



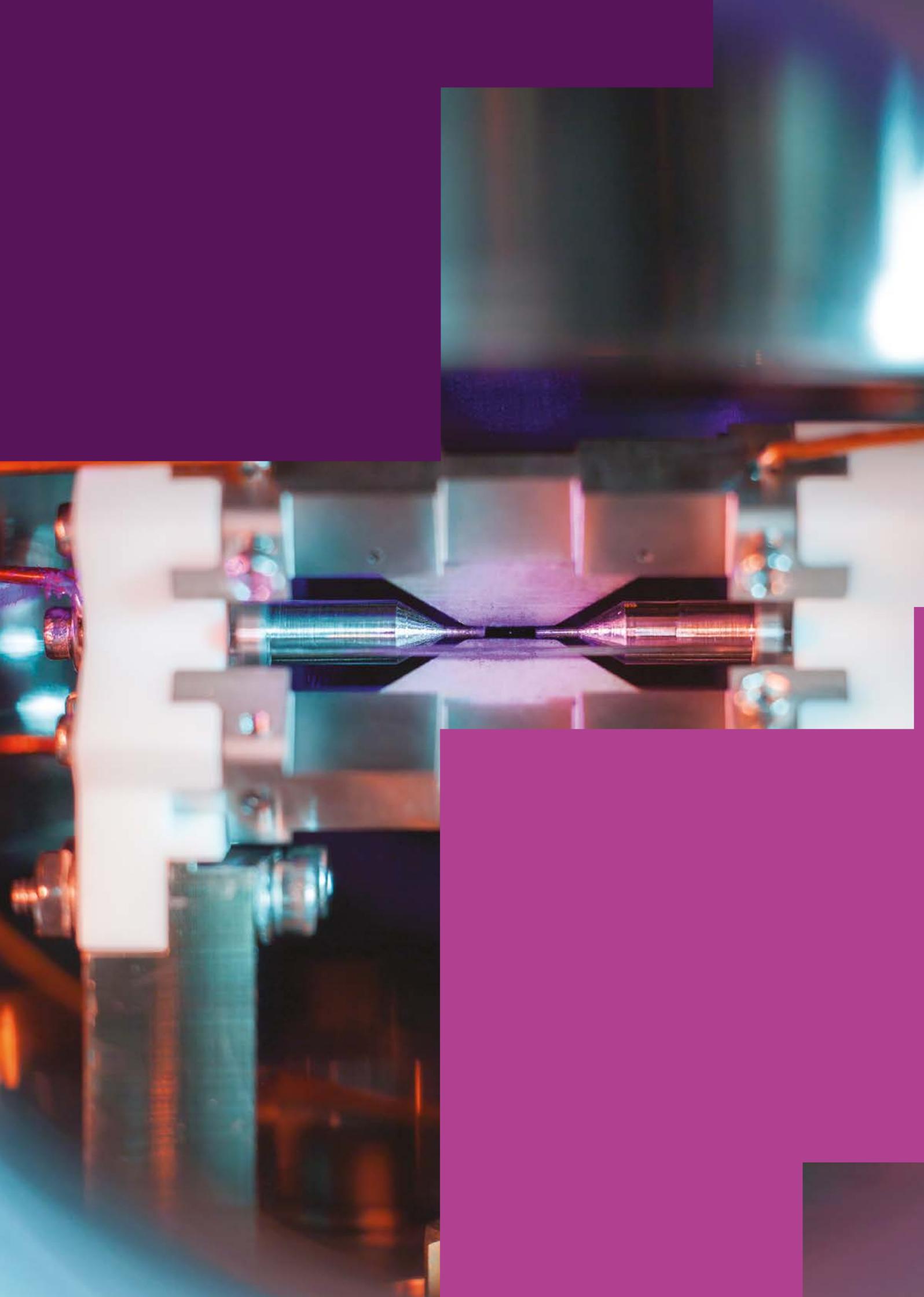
Building the future economy

Plan for action for UK business innovation

inspire | involve | invest

2021–2025





Contents

Foreword	4
Executive summary	6
Introduction	12
Our approach	16
The UK government's vision.	17
Our mission.	17
Strategic themes and strong foundations.	17
 Theme 1: Future economy	20
Understanding the opportunity.	21
Net zero.	22
Health and wellbeing.	23
Technologies.	25
Horizon scanning and foresight.	28
 Theme 2: Growth at scale	30
 Theme 3: Global opportunities	34
 Theme 4: Innovation ecosystem	38
 Theme 5: Government levers	42
Strong foundations	46
 Science and research strengths.	47
 Design.	48
 Societal impact and responsible innovation.	49
 Innovation talent and skills.	51
 Equality, diversity and inclusion.	52
 Place and levelling up.	54
Our partners and associated bodies	56
Appraisal and evaluation	58
How we will support businesses	61
Acknowledgements	63
References	64

Our 12 commitments to innovating UK businesses

- 1** We will inspire, involve, and invest in innovation
- 2** We will focus on opportunities for the future economy
- 3** We will support businesses to grow rapidly
- 4** We will help businesses to succeed on the international stage
- 5** We will make it easier to gain innovation support
- 6** We will help government use its power to support innovation
- 7** We will help UK businesses benefit from the excellent research base
- 8** We will help businesses make better use of design
- 9** We will use responsible innovation to take account of wider societal impacts
- 10** We will help businesses enhance the capability of their people
- 11** We will be inclusive and fair, and bring in under-represented groups
- 12** We will help build local strengths and help businesses benefit from them



Foreword by Indro Mukerjee

**Chief Executive Officer,
Innovate UK**

We are living in a time of challenge; a time of constant change; but also, a time of very significant opportunity. There's the opportunity to help and improve the present and the opportunity to create the future. A future of prosperity, good health, respect for our planet and environment – and a future of fairness, diversity, and equality.

Innovation, the process that turns science and technology into added-value business reality, is the vital ingredient to creating that future.

Innovate UK is the UK's innovation agency. We drive productivity and economic growth by supporting businesses to develop and realise the potential of new ideas, including those from the UK's world-class research base.

We work **to inspire** innovative businesses to create value through innovation. We work **to involve** talented organisations and people to create a vibrant and successful innovation ecosystem. We work **to invest** in innovation to make a clearly tangible positive impact on the UK's economy and society.

This is our plan for action for UK business innovation. This is our plan for how we will deliver on the UK Government's recently published UK Innovation Strategy: *Leading the future by creating it.*

This plan for action will form the basis for our work over the next four years to serve and support UK businesses to use innovation to drive our economic recovery; to fulfil our Net Zero obligations; to help keep everybody in the UK healthy and safe; and to educate our young people and develop the innovators of the future.

We will issue a delivery plan with detailed actions each year, and we will measure and report on our progress in specific areas. We will work efficiently and with a perpetual desire to always want to improve what we do and how we do it.

We will work across our Innovate UK Edge, our Knowledge Transfer Network and Catapults. We will work with our partners inside UKRI and beyond, as well as with research and technology organisations, local and national governments, UK universities and across Government.

We will work to help build our future economy by inspiring, involving and investing in UK business innovation.



Indro Mukerjee
*Chief Executive Officer,
Innovate UK*



Successfully building new sectors

The power of innovation is helping the UK lead the way in new industries that are fundamental to future prosperity and wellbeing and bringing new wealth to the regions.

Investment in research and development, including through Innovate UK and the Offshore Renewable Energy Catapult, helped to make the UK a world leader in offshore wind.

Wind powers the equivalent of 4.5 million homes a year, is generating more than 10% of UK electricity, and became cheaper than coal, gas or nuclear 10 years ahead of expectations.

Our early recognition of the potential of regenerative medicine has helped to build the third largest cluster of cell and gene therapy companies in the world in the heart of the UK.

Similar support helped the top 70 UK synthetic biology start-ups attract more than £1.8 billion private investment between 2014 and 2019.

Our vision for the creative industries has seen London grow into a world centre for the visual effects industry and effects studios opening across the UK.

These are all examples of what innovation can do, especially when support is coordinated and targeted at the best opportunities available to the UK.

**We will inspire, involve,
and invest in innovation.**

Executive summary

Business innovation is the commercially successful application of ideas. It leads to new or improved products, processes, services, and business models based on new ideas and technologies.

The UK is a great place to innovate and do business. It is home to world-leading scientists and to world-class businesses in sectors including aerospace, automotive, health, infrastructure and construction, manufacturing, agriculture and food, design and creative industries, high value services, and in the enabling and emerging technologies. In the Innovation Strategy, the UK government stated its commitment to increase direct public expenditure on R&D to £22 billion per year. We must ensure that the environment is right for the country to achieve this and for UK businesses to capitalise on the opportunities.

This plan for action has been developed using the considerable experience of the Innovate UK team and after consulting with partners and leading players in the UK innovation ecosystem. We will work with partners to turn the principles outlined into delivery programmes.

It builds on our successful approach of drawing in significant business investment in innovation. It sets out new directions including a longer-term perspective on how a future net zero economy will look in 2050, taking a theme-based rather than a sector-based approach, an increased emphasis on growing innovative businesses and on global opportunities, and a greater emphasis on the strengths and values that underpin successful innovation.

Our approach

This document articulates the part Innovate UK will play, with partners, to help deliver the UK Government's innovation strategy.

The UK Government's vision

The Government's vision is for the UK to be a global hub for innovation by 2035.

Our mission

We will help businesses to grow through their development and commercialisation of new products, processes, and services, supported by an outstanding innovation ecosystem that is agile, inclusive, and easy to navigate.

Our approach is built on five strategic themes – future economy; growth at scale; global opportunities; innovation ecosystem; and government levers – and a set of strong foundations that underpin all our activities.

To deliver this we will:

- **inspire:** make the opportunity visible and compelling
- **involve:** bring relevant organisations and people together
- **invest:** convene the resources needed, including our own.

Theme 1: Future economy

Improving the quality of life for all, protecting the environment and conserving Earth's resources mean the future economy will look different from today's. We will focus on the major opportunities we see for UK businesses in the following areas:

- net zero (zero carbon emissions and tackling wider adverse environmental impacts)
- health and wellbeing (sustaining healthy human life, including nutrition and healthcare)
- technologies (creating and benefiting from advances in technology)
- horizon scanning and foresight (continually looking ahead).

Success in these areas will make the UK more attractive for global innovation, deliver better products and services and economic growth, and improve health and wellbeing.

We will focus on opportunities for the future economy.

Theme 2: Growth at scale

Growing, innovating businesses are key to a strong, sustainable, and competitive UK economy. We will increase our efforts to support businesses that are scaling and help companies of all sizes to grow rather than focus our efforts solely on their projects or novel products.

We want to see more businesses accessing markets and the global supply chains of the future, and more businesses with the leadership, skills and commercial capabilities to scale up and to attract investment.

We will support more business-led collaborations that give smaller businesses access to global opportunities and offer more guidance on growing and scaling, and we will build on our programmes to increase the availability of private finance to innovative, high-growth-potential businesses.

We will support innovating businesses to grow rapidly.

Theme 3: Global opportunities

We see large opportunities for UK companies to build on our research and innovation strengths by collaborating with overseas partners, helping build the global supply chains of the future, accessing markets and attracting inward investment.

We should be an innovation partner of choice for the many overseas businesses and organisations that are also aiming to meet global challenges.

Our work will help businesses to access international innovation opportunities, to play a role in tackling global challenges and to take advantage of government support for international innovation, trade and investment. We will also help to build deep and enduring partnerships with key countries and play an active role in global innovation groupings, including EUREKA and TAFTIE.

We will help innovating businesses to succeed on the international stage.



Theme 4: Innovation ecosystem

The innovation ecosystem is made up of many actors, from public agencies to businesses, academia, infrastructure, charities, and the regulatory environment.

We want to see increased responsiveness, agility, and co-ordination to support innovating businesses from idea through to commercialisation, adoption, and diffusion.

We will look at how partners in the ecosystem can work better, design better programmes and better help businesses to access more easily and seamlessly the knowledge, facilities and equipment they need to succeed. We will also work to inspire a national culture of innovation and make the UK a more attractive place for global partners to innovate.

We will make it easier to gain innovation support.

Theme 5: Government levers

Government can use many levers to stimulate innovation, including legislation, regulation, standards, intellectual property regimes, and public procurement.

We will help government to use standards and regulations to accelerate innovation and help businesses to influence their development at home and abroad. We will continue to help the public sector procure innovative solutions to their challenges from businesses and run managed programmes for government departments and agencies.

Our support will include helping UK businesses to be better at protecting their intellectual property and gain the advice they need.

We will help government use its power to support innovation.



Strong foundations

The strong foundations underpin our activities and programmes and are fundamental to successful business innovation. They include values proven to impact business success, such as responsible innovation and equality, diversity, and inclusion. And they include the importance of place and building on local strengths.

We will build on our support for knowledge exchange and the commercialisation of successful research, help researchers to better evaluate the commercial potential of their work, and support businesses to develop leadership skills and access talent. We will support more businesses to use design effectively at an early stage of their activities.

We will ensure that values proven to impact business success are used to guide our programme design and funding decisions, and that the importance of these values to success is also well understood by the businesses we work with.

We will help UK businesses to benefit from the excellent research base.

We will help innovating businesses make better use of design.

We will use responsible innovation to take account of wider societal impacts.

We will help innovative businesses enhance the capability of their people.

We will be inclusive and fair, and bring in under-represented groups.

We will help build local strengths and help companies benefit from them.

Our partners

Organisations are more successful when they work in teams. In delivering our programmes, we will work in collaboration with our partners, including Department for Business, Energy and Industrial Strategy (BEIS), British Business Bank (BBB), British Standards Institution (BSI), Defence and Security Accelerator (DASA), Department for International Trade (DIT), the Defence Science and Technology Laboratory (DSTL), Intellectual Property Office (IPO), National Physical Laboratory and the wider National Measurement System, wider UK Research and Innovation, and associated bodies (see page 57).

Appraisal and evaluation

We will use our four established criteria to prioritise our resources, taking account of:

1. the size of the opportunity – the size of the accessible global market
2. the relative strength of UK capabilities, in both industry and academia – compared to other territories
3. whether it is the right time for business to act
4. added-value – whether the case for public sector intervention is strong, including consideration of the wider environmental and societal impacts.

