

Section II

Government and Parliamentary Initiatives on AI in the UK

Artificial Intelligence in UK Landscape Overview Q3/ 2018

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Introduction

Introduction

The past 15 months have seen a large number of countries launch public governmental strategies to bolster their national efforts in developing and adopting AI technologies, including proposals by Canada, China, Denmark, the EU Commission, Finland, France, India, Italy, Japan, Mexico, the Nordic-Baltic region, Singapore, South Korea, Sweden, Taiwan, the UAE, and the UK. The specific focus of each country's national strategy is also fairly diverse, encompassing scientific R&D, bolstering nations' existing AI talent base, increasing levels of AI-focused education, adoption of AI technologies by public and private sectors, AI ethics, industry standards and regulations, and the development of robust data and digital infrastructures.

In April 2018 the UK government announced their AI Sector Deal, as part of the nation's broader industrial strategy, which seeks to position the nation as a leader of the global AI industry over the next several years. The strategy includes initiatives to develop increased levels of AI talent, enhance the nation's digital infrastructure, increase levels of STEM education, and increase levels of both public and private AI R&D.

Some of the specific milestones associated with the announcement include increasing private sector investment to over £300 million, the launch of a Centre for Data Ethics and Innovation (in an effort to lead global governance of AI ethics), the expansion of the existing Alan Turing Institute and the launch of new Turing Fellowships.

In 2018 the UK House of Lords Select Committee on AI also published a report, entitled “AI in the UK: ready, willing, and able?”, which summarized the results of their ten-month investigation into the economic, social and ethical implications of recent development in AI. The report includes specific policy proposals and governmental recommendations including the launch of a growth fund for SMEs involved in AI, the risk of data monopolization by technology companies, and new approaches to audit datasets. In 2018 the UK government followed-up with an official point-by-point response to the recommendations presented in the report.

Source: <https://medium.com/politics-ai/an-overview-of-national-ai-strategies-2a70ec6edfd>

Tech sector backs British AI industry with multi million pound investment

In April 2018, the launch of a £1 billion deal between the UK Government and the AI industry aiming to inject £300 million in Government funds into the AI industry in an effort to propel the nation to the forefront of the global AI industry was announced by UK Business Secretary Greg Clark and Digital Secretary Matt Hancock.

This deal builds upon the UK Government's commitment to bolster its AI industry made through the inclusion of its AI Grand Challenge as a primary component of its larger Industrial Strategy.

Experts estimate that the UK stands to increase the market cap of its AI industry to £232 billion by 2030, which would account for roughly 10% of the nation's GDP.

The deal includes the provision of £20 million to boost the UK's service industries such as law and insurance, and to launch new pilot projects to determine how AI can be adopted to their benefit, as well as £21 million to create a high-growth tech network for AI-focused entrepreneurs titled Tech Nation, which would aim to incubate mid-size AI companies.

The initiative also aims to bolster the nation's domestic AI talent-base, increasing government investments in post-graduate AI programs, with funding set aside to train 8,000 new computer science teachers, 1,000 government-subsidized AI PhDs by 2025 (aiming to produce 200 new AI PhDs per year through 2020-2021 and 1000 new PhDs by the year 2025), and to launch a Turing Fellowship program at the Alan Turing Institute to help attract the world's best AI talent to the UK, and to double Tier 1 Exceptional Talent visas to 2,000 per year.

AI Sector Deal

The AI Sector Deal marks the first tangible initiative launched under the egis of the broader AI Grand Challenge, which outlined broad proposals for how the UK government can cooperate with its AI industry in order to increase AI adoption and development and to help the nation stay ahead of its international competition.

The focus on AI ethics in the deal, including the development of £9 million Centre for Data Ethics and Innovation also highlights the government's commitment to grow its AI industry with the highest ethical standards in mind.

The center will work to address societal challenges posed by advances in AI and advise the government on appropriate measures for ensuring the safe and ethical use, and on how to protect consumers over the coming years.

