include:

- improved operational and asset performance
- improved safety management
- improved customer experience for users of public transport

The true scale of the advantages and savings generated by Tracsis systems is not available due to commercial confidentiality but the information in the next column provides some indications of their increasing impact:

1998
Scheduling software was used by Virgin West Coast for a 30% increase in train services, with only 0.37% crew increase[17].

Aug 2013–Dec 2020
Minimum estimated £320 million (£43.2m per annum) saving in UK rail crew costs[18].

Current
Remote monitoring of points can reduce the on-site maintenance inspections bringing costs of point maintenance down by up to 70%[19].

Outlook

The UK is committed to a fully decarbonised rail system by 2040, while also aiming to increase the number of journeys taken by rail to reduce the demand for journeys by private vehicles. Tracsis systems are contributing to this goal by increasing the levels of availability and efficiency of the UK's rail system.

EPSRC continues to invest in applying modern computerised techniques to transport problems, for example the recent £20 million investment in a Digital Twinning Research Hub for Decarbonising Transport (TransiT – Digital Twinning for the Decarbonisation of UK Transport).

Bristol, Credit: Adam Gasson

17 Case study of successful train scheduling optimisation https://www.researchgate.net/publication/220366360_Case_studies_of_successful_train_crew_scheduling_optimisation

18 Impact case study submitted to the Research Excellence Framework of 2021 from the University of Leeds, accessed 30/09/25

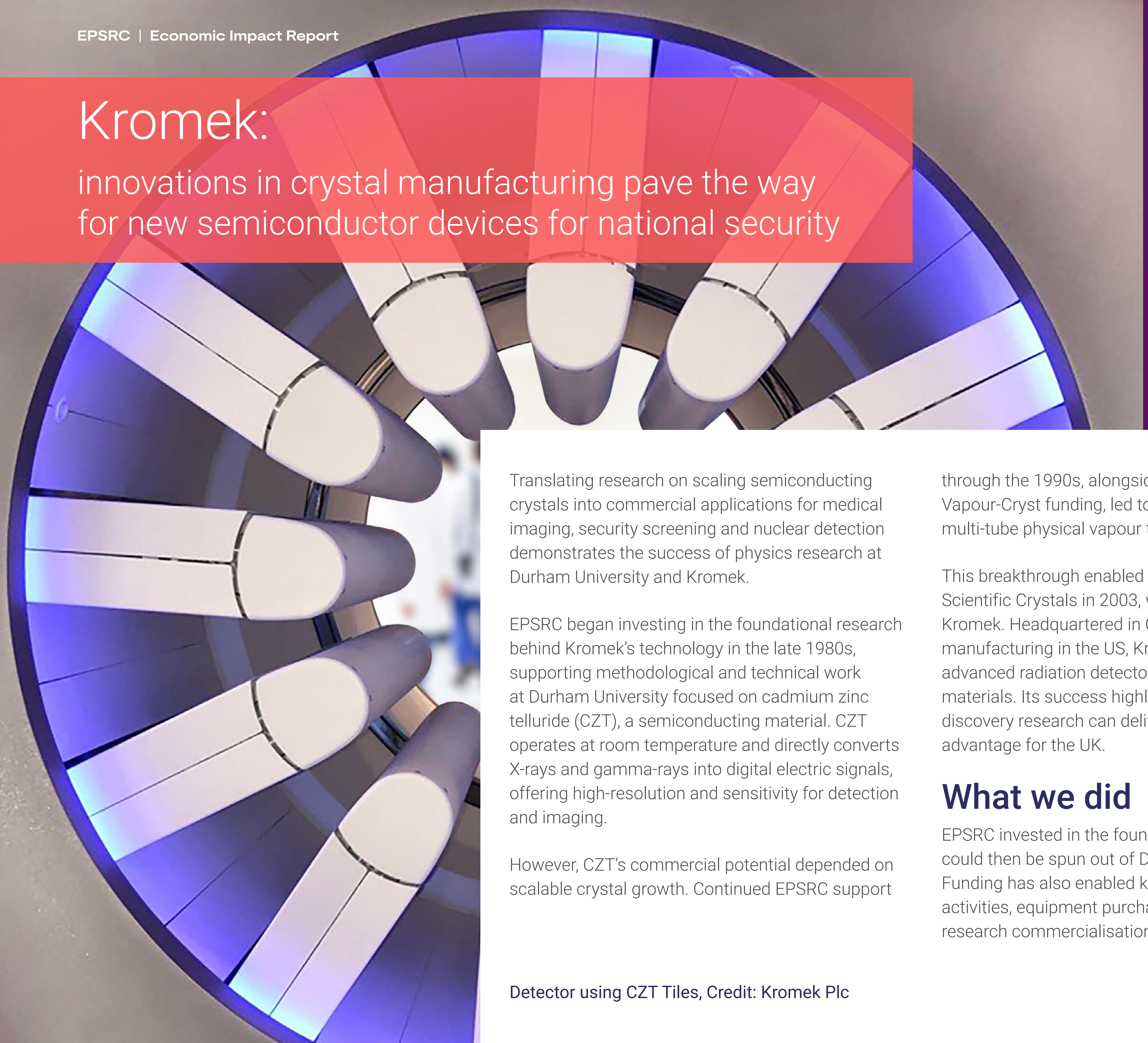
19 Tracsis case study on the remote monitoring of points on rail infrastructure, accessed 30/09/25