We will set out a clear framework to measure our progress, and commission independent rigorous evaluation of our impact.

**We are making the UK
a global innovation hub.**



Recycled aluminium cuts CO₂ emissions for car maker

Jaguar Land Rover has successfully demonstrated how recycled aluminium could be used to make new cars and cut CO₂ emissions.

The REALITY (Recycled Aluminium Through Innovative Technology) project, supported by a £1.3 million Innovate UK grant, looked at how aluminium waste from scrap vehicles, window frames and household appliances could be recycled for use in new cars.

Recycled aluminium uses 90% less energy than creating virgin aluminium and could reduce CO₂ emissions in manufacture by up to 26%. Scrap aluminium is usually 20-30% cheaper. Jaguar Land Rover has reduced its need for new aluminium from 40-50% to 25%.



Introduction

Business innovation is the commercially successful application of ideas. It leads to the development of new or improved products, processes, services, and business models based on new ideas and technologies. It has spawned some of the biggest business sectors of the late 20th and early 21st centuries, including financial services, aerospace, pharmaceuticals, and the creative industries.

Businesses that invest in innovation have higher growth, higher productivity, and export more. Innovation is essential to remaining competitive in increasingly global markets. It can deliver economic growth, new jobs and better living standards for all parts of the UK, and will play a key role in recovery from the impact of the COVID-19 pandemic. Businesses will play a key role by developing the new products, processes and services that will help address the world's biggest challenges – from tackling pandemics, to feeding a growing global population in a sustainable way, treating and curing disease, ensuring healthy living in old age, and achieving net zero carbon emissions.

UK has the strengths to succeed

The UK is well-placed to succeed. Our scientists produce 14% of the most highly cited papers in the world¹ and have won 134 Nobel Prizes². We have world-class companies in many sectors, including in aerospace, automotive, health, infrastructure and construction, manufacturing, agriculture and food, design and creative industries, high value services, and in the enabling and emerging technologies that will underpin progress. Our research and innovation ranks 4th in the Global Innovation Index³. The UK's time zone, capital markets, venture community, long-established rule of law, outstanding service industries, and the prevalence of English as a language all contribute to make the UK a good place to innovate and do business.

In the Innovation Strategy, the UK government stated its commitment to increase direct public expenditure on R&D to £22 billion per year⁴.

We must ensure that the environment is right for UK businesses to capitalise on these strengths and deliver new and sustainable economic growth. Our approach recognises that there are many barriers to innovation and success is not guaranteed. It considers the needs, opportunities, and challenges for business, the trajectory of global markets, and the latest developments in technology and societal megatrends. This document sets out how we will deliver the Government's priorities for innovation support in the UK, and how all partners in the innovation ecosystem can work together to deliver it effectively.

Partnership is important

Our approach has grown out of the collective efforts of Department for Business, Energy and Industrial Strategy (BEIS), British Business Bank (BBB), British Standards Institution (BSI), Defence and Security Accelerator (DASA), Department for International Trade (DIT), the Defence Science and Technology Laboratory (DSTL), Innovate UK, Intellectual Property Office (IPO), National Physical Laboratory and the wider National Measurement System, wider UK Research and Innovation, and associated bodies (see page 57). These, and other, partners will work together on implementation.

Introduction

We have consulted widely with business, governments, academia, and other subject experts and bodies. Around 200 people were consulted during our strategy refresh, including more than 100 businesses (70% at director/executive level). Included were companies of all sizes, from SMEs such as Isogenica in Saffron Waldon, Hexigone in Port Talbot, and Nova Innovation in Edinburgh, to corporates such as Airbus, AstraZeneca, Bombardier (Belfast), Rolls-Royce, and Unilever. Representative groups such as the Confederation of British Industry, UK Business Angels Association, and MakeUK were also consulted.

Strategy implementation takes new directions

The partners bring with them a wealth of knowledge and experience about business innovation – from the standards and regulations needed for innovation to flourish, to the financial support and skills businesses need to innovate and grow.

Most Innovate UK programme staff have a business background. Over the last 14 years, they have supported more than 12,000 UK businesses to carry out more than 20,000 innovation projects. Grant recipients have created an estimated 100,000 jobs and brought an extra £22 billion to the UK economy⁵.

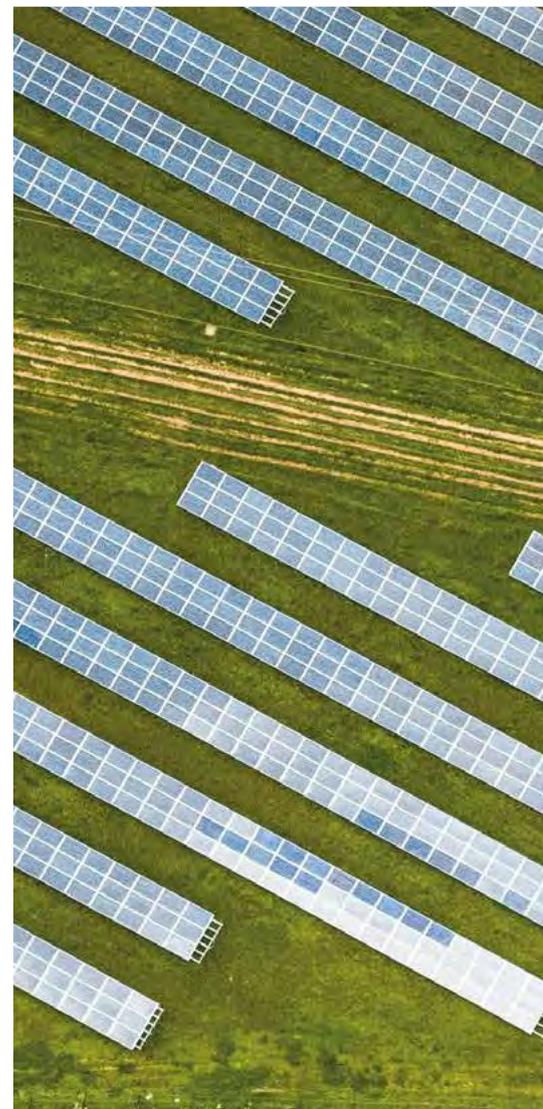
Innovate UK will continue to use its knowledge of innovation barriers and business opportunities to support the very best ideas through competition and independent assessment. This includes use of trusted and well-proven tools, such as feasibility studies, collaborative research and development, SBRI, intellectual property policies, standards, Catapults, Global Business Innovation Programme, Knowledge Transfer Partnerships, Knowledge Transfer Network, mission-based programmes, Analysis for Innovators, and Smart grants. It also includes helping businesses to access facilities, expertise, and capital.

Success will require significant business investment in innovation. Our tools are known to bring in private money. For example, analysis of the Biomedical Catalyst found that £250 million of public money to 300 projects brought in more than £1.3 billion of new private investment through additional funding, licensing deals, or acquisition⁶.

The approach also brings important changes. As trailed in the Government's innovation strategy, it takes a holistic view of all the elements that can influence innovation, from funding support through to the impact of factors such as innovation talent

and skills, place, and equality, diversity, and inclusion. There is a greater emphasis on the desired outcomes of the work and on measuring their successful achievement. Key changes include:

- a longer-term perspective on how a future net zero economy will look by 2050
- a theme-based approach on the areas of greatest opportunity, drawing on sector and technology expertise
- a strategic shift to focus on the growth of innovative companies rather than just the success of the innovative projects
- increased emphasis on global opportunities in a post-EU exit and increasingly globalised world
- greater working together in the innovation ecosystem
- more commitment to helping the government to use the levers of support at its disposal
- greater emphasis on the UK's strengths and on the values, such as responsible innovation, and equality, diversity, and inclusion, that underpin successful innovation.



UK the place to invest

Business innovation can make a huge contribution to the challenges we face now and will face in the future. Through our new approach we aim to improve the position of UK businesses in the global economy and help them play their part in the supply chains of the future. We want to showcase them as outward-looking and as good innovation partners. Ultimately, we want the UK to be the place of choice for those seeking to invest in or set up new operations.

This document is specifically focused on UK business innovation. It sits within a broader strategic landscape, including HM Treasury's *Plan for Growth*, and sets out how we will deliver the Government's wider strategy for innovation in the UK, *UK Innovation Strategy: Leading the future by creating it*⁷.



Robot seeks out chemical contamination

An autonomous robot developed by Midlands-based HORIBA MIRA with funding from the Defence and Security Accelerator (DASA) could help the military check more safely for chemical contamination on the battlefield or in security situations.

The Merlin Robot has been developed with Defence Science and Technology Laboratory (Dstl) scientists. It successfully completed trials in a number of scenarios including a simulated incident where the robot scanned over 10,000 square metres whilst allowing personnel to monitor from a safe distance. The Merlin robot uses the same autonomy software as HORIBA MIRA's much larger VIKING Unmanned Ground Vehicle (UGV). Three prototype VIKING UGVs have now been delivered to Dstl for further experimentation and trials for the British Army.



Our approach

This document sets out how we – Innovate UK and wider UK Research and Innovation, and our partners Department for Business, Energy and Industrial Strategy (BEIS), British Business Bank (BBB), British Standards Institution (BSI), Defence and Security Accelerator (DASA), Department for International Trade (DIT), the Defence Science and Technology Laboratory (DSTL), Intellectual Property Office (IPO), National Physical Laboratory and the wider National Measurement System, and associated bodies – will support innovation in the UK between 2021 and 2025.

This activity is an important part of the delivery of the UK Government's innovation strategy. Where 'we' commit to actions, it means that Innovate UK and relevant partners will pursue those actions. Where one or more partners outside Innovate UK have a specific role in leading and delivering the action, we make that clear in the action points or the preceding text.

The UK Government's vision

The Government's vision is for the UK to be a global hub for innovation by 2035.

Our mission

We will help companies to grow through their development and commercialisation of new products, processes, and services, supported by an outstanding innovation ecosystem that is agile, inclusive, and easy to navigate.

Agile means the ecosystem responds to needs quickly and appropriately and delivers expertise and assets without friction. You can navigate it easily and find the right sources of help at the right time. Inclusive means that diversity in all its forms matters and leads to better innovation, greater commercial impact and a welcoming environment for overseas investors.

Strategic themes and strong foundations

We have identified five strategic themes:

- Future economy
- Growth at scale
- Global opportunities
- Innovation ecosystem
- Government levers

These themes are areas where we believe our efforts can have a significant impact on the returns the UK gains from business innovation. The components of any theme may apply across all themes. They are described as distinct elements for simplicity and clarity, and the outcomes and priority themes in each one will stimulate and guide our actions.

We have also identified six strong foundations:

- Science and research strengths
- Design
- Societal impact and responsible innovation
- Innovation talent and skills
- Equality, diversity, and inclusion
- Place and levelling up

These are both exploitable assets for businesses and critical, cross-cutting, underpinning principles and values that have a positive impact on business success and apply to all we do and intend to do.

Five themes



Strong foundations

Delivering the mission

Each theme and foundation is defined by the outcomes we wish to see from a successful approach. Our action points demonstrate how we will achieve them. We and our partners, working with business, will:

- **inspire:** make the opportunity visible and compelling
- **involve:** bring relevant organisations and people together
- **invest:** convene the resources needed, including our own.

As the CBI notes, the time to act is now⁸.

**The Government's vision
is for the UK to be a
global hub for innovation
by 2035.**

UK leads the world in offshore wind energy

The UK is the world leader in offshore wind. It powers the equivalent of 4.5 million homes a year, is generating more than 10% of UK electricity, and became cheaper than coal, gas or nuclear 10 years ahead of expectations.

Investment in research and development and creation of the right conditions for the industry to thrive have driven down costs and fast-tracked technologies that have led to larger turbines, improved installations and better operations and maintenance.

The Offshore Renewable Energy Catapult, which has facilities in Glasgow, Blyth and Levenmouth, has played a key role in the testing of new turbine blades and other innovations.

Innovate UK has led funding for many of the technology developments including through its infrastructure programmes, the Industrial Strategy Challenge Fund, and SMART awards.

LM Wind Power recently announced the opening of a new blade manufacturing facility in Teesside that is expected to create 2,250 jobs both directly and indirectly. Meanwhile, the UK government's ambition is to see offshore wind energy quadrupled to 40GW by 2030.



Theme 1: Future economy

A growing global population, improving the quality of life for all, and the need to conserve resources and protect the environment mean the global economy will look very different by the end of this century. We have to do things differently if we want to have a stronger and more equitable economy and protect the environment⁹. Business innovation is essential to this.



We see major opportunities for UK businesses in the following areas:

- net zero (zero carbon emissions and tackling wider adverse environmental impacts)
- health and wellbeing (sustaining healthy human life, including nutrition and healthcare)
- technologies (creating and benefiting from advances in technology)
- horizon scanning and foresight (continually looking ahead).

The UK has excellent business capacity and outstanding research in these areas, and the global markets are large. Any given sector can contribute in multiple areas. For instance, UK technology businesses can provide innovative solutions in healthy living (digital health technologies, and use of artificial intelligence in enhanced diagnostics and in therapy development), and net zero (optimisation of electricity generation and distribution, and green materials).

Understanding the opportunity

Our approach will be to understand the opportunities for business, identify the obstacles to realising them, decide whether public sector intervention is appropriate, and, if so, design and deliver co-ordinated programmes that recognise the challenges of systemic change and help companies overcome the barriers.

A summary of our thinking in each of these areas is outlined below. We will also increase our communication and engagement around the enabling and emerging technologies that we believe will be of particular importance to industry over the next 30 years. And we will continue to balance our thematic support with investment in the best ideas that businesses working in any market or technology area approach us with.

Successful outcomes of this work for future economy will be:

- a more attractive UK for global business innovation
- business and sector growth in priority market areas
- new products, services and processes that help the UK and the world to deliver net zero, and the groundwork in place towards achieving a net zero UK economy
- improvements in healthcare products and services
- businesses benefitting from increased technology development and adoption, including through digital, other transformative enabling and emerging technologies and novel business models.

