



HM Government

# Industrial Strategy

Building a Britain fit for the future



**INDUSTRIAL  
STRATEGY**

# Foreword from the Prime Minister



10 DOWNING STREET  
LONDON SW1A 2AA

*Over the last seven years, we have made huge progress in restoring our public finances and rescuing our economy from the brink of bankruptcy. Thanks to the sacrifices of the British people, the deficit is now down two-thirds since 2010, the unemployment rate is at its lowest in over 40 years and we have had 19 continuous quarters of economic growth.*

We should take enormous pride in these achievements and the difference they are making for many families and businesses in our country. But at the same time, we must also recognise there are some communities which have struggled to keep pace with changes in the global economy and as a result not fully shared in the prosperity that growth has delivered.

For me it is not enough to see growth in the national economy if your local economy is shrinking. It is not ambitious enough to have record jobs growth, unless those jobs are secure and delivering real growth in wages. And we are not fulfilling Britain's potential if, despite having scientists and universities renowned the world over, we cannot turn their ideas into the products and services on which the industries of the future will be built.

That is why one of my first actions as Prime Minister was to begin the development of a modern Industrial Strategy that would help businesses to create high quality, well paid jobs right across the country. This document is a vital step in delivering that vision. More than just a set of announcements, it heralds a new approach to how government and business can work together to shape a stronger, fairer economy. At its heart it epitomises my belief in a strong and strategic state that intervenes decisively wherever it can make a difference. It is rooted in the conviction that a successful free-market economy must be built on firm foundations: the skills of its workers, the quality of the infrastructure, and a fair and predictable business environment. And where these are missing it takes energy and partnership between government and the private sector to address the problems.

That is exactly what this Industrial Strategy aims to do. It will help young people develop the skills they need to do the high-paid, high-skilled jobs of the future. It backs our country for the long-term: creating the conditions where successful businesses can emerge and grow, and helping them to invest in the future of our nation. And it identifies the industries that are of strategic value to our economy and works to create a partnership between government and industry to nurture them. In doing so, it will help propel Britain to global leadership of the industries of the future - from artificial intelligence and big data to clean energy and self-driving vehicles.

Two centuries ago it was our industrial revolution which led the world. Thirty years ago, it was our bold, pro-market reforms which set an example for others to follow. Today, our ambition is just as high. As we leave the European Union and forge a new path for ourselves, so we will build a Britain fit for the future and fulfil the mission that I set on my first day as Prime Minister: to make our United Kingdom a country that truly works for everyone.



**The Prime Minister**

A handwritten signature in blue ink, which appears to be 'T. May', written on a white background.

# Foreword from the Secretary of State

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*We are at one of the most important, exciting and challenging times in the history of global enterprise.*

Powered by new technologies, the way we live our lives as workers, citizens and consumers is being transformed across the world.

Britain is extraordinarily well-placed to benefit from this new industrial revolution. We are an open enterprising economy, built on invention, innovation and competition. Our universities and research institutions are among the best in the world. We have a deserved reputation for being a dependable and confident place to do business, with high standards, respected institutions, and the reliable rule of law. We have achieved near historic levels of employment. We are a crossing point for the world because of our geographic position, the English language, our strong ties, our openness to ideas and our vibrant culture. We have many industries - from financial services to advanced manufacturing, from the life sciences to the creative industries - which are world leading.

To benefit from the opportunities before us, we need to prepare to seize them. This would be needed at any time, and Britain's decision to leave the European Union makes it even more important.

More decisions about our economic future will be in our own hands, and it is vital that we take them.

In our Industrial Strategy we set out how we will build on our strengths, extend them into the future and capitalise on the opportunities before us.

A serious strategy must also address the weaknesses that keep us from achieving our full potential.

For all the excellence of our world-beating companies, the high calibre of our workforce and the prosperity of many areas, we have businesses, people and places whose level of productivity is well below what can be achieved.

By improving productivity while keeping employment high, we can earn more - raising living standards, providing funds to support our public services and improving the quality of life for all our citizens.

So this Industrial Strategy deliberately strengthens the five foundations of productivity: ideas, people, infrastructure, business environment and places.

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As well as setting a path to improved productivity, our Industrial Strategy sets out four areas where Britain can lead the global technological revolution.

These four Grand Challenges - in artificial intelligence and big data; clean growth; the future of mobility; and meeting the needs of an ageing society - have been identified on the advice of the our leading scientists and technologists. They will be supported by investment from the Industrial Strategy Challenge Fund and matched by commercial investment.

Our Industrial Strategy will inform decisions now, and in the future. Other countries have benefited from establishing policies and institutions which endure. That is our aim. Through the consultation on our Green Paper, over 2,000 organisations from all parts of the United Kingdom have helped shape this strategy.

That partnership with innovators, inventors, job creators, local leaders, the devolved administrations, workers and consumers will continue as we work together to make our country fit for the future.



**Rt Hon Greg Clark MP**

Secretary of State for Business,  
Energy and Industrial Strategy

A handwritten signature in white ink that reads "Greg Clark". The signature is stylized and cursive, with the first letters of "Greg" and "Clark" being larger and more prominent.