Kromek:

innovations in crystal manufacturing pave the way for new semiconductor devices for national security

Advanced Manufacturing
Defence
Life Sciences

case study 07



Detector using CZT Tiles, Credit: Kromek Plc

> "EPSRC support was critical in developing that early technology to the stage where it could be spun out as a company. Without it, the work might never have left the lab."
>
> Dr Ben Cantwell, Innovation Director at Kromek

Translating research on scaling semiconducting crystals into commercial applications for medical imaging, security screening and nuclear detection demonstrates the success of physics research at Durham University and Kromek.

EPSRC began investing in the foundational research behind Kromek's technology in the late 1980s, supporting methodological and technical work at Durham University focused on cadmium zinc telluride (CZT), a semiconducting material. CZT operates at room temperature and directly converts X-rays and gamma-rays into digital electric signals, offering high-resolution and sensitivity for detection and imaging.

However, CZT's commercial potential depended on scalable crystal growth. Continued EPSRC support through the 1990s, alongside STFC and European Vapour-Cryst funding, led to the development of the multi-tube physical vapour transport method.

This breakthrough enabled the creation of Durham Scientific Crystals in 2003, which evolved into Kromek. Headquartered in County Durham with manufacturing in the US, Kromek now produces advanced radiation detectors using CZT and related materials. Its success highlights how long-term discovery research can deliver global technological advantage for the UK.

What we did

EPSRC invested in the foundational research that could then be spun out of Durham University. Funding has also enabled knowledge exchange activities, equipment purchase, doctoral training and research commercialisation.

Kromek continues to be an active partner in EPSRC research projects and has also taken part in programmes run by STFC and Innovate UK.

The company hosts interns from universities across the UK and continues to work with academics at Durham University, most recently through a UKRI-funded Future Leaders Fellowship partnership. Kromek now works with universities across the UK, many of whom are EPSRC strategic partners.

Dr Ben Cantwell, Innovation Director at Kromek, said in 2025: "Kromek began as a piece of discovery research at Durham University. EPSRC support was critical in developing that early technology to the stage where it could be spun out as a company. Without it, the work might never have left the lab.

Since then, our collaboration with academic institutions across the UK and globally, has been essential, giving us access to world-class expertise and keeping us at the forefront of new scientific advances. That partnership between academia and industry is what allows us to turn cutting-edge research into real-world impact."

Dr Cantwell was a recipient of EPSRC PhD funding who joined Kromek on completion as one of the co-founders.

HRH King Charles visiting Kromek Plc's Sedgefield headquarters, Credit: Kromek Plc

Impacts

Regional development and jobs in north-east England

Kromek is headquartered in Sedgefield in the north-east of England and has grown into a nationally significant company working at the cutting edge of semiconductor and detection technology, with revenues of £26.5 million in 2025.

From two staff in 2003, Kromek achieved its first order from the European Space Agency within 12 months and has now grown to approximately 80 UK-based staff alongside a similar number located in the US. 15% of the Kromek workforce is qualified to doctoral level.

Contributions to national security

CZT's nuclear detection properties have seen it applied in a wide range of fields including nuclear counterterrorism, nuclear emergency response and biological threat monitoring.

Contracts have been secured with large multinationals, UK government departments and the US Department for Homeland Security, which has enabled the company to build a bioaerosol evaluation chamber at its headquarters in order to safely release controlled amounts of airborne particles containing bacteria or viruses to test and improve air sampling and pathogen detection systems[20].

UK company growth and development

Kromek has been able to continue its investment and expansion. From a turnover of £2.7 million in 2013, Kromek announced final results for the year ended 30 April 2025 that revenue had reached £26.5 million. Profit before tax in 2025 was significantly ahead of market expectations at £3.1 million.