Net zero



Limiting greenhouse gas emissions and achieving net zero is a historic challenge and opportunity. To achieve it requires successful innovation at scale. UK businesses can grow through the creation of new products, services and processes that help the UK and wider world to decarbonise and minimise other adverse environmental impacts of their economies. The UK low carbon and renewable energy economy was worth £46.7 billion in 2018 and employed 224,800 people¹⁰. This is forecast to rise to as many as 700,000 direct jobs by 2030 and to more than 1 million by 2050¹¹.

The UK government is committed to net zero, and there are significant national programmes to help companies develop new products and services to meet the challenge. There are opportunities to adopt new approaches in energy systems, agriculture and food production, transport, buildings, manufacturing and material use, services, and many other areas.

Energy

Energy powers human life on this planet. The world will have an ongoing need to generate, store, distribute and use energy in a way that protects the environment.

Almost 28 million homes and six million business premises in the UK will have to change the way they use energy, including through the adoption of energy efficiency measures, low-emission heating systems, and smarter management of their energy use to smooth out demand.

Manufacturing, transport, and other industries will have to undergo major change. We need to see more low-carbon generation. Changes to power systems, distribution networks, use of alternative fuels, adoption of clean manufacturing technologies, optimal use of resources, roll-out of low-emission vehicles, and much else must be delivered in less than 30 years.

All of these present huge opportunities for innovative UK businesses.

Impact of industrial processes and use of materials

Greener materials and manufacturing processes must be developed. Products must reduce their impact by becoming more durable and more reusable, and by being designed to be upgradeable and repairable. The energy used to produce materials – cement, steel, glass, bricks, aluminium, polymers,

and so on – are a major source of global and UK climate emissions, contributing significantly to the UK's CO₂ equivalent emissions. Significant emissions are generated in overseas production, and their negative climate impact imported to the UK.

We must find ways of reducing the damaging environmental impacts of our materials' use. Companies need help to develop industrial processes and business models that support a circular economy powered by sustainable energy.

Agriculture and food, and other sources of emissions

Agriculture and the food chain accounts for approximately 20% of UK CO₂ equivalent emissions¹². The most significant causes of biodiversity decline are habitat change/loss and over-exploitation, primarily from demand for food¹³. Biodiversity is both threatened by climate change and a part of the solution to it.

Farming emissions could be reduced through precision farming techniques and technologies such as genetics, data analytics and AI, robotics and automation. These technologies could also increase efficiency in agriculture and food production while better protecting soil, air and water quality, biodiversity, and animal welfare. There are also business opportunities to extend shelf life, cut waste, increase efficiency of refrigeration, and replace single-use plastics.

Capital intensity

Heavily capitalised industries cannot make major changes overnight. They need time to ready themselves for a transition, build expertise, identify products, and bring new greener materials, technologies, and industries to the market. The world is expected to invest \$90 trillion by 2030 on infrastructure to address climate change¹⁴. Investments on this scale create a major market opportunity and require significant innovation.

We will:

- outline an ambitious 10-year approach to net zero innovation that delivers real progress towards net zero carbon and reduced environmental impact, and generates economic growth
- support UK businesses to develop, demonstrate, and scale technological solutions capable of being deployed domestically and across the world, including through challenge programmes
- support UK businesses to access world-class facilities and expertise (such as offered by the Catapults and agri-tech centres), investors, and global markets to deliver real change in environmental impacts

UK leading the way on advanced therapies

The UK hosts 38% of European and 12% of global clinical trials of advanced therapy medicinal products.

Innovate UK recognised the economic potential of regenerative medicines in 2009. In 2010, we co-funded with Medical Research Council, Engineering and Physical Sciences Research Council and Biotechnology and Biological Sciences Research Council, a £20 million programme to bring together industry and academia to develop new products and services.

We set up the Cell and Gene Therapy Catapult in 2011 to provide access to expertise and equipment for the growing industry. Grants from Innovate UK and MRC, and through the Industrial Strategy Challenge Fund Medicines Manufacturing Challenge, provided further support.

Today, Stevenage, home to the Catapult's manufacturing centre, has the third largest cluster of cell and gene therapy companies in the world.

New advanced therapy treatment centres, supported by the Industrial Strategy Challenge Fund and coordinated by the Catapult, are taking these new therapies to the NHS to the benefit of patients.



- help the development and adoption of international standards to accelerate progress towards global sustainability goals, such as those agreed at COP26
- enhance local capacity for net zero innovation and deliver transformational place-based programmes throughout the UK.

Health and wellbeing

Health and wellbeing includes sectors and technologies supporting healthy life in the UK and elsewhere, including:

- prevention of ill health, including from infection or lifestyle-related disease
- improved medical diagnostics including early diagnosis
- provision and use of medicines and novel therapeutics

- connected health and social care services
- wider impact of diet, and the provision of healthy and nutritious food
- innovations that improve healthy longevity, including in environments such as homes and communities.

Advances in our understanding and stratification of disease, and in medical and health technologies, will improve the health of individuals in the UK and globally. The growing and ageing population will need to eat healthily, will want to maintain good health, and will require access to good medicines and health and care provision.

The UK life sciences sector is a global leader in medicines and medical technologies manufacturing. The industry employs 250,000 people in 63,000 businesses and generated £80 billion in 2019¹⁵.

Tackling ill health

Non-communicable diseases, such as cancer, cardiovascular diseases and type 2 diabetes, account for 70% of all deaths and more than three out of four years lived with a disability¹⁶.

Theme 1: Future economy

The number of people in the UK with dementia is estimated at 850,000¹⁷, and one in four adults and one in ten children in the UK experience mental illness¹⁸. Patients with multiple health conditions (multimorbidities) represent an increasing challenge for healthcare systems, with around 70% of healthcare costs now associated with multimorbidities' management¹⁹.

We are increasingly seeing the use of genome-based technologies, improved diagnostics, AI, and advanced imaging techniques to enable improved and earlier diagnosis of diseases such as cancer. Advances in cell and gene therapies could cure previously incurable diseases. Precision medicine offers new ways of treating disease based on individual patient characteristics. Other technologies, such as the use of robotics, 3D printing and digital therapeutics will drive further change.

The recent pandemic has identified how critical it is not only to discover new medicines, but also to manufacture them. We need to fund innovation to transform medicines manufacturing processes, equipment and systems in order to provide safe effective medicines to patients in the quantities needed, when they are needed, and at costs that make them accessible globally.

The COVID-19 pandemic put stress on healthcare systems across the world. Opportunities exist to learn from new approaches developed during the pandemic, apply them to preparing for future pandemics and infectious disease threats (including anti-microbial resistance) and deploy them in other areas such as complex medicines and medtech development and manufacturing.

Wellbeing

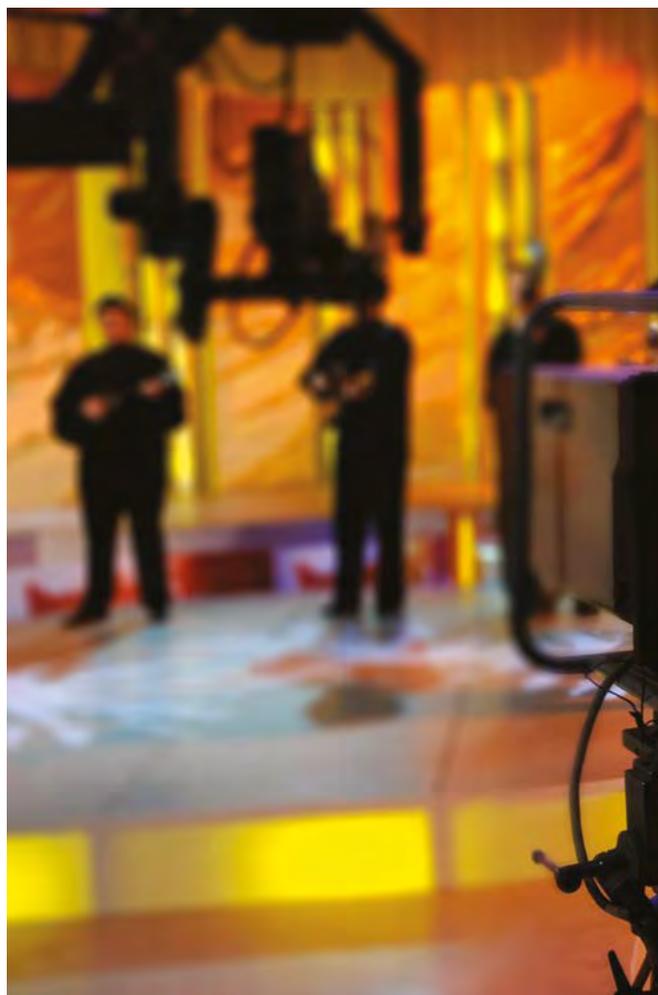
Innovations that promote wellbeing are needed to reduce the burden of non-communicable disease and the impact of disabilities. For instance, innovations that promote activity and good diet will help to tackle obesity, as will innovation to reduce obesogenic environments in construction, transport and leisure services. Public health innovations are needed to address growing health inequalities, ensuring that solutions are accessible, affordable and attractive to a diverse range of users and public providers globally. We need innovation in preventive measures for disease, early detection, new treatments, and reduction of health inequalities to ensure that increased life expectancy does not mean more years of disability and social isolation. Innovations, such as digital and wearable technologies will empower patients to better manage their own health, improve self-assessment, alter their own behaviour, and use remote monitoring solutions.

Diet and food

The secure supply of safe, nutritious, and affordable food supports good health. Changing consumer trends, ageing society, and concerns over diet-related disease will all drive changes to our eating habits and affect demand. Improved understanding of the complex relationships between genetics, phenotype, gut microbiome, food processing and nutritional quality present opportunities for better informed personal diet choices and improved health.

We will:

- continue to support investment in health data innovation, prevention, earlier and more accurate diagnosis, precision medicine, digital health, imaging, and cell and gene therapies through challenge funding (such as Industrial Strategy Challenge Fund) and Catapult investments (such as Cell and Gene Therapy and Medicines Discovery Catapults)
- review the more agile processes developed in response to the COVID-19 global health emergency and, where possible, start to embed them into routine innovation support
- continue to support innovation in the agriculture and food sector
- support innovations in healthy longevity that offer opportunities for all.



Technologies



Seven technology families

The UK Government's innovation strategy describes seven technology families of particular UK strength and opportunity: advanced materials and manufacturing; AI, digital and advanced computing; bioinformatics and genomics; engineering biology; electronics, photonics and quantum; energy and environment technologies; robotics and smart machines.

As per our mandate from the Government Innovation Strategy, we will continue to support UK businesses to explore how best to develop and deploy new technologies such as these in their application areas, from early-stage emerging technologies, such as quantum technologies, to the latest refinements of enabling technologies, such as electronics, photonics, advanced materials, robotics, and biosciences. This includes support for innovations that rely on the bringing together of multiple technologies in new products, services, processes, or business models.



London lights the way on visual effects

London has grown into one of the world's leading centres for the visual effects industry, and new digital studios are forming across the UK.

Innovate UK's creative industries strategy in 2009 highlighted major opportunities for UK business using digital tools to create digital products and services. We have supported research and development and invested in the Digital Catapult.

One project – ASAP: a scalable architecture for cross media virtual production – involved Double Negative, FilmLight, The Foundry, Ncam, and Rebellion and generated a return of more than 30 times the grant award in efficiency savings and new revenue opportunities.

There has been unprecedented film industry investment in the UK from the likes of Pinewood, Shepperton, Elstree, Sky Studios, Disney and Sony. The global visual effects business founded by George Lucas, Industrial Light and Magic, was attracted to London in 2014 and brought work on productions including *Star Wars*, *The Last Jedi* and *Jurassic World* – creating more than 1000 jobs and generating \$1 billion for the UK economy.

Other developments include a £150 million plan by Blackhall Studios to build the UK's biggest film studio in Reading, a 32-acre studio complex to be built in Elstree, and shooting of the *Game of Thrones* prequel at Titanic Studios Belfast.

We will:

- provide innovation networking support in the technology family areas through our Knowledge Transfer Network
- help companies grow by developing and making greater use of the technologies on the Government's list of seven technology families
- continue to help companies gain access to the technology expertise, test beds, and equipment they need from the research base, Catapults and other appropriate technology organisations.

Next-generation digital technologies

Digital technologies warrant special focus. They are relevant to most of the seven technology families, and they provide the tools, connectivity and infrastructure needed to support product, process and service enhancements in all sectors of our economy²⁰. This includes the gathering, curating, storing, retrieving and analysis of data and their safe and secure use in cyber environments.

Digital technologies have already transformed our world, and their increasing performance and falling costs are opening yet more new and exciting markets across the economy, including in manufacturing and the service industry. Digital technologies are key to delivering increased productivity and competitiveness.

They can also increase access to key services such as financial services, legal advice and insurance that, together with cyber security, lead to a more resilient society for individuals and businesses.

The UK's thriving digital sector contributed £149 billion or 7.7% to the economy in 2018. This represented 7.9% growth on the previous year, nearly six times larger than growth across the whole economy²¹. The UK is ranked third in the global AI Index²² and fourth for academic publications on AI²³.

Methods of sensing, collecting, storing, transmitting, and analysing data will become increasingly powerful. Artificial intelligence and machine learning – the ability of machines to perform tasks that would normally require human intelligence – has much more to offer. Whilst it provides many opportunities for companies to grow, much development, validation and adoption has yet to be done, including on its responsible deployment.

Suites of digital technologies (such as machine intelligence, 5G and new communications technologies, Internet of Things, digital twin, distributed ledger technologies, new classes of digital circuits, cloud, augmented reality/virtual reality, and satellite and space technologies) will become bundled into increasingly complex systems to meet increasing customer demand.





With increasing complexity comes increasing risk of failure, demanding a greater focus on the prevention of unhelpful emergent behaviour in complex software systems. Greater reliance on these systems, and ever more sophisticated criminal attack, require even greater cyber security if the benefits they offer are to be realised.

The nature of what we know today as digital technologies will be hugely different by 2035. Quantum technologies could be in widespread use. The way people interact with machines and devices will have been transformed (touch, voice, gestures), and there will be more widespread adoption of technologies such as mixed reality experiences, neural interfaces, and human augmentation.