# Overview: We will create an economy that boosts productivity and earning power throughout the UK

## Our five foundations align to our vision for a transformed economy



## We will set Grand Challenges to put the United Kingdom at the forefront of the industries of the future:



### AI & Data Economy

We will put the UK at the forefront of the artificial intelligence and data revolution



### Clean Growth

We will maximise the advantages for UK industry from the global shift to clean growth



### Future of Mobility

We will become a world leader in the way people, goods and services move



### Ageing Society

We will harness the power of innovation to help meet the needs of an ageing society

## Key policies include:

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### Ideas

- ▶ Raise total research and development (R&D) investment to 2.4 per cent of GDP by 2027
- ▶ Increase the rate of R&D tax credit to 12 per cent
- ▶ Invest £725m in new Industrial Strategy Challenge Fund programmes to capture the value of innovation

### People

- ▶ Establish a technical education system that rivals the best in the world to stand alongside our world-class higher education system
- ▶ Invest an additional £406m in maths, digital and technical education, helping to address the shortage of science, technology, engineering and maths (STEM) skills
- ▶ Create a new National Retraining Scheme that supports people to re-skill, beginning with a £64m investment for digital and construction training

### Infrastructure

- ▶ Increase the National Productivity Investment Fund to £31bn, supporting investments in transport, housing and digital infrastructure
- ▶ Support electric vehicles through £400m charging infrastructure investment and an extra £100m to extend the plug-in car grant
- ▶ Boost our digital infrastructure with over £1bn of public investment, including £176m for 5G and £200m for local areas to encourage roll out of full-fibre networks

### Business Environment

- ▶ Launch and roll-out Sector Deals - partnerships between government and industry aiming to increase sector productivity. The first Sector Deals are in life sciences, construction, artificial intelligence and the automotive sector
- ▶ Drive over £20bn of investment in innovative and high potential businesses, including through establishing a new £2.5bn Investment Fund, incubated in the British Business Bank
- ▶ Launch a review of the actions that could be most effective in improving the productivity and growth of small and medium-sized businesses, including how to address what has been called the 'long tail' of lower productivity firms

### Places

- ▶ Agree Local Industrial Strategies that build on local strengths and deliver on economic opportunities
- ▶ Create a new Transforming Cities fund that will provide £1.7bn for intra-city transport. This will fund projects that drive productivity by improving connections within city regions
- ▶ Provide £42m to pilot a Teacher Development Premium. This will test the impact of a £1000 budget for high-quality professional development for teachers working in areas that have fallen behind

**We will ensure our Industrial Strategy will endure by creating an independent Industrial Strategy Council that will assess our progress and make recommendations to the government.**



Technological innovations are transforming how we live and work

## The challenge for the future

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*The United Kingdom is a successful, competitive, open economy.*

We have many strengths on which we can build, and some weaknesses we need to address. As we leave the European Union we need to raise our game at home and on the world stage. This can be done if we seize the opportunities of the years ahead - and it is essential if the British people are to enjoy prosperous lives with fulfilling work and high quality public services.

At the same time, the world is changing in fundamental ways. Technological innovations are transforming how we live and work. The proportion of older

people in our society is growing. The way we generate and use energy is changing rapidly.

The Industrial Strategy sets out how we are building a Britain fit for the future - how we will help businesses create better, higher-paying jobs in every part of the United Kingdom with investment in the skills, industries and infrastructure of the future. It ensures that our country and its citizens can embrace and benefit from the opportunity of technological change.

Our vision is for:

- ▶ the world's most innovative economy
- ▶ good jobs and greater earning power for all
- ▶ a major upgrade to the UK's infrastructure
- ▶ the best place to start and grow a business
- ▶ prosperous communities across the UK

To achieve this, we must ensure every part of our country realises its full potential. We are taking action now, including making the biggest ever increase in public investment in research and development, establishing a new fund to drive productivity by improving connections within city regions, and agreeing Sector Deals which will drive transformation in investment and productivity across the economy.

This Industrial Strategy is for the long term. It provides a policy framework against which major private and public sector investment decisions can be made with confidence. It is a strategy that is being implemented with, not just for, British enterprise - with the full involvement of innovators, investors, job creators, workers and consumers in England, Scotland, Wales and Northern Ireland.

It is also a strategy that recognises and respects the devolution settlements of Scotland, Wales and Northern Ireland. With many of the policies that can drive productivity being devolved, it is a strategy that necessarily brings our work together with that of the devolved administrations as we work in partnership to get the best possible outcome for every part of the UK.

The strategy set out in this paper is the work of many people, businesses, local leaders and institutions. It builds on nearly 2,000 formal responses to the public consultation on our Green Paper, *Building our Industrial Strategy*<sup>1</sup>, from all types of organisation, sectors of the economy, groups of businesses and individuals - and many thousands of contributions through our programme of engagement throughout the UK over the last 10 months.

# Our approach

*Our consultation reinforced the importance of five foundations of productivity – the essential attributes of every successful economy.*

These are **Ideas, People, Infrastructure, Business Environment** and **Places**. Our focus on them responds to the detailed feedback to the Green Paper.