Outlook

Semiconductor technologies and the increasingly sophisticated microchips that use them are a crucial building block for the development of devices all around us, from household appliances and cars to telecoms networks and defence systems.

Kromek is at the heart of one of the UK's globally important clusters for semiconductor innovation in the north-east of England.

Semiconductors have been explicitly referenced as part of six frontier technologies in the 2025 Industrial Strategy and have been backed by funding in the UK government's national semiconductor 20-year strategy.

The semiconductor industry is a high value sector in terms of average GVA per employee and revenue per employee[21]. EPSRC's recent investments in innovation and knowledge centres to commercialise semiconductor technologies alongside skills investments by Innovate UK are part of a mission to ensure that the UK successfully delivers the future needs of the semiconductor industry.

20 Kromek Group unveils cutting-edge lab to boost airborne virus detection – Kromek, accessed 07/10/25

21 Semiconductor sector study – GOV.UK, accessed 07/10/25

Defence

Digital and Technologies

Financial Services

case study 08

Innovative cybersecurity technologies deliver security and growth

Fundamental computer science research invested in by EPSRC over the past 20 years has helped drive the development of technologies enabling the creation of secure communication systems vital for modern digital infrastructure.

Advanced cybersecurity technology developed with EPSRC investment is helping UK businesses defend themselves from increasingly sophisticated cyber threats. With cyber attacks costing British businesses around £44 billion over the past five years[22], strengthening digital security is a national priority.

Fundamental computer science research invested in by EPSRC over the past 20 years has helped drive the development of technologies enabling the creation of secure communication systems vital for modern digital infrastructure.

Advancements in AI and machine learning, data encryption, network security systems and intelligent surveillance technology underpin the creation of innovative new technologies in information and people security applications. Such applications include processes for real-time detecting and filtering of malware and cyber attacks.

Professor Máire O'Neill, Queen's University Belfast

Cyber-attacks have serious consequences for government organisations, public services, business and people's lives. This year alone there have been several attacks on UK business, causing major disruption and costs. EPSRC is supporting research aiming to strengthen cybersecurity, realise the benefits of emerging technologies and better prepare society against future cyber threats.

What we did

For over 20 years, EPSRC has invested in research at Queen's University Belfast into cybersecurity technologies relevant to a wide range of digital systems: from Internet of Things devices to the ad-hoc wireless networks required in modern defence applications.

In 2009 EPSRC provided the core investment for a newly established Centre for Secure Information Technologies (CSIT) at Queen's University Belfast and it continues to invest in major research projects that raise the bar in cybersecurity. Headed by Professor Máire O'Neill, the centre's work had enabled the creation of a new business cluster which is significantly impacting on the regional economy.