We will:

- help companies grow by developing and making greater use of innovative digital technologies across the economy, including in manufacturing, high-value services and creative industries, and encourage companies in all sectors to adopt responsible innovation approaches
- support companies to develop, and deploy, better cyber security technologies and processes and more resilient digital infrastructure
- continue to help companies gain access to the digital expertise, test beds, and equipment they need from the research base or Catapults (Digital and High Value Manufacturing Catapults)/ research and technology organisations
- help companies to explore the impact on their future business models of adopting disruptive digital technologies.

Horizon scanning and foresight



Markets and technologies evolve in ways that cannot be precisely predicted. Emerging technologies can change the game completely, as happened with disruptive technologies such as the silicon chip, gene editing, and GPS.

We must constantly survey the horizon and respond intelligently and in an agile way to what we see and hear, in the UK and internationally. This includes bringing together the best possible insights and wisdom from across the UK, including from industry, research councils, government chief scientists, learned societies, academia, research and technology organisations, public sector research establishments, and our innovation partners.

We will:

- build innovation communities in high-potential areas through our Knowledge Transfer Network to benefit both existing and new industries
- conduct regular horizon-scanning to maintain awareness of the trajectory of global markets and societal megatrends, and to identify new and emerging technologies
- bring the world-class metrology and standards expertise of the National Physical Laboratory, the wider National Measurement System and BSI to bear on the most difficult systemic problems emerging industries face.

We see major opportunities for UK businesses.

Early recognition helped synthetic biology businesses

The UK is now host to more than 150 synthetic biology start-ups that are attracting increasing amounts of private investment.

Innovate UK recognised the potential for business innovation in synthetic biology in 2013 when support was introduced under our emerging technologies and industries programme. It has helped grow by more than five times the number of businesses in the sector and supported them to develop new products and platforms and bring in investment.

The top 70 UK synthetic biology start-ups attracted more than £1.8 billion private investment between 2014 and 2019.

Prokarium received a £238,000 grant from Innovate UK to support development of a new synthetic biology-based vaccine delivery platform. It has since attracted more than \$30 million in private investment and received a grant of £4.6 million from the Wellcome Trust to fund a clinical trial of a vaccine for enteric fever.



Purpose-driven challenge and innovation mission programmes

Purpose-driven mission or challenge programmes are a proven way of supporting innovation with a large-scale ambitious and specific outcome in mind. They are effective in stimulating industry, government, academia and civil society to work together to overcome intractable systemic problems in important challenge areas, sectors or technologies, such as our future economy areas.

The UK has a successful track record in designing and delivering such programmes, including through the current Industrial Strategy Challenge Fund (ISCF) programmes.

For example, the ISCF Faraday Challenge is helping bring better electric vehicles to market by resolving

difficult challenges in battery life, manufacturing, and recycling. The Transforming Construction Challenge is bringing factory efficiencies to building site environments, reducing the cost and improving the quality of future homes. The Industrial Decarbonisation Challenge is helping UK energy intensive industries prepare for a net zero carbon future.

In line with the Government's Innovation Strategy, we will continue to work with Government to help identify, define and deliver innovation missions. They represent major opportunities for business and society in our future economy programme areas.



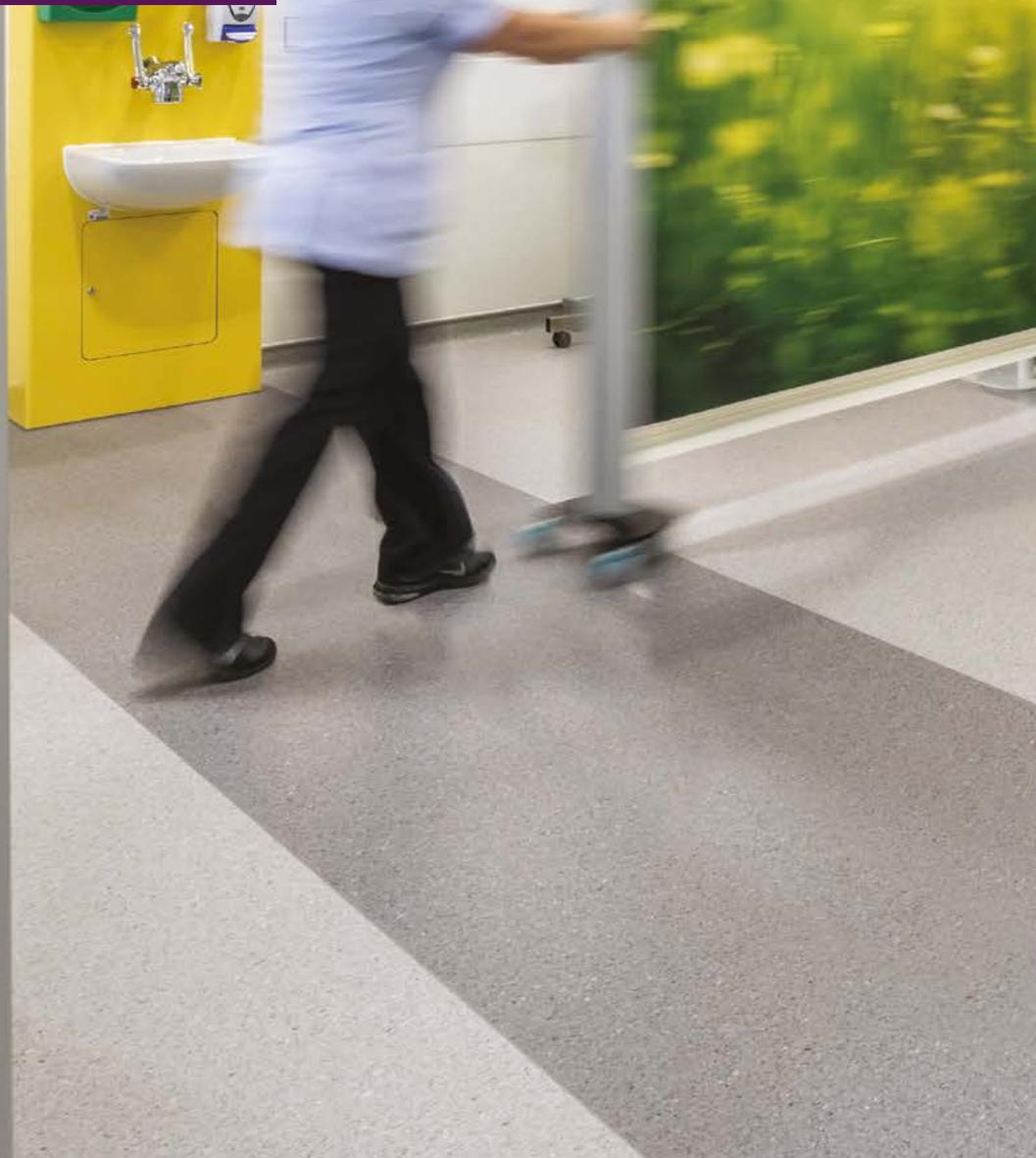
Innovation loans help KwickScreen to grow and tackle COVID

Innovation UK Innovation Loans have helped London business KwickScreen scale up and automate production of its award-winning portable, adaptable and hygienic screen and help hospitals across the world create COVID-secure spaces during the pandemic.

The business has been developing its screens since 2008 to counter hospital-borne infections such as MRSA.

It received an innovation loan of £300,000 in 2018 and an innovation continuity loan of £1.6 million in 2020.

The screens are now being used in every NHS trust in the UK and in hospitals in Europe, USA, Asia and Australia. The company has increased production from 16 to 200 screens a day, trebled its income to £7 million and grown its workforce from 12 to 90 employees.



Theme 2: Growth at scale

Growing innovating businesses are key to a strong, sustainable, and competitive UK economy. We want more businesses to adapt, innovate, grow and scale. We should help companies of all sizes to grow rather than focus our efforts solely on their projects or novel products.



It means improving access to global markets, commercial capabilities, growth capital and resources, and connections that are particularly critical to the success of companies. This strategic change in our approach will fully realise the UK's innovation-based competitive advantage.

Our focus is on supporting businesses that are scaling, where economic impact tends to be strongest, and on helping more businesses to scale. Businesses scaling up appear in all sectors, and successful scaling is relevant to companies of all sizes. They are innovative, international, diverse, productive, and creators of high-quality jobs. Research from the ScaleUp Institute shows that UK scale-up businesses had an aggregate turnover of £1 trillion in 2018 – 50% of the total SME economy – employed 3.5 million people, had an average turnover of £29.5 million and continued to outperform the wider economy²⁴. The UK ranks 3rd in the world for startups, according to the Organisation for Economic Co-operation and Development, but is only 13th for the number of businesses that successfully scale²⁵. There is huge opportunity to increase the number of successful scale-ups and drive significant economic impact. As the Royal Academy of Engineering points out, late-stage research and development is particularly important²⁶.

Successful outcomes of improving business growth will be:

- more growing businesses accessing markets, including through private and public sector channels, and better positioning in the global supply chains of the future
- more innovative businesses with the leadership and commercial capabilities and resources to access markets and scale up
- more innovative businesses prepared for growth at scale, investment ready, and able to attract the capital to achieve it.

Accessing markets

Innovative firms must be positioned in the value and supply chains of the future and in the markets being disrupted by new technologies and business models. These businesses must also have the commercial and leadership abilities and the connections to realise their ambition and to position for investment and growth in new markets.

Collaboration is a good way to gain access to markets. It helps to embed young, innovative, growth-oriented businesses into future supply chains and to expose them to potential future customers or suppliers. Growth in SMEs can be greatly helped if they can establish themselves in the supply chains of larger and more established players, including with the multinationals.

Theme 2: Growth at scale

The public sector must be open to the adoption of innovations and have procurement and contracting processes that encourage the growth of smaller businesses and permit access to capital where needed. We address this in the government levers theme of this document.

We will:

- support more business-led collaboration that provides smaller businesses with access to the global supply chains of the future
- continue to work with ScaleUp Institute and take account of its expertise in the design and implementation of growth-at-scale programmes, particularly for the development of 'peer to peer' support and scale-up networks for potential innovation-led businesses.

Preparing for and delivering growth at scale

Highly innovative SMEs seeking to grow and scale need founders and leaders with a growth mindset and commercial skills that are markedly different from those needed at startup.

We can help develop innovative businesses with broad diverse leadership teams, and with the commercial capabilities to deliver on their vision, through selection processes for funding, through collaborations with the investor community, through delivery of bespoke support services and through connecting with the broader ecosystem.

We will:

- provide more of our highest-growth-potential innovative small and medium-sized companies with support on how to grow and scale in the UK and internationally through Innovate UK EDGE's unique specialist-led capability, our KTN, Catapults, and other partners
- support scaling businesses to maximise their potential in the global markets of the future
- support the founders and leaders of the most innovative and ambitious companies to access resources on leadership skills, growth and commercialisation, design of future business models, supply chains and opportunities, and standards
- expand collaboration with Intellectual Property Office programmes that help companies to identify, protect, manage, and commercially exploit intellectual property.

Supply of growth capital

The UK has a relatively strong supply of capital for the startup stage of innovative, technology-led businesses. It is driven by business angel networks, crowdfunding platforms (many benefitting from tax benefits or public sector co-funding), and early-stage venture capital investors (many supported by investment from the British Business Bank). However, follow-on investment is weaker, particularly compared to the US, where the investments that companies receive at the growth stages are around 2.4 times greater than in the UK²⁷. Capital issues are greatest for research-and-development-intensive and hardware-centric businesses with longer periods to reach scale.

We should bring together public sector players (for example, Innovate UK, wider UKRI, British Business Bank and Department for International Trade) and private sector players (for example, large asset managers, corporates, venture capitalists, and London Stock Exchange Group) to more closely match the needs of innovative businesses with those of investors.

We will:

- embed the use of investor partnerships to accelerate investment into innovative, high-growth-potential businesses, including exploring the use of on-line showcasing platforms
- use innovation loans to support capital-constrained SMEs with strong research and development projects and a clear route to commercial success
- ensure that the power of finance for scaling innovation is leveraged in UK policy through the British Business Bank
- develop an online Innovation Hub to sit alongside and complement the British Business Bank's existing Finance Hub, with clear links between the two to provide innovators with a complete view of government-backed funding options
- continue to create more early-stage fund managers and angel networks with wider interests through investment by the British Business Bank, so that more equity finance is available to scale innovative products, services, and business models
- increase the availability of larger venture and venture growth investments in the UK through the British Business Bank and British Patient Capital, so that our most promising companies reach global scale.



Innovate UK EDGE

Innovate UK's bespoke business growth support is known as Innovate UK EDGE.

It supports ambitious, innovative businesses to accelerate their growth and achieve scale. The support provided by Innovate UK EDGE is tailored to the needs of individual businesses across all areas of the economy and responds to the evolving needs of innovative businesses competing globally.

Innovate UK EDGE has dedicated innovation and growth specialists based in all areas of the UK, who support high growth and potential scaleup innovative businesses. The specialists work with companies, offering support and coaching in areas such as strategy development, innovation management, access to markets, leadership, access to finance and investor readiness.

Innovate UK EDGE also supports innovative businesses with peer-to-peer networking and can help with access to international markets. It also works with and makes the connections to local clusters, investors, world-class resources in Catapults, universities, the ScaleUp Institute, London Stock Exchange, Intellectual Property Office, BSI, KTN, Department for International Trade, and British Business Bank.

Find out more at innovateukedge.ukri.org/



Graphene pioneer Versarien launches international operations

A Gloucestershire-based graphene developer has secured £1.93 million in investment from a South Korean company, following support from Innovate UK EDGE and funding from Innovate UK.

Versarien PLC became the world's first verified graphene producer in 2019 and uses the extremely strong and highly versatile material to develop commercially viable products for sectors as diverse as automotive, clothing, biomedical and aerospace.

Graphene was first isolated at Manchester University in 2004. Versarien's development of graphene for commercial production has been supported by Innovate UK through research and development grants and innovation loans. The company was also able to build relationships in South Korea with help from the Innovate UK Global Business Innovation Programme.

The investment by Seoul-based Graphene Lab grants Versarien access to research and production facilities in South Korea and enables the company to develop new graphene-based technologies for the South Korean electronics sector and accelerate projects in Japan, China and other markets.