The deal includes contributions from more than 50 businesses, and some specific investments and joint ventures already announced as part of the deal include:

- A joint venture between the Alan Turing Institute and Rolls-Royce to run research projects aiming to explore how data science can be applied at scale, the adoption of AI across supply chains, and the role of AI in science.
- The development of a £10 million AI supercomputer at the University of Cambridge, which will be available for use to businesses
- The launch of a European HQ by Vancouver-based VC firm Chrysalix, as well as £110 million-worth of investments into AI and robotics companies
- The launch of a European HQ by Japan-based VC firm Global Brain, as well as £35 million-worth of investments into UK deep tech startups.

Source: <https://www.gov.uk/government/news/tech-sector-backs-british-ai-industry-with-multi-million-pound-investment>

Opinions

Secretary of State for Wales **Alun Cairns** said:

“Wales is already embracing the opportunities provided by artificial intelligence to revolutionise many different areas of work, including the medical and semiconductor sectors. The deal will mean even closer cooperation between UK Government and industry in Wales, creating jobs in new fields and building a stronger, more resilient economy.”



Business and Energy Secretary **Greg Clark** said:

“Artificial intelligence provides limitless opportunities to develop new, efficient and accessible products and services which transform the way we live and work. The new deal with industry will ensure we have the right investment, infrastructure and highly-skilled workforce to establish the UK as a driving force in the development and commercial use of artificial intelligence technologies.”



Source: <https://www.gov.uk/government/news/tech-sector-backs-british-ai-industry-with-multi-million-pound-investment>

The Rosalind Franklin Institute (RFI) to transform drug discovery

On 6th June 2018 Business Secretary Greg Clark announced funding for a series of ambitious technology projects that will transform the way medicines are discovered, enabling the pharmaceutical industry to develop groundbreaking drugs faster, cheaper and better than ever before. The projects are the first wave of major initiatives for the £103 million Rosalind Franklin Institute, that was launched at the Harwell Campus, Oxfordshire.

The Rosalind Franklin Institute (RFI) will harness disruptive new technologies such as AI and robotics to dramatically improve our understanding of biology, leading to new diagnostics, new drugs, and new treatments for millions of patients Worldwide.

Business Secretary **Greg Clark** said: *“The new Rosalind Franklin Institute will lead a revolution in drug development and diagnosis to improve the lives of millions of patients. And with over 10 million people in Britain alive today expected to live to 100, now more than ever it is vital that the Government invests in the development of new technologies and techniques which will support people to have healthier lives.”*

The Institute is an independent organisation funded by the UK government through the Engineering and Physical Sciences Research Council (EPSRC) and operated by ten UK universities.

UK Research and Innovation's Chief Executive, Professor **Sir Mark Walport** said:

“The UK is home to a vibrant life sciences research community. The Rosalind Franklin Institute's strength is in bringing this together with physical scientists and engineers at the heart of a campus that fosters innovation and collaboration. Through its pioneering interdisciplinary research and the development of new technologies, it will support advances including improved drug discovery and the faster development of effective treatments for chronic conditions. Through partnership with industry, it will help ensure its insights are more rapidly translated into impacts and drive growth across the UK's important life sciences sector.”

Source: <https://epsrc.ukri.org/newsevents/news/ukinstitutedrugdiscovery/>

Chapter I:

AI and UK Government: Key Statements and Development Strategies

Key Highlights

- The UK Government is putting forward more than just money into the development of their AI industry. Besides committing more than £1 billion in joint Government-Industry funding, various UK government bodies have complemented this effort by proposing guidelines, principles and recommendations in order to guide the development of AI businesses and technologies within the nation.
- Many such proposals and guidelines focus on the need to develop AI safely and ethically, with a strong focus on informed and transparent AI governance, on maximizing the social impact of AI for the benefit of a wide variety of UK stakeholders, and in ensuring that the deliverables of the AI industry serve to promote social good and well being among as large a proportion of the nation's population as possible.
- A report released by the House of Lords Artificial Intelligence Committee has attempted to put the above motivation into action by offering five core principles for the safe and ethical development of AI in the UK in a report entitled "[AI in the UK: Ready, Willing and Able?](#)", focusing on how AI should be developed for the wider benefit of humanity, should operate according to principles of intelligibility and fairness, should not be used to reduce data rights and privacy, should include initiatives to help citizens become educated about the changes brought about through AI so that they can use them to their social benefit, and should avoid providing AI with the power to hurt, destroy or deceive human beings.
- One practical result of these efforts is the launch of several new governmental bodies tasked with providing guidance on the development of the AI industry, including the new Office for Artificial Intelligence, the Centre for Data Ethics and Innovation, and the AI Council.
- In a June 2018 report entitled "[Government response to House of Lords Artificial Intelligence Select Committee's Report on AI in the UK: Ready, Willing and Able?](#)" the UK Government has stated that "the Office for Artificial Intelligence, the future Centre for Data Ethics and Innovation and the AI Council will work together to create Data Trusts. Data Trusts will ensure that the infrastructure is in place, that data governance is implemented ethically, and in such a way that prioritises the safety and security of data and the public."

Margot James' statement on AI Sector Deal

In April 2018 the UK Minister for Digital and the Creative Industries, Margot James, offered her comments on the new AI Sector Deal in a statement made in the House of Commons, welcoming the deal and the Government's commitment to become a world leader in the global AI industry in the coming years.



Today the UK already has a formidable position in the international AI industry, and was ranked first among OECD countries in Oxford Insights' AI Government Readiness Index.

It is home to some of the more reputable AI companies, including Deepmind, Swiftkey and Babylon Health, a position which is supported by a number of factors including the UK's reputation for forming strong collaborative relationships between companies and world-class academic institutions and universities, the strength of its AI-focused VC market, and trusted public institutions committed to staying abreast of data-driven innovations and the application of AI for the broader public good, like the NHS.

The Minister told the House that the AI sector deal was just the start of the UK's plans to “*seize the opportunities of modern technology*” and ensuring that the government is building a “*Britain that is fit for the future*”.

“AI holds transformative potential for every aspect of our lives—from how we travel to how we work and live—and for every sector of the economy. For the UK, the prize is clear: potentially adding 10% to our GDP by 2030 if adoption is widespread, with a productivity boost of up to 30%. In pursuing that prize, we start with strong foundations. Taken together, these measures send a signal to AI business, science and research communities around the world. The UK will attract talent, invest and lead on standards and ethics. That message is made clear by the investment of industry that, along with investment from the Government, forms a total package of almost £1 billion.”

Source: <https://www.gov.uk/government/news/margot-james-statement-on-ai-sector-deal>
<https://government.diginomica.com/2018/04/30/labour-governments-1bn-ai-sector-deal-government-better/>

The new Government Office for AI

In June 2018 the UK Government announced another tangible result of their commitment to bolster their AI industry - namely, the launch of a UK Government Office for AI.

The Office will be advised by Dr. Demis Hassabis, co-founder of renowned AI company DeepMind, who has committed to provide needed industry guidance in order to execute the Government's plans to capitalize on the potential of AI for the UK national economy.

Digital Secretary Matt Hancock also confirmed the appointment of Tabitha Goldstaub, co-founder of CognitionX (an company that connects companies to AI experts) and the organizer of CogX (one of the largest gathering of AI experts globally) as chair and spokesperson of the AI Council, a new industry body that will play an integral role in translating the UK's AI Grand Challenge from commitment to practice.

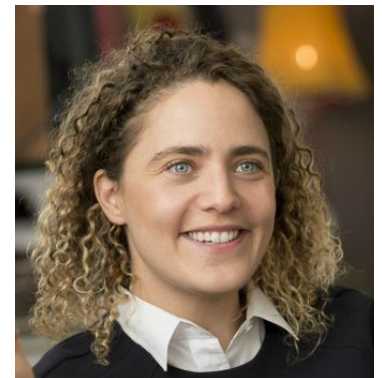
Matt Hancock also announced Tabitha Goldstaub as the UK's AI Business Champion and Dame Wendy Hall as the nation's Skills Champion for AI.