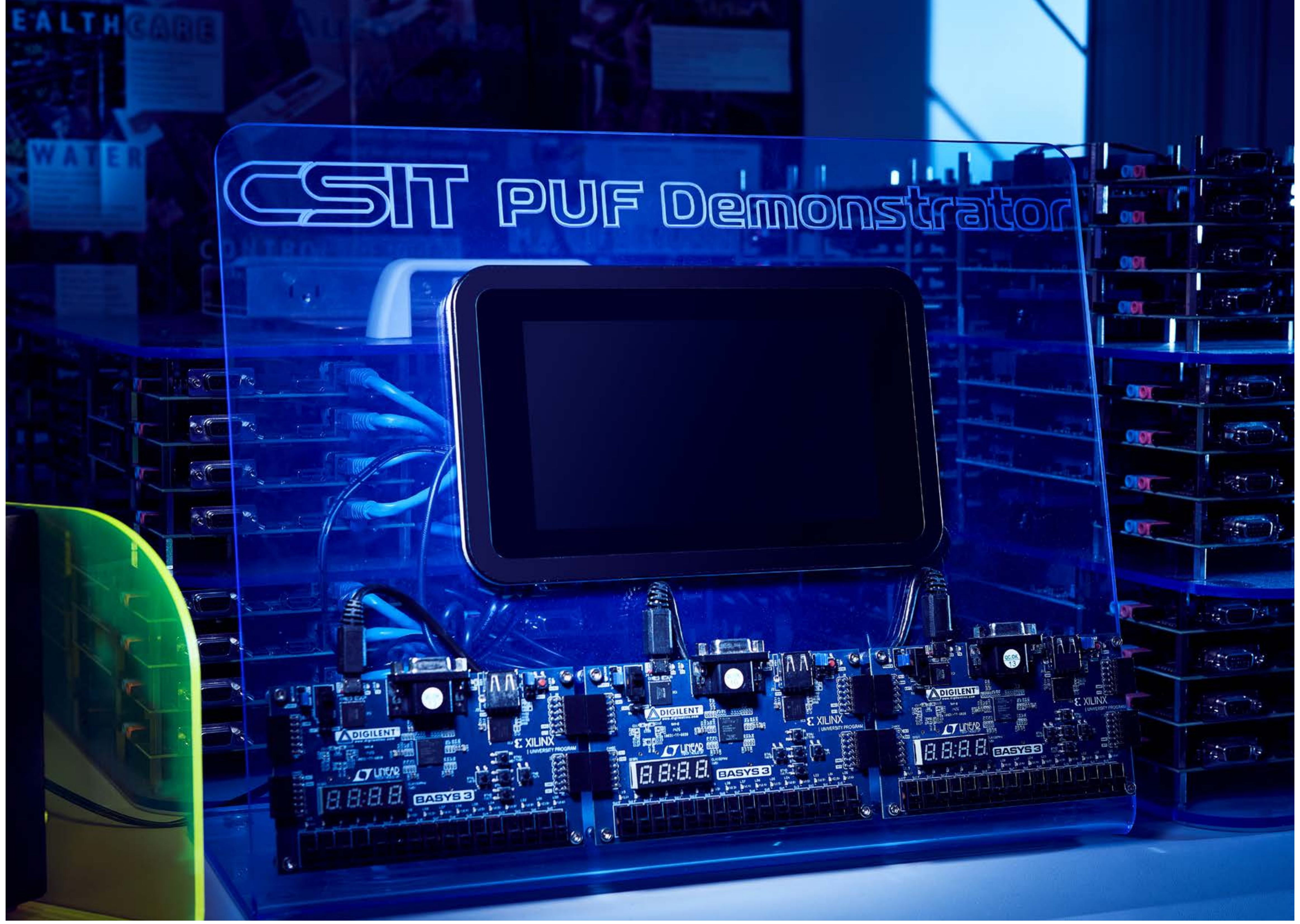
Investment by EPSRC, Innovate UK and Invest Northern Ireland is supporting the commercialisation of emerging disruptive technologies through creating a critical mass of early-stage research and development activity to leverage the UK's developing competitive advantage in commercialisation of cybersecurity technologies.

22 Cyberattacks cost British businesses $55 billion in past five years, broker says, Reuters, accessed 22/09/25

As one of the UK's Innovation and Knowledge Centres, CSIT is designed to exploit the UK's international quality research capability by bringing those at the cutting-edge of research together with innovators in business to work together. They develop their ideas and energise the commercialisation of new products and processes. CSIT acts as a nucleating point for the emergence of a new industry and helping UK business to benefit from the excellent research work being carried out.

Currently, CSIT is leading on the Cyber-AI Hub programme; working with eight industry partners on collaborative R&D projects and supporting a cohort of 15 PhD researchers and 40 MSc students. The centre also leads the UK Research Institute in Secure Hardware and Embedded Systems (RISE) and works closely with DSIT and EPSRC on the delivery of the security pillar of the UK's semiconductor strategy.

It has also been a core partner in the UK Research Institute in Trustworthy Inter-connected Cyber-physical (RITICS). Both initiatives have been funded by EPSRC and the National Cyber Security Centre.



Anti-counterfeiting demonstrator, Queen's University Belfast

Impacts

Regional development and jobs creation in Northern Ireland

Since CSIT was established, over 125 companies and 2,750 highly skilled cybersecurity jobs have been created in the Belfast area, bringing £80 million per year in salaries into the local economy. A 2023 study estimated that the direct GVA generated by the Northern Ireland cybersecurity sector is £237 million per annum, a 47% increase in GVA since 2021[23].

UK company growth and development

CSIT was a delivery partner on the UK government-funded London Office for Rapid Cybersecurity Advancement (LORCA), helping over 72 UK-based cybersecurity start-up and scale-up companies to grow by providing engineering and academic expertise. A 2023 evaluation of LORCA reported 865 jobs created, £37 million of revenue uplift and £210 million investment raised[24].

Foreign direct investment into a global innovation hub

CSIT has helped to attract high-tech foreign direct investment, making Northern Ireland a top European investment location for US cyber security firms. It has developed 10 new product concepts with a clear route to market and created spin-outs including world-leading network intelligence technology developer Titan IC, which was acquired by Mellanox in 2020.