Theme 3: Global opportunities

More and more countries are looking to science and innovation to build their economies and meet global challenges. There is a major opportunity for international co-operation on research and development and innovation that builds on our world-class science and research capabilities and industry strengths.



The 97% of global GDP generated outside the UK is a huge potential market for UK businesses to participate in. We must ensure, in an increasingly competitive world, that the UK is the partner of choice and one of the most attractive places to do innovation. Overseas private investment already makes up 14% (£5 billion) of the 1.7% of GDP spent on research and development, and we welcome more.

The opportunities are large. Participants in the global EUREKA innovation programme showed additional annual employment growth of 3.5% compared to non-participants. Almost two-thirds entered new markets, and more than half improved their market share²⁸.

Successful outcomes of a stronger global approach will see:

- more UK businesses making global success a key part of their innovation-driven growth and scaling
- the UK as the international innovation partner of choice and one of the most attractive places in the world to do innovation
- increased inward investment in research and development in the UK
- UK businesses building impact-driven innovation alliances to tackle global challenges.

Business must think and act globally

UK businesses must think and act globally, designing and configuring their products and services for global markets from the outset. We can help UK businesses to overcome barriers and seize the opportunity to engage and work with the best innovation expertise and partners across the globe.

We can also reduce barriers by working with international partners on the development of international standards, easing the friction that different and conflicting national standards can create.

We will:

- deliver the full spectrum of innovation support UK businesses need to succeed globally
- help businesses to increase their access to international programmes, expertise, and opportunities
- help businesses to fully exploit opportunities offered by the Horizon Europe programme and our membership of EUREKA
- join up innovation and trade opportunities to turn ideas into exports through work with the Department for International Trade and devolved administrations.

**Building and strengthening
our global relationships
will open more opportunities
for the UK.**



- increase representation of UK perspectives in the development of international standards and measurements through BSI and through the National Measurement System and its quality infrastructure partners
- provide support on intellectual property for companies working in global collaborations through working with the Intellectual Property Office's IP Attaché Network.

UK as innovation partner of choice

Building and strengthening our global relationships will open more opportunities for UK and global businesses, from the longer-established markets of Europe and North America to the increasing economic powers in Asia and future and emerging economies. We must present a compelling and coordinated innovation 'offer' to the world, showcasing the excellent opportunities we can provide through our innovation support and expertise. It will ensure we retain our best businesses and encourage more companies to locate and invest here.

We will:

- pursue a more long-term and joined-up approach across government to build important, trusted, and sustainable relationships with key partner countries that deliver business success and address global challenges
- work with the Department for Business, Energy and Industrial Strategy; Foreign, Commonwealth and Development Office, including the Science and Innovation Network; Department for International Trade; devolved administrations; and other organisations across the innovation ecosystem to build and manage global relationships and promote a coherent UK-wide innovation offer to the world, enhancing outreach and encouraging more inward investment in R&D
- play an active role in global innovation groupings and associations to ensure we are at the forefront of innovation policy, standards and regulation, and delivery, and maximising the impact of the UK's Presidency of TAFTIE in 2022.

Addressing global challenges

Global challenges require global responses. Innovative UK businesses have, or can develop, the technology, innovation, and commercial solutions to help tackle some of the largest global challenges. These innovative solutions are also significant growth opportunities for businesses with global mindsets. Supply chains will span countries and continents and mean collaboration is essential for UK businesses to participate fully.

We will:

- provide opportunities for innovative UK businesses to collaborate and play a meaningful role in tackling global challenges
- work across government to ensure Official Development Assistance-funded innovation allows UK businesses to contribute to socio-economic challenges as impactfully and equitably as possible and delivers a strong programme with developing and emerging economies.



KTN and the Immerse UK network set agenda

Our Knowledge Transfer Network (KTN) established an industry-led innovation network Immerse UK to increase research and development in the use of immersive technologies – artificial reality and virtual reality.

KTN is a delivery body of Innovate UK and UKRI that supports collaboration and networking. It aims to connect ideas, people, and communities to respond to challenges and drive positive change through innovation.

Immerse UK has more than 4,000 members, ranging from small creative production firms to major construction companies and defence corporations.

The network worked with the Digital Catapult to launch the first immersive economy in the UK report in 2018. This led to the setting-up of the Industrial Strategy Challenge Fund (ISCF) Audience of the Future challenge.

Immerse UK also informed the Digital Catapult's strategic priorities and its subsequent capital investment in world-class immersive capability, and it has helped to put companies in front of investors.

KTN's work with more than 7,000 businesses since 2018 alone has led to more than 2,100 business-to-business and business-to-research collaborations across many different sectors.

Find out more about KTN at ktn-uk.org



Theme 4: Innovation ecosystem

Innovate UK, the UK's innovation agency, BEIS, and many other interacting organisations, institutions, businesses, academia, infrastructure, culture, and the regulatory and market environment, make up the UK business innovation ecosystem.



Key organisations include:

- BEIS, the department responsible for business in the UK and the sponsors of UKRI and Innovate UK
- public institutions and agencies, employer organisations, and industry bodies working to shape the market and regulatory environment, such as BSI, Better Regulation Executive, Intellectual Property Office
- funding and support for research and innovation, such as from UKRI, Innovate UK and Innovate UK EDGE, the Advanced Research and Invention Agency, the agencies in the devolved nations, the Defence, Science and Technology Laboratory, Defence and Security Accelerator, and National Institute for Health Research
- intermediaries, services, and facilities that help businesses to innovate, collaborate and grow, such as our Knowledge Transfer Network, the National Measurement System, and British Business Bank
- universities and their out-reach departments
- research and technology organisations, public sector research establishments, and individual Catapults and the Catapult and agri-tech centres network.

Many others play a role, including private sector investors, further education colleges, learned societies, third sector organisations and charities, science parks, researchers, and local agencies and actors providing targeted support to local businesses and innovators.

A well-functioning ecosystem supports innovation from idea through to commercialisation, adoption, and diffusion. A business moves through it seamlessly, accessing the partners, facilities, funding, and advice it needs, from the right place at the right time.

Successful outcomes of this work will see an innovation ecosystem that:

- meets the needs of innovating businesses and supports government strategic priorities through increased agility, responsiveness, and co-ordination among innovation actors
- is easy for businesses wanting to develop and commercialise innovations to understand and navigate
- inspires more businesses and individuals to innovate and adopt innovations
- makes the UK a more attractive location for innovation activity, increases inward investment, improves access to capital, and helps companies deliver new products and services to the global market more quickly and efficiently.

Agile and responsive

All the partners in the innovation ecosystem make an outstanding contribution in their own right. We want everyone to work together to make the whole system more effective. That means being faster and more agile in delivering support and in responding to innovation opportunities.

Theme 4: Innovation ecosystem

All actors must work together to realise the benefits that will flow from a better innovation ecosystem. They must help companies respond to global market opportunities and emerging challenges in a coherent way, as we saw in the response to the COVID-19 pandemic.

A highly functioning ecosystem also co-ordinates the design of programmes that identify and help to overcome key innovation challenges, such as in the journey to net zero. Our role is to support the development of the required technologies, processes, systems, business models, standards, regulations, and infrastructure. Some actors, including universities, Catapults and the broad range of public sector research establishments, also have an active research and development role to play.

In delivering the Government's innovation strategy, we will:

- explore how ecosystem partners can work together to be more agile and responsive to specific business needs, learning from what worked in responding to COVID-19 challenges
- work with ecosystem partners to design programmes that are more agile and responsive to business innovation needs
- help businesses to explore in more depth commercial opportunities and potential routes to market
- help businesses to grow through innovation by accessing the required knowledge, facilities, equipment, and investment
- work with the Advanced Research and Invention Agency to help companies accelerate to market the outputs of their research and invention activities
- identify global trends in emerging technologies that may impact on national prosperity, resilience and sustainability, in order to inform and promote investment in innovation in the UK and explore and scope potential technical programmes in areas of common interest to the Defence Science and Technology Laboratory and Innovate UK.

Easy to navigate

The UK's innovation ecosystem is well established and diverse, but it can also appear complex and fragmented to newcomers. All businesses should receive the right support and advice from the relevant part of the system as and when it is

needed, regardless of their location or sector, age, or experience. We should ensure actors can work better together to both help innovative businesses navigate the ecosystem and respond to their needs.

We will:

- make the support available from the innovation partners, and across UKRI funded bodies, more visible to business, including through better laid out weblinks
- provide businesses with joined-up, seamless guidance through the innovation system
- simplify access to innovation support programmes, whilst continuing to offer a wide range of funding and non-financial mechanisms to support innovation.

A national culture of innovation

We want a dynamic, inspiring culture of innovation in the UK that motivates companies and individuals to try new things. The UK has a long history as an innovative nation. However, innovation activity has been falling since 2012²⁹, and more than three-quarters of the UK's total business research and development is conducted by just 400 companies³⁰.

Driving culture change and increasing successful innovation will require sustained, visible support and promotion by key actors. We will need long-term programmes that provide certainty to companies and encourage them not just to invest, but to grow and attract further innovation activity to the UK.

We will:

- encourage all parts of the ecosystem to be vocal champions for business innovation
- expand programmes such as our KTN, Catapults and KTP to support greater adoption and diffusion of innovations by businesses across the UK
- work with ecosystem actors to develop and implement an adoption and diffusion framework that will set out definitions and appropriate metrics, and identify best practices
- align our measurement of success to capture innovative behaviours, as well as successful outcomes
- promote the value of business innovation to public sector partners, and ensure their policies and strategies incorporate, where appropriate, the needs and opportunities of business innovation.

Standards set on trials of automated vehicles

BSI has worked with the Centre for Connected and Autonomous Vehicles, Innovate UK and industry to develop standards for safe trialling of automated vehicles³¹.

Work also included promotion of consistent terminology critical to increasing understanding and awareness.

BSI tapped into the UK's various demonstrator projects to build on real-world experience and technical expertise.

The work also highlighted future areas for standardisation such as cyber security, virtual testing and machine-learning.

The BSI PAS has been downloaded in more than 55 countries and has been used to shape development of international standards on safe operation of automated vehicles.



Making the UK more attractive for innovation

An agile, responsive and coherent research and business innovation ecosystem receptive to international investment makes the UK more attractive for internationally mobile business innovation and helps attract inward investment.

Actors who have a role to play in facilitating stronger relationships with global partners include:

- the Department for Business, Energy and Industrial Strategy, as innovation policy lead, funder and supporter, and other government departments such as Department for International Trade
- the devolved administrations, with their remits on international trade and investment
- organisations such as the Intellectual Property Office, BSI and the National Measurement System that help to facilitate and support innovation
- inter-governmental frameworks (including Horizon Europe and EUREKA) and peer innovation agencies
- investors
- business organisations and research and technology organisations.

We will:

- work with partners to make the UK an attractive destination for innovation activity, driving up inward investment and increasing the quality and quantity of innovation in the UK.

Catapults: access to expertise and equipment

Catapults are technology and innovation centres that together manage more than £1.3 billion of research and demonstration facilities and provide companies with access to expertise and equipment they might otherwise find difficult to resource on their own. Catapults are a critical part of Innovate UK's overall offer to innovative businesses, with deep expertise in areas including cell and gene therapy, connected places, compound semiconductors, digital, energy systems, high value manufacturing, medicines discovery, offshore renewable energy, and satellite applications.

The portfolio of Catapults has centres throughout the UK, able to leverage the capabilities, technologies and experience of different sectors to create opportunities for innovative businesses of all sizes.

Find out more about the Catapults at catapult.org.uk

Hero Arm empowers amputees

Open Bionics Ltd was able to medically certify its bionic limb for children and adults after being awarded almost £700,000 by NHS England for clinical trials.

The award was made under the Small Business Research Initiative (SBRI) and led to the Hero Arm becoming the world's first clinically approved 3D-printed bionic arm, with multi-grip functionality and empowering aesthetics.

The low-cost Hero Arm is now available in the USA, UK, Europe, Australia and New Zealand, for below-elbow amputee adults and children aged eight and above.

The Bristol-based company recently attracted £4.6 million from investors, which will help it to make the Hero Arm available to more people.

It also received a grant under Innovate UK's Sustainable Innovation Fund aimed at building UK resilience following the coronavirus outbreak. The grant helped Open Bionics to open the UK's first clinic to only offer 3D printed sockets and to become a clinical provider of bionic limbs.



Theme 5: Government levers

The UK Government is committed to the growth of UK companies through innovation and placing innovation at the heart of Government. Its approach is laid out in the Government's Innovation Strategy.



There are many things government can do to shape markets and help companies develop and take new products, services and processes to market. We are committed to supporting that effort.

Government can use numerous levers to stimulate and support UK business innovation, including legislation, regulation, standards, intellectual property regimes, and public procurement. We work with partners across government and the public sector to help them use these levers as a catalyst for innovation.

Innovate UK, the BEIS Better Regulation Executive, BSI, regulators, National Quality Infrastructure partners³², and the Intellectual Property Office (IPO), will continue to work closely together to ensure that innovation in the UK remains world-leading.

Successful outcomes of our work supporting government's use of its levers will see:

- public sector procurement helping more companies get new products and services to market sooner
- new standards, codes, and regulation used to help shape future markets, accelerate business innovation and achieve societal good
- more UK companies growing through helping government achieve policy objectives.

Innovation friendly regulatory and standards environment

The UK government has successfully used regulation to accelerate the adoption of innovation. For example, the move to lead-free petrol, the Human Fertilisation and Embryology (Mitochondrial Donation) Regulations 2015, and by signalling the direction of travel on electric vehicles. Standards can also encourage innovation, such as guidance issued by the Health and Safety Executive³³.

Government can also shape markets through tax incentives, such as increasing levels of vehicle excise duty for the most polluting vehicles, or the patent box scheme to encourage innovation in multiple areas.

The UK should continue to play its important part in the development and adoption of internationally agreed measurements, standards, and new regulation that support business-led innovation. The ability to independently measure the performance of ideas de-risks claims and makes them more attractive to investors. The National Physical Laboratory and the wider National Measurement System will be focusing on how this approach can be developed and made widely available to innovators, for instance through scaling-up programmes such as Analysis for Innovators.