Our five foundations align to our vision for a transformed economy – a transformation that is already taking place and will accelerate over the course of the coming decades:

Through this process we have also identified Grand Challenges which we will set for the UK government and wider economy. These are in response to global forces that will shape our rapidly changing future, and which the UK must embrace to ensure we harness all the opportunities they present. The Grand Challenges commit to:

- ▶ put the UK at the forefront of the artificial intelligence and data revolution;
- ▶ maximise the advantages for UK industry of the global shift to clean growth;
- ▶ become a world leader in shaping the future of mobility; and
- ▶ harness the power of innovation to help meet the needs of an ageing society.

Our foundations and Grand Challenges are set out in the sections that follow. This strategy also refers to a number of policies that will be added to over time to support the foundations and drive the UK's transformation.

## Our five foundations



### Ideas

the world's most innovative economy



### People

good jobs and greater earning power for all



### Infrastructure

a major upgrade to the UK's infrastructure



### Business Environment

the best place to start and grow a business



### Places

prosperous communities across the UK

We will:

### Ideas

- ▶ raise total research and development (R&D) investment to 2.4 per cent of GDP by 2027;
- ▶ increase the rate of R&D tax credit to 12 per cent;
- ▶ invest £725m in new Industrial Strategy Challenge Fund programmes to capture the value of innovation;

### People

- ▶ establish a technical education system that rivals the best in the world to stand alongside our world-class higher education system;
- ▶ invest an additional £406m in maths, digital and technical education, helping to address the shortage of science, technology, engineering and maths (STEM) skills;
- ▶ create a new National Retraining Scheme that supports people to re-skill, beginning with a £64m investment for digital and construction training;

### Infrastructure

- ▶ increase the National Productivity Investment Fund to £31bn, supporting investments in transport, housing and digital infrastructure;

- ▶ support electric vehicles through £400m charging infrastructure investment and an extra £100m to extend the plug-in car grant;
- ▶ boost our digital infrastructure with over £1bn of public investment, including £176m for 5G and £200m for local areas to encourage roll out of full-fibre networks;

### Business Environment

- ▶ launch and roll-out Sector Deals - partnerships between government and industry aiming to increase sector productivity. The first Sector Deals are in life sciences, construction, artificial intelligence and the automotive sector;
- ▶ drive over £20bn of investment in innovative and high potential businesses, including through establishing a new £2.5bn Investment Fund, incubated in the British Business Bank;
- ▶ launch a review of the actions that could be most effective in improving the productivity and growth of small and medium-sized businesses, including how to address what has been called the 'long tail' of lower productivity firms;

### Places

- ▶ agree Local Industrial Strategies that build on local strengths and deliver on economic opportunities;
- ▶ create a new Transforming Cities fund that will provide £1.7bn for intra-city transport. This will fund projects that drive productivity by improving connections within city regions; and
- ▶ provide £42m to pilot a Teacher Development Premium. This will test the impact of a £1000 budget for high-quality professional development for teachers working in areas that have fallen behind.

These policies, alongside the many others set out in this document, are the first strategic actions of a long-term approach to transform our levels of productivity and our earning power as a nation, as businesses, as places, and as individuals. We are ready to be judged on our performance in implementing them.



We will agree Local Industrial Strategies that identify and build on strengths across the country

# Grand Challenges

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*We will set Grand Challenges to put the United Kingdom at the forefront of the industries of the future.*

The world is undergoing a technological revolution. Artificial intelligence (AI) will transform the way we live and work, from the way we diagnose and treat cancer to the security of online transactions. This fourth industrial revolution is of a scale, speed and complexity that is unprecedented. The first industrial revolution mechanised production using water and steam power; the second created mass production using electric power; the third automated production using electronics and information technology. This fourth revolution is characterised by a fusion of technologies that is blurring the lines between the physical, digital and biological worlds<sup>15</sup>. It will disrupt nearly every sector in every country, creating new opportunities and challenges for people, places and businesses to which we must respond.

This is not the only seismic global change to which the UK needs to respond. We owe it to ourselves and future generations to lower carbon emissions and move towards cleaner growth; we are facing a fundamental demographic shift as our population ages; and we are on the cusp of a profound shift in how we move people, goods and services around our towns, cities and countryside.

We need to make the most of the global market opportunities these changes

present. We must also embrace the technological advances that improve productivity across many sectors, as well as the quality of our everyday lives.

A truly strategic government must do more than just fix the foundations: it must also plan for a rapidly changing future, look to shape new markets and industries, and build the UK's competitive advantage. The public and private sector must work with universities, researches and civil society to put the UK at the forefront of these revolutions, breaking down conventional barriers within and between business sectors and academic disciplines. This is what the Grand Challenges will achieve.

History shows governments around the world have taken advantage of global challenges. In the 1970s, the UK government was instrumental in developing the North Sea oil and gas industry. More recently, thanks to tailored public support, the UK has built the largest off-shore wind capacity of any country<sup>16</sup> and developed world class gene sequencing technologies.

Overseas, Germany's Industrie 4.0<sup>17</sup> is an example of a government helping prepare the country to take advantage of major trends, while in the United States the Defense Advanced Research Projects Agency (DARPA) and other



public research institutions have played a significant role in developing the technologies behind the internet and smartphone, spurring the growth of entire new markets. Other countries are already looking to capitalise upon the fourth industrial revolution. Japan, for example, has deliberate strategies to prepare for and to embrace these transformational changes in technology.