Outlook

CSIT continues to accelerate and promote business exploitation of emerging research and technology and to speed up full-scale industrial adoption. Its partners include:

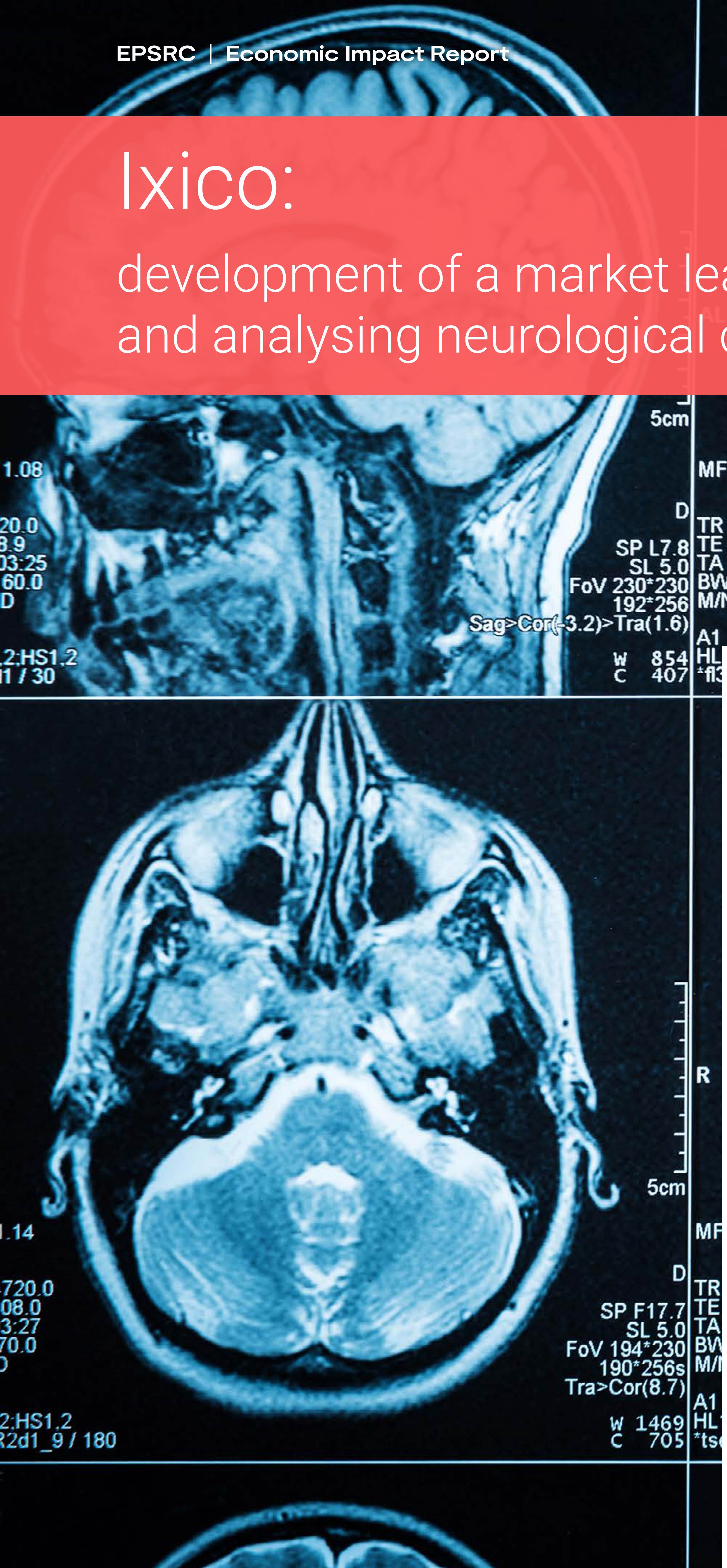
- Rolls Royce
- Qualcomm
- Thales
- Rapid7
- eBay
- Intel
- Allstate
- BAE Systems

With the National Cyber Security Centre, EPSRC has invested in the Academic Centres of Excellence in Cyber Security Research scheme – one of several initiatives outlined in the UK government's National Cyber Security Strategy.

EPSRC is investing in the Cyber Security Research and Networking Environment NetworkPlus, led by the University of Oxford. The goal is to drive better cyber security across the economy, including sectors from manufacturing and healthcare to law enforcement.

23 Jobs, Growth, Excellence: Northern Ireland's Thriving Cyber Security Sector, CSIT, Queen's University Belfast, accessed 22/09/25

24 Department of Science, Innovation and Technology policy paper on the London Office for Rapid Cybersecurity Advancement innovation centre, accessed 08/10/25




case study 09

Digital and Technologies

Life Sciences

Ixico:

development of a market leader in managing and analysing neurological clinical trials

Ixico has become one of the world's leading medical imaging providers. The company is ideally placed to support the UK's ambition to be a world leader in clinical trials and medical research.