Regulation can stimulate and shape markets but, if poorly drafted, can hamper innovation. The UK Government plans to transform the regulatory system to support innovation while protecting citizens and the environment³⁴.

Theme 5: Government levers

If we get this right, it will stimulate innovation rather than block implementation, it will reduce investment risk rather than increase it, and it will improve consumer confidence and attract inward investment.

An agreed approach to measuring and validating new and emerging technologies, products, and services is vital to support early adopters and policy development. Standards can reduce the time to commercialise new technologies and accelerate the speed at which innovations are adopted. For example, they can ensure interoperability between products and services supplied by different organisations.

We will:

- help the Government use its standards, regulatory and legislative levers to shape markets and accelerate business innovation in line with policy objectives
- support innovators to influence and access global markets, and share UK innovation perspectives on international standards and regulations
- consult and involve innovative businesses in developing standards and regulations
- continue to develop internationally recognised measurement solutions that are widely adopted in new emerging areas, such as the quantum technologies test and validation programme.

Public sector innovation needs

The UK government, devolved administrations, and wider public sector, recognise the part public procurement plays in driving innovation, stimulating the market for new products and services, encouraging businesses to develop new solutions to public sector issues, and acting as a powerful lead customer to stimulate further private sector investment³⁵. SBRI (Small Business Research Initiative) is one form of pre-commercial procurement that is already widely used in the public sector³⁶. The Defence and Security Accelerator is helping defence customers access innovations from SMEs, supporting the creation of new products and services and connecting their originators to the major defence suppliers³⁷. SBRI is similarly being deployed in healthcare³⁸ to signal the challenges that the NHS and the wider system face and invite ventures to deploy innovative solutions to deliver improved outcomes of care. There are numerous other examples across government.

Many government assets can also be used to stimulate innovation, ranging from government-owned intellectual property and data, to the electromagnetic spectrum for telecommunications. They are often intangible and distinct from those generated by direct public spending on innovation.

We will:

- continue to lead on pre-commercial procurement for the UK, helping coordinate activities across the public sector to create a coherent and significant UK pre-commercial procurement programme
- run managed programmes (such as the Advanced Propulsion Centre and Aerospace Technology Institute programmes) on behalf of government departments, to help them achieve their policy objectives
- explore new rapid and flexible procurement approaches with the Crown Commercial Service and Cabinet Office, and with the Ministry of Defence through the Defence and Security Accelerator
- help government act as a lead customer for innovative solutions and processes by working with Crown Commercial Service and the public sector
- work with government and other relevant bodies to help deliver the outcomes of the Mackintosh Report³⁹, including to understand how more publicly owned assets, such as government-owned data sets, can be securely and transparently used to stimulate business-led innovation.



Intellectual property framework

A flexible and dynamic system that allows appropriate protection of intellectual property and intellectual assets is crucial to supporting a healthy innovation ecosystem. Innovating companies must take steps to protect their intellectual assets in a balanced and rounded way. Failure to do so leaves them exposed to the risk that others will infringe their rights and erode their market share and profitability. Helping innovators to understand intellectual property can reduce those risks by protecting their creations through the interconnected system of intellectual rights, trademarks, patents, copyright, and designs.

In collaboration with the IPO we will:

- encourage UK businesses to protect their intellectual assets more robustly and help make the intellectual property system simpler to navigate
- work together to analyse and anticipate future needs and ensure the system of intellectual property in the UK remains flexible and agile
- help innovative UK businesses access the intellectual property advice they require to support their business growth.



University spin-out offers new treatments for diabetes

Ziylo, a company spun out of the University of Bristol to commercialise research into a new treatment for diabetes, was recently acquired by the world's biggest maker of diabetes drugs, Novo Nordisk, in a deal that could ultimately be worth £623 million.

The new treatment is rooted in chemistry research funded at the University of Bristol by the Engineering and Physical Sciences Research Council.

Ziylo, founded by Professor Anthony Davis, PHD student Dr Harry Destecroix, and businessman Tom Smart, was helped in exploring the commercial potential of its idea by a £500,000 Innovation and Commercialisation of University Research (ICURE) award from Innovate UK.

It is hoped that further work will lead to a groundbreaking treatment for diabetics by the end of the decade.



KTPs take wheelchair into digital age

Award-winning design house Phoenix Instinct is bringing the wheelchair into the digital age with the help of Knowledge Transfer Partnerships (KTP).

The company, based in Moray, Scotland, designs user friendly, practical, and life-enhancing products for wheelchair users. The wheelchair has been technologically unchanged for decades.

The University of the West of Scotland worked with Phoenix Instinct to transfer knowledge and expertise in carbon fibre component design, rapid prototyping, analysis, and manufacturing.

It led to Phoenix Instinct winning the prestigious 2021 \$1 million global Toyota Mobility Unlimited Challenge. Its workforce and sales of its products have doubled, and additional profits of more than £1 million directly attributable to the KTP are forecast over the next 5 years.

A second KTP aims to bring the manufacture of electronics used in the production of the wheelchair in house by 2024. Both KTPs have been jointly funded by Innovate UK and Scottish Funding Council.



Strong foundations

The strong foundations are underpinning activities or programmes supporting the themes. They are all fundamental to successful business innovation. We will apply these foundations in all our work. The foundations include UK assets of value to businesses, such as research strengths, design, and innovation talent and skills. They also include values with a proven impact on business success that we use to guide programme design and funding decisions, such as responsible innovation; equality, diversity, and inclusion. And they include the importance of place and building on local strengths.

Science and research strengths



The outputs of science and research make new things possible and offer innovative businesses new opportunities and ways to solve problems.

The UK is second in the world for research according to the World Economic Forum, sixth for industry-university collaboration, and seventh for knowledge exchange⁵⁹. This strengthens UK companies and attracts inward investment and innovation activity from companies seeking to use these strengths.

Universities provide pools of experts across disciplines, and entrepreneurial students and alumni. They are connected to networks of industry leaders, experts, investors, and support. Around a quarter of business-led projects funded by Innovate UK include an academic collaborator. Over three-quarters of university spinouts created in 2014⁴⁰ survived beyond five years⁴¹ – a higher rate than the average UK startup. There is clear potential for increasing the translation of this research excellence into new business innovations.

Successful outcomes of a greater exploitation of science and research strengths will see:

- increased use of the UK's excellent research through a stronger culture of collaboration and knowledge exchange and demand-driven innovation with business
- a consistent funding and support framework for

commercialisation of research, from fundamental research and invention through to translation, commercialisation, and adoption

- increased training in entrepreneurial and commercialisation skills for academics.

Building a culture of knowledge exchange and innovation

We must continue and increase work that connects knowledge and ideas with their application in commercial products and services. More can be done in more sectors, businesses, universities, and public sector research establishments to build on the productive relationships that already exist.

The establishment of UK Research and Innovation brought Innovate UK together with the research councils under the umbrella of a single funder of research and innovation. We can now take a more joined-up approach to the commercialisation of university research.

We will:

- further strengthen programmes, such as Knowledge Transfer Partnership, that support knowledge exchange between academia and companies
- increase investment in research commercialisation, focusing on accelerating early-stage, high-potential technologies, ventures, and entrepreneurs

Strong foundations

- work with relevant partners in industry and academia to simplify collaboration mechanisms and ensure they are fit for purpose for all types and sizes of business in all sectors
- help researchers to better evaluate the commercial value of their outputs and understand the options for capturing it in the UK, by strengthening schemes such as ICURE
- bring together the key elements required for new industries to grow from technologies emerging from the research base and industry.

Commercialisation skills in academia

Academic career incentives can be too focused on publications and too little on commercialisation. Researchers with marketable ideas do not always have the skills or experience to develop them in a customer-focused way and may struggle to find a route to market.

Universities can adopt professional development programmes in entrepreneurship, technology, and commercialisation, tailored to growth sectors and local needs.

We will:

- explore ways to incentivise knowledge exchange and commercialisation in academic careers
- work with groups such as the Russell Group, Universities UK, University Alliance, learned societies such as Royal Academy of Engineering, and further education bodies to improve business skill and knowledge among graduates
- work with relevant partners to increase understanding and awareness of key commercialisation skills, including in intellectual property, technology valuation, standards, metrology, and deal-making.

Design



Great design extends beyond finish and appearance. It encourages businesses to understand and reframe business opportunities and problems from the perspectives of all involved, particularly users and customers. When used early in the innovation process, it can inspire better ideas and allow changes of direction before they become too expensive. Studies by McKinsey⁴² and the Design Management Institute (DMI)⁴³ clearly demonstrate that businesses with strong design capability outperform their peers by around 200% in terms of revenue and shareholder returns.

Successful outcomes of implementing our *Design In Innovation* strategy⁴⁴ will see:

- more UK businesses using design effectively to boost the value of their innovation activities and outputs
- more products, services, places, and business models designed to really work for people
- increased growth of innovative UK companies at home and in international markets through use of design to understand and satisfy customer needs
- greater inward investment in UK innovation resulting from a world-class fusion of technology and design.

Added value of design

The economic, social, and environmental benefits of new ideas can only be realised when they are adopted and used. Successful innovation must include activity to understand people's needs and behaviours, and to translate that understanding into solutions that are more desirable and fit for purpose. Design helps businesses do that and is an essential foundation of effective innovation.

We will:

- bring human-centred design principles to our future economy programmes
- help companies to grow at scale by using design methods to develop more desirable products and services in response to genuine customer needs
- help companies use the power of design to attract the investment they need
- help UK businesses use design to create solutions that better meet the needs of international markets and attract inward investment.

Better design drives £1 million in new contracts

Internet technology and machine learning experts Senseye attracted extra contracts worth more than £1 million following work to improve users' experience of its products.

Robert Russell, chief technology officer, said: "We thought we had a good product, but when we watched people using it, we noticed they were struggling, having to use lots of workarounds. Some of the features we thought were powerful, weren't being used at all."

The business, which specialises in predictive condition monitoring of factory machinery, used an Innovate UK award to work with Thomas Buchanan Design on improving user experience.

It says user experience is now a key driver and it has appointed a full-time head of user experience design. Customers have commented that user experience is significantly ahead of the competition.

Societal impact and responsible innovation

We must account for environmental and societal impacts if we want to maximise long-term and sustainable economic growth.

Business-led innovation can play a leading role in solving global challenges, for example around the environment, changing demographics, and inequalities. The COVID-19 pandemic demonstrates how much can be achieved when the innovation ecosystem works together to tackle a challenge.

We aim to set out how innovation partners can deliver solutions at pace that carefully consider the impact on the business, customers and suppliers, investors, and wider society and the environment. Business innovation is at its best when it achieves company growth, wider benefits for society and the environment, and avoids negative or unforeseen impacts.

Successful outcomes of our work in responsible innovation will see:

- more companies using a structured responsible innovation approach in product, process and service development
- more UK businesses demonstrating clear positive contributions to sustainable growth and wider societal benefits
- more innovative companies putting in processes, such as 'know your customer', to reduce or mitigate any potential third-party harms
- increased tracking of the wider societal and environmental impacts of our programmes.

Wider impacts of business innovation

An increasing number of businesses, consumers and investors are putting environmental and societal benefit at the front of their investment and spending decisions. They are considering the needs of all their stakeholders, rather than just their shareholders or immediate customers. Innovating businesses need a way of considering what these effects might be, and of taking them into account.

The societal impacts of early-stage technologies warrant particular attention. Society needs the improvements they can bring, but it is harder to foresee how their impact might play out in the future. Radical innovation with the potential to transform sectors can sometimes carry a risk of potentially negative or unforeseen impacts on some groups. We need to identify these and mitigate against them.

Responsible innovation standards

Responsible innovation considers all the benefits – societal, environmental, and economic – of an innovation. It aims to achieve those benefits and seeks to eliminate, minimise, or mitigate any potential harm from the perspectives of all stakeholders, not just the company, customers, or shareholders.

Thousands of UK companies have been taking different approaches to their responsible behaviour. It is why Innovate UK supported and worked with BSI to create a new standard to guide responsible innovation, PAS (publicly available specification) 440⁴⁵. PAS 440 has been downloaded by thousands of businesses since its launch in April 2020. It is helping them to gain the benefit from their planned innovations, and to mitigate any potential downsides. The standard is even being used to decide whether to launch a company⁴⁶. This excellent start bodes well for future innovation, but there is much more to be done.

Innovating responsibly

Innovate UK worked with BSI to create a new standard, PAS 440, to help companies innovate more responsibly, and to demonstrate the fact. PAS 440 has been downloaded more than 3,000 times since its launch in April 2020, making it already one of the most viewed PASs in BSI's history.

MiAlgae Ltd used PAS 440 in the development of a new fish feed product for the aquaculture industry produced from co-products of the whisky industry – potentially significantly improving the environmental sustainability of the sector.

John Innes Centre and The Sainsbury Laboratory used PAS 440 to help them weigh the social, ethical and regulatory issues involved in creating the spin-out company Norfolk Plant Sciences to commercialise a purple tomato product for tomato juice containing enhanced levels of anthocyanins – claimed to reduce chances of cancer and improve cardiovascular function.

Adapt your business to future trends

The Horizons tool helps businesses identify the big trends, issues, risks and opportunities coming their way. What do future environmental constraints look like? And how could your business model adapt to them?