The ability to meet our Grand Challenges rests on broad capabilities. The DARPA programme has been effective because it is part of a much wider research and development (R&D) effort. Our capacity to act nimbly and effectively depends on maintaining capacities across a wide range of technologies and disciplines.

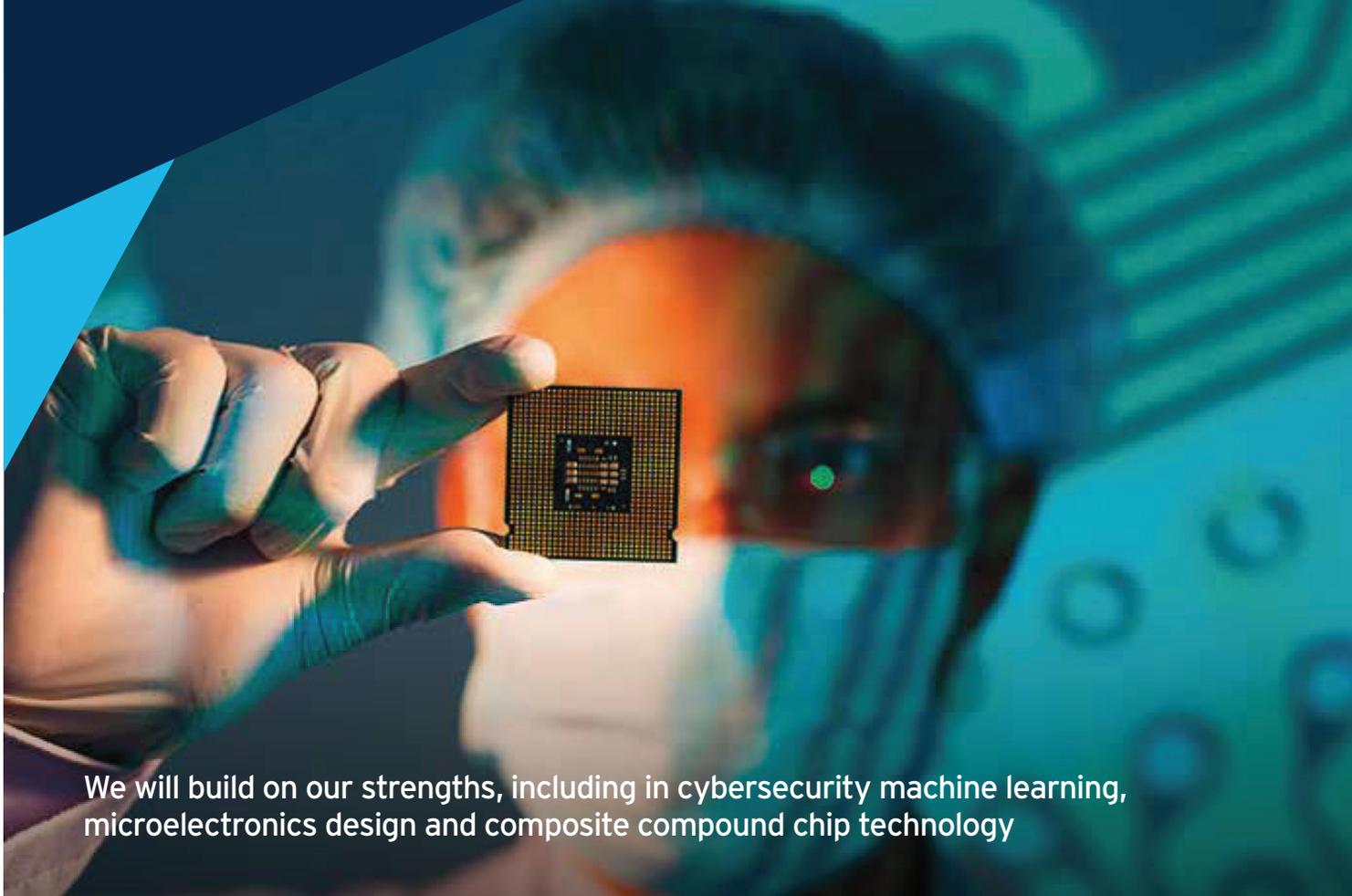
We can engage now with the challenge of AI because of previous investments in high performance computing. Similarly, we can rise to the challenge of an ageing society because we have already invested in resources such as the UK Biobank, which tracks the health information of 500,000 volunteers<sup>18</sup>, and we have a lead in understanding the interaction between genes and environment.

We must continue to support a broad range of key capabilities and emerging technologies.

We also need to be clear where our distinctive advantages lie. We will build on our existing strengths, from cybersecurity, machine learning, microelectronics design and composite compound chip technology to biotechnologies and life sciences such as genetics and cell therapies. At the same time we must develop new strengths in emerging sectors. We must do this as a partnership between businesses, scientists, investors, educators and policy makers to take full advantage of the transformational potential of these trends to improve people's lives, their work and the nation's productivity.

This partnership must be UK-wide, embracing our four nations. The UK government needs to work in collaboration with the governments and businesses of Scotland, Wales and Northern Ireland. Just as we committed in the Green Paper to holding ministerial forums with each devolved administration, we will work together to rise to each of the Grand Challenges.