EPSRC investment and support have resulted in the development of accurate and detailed 3D representations of patients' brain scans from multiple images generated by MRI, PET and CT scans, with additional support from MRC.

Ixico, a spin-out company from University College London and Imperial College London was formed in 2004 and has become one of the world's leading medical imaging providers. The company is ideally placed to support the UK's ambition to be a world leader in clinical trials and medical research.

By the 1980s there were three types of medical scanning in regular use to aid understanding of the functional activity of cells and organs:

- computer tomography (CT) that combined X-ray images for cross-sectional views
- magnetic resonance imaging (MRI) for high-resolution structural detail
- positron emission tomography (PET)

EPSRC investment in the early 1990s supported fundamental research to investigate the problem of transforming and combining images from these multiple data sources. This research led to the identification of key co-ordinates from different scans taken at varying times that allowed them to be combined.

Further funding for translational research led to the creation of algorithms to automate the process and make allowances for patient movement providing more precise 3D images.

Following formation of the spin-out to commercialise the research and data-handling methods, further funding from both EPSRC and Innovate UK enabled development of Ixico's AI-driven analytics platform enabling large amounts of data to be used in the neurological clinical trials process.

What we did

Five EPSRC grants were issued between 1990 and 1997 to investigate the fundamental science of image registration. Between 1998 and 2003, EPSRC made investments in translational research that led to the development of an image registration algorithm and the development of The Brain Atlas. Ixico was the lead participant in six Innovate UK projects to develop a novel digital healthcare system allowing dementia diagnoses to be made quickly, cost-effectively and earlier.

MRI scan of the brain

At the time of Ixico's incorporation in 2004, EPSRC made four investments in the company's underpinning research, which helped create a grid-enabled image registration and segmentation system for drug discovery, medical research and decision support in healthcare using large-scale image processing accessing distributed image resources.

EPSRC is committed to supporting company growth through research partnerships. In 2019 Ixico was confirmed as a partner in the King's College Medical Imaging and Artificial Intelligence Centre established as part of UKRI's Industrial Strategy Challenge Fund. Ixico was also a partner in the EPSRC Centre for Doctoral Training in Medical Imaging.

MRI laboratory, University of Sheffield

Impacts

Accelerated drug development for neurological disorders like Alzheimer's, Parkinson's, Huntington's and multiple sclerosis

By providing reliable, quantitative imaging biomarkers, Ixico reduces uncertainties in drug discovery and development. In 2025 this led to the development of a new blood-based test that will help advance diagnosis and drug development in Alzheimer's[25]. The total social cost to the UK of dementia is £58 billion annually[26].

New datasets for the NHS

Ixico was the orchestrator of project CYGNUS[27] with the Northern Health Service Alliance to develop interpretive algorithms that extract clinically meaningful biomarkers from new data types such as from wearable biosensors.

This co-developed system standardises data collection, diagnosis and care pathway management for people with mild cognitive impairment (MCI) and dementia and can be rolled out across the NHS.

Creation of the IXI Brain Atlas

Powered by advanced AI and quantitative image analysis, this technology enables information to be generated from images by identification and measurement of over 150 unique brain structures and digital biomarkers with microscopic precision.

The Information eXtraction from Images (IXI) Brain Atlas has been used in over 10,000 patient visits in more than 40 clinical trials for Alzheimer's and other neurodegenerative disease.

Imaging centres for consistent data collection

Ixico operates over 2,000 imaging centres across 75 countries, allowing rapid set up of large-scale clinical trials and ensures consistent, high-quality imaging data collection worldwide[28].

Outlook

EPSRC and UKRI are investing £16.5 million in digital health hubs across the UK to build on our track record of developing innovative digital technologies for healthcare.

UK policy emphasises digital transformation and innovation in healthcare, areas in which Ixico excels. The company's AI-powered platform and focus on digital biomarkers are directly aligned with national priorities. Ixico is also ideally placed to support major government initiatives such as cutting clinical trial set-up times to 150 days or less and the use of NHS data for research.