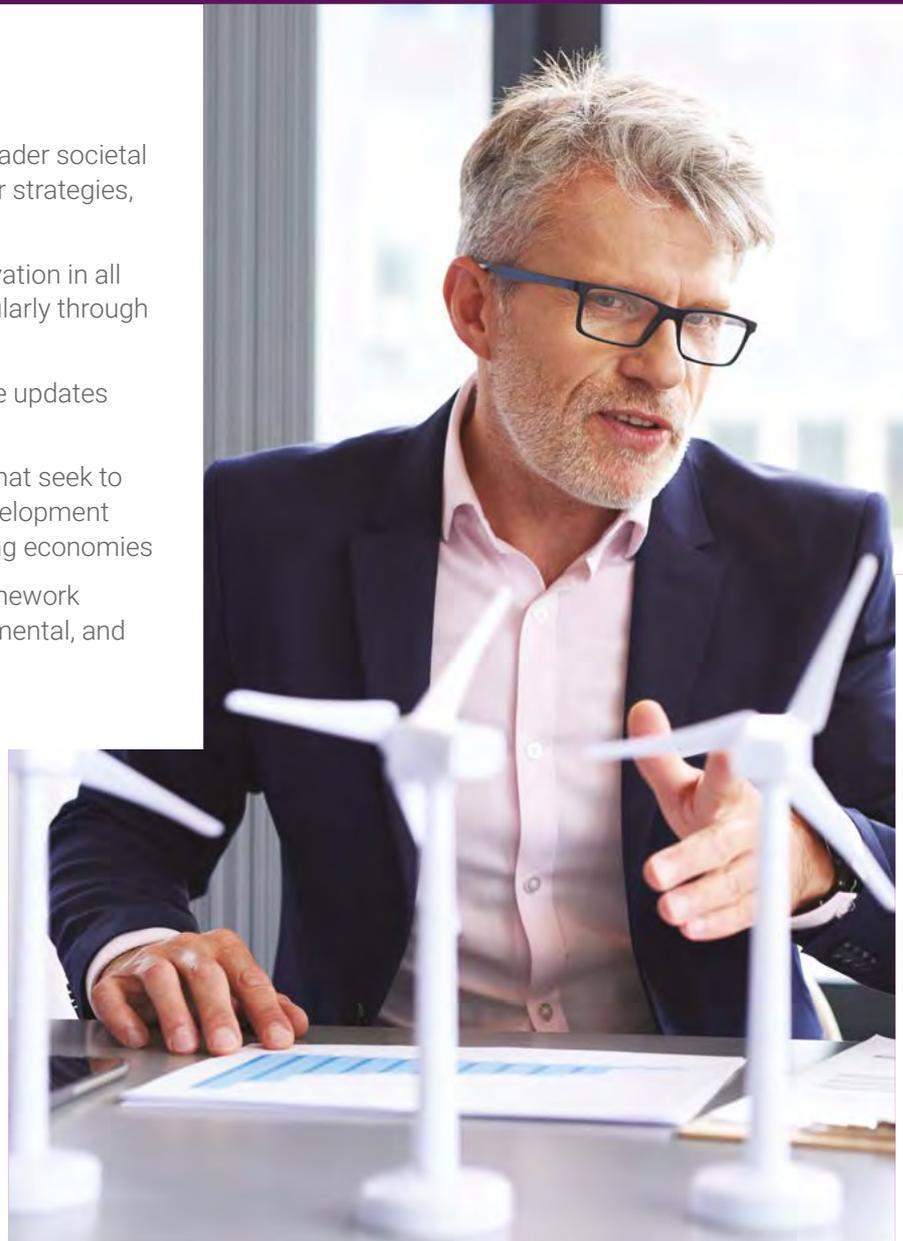
Horizons is hosted by our Knowledge Transfer Network and is based on a sustainable economy framework developed by Forum for the Future, Innovate UK and the business and academic community.

Businesses can use it to find out more about the trends driving development of the future economy – such as the digital revolution, pollution levels, public trust and energy security – the risks they present, and the global market opportunities they reveal.

Find out more about Horizons and download the Horizons toolkit at ktn-uk.org/programme/horizons

We will:

- improve the way we consider the broader societal impacts of business innovation in our strategies, programmes and funding decisions
- promote the use of responsible innovation in all technology and market areas, particularly through standards such as PAS 440
- monitor the use of PAS 440 and issue updates and improvements as necessary
- support challenge-led programmes that seek to contribute to the UN Sustainable Development Goals⁴⁷ both in the UK and in emerging economies
- develop an impact management framework that incorporates economic, environmental, and societal contributions.



Innovation talent and skills



Economic success depends on companies being able to increase productivity and grow through innovation. They need the right talent and skills to do this, either sourced in the UK or by accessing international talent. We focus primarily on enhancing the leadership and commercialisation skills needed by companies to grow their businesses. Where appropriate, we will take a role in foresighting future skills needs and will signpost innovating businesses to others best placed to address skills shortages in technical areas such as to the higher and further education sectors, the doctoral training centres, or other training providers.

Successful outcomes of our work on innovation talent and skills will see:

- more innovative businesses in the UK recognising and investing in their leadership and commercial skills
- industry leaders in a limited number of specialist areas identify and influence future skills provision in response to changing technologies and market demands to ensure a robust pipeline of future skills and talent.

Embedding talent and skill into growth strategy

Businesses without the required leadership and commercial skills are unable to successfully scale, even if their products and services have high potential⁴⁸. More leaders able to commercialise and scale will improve productivity and profitability in more businesses⁴⁹.

We will:

- help companies evaluate and develop their leadership and commercialisation skills
- support businesses to access talent, and learning and development, at home and abroad
- help UK companies develop the skills they need to identify, protect, manage, and exploit their intellectual property more effectively to support business growth
- embed standards into programme development and help businesses to gain skills to apply standards to further their economic, societal, and environmental impact.

Developing future technical skills

In a limited number of areas, the future benefits of transformative technology innovation will only be realised by enhancing quite specific technical skills and capabilities within companies. We will gather evidence from partners in our future economy thematic areas and relevant priority sectors and provide feedback to businesses, training providers and funders on skills implications to help ensure both current and future skills gaps are met. This builds on the work of Gatsby Charitable Foundation and the Catapults on skills value chain, as flagged in the Government's *Innovation Strategy*. The UK government recognises the importance of employers being at the heart of identifying and filling skills gaps⁵⁰. Supporting innovating business to access programmes will lead to more strongly growing innovative businesses and help to draw in inward investment.

We will:

- provide a framework, building on the work of the skills value chain, to help industry in a limited number of specialised innovation areas identify future skills shortfalls and explore with stakeholders how such gaps could be addressed
- work with universities and public sector research establishments to identify potential programmes for encouraging academic and technical talent into industry, including secondments, postgraduate programmes, fellowships, and the Technician Commitment⁵¹.

Delivering advanced therapy skills

The Cell and Gene Therapy Catapult has co-ordinated development of innovative apprenticeship programmes supported by industry to grow specialist knowledge, technical skills and professional behaviours.

Funding has helped to support apprenticeships in advanced therapies to grow from none in 2018 to more than 140 today in 39 individual companies, many of them SMEs. Funding has also supported the new Advanced Therapies Skills Training Network that features an online training platform, innovative immersive reality tools, a network of national training centres and a career convertor tool to attract talent from declining sectors.

The UK biotech sector is experiencing strong growth. Employment in advanced therapies is expected to double by 2025. Almost £3 billion in finance was raised in 2020, and strong investment has continued into 2021.

Equality, diversity and inclusion



Diversity in *all its many forms* matters. A great idea can come from anyone. Diversity in businesses contributes to enhanced performance and commercial success. Companies with executive teams in the top quartile for gender diversity are 25% more likely to outperform their competitors on profitability than those in the lowest quartile. This rises to 36% for ethnic diversity⁵². Greater representation from different backgrounds, experiences, perspectives, economic circumstances, women, disabled people, black and other ethnic minorities in business innovation is a huge opportunity for positive economic and societal impact in the UK.

Innovate UK's *Supporting Diversity and Inclusion in Innovation*⁵³ report highlighted significant potential for widening participation in business innovation. The *Rose Review* says increasing female entrepreneurship in the UK could add £250 billion to the economy⁵⁴, while the Federation of Small Businesses report *Unlocking Opportunity* highlights how ethnic minority firms in the UK are more likely to have innovated in product or service and are more likely to export than other businesses⁵⁵.

Lack of diversity in innovation has consequences. Biases unintentionally embedded in artificial intelligence systems or present in underlying machine-learning training data have real-world consequences, including in areas such as recruitment and facial recognition. UK businesses lose approximately £2 billion a month by ignoring the needs of disabled customers⁵⁶.

Successful outcomes of our work on equality, diversity, and inclusion will see:

- a more diverse innovation system that values difference, excites future innovators and enables the best ideas to succeed
- more businesses driving an inclusive culture, improving the UK's ability to attract and retain the best talent and boosting competitiveness and profitability
- more innovations developed with improvements in equality, diversity, and inclusion as a goal, resulting in a higher chance of commercial success and delivering benefits to all parts of society
- a supply of more relevant data that leads to action targeted in the right places and increases inclusion.

Women in Innovation award helps AirEx tackle fuel poverty

AirEx co-founder and winner of an Innovate UK Women in Innovation award Agnes Czako has raised £2 million to support development of the company's retrofit efficiency technologies that tackle fuel poverty and climate change.

The award helped AirEx develop a smart ventilation system for draughty and poorly insulated homes that reduces heat loss without compromising damp and indoor air quality. The system optimises air flow through the home by using artificial intelligence to predict occupants' behaviour and weather patterns.

The company has already sold 2,000 units to social landlords, energy companies and retrofit installers.

Agnes said: "Our mission is to end fuel poverty by bringing comfort to everyone and to protect people's health and the planet. We would like to see AirEx deployed in millions of homes in the UK and beyond in the next decades."



Delivering a truly diverse innovation system

We must increase the diversity of upcoming innovation talent and make innovation support more visible, accessible, and inclusive to all. We must tailor what we communicate and how we communicate to different groups, as this makes a massive difference to who listens and who wants to engage.

We will:

- review processes, decision-making and the distribution of funding and support, and implement changes to incentivise and deliver increased diversity and inclusion that better reflects the demographics of the UK population
- tailor our support and communications, and work with role models and ambassadors to attract new diverse audiences
- learn from our partners, and work with networks and community-led groups to build trust with new communities and open new channels to innovation support
- encourage the innovative businesses we support to share their stories to inspire future innovators.

Attitudes and culture within UK business

There is a growing divide between a third of companies improving gender and diversity in their executive teams over the last five years and the majority either stalling or slipping backwards⁵². We need to make our message to business clear: be bold, act now, and reap the rewards.

We will:

- lead by example and support innovative businesses to fully understand the value of equality, diversity and inclusion and build it into their innovation and growth strategies.

Equality, diversity, and inclusion in new products and services

Encouraging businesses to consider diversity and inclusion in their approach to innovation includes ensuring that new products and services are designed at the outset with diversity, and diverse users, in mind.

We will:

- encourage companies to improve their product and service development by working with more diverse teams.

The right data

We need good data to target action in the right places and monitor impacts and progress. The Investing in Women Code already commits financial organisations to increase transparency of data on support for female entrepreneurs⁵⁷. The YSYS (Your Startup Your Story) #KnowYourData Campaign calls for startups and venture capitalists to collect diversity data⁵⁸. Public and private funders investing in business innovation can join forces.

We will:

- work with partners across the innovation system to develop a consistent approach to collection of equality, diversity, and inclusion data on innovation support
- address current data gaps and enable robust analysis at scale by trialling innovative approaches to gathering insights and improving our understanding of diversity in innovation.

**Be bold, act now
and reap the rewards.**



Place and levelling up

Vibrant local business clusters attract investment and talented workers and help companies to grow. Strong and innovative supply chains influence the location of global corporations. This can all lead to further investment in the skills of local people, quality jobs, and opportunity. Working together in a local supply chain to innovate and do things differently can improve productivity and enrich local economies. We support the government's levelling-up agenda, and innovation is critical to its success.

Outcomes of a successful strategy for place will see:

- local innovation strengths developed to support UK capabilities
- better connection and alignment between national and local innovation programmes and strategies
- increased local impact, greater capacity, and improved productivity in places across the UK through wider diffusion and adoption of cutting-edge technologies and greater connectivity between businesses and researchers.

Strengthening UK capability in places

We must support existing excellent local innovation strengths that are critical to overall UK capability, for example through investments in strategic infrastructure such as the Catapult network, or building clusters of excellence through UKRI's challenge programmes.

We will:

- ensure that place is a consideration in decision-making on major innovation programme investments
- consult across the UK when we consider major new programmes
- ensure that our pool of independent expert assessors is drawn from across the whole of the UK
- inform our decisions with the most robust datasets and analysis available on local strengths and opportunities, and improve frameworks needed to deliver this.

Connecting national to local

We need local and national business support to work together. Businesses are often aware of support available locally but may need better signposting and awareness of national and specialist support. We must make it easier for businesses to find the best support, whether local or national, from a perspective of broad economic geographies rather than narrow local authority boundaries.

We will:

- build greater coherence between national economic plans, local industrial strategies and the Government's innovation strategy by working with colleagues in the government's Cities and Local Growth Unit, Department for International Trade, British Business Bank, local business chambers, Intellectual Property Office and other business groups
- integrate our UK-wide offers into the local gateways for business provided by growth hubs and devolved-nation agencies
- build local-to-national-to-international networks by harnessing the resources and connections of our Innovate UK EDGE, KTN and the Catapults.

Driving local impact

The needs of clusters of innovative businesses will vary from place to place, and we must tailor our support to build capacity, stimulate greater connectivity between local businesses and the research base and to improve productivity.

We must make sure local businesses are aware of new knowledge, skills, and cutting-edge technologies and use them to deliver greater productivity and economic impact.

We will:

- deliver existing place-based programmes and develop new ones with our partners
- support local leaders across the UK as they develop innovation strategies, and seek opportunities for alignment and co-creation wherever possible
- help local businesses to exploit the UK-wide capability of the Catapult network
- research with partners the skills needed locally to support business innovation and growth.