*'A truly strategic government must do more than just fix the foundations: it must also plan for a rapidly changing future.'*



We will build on our strengths, including in cybersecurity machine learning, microelectronics design and composite compound chip technology

## What are the Grand Challenges?

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We have taken evidence from our Green Paper consultation, and worked with scientific leaders - the Government Office for Science, UK Research and Innovation (the Research Councils and Innovate UK), the Council for Science and Technology and the national academies - to identify four Grand Challenges. We will:

- ▶ put the UK at the forefront of the artificial intelligence and data revolution;
- ▶ maximise the advantages for UK industry from the global shift to clean growth;
- ▶ become a world leader in shaping the future of mobility; and

- ▶ harness the power of innovation to help meet the needs of an ageing society.

We must not expect that every individual action will bring guaranteed or immediate success. Through inviting competing proposals and ideas, the government will identify, support and fund a range of promising projects. We must not let a fear of failure make us unimaginative or risk averse. The government must be willing to back a broad portfolio of risky initiatives rather than be constrained by the possibility of individual failures.

To respond to the Grand Challenges, business, academia, civil society and

the government must work together, bringing their expertise and entrepreneurial spirit, to drive us all towards success. By setting out strategic visions and a positive role for government we hope to attract the engagement of some of the brightest minds from across the private and public sectors. For each Grand Challenge, we will ask leading figures from industry and academia to act as expert advisors, led by a 'Business Champion'. Working alongside ministers, these figures will be responsible for engaging a diverse range of industry voices and raising the profile of the challenge. They will advise on how to make the most of the global opportunity it presents and review how we can work together to respond to it – such as improving supply and increasing demand in nascent markets, and ensuring that innovations can diffuse and scale. We will look to appoint Business Champions and external advisers in early 2018.

We will ensure that the government makes the most of all its policy levers to achieve success. Levers include regulations, funding and Sector Deals.

We will also direct the government's convening power, promote exports and inward investments, and build consumer trust in new technologies. Where appropriate, teams will develop 'missions' to tackle the Grand Challenges. They involve tackling specific problems, such as reducing carbon emissions by a given percentage over a specific year period<sup>19</sup>, using well defined and concrete goals to allow progress to be monitored and assessed, and the option to change course when appropriate.

Progress on each Grand Challenge will be regularly reviewed to ensure that policies are having the desired impact, we are focusing on the correct issues, and we are aware of any changes in the UK's advantage over other countries.

In the next section we set out some early priorities for each of the four Grand Challenges. These will be developed in more detail with the Grand Challenge teams over the coming months including setting missions where appropriate.



*'Business, academia, civil society and the government must engage together, bringing their expertise and entrepreneurial spirit, to drive us all towards success.'*



SecondHands is a research project led by Ocado Technology that aims to design a collaborative robot that can offer help to maintenance technicians working in Ocado's highly automated grocery warehouses

## Growing the AI & Data-Driven Economy

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*We will put the UK at the forefront of the AI and data revolution.*

Artificial intelligence and machine learning are general purpose technologies already starting to transform the global economy. They can be seen as new industries in their own right, but they are also transforming business models across many sectors as they deploy vast datasets to identify better ways of doing complex tasks - from helping doctors diagnose medical conditions more effectively to allowing people to communicate across the globe using instantaneous speech recognition and translation software.

Embedding AI across the UK will create thousands of good quality jobs and drive economic growth. A recent study found digital technologies including AI created a net total of 80,000 new jobs annually across a population similar to the UK<sup>20</sup>. By one estimate, AI could add £232bn to the UK economy by 2030<sup>21</sup>.

We start from a position of strength. The UK is already a world leader in AI, with the building blocks to make significant advances. We have some of the best research institutions in the world and

globally-recognised capability in AI-related disciplines, including maths, computer science, ethics and linguistics. We have substantial datasets in public institutions where AI can be explored safely and securely. We have great strengths in the underpinning technologies, from ARM's microchips to the microcomputers of Raspberry Pi. UK innovators push boundaries in robotics and the internet of things. These strengths are the result of academic excellence, research ingenuity, smart business decisions, and investment by previous governments of different political persuasions.

As with previous revolutionary technologies, these changes cannot be resisted and it would be irresponsible to fail to prepare. Meeting our Grand Challenge means maximising the opportunities created by AI and advanced data technologies, and responding to the potential impacts on society. It is a call for businesses, research institutions and the government to work together throughout the UK to invest in these technologies, encourage their adoption and set standards in secure, trusted use of data.