25 FDA Clears First Blood Test Used in Diagnosing Alzheimer's Disease, FDA, accessed 25/09/25

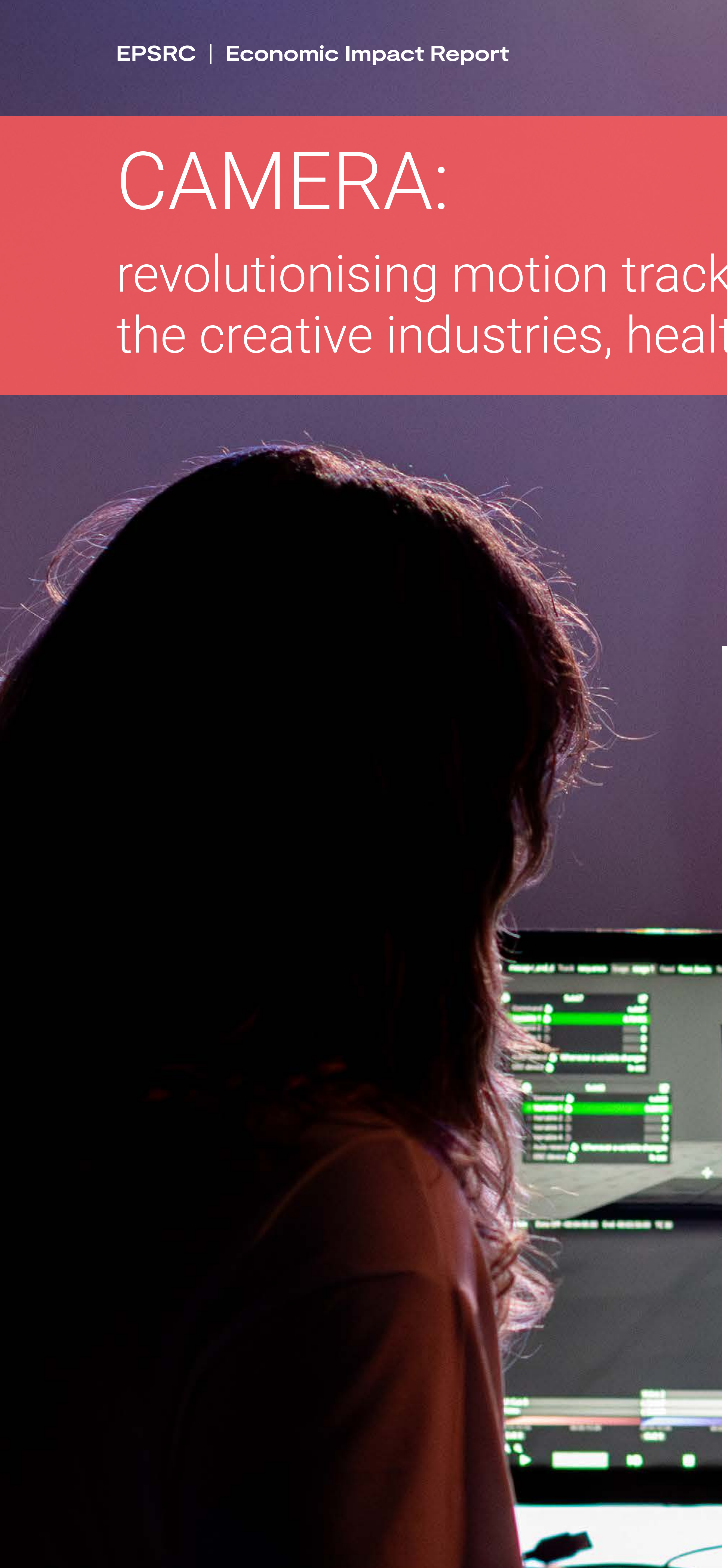
26 2015 study found total social cost to be £42 billion annually, inflated to 2025 prices using the Bank of England Inflation Calculator. Study: Wittenberg R, Knapp M, Hu B, et al. The costs of dementia in England. Int J Geriatr Psychiatry. 2019;34(7):1095-1103. doi:10.1002/gps.5113

27 Securing Funding: IXICO plc – The NHSA, accessed 25/09/25

28 IXICO – ataxia-global-initiative, accessed 21/10/25

CAMERA:

revolutionising motion tracking and image capture for the creative industries, healthcare and biomechanics



“EPSRC’s investments over the last 15 years will be key to ensuring the region can exploit this phenomenal opportunity to the absolute maximum.”

Neill Campbell, CAMERA director

Driven by pioneering fundamental research in motion tracking and image capture, the Centre for the Analysis of Motion Entertainment Research and Applications (CAMERA) has emerged as a national asset in immersive technology and content creation. This has helped to secure the UK’s global leadership in creative industries, sport and digital healthcare, while unlocking innovation and economic growth.