Research and innovation cluster brings £172 million to South Wales

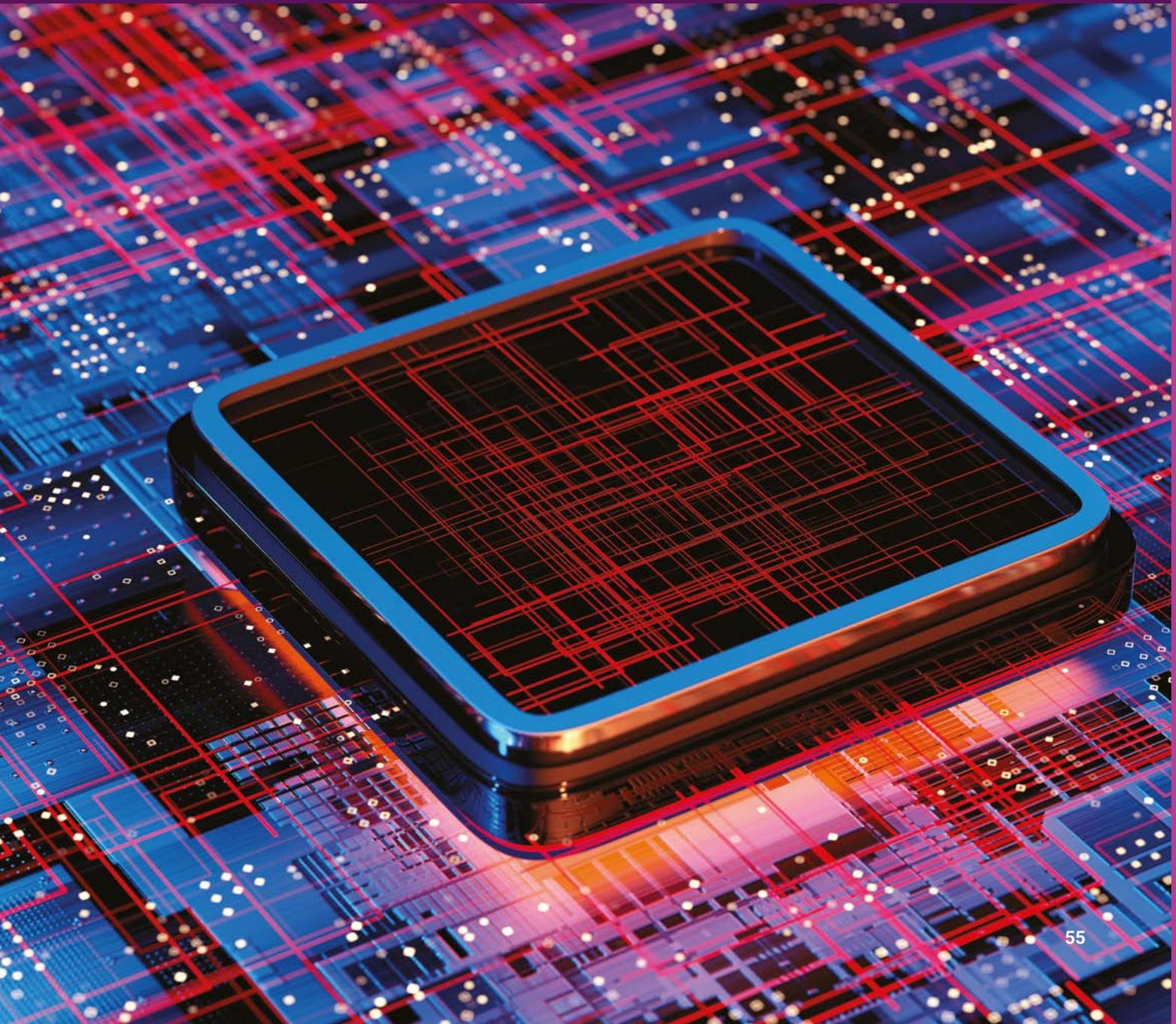
A business and research cluster in South Wales built around innovative new compound semiconductors contributed around £172 million to the Welsh economy in 2020 and is supporting 2,100 jobs.

Semiconductors are at the heart of many modern technologies such as smart phones. The latest compound semiconductors are more complex to manufacture but offer greater performance than silicon semiconductors.

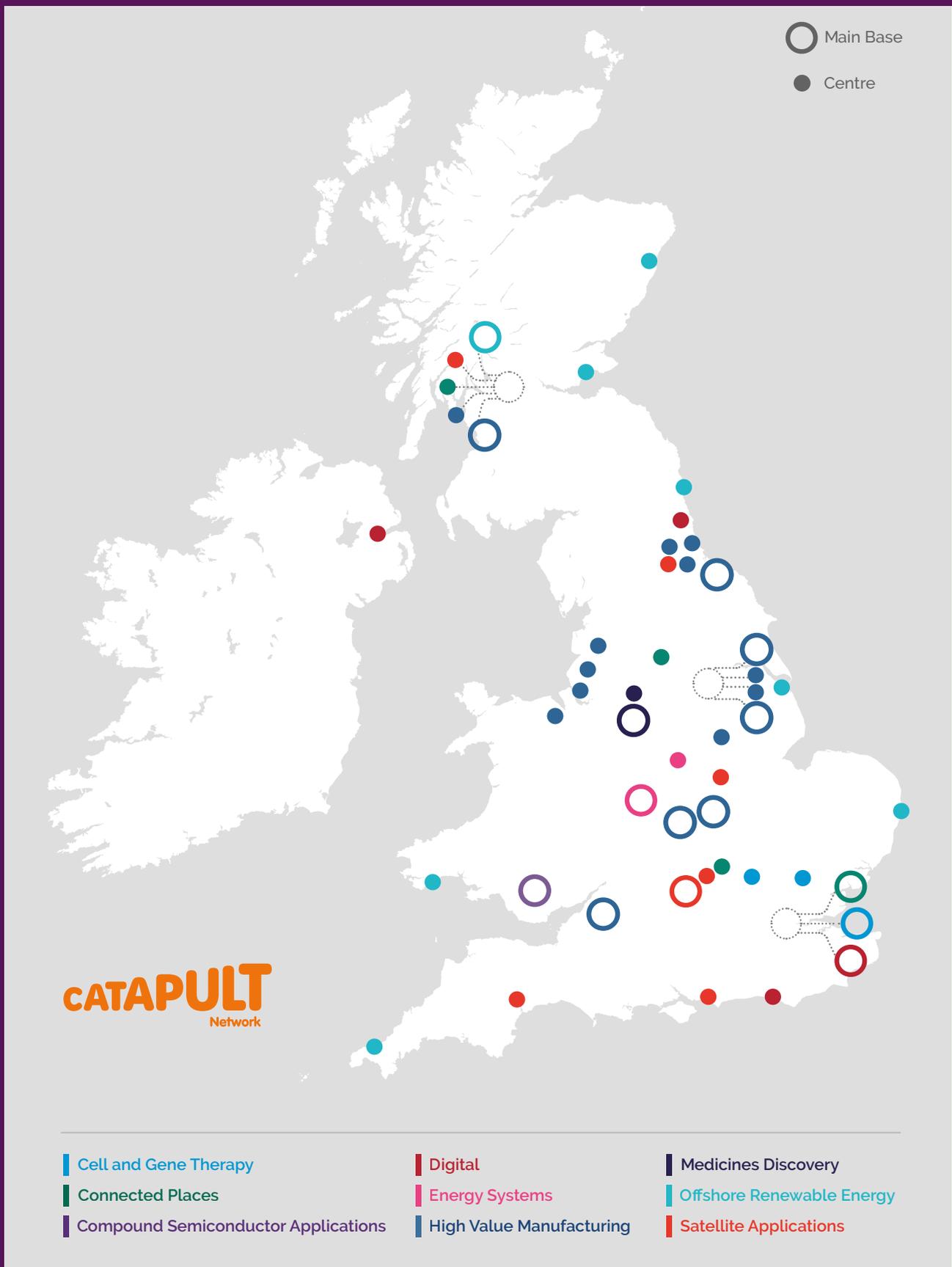
The Compound Semiconductor Centre was created as a joint venture by IQE plc and Cardiff University, and Innovate UK invested £50 million in the establishment of the Compound Semiconductor Applications Catapult.

Other investments have included £10 million from the Engineering and Physical Sciences Research Council for a compound semiconductor hub at Cardiff University and £37.9 million from the Cardiff capital Region City Deal into a state-of-the-art foundry.

The region successfully won £25 million from UK Research and Innovation's Strength in Places Fund in 2019, which is expected to bring in a further £19 million from other sources.



Catapults: access to expertise and equipment and across the UK



Our partners and associated bodies

This document has been developed with partners, and will be implemented through close working with them, including:

BEIS: government department responsible for business and innovation

British Business Bank: government-owned business development bank dedicated to making finance markets work better for smaller businesses

BSI (British Standards Institution): the UK's national standards body and representative in international standards

Catapults: the Catapults are research and technology centres that provide companies access to a critical mass of expertise and equipment 'under one roof'

Defence and Security Accelerator (DASA): finds and funds exploitable innovation for UK defence and security and boosts UK prosperity, including running SBRI calls in the defence and security arena

Defence Science and Technology Laboratory (DSTL): the UK's primary body for defence S&T capability

Intellectual Property Office: the official government body responsible for intellectual property rights in the UK

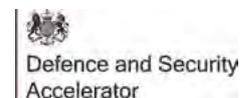
Knowledge Transfer Network: builds communities and networks in areas of strategic importance to the UK

National Laboratory Alliance: a collection of 10 public sector research establishments (such as NPL, AWE, FERA and Met Office) with deep expertise in applied science. They have much to offer in support of UK business innovation

National Measurement System: the technical and organisational infrastructure which ensures a consistent and internationally recognised basis for measurement in the UK

National Physical Laboratory: the UK's National Metrology Institute, responsible for UK metrology infrastructure and a primary contributor to the development of the National Measurement System

UK Research and Innovation: the body, that includes Innovate UK, that provides most public sector research and innovation funding in the UK



Measurement expertise saves business £900,000 a year

Scottish textile and clothing manufacturer Johnstons of Elgin created new quality standards for the finish of its cashmere and could realise £900,000 in savings once they are industrialised.

The company worked with the National Physical Laboratory under the Analysis for Innovators funding scheme. Analysis for Innovators gives companies access to world-leading research and development facilities to improve their products and processes by solving technical analysis or measurement problems that are holding back innovation.

The company said the project improved its on-time in-full delivery and brought measurement and surety to what used to be an artisan process. It added that the quality and repeatability of finish was admired by competitors and differentiated it for its customers.

Appraisal and evaluation

Global opportunities for business, and the demand for public sector innovation support, are immense. We must prioritise our resources.

We will take account of:

- the size of the opportunity – the size of the accessible global market
- the relative strength of UK capabilities, in both industry and academia – compared to other territories
- whether it is the right time for business to act
- added-value – whether the case for public sector intervention is strong, including consideration of the wider environmental and societal impacts.

How we will monitor progress

Ours is an outcomes-based approach. We are explicit on what we aim to achieve (the outcomes and impact) and will ensure that all activities (the things we do) aim to deliver the agreed outcomes.

This approach allows us to determine outcomes and performance indicators for the key strands (themes and foundations) and the overarching approach. We will assess our progress and success in delivering over the four years. For example, where our activity funds an innovation project in a business, we would expect the output to be increased knowledge and skills, and the progression of an innovation towards market. Over time, these outputs would be converted into business growth, measured through increases in turnover or profit, and perhaps employment growth.

The cumulative impact of these outcomes would be wider economic growth measured through UK gross value added, and, in some instances, wider societal and environmental impacts.

We will set out a clear framework to measure our progress, and commission independent rigorous evaluation of the work's impact. To date, this has been done at the level of individual programmes. We will continue those detailed evaluations, but will also evaluate the successes and challenges of our work overall during the four-year period. This might mean evaluating the wider societal impacts of our programmes, for example on net zero carbon emissions, as well as on business growth.



How we will support businesses

The barriers to innovation are numerous. They can be there at the first idea, right through to turning it into a commercial success.

No one intervention can overcome every barrier, but many can be overcome if a range of appropriate tools are deployed. We will continue to make connections, enable access to equipment and expertise, provide financial support through grants and loans, and support technology transfer and outreach to help the best innovators with the very best ideas to grow their businesses in the most promising global markets.

Businesses compete for our financial support, and we will use expert and independent assessors to help us evaluate the relative merits of the many ideas we receive. We are reviewing our application and assessment processes to ensure they maximise our ability to fund the most promising applications whilst minimising the burden of application on businesses.

For simplicity we deploy existing tools, but if none of these would be effective, we create new tools. The main Innovate UK tools are listed below:

Analysis for Innovators: metrology support to solve product quality or production problems

Catalyst: thematic investment across the full range of technology or market maturities

Catapults: create a critical mass of expertise and equipment in a priority area

Collaborative research and development: longer projects with partners to develop an idea in a useful direction

Design Foundations: early-stage human-centred design project

Eureka: network supporting global research and development and innovation collaboration

Feasibility studies: short projects to test an early-stage idea to establish its merit

Future Leader Fellowship: strategic investment in an individual with high-potential innovation ideas

Global Business Innovation Programmes: help high growth businesses explore global innovation opportunities

Global Expert Missions: deep dives to scope future global innovation opportunities

Global Incubator Programme: immersion programme to equip high growth businesses for international markets

ICURE: decision-making and company launch support for early-stage researchers

Innovation and knowledge centres: university-based innovation centres, acting as nucleating points for an emerging industry

Industrial Strategy Challenge Fund: challenge programme in a strategic area of importance

Innovate UK EDGE: bespoke growth services for companies looking to grow and scale

How we will support businesses

Innovation Loan: a business loan supporting late-stage research and development

Innovation networks: communities of practice in a given area, convened by the Knowledge Transfer Network

Investor Partnership: programme aligning public grant and private enterprise investment

Knowledge Transfer Network: builds innovation communities and networks

Knowledge Transfer Partnership: transfers knowledge through the movement of people (usually from academia into business)

Launchpad: topic-centric investment to strengthen business capability in a particular location

SBRI (Small Business Research Initiative): research and development procurement driven by government policy objectives

Smart: topic agnostic grant funding competition

Technology roadmap: document laying out options and actions to achieve sector growth

Women in Innovation Awards: innovation grant to support women innovators

Young Innovators Awards: innovation grant to support young innovators

The main partner tools in support of this plan for action are listed below:

BBB: equity and debt provision to business

BSI: creation and dissemination of consensus knowledge through national or international standards

DASA: wide range of science and technology capabilities, technology foresighting, SBRI

DSTL: wide range of science and technology capabilities, technology foresighting, SBRI

IPO: IP training, Global IP Attachés, patent trend landscape analysis

National Physical Laboratory and wider National Measurement System: wide range of analytical technologies, development of new measurement standards

PSRE/NLA: wide range of science and technology capabilities

UKRI: research funding, impact accelerator accounts, industry clubs, innovation and knowledge centres, Catalysts

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