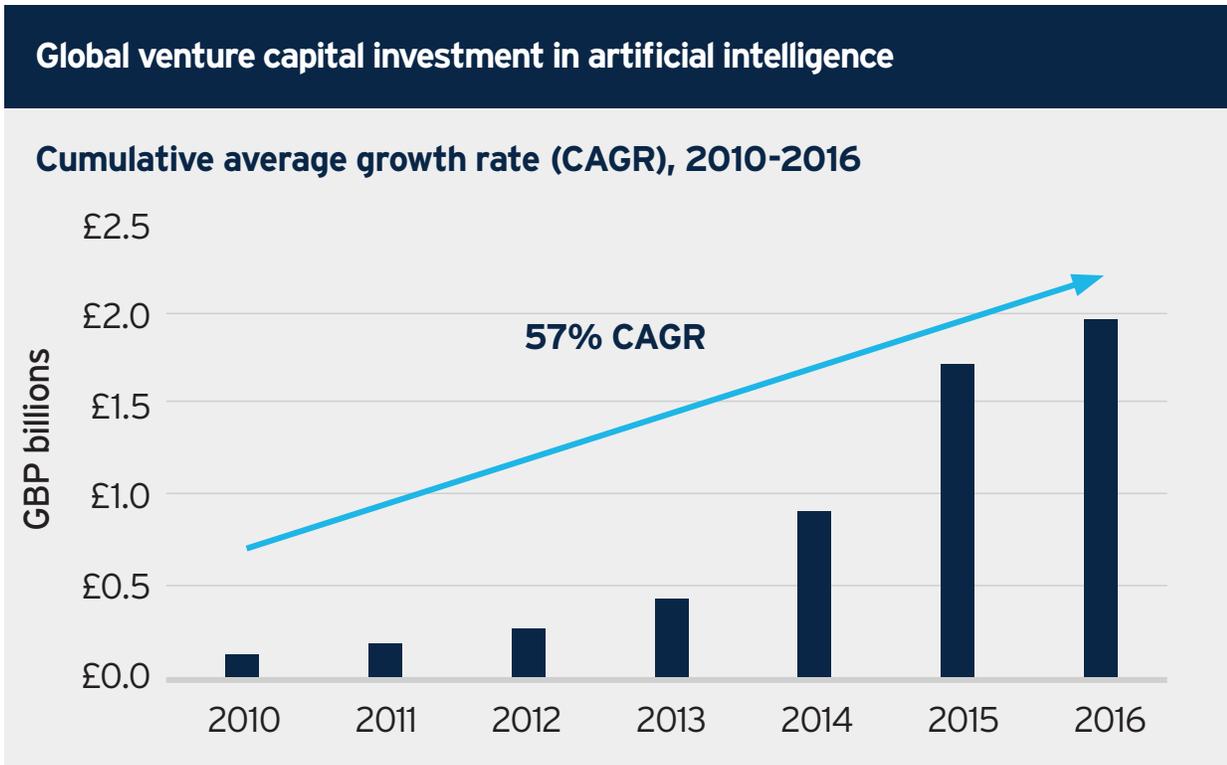
*'Embedding AI across the UK will create thousands of good quality jobs and drive economic growth. AI could add £232bn to the economy by 2030.'*

## The AI and data-driven economy

**Artificial intelligence:** technologies with the ability to perform tasks that would otherwise require human intelligence, such as visual perception, speech recognition, and language translation

**Machine learning:** a type of AI that allows computers to learn rapidly from large datasets without being explicitly programmed

**Data-driven economy:** a digitally connected economy that realises significant value from connected, large-scale data that can be rapidly analysed by technology to generate insights and innovation



Source: Hall, W. and Pesenti, J. (2017) *Growing the Artificial Intelligence Industry in the UK*. Growth is cumulative average growth rate 2010 to 2016

We must ensure that Britain is among the first countries to ensure that everyone benefits from this revolution.

An early response to this challenge is the Artificial Intelligence Sector Deal, responding to the review by Professor Dame Wendy Hall and Jérôme Pesenti, *Growing the AI Industry in the UK*<sup>22</sup>.

In consultation with a range of people with expertise in this area, we have identified four priorities for this Grand Challenge:

**We will make the UK a global centre for artificial intelligence and data-driven innovation**

We will build on our world-class research by working with industry

to develop innovative uses of AI and advanced analytic technologies through the Industrial Strategy Challenge Fund\*. For example, through the Industrial Strategy ‘Next generation of services’ project we will invest in developing applications of AI and data-driven innovation for service sectors; and, through the ‘Data to early diagnostics and precision medicine’ programme we will invest to enhance the power of health data to diagnose life-changing diseases at the earliest possible stage and develop precision treatments to cure them.

\*All wave 2 programmes are subject to final business case, when further details on funding will be made available



We will also support businesses with regulation that stimulates and facilitates innovation. Building on the 'sandbox' approaches that the Financial Conduct Authority and Ofgem, the energy regulator, have successfully implemented, we are establishing a £10m Regulators' Pioneer Fund to support UK regulators to develop innovative approaches to emerging technologies.

We will foster, attract and retain the best and brightest research talent. The Alan Turing Institute will become the national research centre for AI, supporting new Turing Fellowships. We will invest £45m to support additional PhDs in AI and related disciplines, increasing numbers by at least 200 extra places a year by 2020-21, aiming to expand the numbers in UK universities year-on-year into the next decade.

We will also develop people's skills to keep up with the speed of technological change by supporting universities and businesses to develop an industry-funded masters programme, with an initial scale of over 200 places. We will also work

with industry to explore how best to train cross-discipline professionals to apply AI in their specialist areas, for example through conversion courses and continuing professional development.

### **We will support sectors to boost their productivity through artificial intelligence and data analytic technologies**

A major source of productivity improvements comes from making the most of AI and machine learning across the economy. We are working with industry to establish an industry-led AI Council that can take a leadership role across sectors. The AI Council will be supported by a new government Office for AI. In partnership with industry and academia, these bodies will champion research and innovation, stimulate demand and accelerate uptake across all sectors of the economy. The office, working with the AI Council, will lead work to increase awareness of the advantages of advanced data analytic technologies and promote greater diversity in the AI workforce.