Since the early 2000s, EPSRC has invested in research into new algorithms and underlying mathematical models for machine and computer vision and motion capture. Motion capture research and development started in the fields of biomechanics, health and sport and was heavily invested in by the creative industries sector for use in visual effects for film production and games.

Our investments into fundamental research have led to the ability to measure movement in any environment and without tracking markers. EPSRC has also supported research that uses cameras and computational methods to create 3D models of environments constructed from 2D images.

CAMERA was founded as a next stage digital economy centre to meet EPSRC’s priorities of linking fundamental computer science research with cross-disciplinary academic collaboration and external impact.

CAMERA combines creative innovation and scientific precision, applying fundamental computer science to meet diverse industry needs. The transdisciplinary programme is not only bridging the gaps between academic disciplines but also driving cross-sector impact and powering growth in the UK’s digital economy.

What we did

In the early 2000s, EPSRC invested in fundamental research into light-based motion tracking and construction of facial models using 4D data (3D data that changes over time). Further investment fostered dissemination and collaboration between the computer and biological vision research communities.

The EPSRC Doctoral Training Centre for Digital Entertainment (CDE) was funded for two rounds. Every student has an industrial collaborator and supervisor paired with their academic supervisor, generating a large network of trusted collaborations built with industries across multiple sectors including:

- entertainment & visual effects (Ninja Theory, Double Negative, Sony, Disney Research, Electronic Arts)

Optical motion capture studio, CAMERA, Credit: Michelle Wu

- healthcare & science (NHS, Perkin Elmer Ltd)
- culture & conservation (National Trust, Liverpool Conservation Technologies).

The next stage digital economy centre CAMERA was established in 2015 with investment from EPSRC. Further inward investment from Horizon Europe and other parts of UKRI, including Innovate UK and EPSRC (2020-2025), brings together 14 academics and over 40 researchers with 20 impact partners. CAMERA is also a core partner in AHRC's Creative Industries Cluster programme based at Bath and Bristol.

Impacts

Cost savings and efficiencies in visual effects

By offering accessible cutting-edge technologies, CAMERA has supported over 100 businesses across the creative, sports and cultural industries to streamline their visual effects workflows, saving time and money. CAMERA's workflows are faster and more scalable than traditional motion capture technologies. Projects such as SMARTRoto have developed tools that can save up to 25% of a visual effects artist's time.

Improving quality of life through digital health and assistive technologies

CAMERA has supported the development of personalised prosthetic limb liners, powered ankle prostheses and myoelectric arm prostheses with the NHS, Blatchford Healthcare and Open Bionics.

An app developed using their products has shown a 50% reduction in knee pain for patients with

Full-body photogrammetry rig, CAMERA, Credit: Michelle Wu

knee osteoarthritis. Markerless motion capture technologies are now being applied to a project with the Ministry of Defence (MOD) aimed at reducing musculoskeletal injuries to improve military recruitment and rehabilitation, saving money and supporting national defence[29].

Widening access to cultural products

CAMERA's scientific breakthroughs have allowed researchers to digitally reconstruct and share ancient artifacts, historic locations, and entire performances.

National and regional development and job creation

CAMERA's innovation Programme helps SMEs and start-ups in the West of England to innovate and grow, supporting up to 237 FTEs[30]. CAMERA has also worked with partners across the UK including three major players in the UK's visual effects and digital entertainment ecosystem: DNEG, Foundry, and the Imaginarium.

Outlook

CAMERA is a key partner in UKRI's £46 million, five-year MyWorld investment. Led by the University of Bristol, MyWorld will transform the creative technology sector by:

- positioning south-west England as an international trailblazer in screen-based media
- forging dynamic collaborations to progress technological innovation
- delivering creative excellence and catalysing innovation through collaborative R&D, open innovation competitions and prototype development
- establishing and operating state-of-the-art facilities (of which CAMERA is one)
- offering skills training
- driving inward investment

This will help to raise the region's profile on the global stage. CAMERA director Neill Campbell says: "EPSRC's investments over the last 15 years will be key to ensuring the region can exploit this phenomenal opportunity to the absolute maximum."

Through his recent appointment as a professor at UCL, Neill is looking forward to exciting projects with new collaborators and colleagues.

29 New project to reduce injuries in new military recruits, accessed 07/10/25

30 Figure taken from an independent evaluation commissioned by CAMERA and shared with EPSRC

Engineering and Physical Sciences Research Council

Front cover: Dr Sugandh Sirohi and PhD student Mariana Ma
in Heriot-Watt University's Beyond Binary Quantum Information Lab

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