*'We will build on our world-class research by working with industry to develop innovative uses of AI and advanced analytic technologies through the Industrial Strategy Challenge Fund.'*

To support rapid adoption of AI technologies at scale, the Office for AI will work initially with six priority business sectors: cybersecurity; life sciences; construction; manufacturing; energy; and agricultural technology. The office will work in partnership with the new GovTech Catalyst to ensure the public sector can benefit from these technologies. It will also collaborate with partners to promote adoption, for example through the Digital Catapult's 'Machine Learning Garage' programme launching in January. This programme will provide low-cost access to high quality machine learning computation power for start-ups, and support businesses of all sizes with expertise on cost-effective machine learning computation.

As the global market expands, we will increase our export support for AI and data businesses. The Global Entrepreneur Programme will look to increase its focus on attracting AI and data-led businesses to establish headquarters in the UK.

### **We will lead the world in safe and ethical use of data and artificial intelligence giving confidence and clarity to citizens and business**

AI and data are already creating enormous opportunities for us to understand more about everything, from our health to what we like to buy. But it is vital that we remove barriers to innovation and ensure that data is used in a way that is both safe and fair to individuals.

The UK will take an international leadership role by investing £9m in a new Centre for Data Ethics and Innovation. This world-first advisory body will review the existing governance landscape and advise the government on how we can enable and ensure ethical, safe and innovative uses of data, including AI. This will include engaging with industry to explore establishing data trusts to facilitate easy and secure sharing of data. We will consult widely in due course on the detailed remit for this new centre.

We will also strengthen overall data security, reinforcing the UK's position as a global centre for cybersecurity. We will develop detailed recommendations over the next six months.

### **We will help people develop the skills needed for jobs of the future**

AI and data analytics will change jobs and businesses, and we want people to be able to capitalise on these opportunities. Our Industrial Strategy builds on our work to develop people's skills, investing an additional £406m in maths, digital and technical skills in England. This includes investing £84m over the next five years to deliver a comprehensive programme to improve the teaching of computing and drive up participation in computer science. We will up-skill 8,000 computer science teachers and work with industry to set up a new National Centre for Computing Education.



We will also promote a new adult digital skills entitlement to support basic training and our new National Retraining Scheme will help people re-skill and up-skill as the economy changes, including as a result of automation. This scheme will be informed by career learning pilots, which are testing barriers to adults engaging in learning, and the National Retraining Partnership. Initially it will focus on priority skills, including digital. As a first step, we will invest £30m to test the use of AI and innovative education technology (edtech) in online digital skills courses.

We also need to build an evidence base about how technological change may affect different sectors, groups and places. Building on the work of Skills Advisory Panels and local Digital Skills Partnerships in England, the government and industry will explore how data analytics can be used to improve our understanding of employer demand for skills.

*'AI and data are already creating enormous opportunities for us to understand more about everything, from our health to what we like to buy.'*

One of the many applications of AI and data analytics technologies is to enable more efficient use of energy and resources. For example, intelligent algorithms applied to data on atmospheric conditions and soil moisture could dramatically reduce the amount of water needed for agriculture. Actions to support our first Grand Challenge will complement the second challenge we have identified - maximising the advantages to UK industry of the global shift to clean growth.

## Artificial Intelligence Sector Deal

*The government and the artificial intelligence (AI) sector have agreed a Sector Deal to boost the UK's global position as a leader in developing AI technologies.*

Taking immediate, tangible actions to advance our AI and Data-Driven Economy Grand Challenge, this deal will anchor the UK as the go-to destination for AI innovation and investment.

AI's extraordinary potential is already well known: by one estimate it could add £232bn to the UK economy by 2030<sup>197</sup>. The UK is a recognised world leader in developing AI: Deepmind, Babylon and Swiftkey - which was backed by Innovate UK - are all globally renowned companies founded here.

The Sector Deal builds on the review by Professor Dame Wendy Hall and Jérôme Pesenti, *Growing the artificial intelligence industry in the UK*, which involved an extensive range of business leaders, academics and research councils. The review made recommendations for both the government and industry, recognising the role that the government can play in creating the conditions to support emerging sectors to grow.

The deal will establish an enduring partnership between industry, academia and the government through the UK Artificial Intelligence Council, where all partners will work together to promote the safe, fair application of this technology. The deal contains mutual commitments to encourage the responsible sharing of data to develop new value, and to ensure that the UK produces and retains the best global talent.

### What is in the deal?

#### Realising the Potential of Data

The deal recognises the critical importance of data availability, and its responsible use, to businesses at the forefront of the development of AI applications. The government and industry will work together to establish data trusts, an innovative approach to stimulating fair, safe and equitable data sharing between parties.



*'[The AI Sector Deal] will anchor the UK as the go-to destination for AI innovation and investment.'*

## **A Skilled and Diverse Workforce**

To be global leaders in the application of AI, companies must attract the talent they need. We are committed to working together to build and maintain the best AI workforce in Europe, focusing on post graduate level skills and above. We will invest £45m to support additional PhDs in AI and related disciplines, create a prestigious artificial intelligence fellowship programme and work together to develop an industry-funded masters programme.

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## **Coordination and Uptake**

For the economy to realise the benefits of AI, the sector and the government will coordinate action on solutions to shared challenges and opportunities through an AI Council, a new government Office for Artificial Intelligence, an expansion of Tech City UK to become Tech Nation and a new GovTech Fund.

**Nissan Juke production line in Sunderland**





Leeds city centre

## Our approach

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*The people best placed to drive forward local economies are those who live, work and do business in them.*

We need to harness this local insights to develop clear, long-term strategies for future growth - this approach is vital to successful local economies.

We will work in partnership with places to develop Local Industrial Strategies, which will be developed locally and agreed with the government. These strategies will help identify priorities to improve skills, increase innovation and enhance infrastructure and business growth. This will guide the use of local funding streams and any

spending from national schemes.

Local Industrial Strategies will be long-term, based on clear evidence, and aligned to the national Industrial Strategy. They will identify local strengths and challenges, future opportunities and the action needed to boost productivity, earning power and competitiveness. This might include addressing skills issues, improving infrastructure, harnessing the potential of world-class science and innovation, supporting new high-value

businesses, or identifying leading sectors to inform the development of deals.

These strategies will establish new ways of working between national and local leaders in both the public and private sectors. Universities, colleges and other local institutions will be key, as will an approach that is responsive to both local and global market conditions to provide greater long-term certainty.

We will agree the first Local Industrial Strategies by March 2019.

We will prioritise areas with the potential to drive wider regional growth, focusing on clusters of expertise and centres of economic activity.

Places in England with a Mayoral Combined Authority will have a single strategy led by the mayor and supported by Local Enterprise Partnerships. For parts of the country without a mayor, the development of the strategy will be led by the Local Enterprise Partnership. We will also discuss the suitability of this approach with the devolved administrations.

## Local leadership

Successful strategies require strong public and private leadership. We will continue to work with the new city region mayors, combined authorities, local authorities and Local Enterprise Partnerships to drive growth in England. We will continue to support locally-driven partnerships, proposals and reforms, with the aim of ensuring that economic powers are exercised at the most appropriate level and that decision-making is effective and clear.

We recognise that there are different arrangements for local government and business leadership at a regional level in each of the devolved nations. City and Growth Deals will continue to support growth and create opportunities across Scotland, Wales and Northern Ireland, and we will discuss further collaboration with each of the devolved administrations.

We now have directly elected mayors in place for a number of our English city regions, covering a third of the English population.



*'Local Industrial Strategies will be long-term, based on clear evidence, and aligned to the national Industrial Strategy.'*

The government will make available to Mayoral Combined Authorities a £12m fund for 2018/19 and 2019/20 to boost the new mayors' capacity and resources.

We have announced a deepening of the devolution deal with the West Midlands Combined Authority, which includes £6m for a housing delivery taskforce, £5m for a construction skills training scheme and a £250m allocation from the Transforming Cities Fund to be spent on local intra-city transport priorities. In addition, Greater Manchester and the government will work in partnership to develop a Local

Industrial Strategy. The government will provide a £243m allocation from the fund and will continue to work with Transport for Greater Manchester to explore future options.

We have agreed a 'minded to' devolution deal with the North of Tyne authorities, which will be subject to the consent of local partners. This will see £600m of investment in the region over a 30-year period and create a new mayor to be elected in 2019 with control over economic levers including planning and skills.

### **Case Study: Local leadership of industrial regeneration in the Tees Valley**

The government is working with the Tees Valley mayor to support the regeneration of an extensive industrial area at Redcar by the South Tees Development Corporation. This is the first Mayoral Development Corporation outside London and is promoting local economic development and inward investment on the south bank of the River Tees. The government announced £118m at the Autumn Budget 2017 to ensure the ongoing safe and secure management of the former SSI steelworks, an integral part of the wider 4,500 acre development site. This includes removing dangerous

substances left over from the SSI steel production processes and making the site attractive to private sector investment. A further £5m was announced at the same time for the South Tees Development Corporation to take forward its plan.

The South Tees Development Corporation estimates the project could create 20,000 new jobs in skilled sectors and contribute an additional £1bn per annum to the local economy. This sustained economic growth will benefit the entire Tees Valley and demonstrates the importance of the powers devolved to its mayor.

We remain firmly committed to Local Enterprise Partnerships. From next year, the Prime Minister will chair a biannual 'Council of Local Enterprise Partnership Chairs'. This will provide an opportunity for Local Enterprise Partnership leaders to inform national policy decisions.

While Local Enterprise Partnerships across the country have played an important role in supporting local growth, feedback suggests that their performance has varied<sup>213</sup>. We are reviewing the roles and responsibilities of Local Enterprise Partnerships and will bring forward reforms to leadership, governance, accountability, financial reporting and geographical boundaries. We will work with Local Enterprise Partnerships to set out a more clearly defined set of activities and objectives in early 2018.

These will be driven by influential local leaders, acting as figureheads for their area's economic success, and a clear strategy for local and national partnership.

We will agree and implement appropriate structures for holding Local Enterprise Partnerships to account. We will work with Local Enterprise Partnerships to review overlapping geographies and ensure people are clear as to who is responsible for driving growth in their area.

We recognise that in order to deliver their role effectively, Local Enterprise Partnerships need financial support. We will make additional financial resources available to Local Enterprise Partnerships that demonstrate ambitious levels of reform following the review.



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