Commenting on the launch of the new Government Office for AI and the AI Sector Deal, UK Digital Secretary Matt Hancock stated:

“The UK must be at the forefront of emerging technologies, pushing boundaries and harnessing innovation to change people's lives for the better. Artificial Intelligence is at the centre of our plans to make the UK the best place in the world to start and grow a digital business. We have a great track record and are home to some of the world's biggest names in AI like Deepmind, Swiftkey and Babylon, but there is so much more we can do. By boosting AI skills and data driven technologies we will make sure that we continue to build a Britain that is shaping the future”



Demis Hassabis



Tabitha Goldstaub

Source: <https://www.gov.uk/government/news/world-leading-expert-demis-hassabis-to-advise-new-government-office-for-artificial-intelligence>

UK Government Proposes Five Basic Principles to Keep Humans Safe From AI

A report entitled “AI in the UK: Ready, Willing and Able?” put forward by the House of Lords Artificial Intelligence Committee aimed to chart the path toward increasing the UK’s position as a world leader in AI both from the perspective of the private sector and the UK Government itself.

The report also put great emphasis on executing on this goal in a way that operates according to the highest ethical principles, suggesting five core principles intended to promote safety and ethicacy:

- *Artificial intelligence should be developed for the common good and benefit of humanity.*
- *Artificial intelligence should operate on principles of intelligibility and fairness.*
- *Artificial intelligence should not be used to diminish the data rights or privacy of individuals, families or communities.*
- *All citizens have the right to be educated to enable them to flourish mentally, emotionally and economically alongside artificial intelligence.*
- *The autonomous power to hurt, destroy or deceive human beings should never be vested in artificial intelligence*

The report highlights the specific need to avoid "data monopolies" held by technology companies, to produce public education about both the promise and potential perils of AI, and to avoid possible negative consequences of bolstering their AI industry, like technological employment.

The Committee hopes that both AI developers and lawmakers will use these core principles as guideposts for AI development and regulation. The Committee also recommended the establishment of a UK AI Council tasked with working with the AI industry in order to "inform consumers when artificial intelligence is being used to make significant or sensitive decisions.”

UK government using emotion detecting AI for digital content

The UK government is also employing AI that detect and classify emotion on social media platforms in order to derive deeper insight into how the public feels about certain topics and issues.

One company operating in this space is FlyingBinary, a small business focusing on the application of AI to web science, GDPR and security, and has worked to support nearly 40,000 government organizations in their efforts to understand emotions on the social web.

FlyingBinary has released the "artificial emotional intelligence" service to the government's G-Cloud marketplace, in partnership with emotional AI recognition company Emrays B.V. The two companies have deployed the artificial emotional intelligence engine as part of a newly awarded G-Cloud 10 service built for the UK government.

The engine learns collective patterns of emotional reactions to digital content publicly available on the web. The emotion AI analyses and "feels" content on par with humans, based on more than one billion data points it has already been trained on. It uses a diverse set of human emotions, such as love, anger, surprise and shock. No personal data is used by the AI engine and that it focuses instead on the content itself and the human emotion expressed.

G-Cloud 10, which is predicted by the government to have a potential worth of £600 million, gives the central government, local councils, NHS Trusts and other public sector bodies a way to purchase cloud-based services, such as web hosting from a single, central website.

Huge boost to UK's data capability

Major businesses including Ocado, Amazon, Rolls Royce and McKinsey & Quantum Black are backing a world-first industry and government collaboration to develop the next generation of AI experts in the UK.

The plans are part of a package to boost the UK's data capability being unveiled by the Department for Digital, Culture, Media and Sport, which also includes:

- Confirmation that Roger Taylor will chair the Centre for Data Ethics and Innovation;
- The launch of a consultation on the Centre's remit and a search for the team to run it;
- New plans to develop a National Data Strategy to unlock the power of data in the UK;
- Measures to increase the UK's leading role in the ethical use of data in the public sector;
- £350,000 to help Internet of Things (IoT) innovators and the emerging technology sector;
- The South West being selected as one of two areas designated as a Digital Skills Pilot Area, with the establishment of a new Digital Skills Partnership to build a thriving digital economy in the region.

These announcements come as the Government also confirms:

- A new Start-Up Visa for entrepreneurs to launch in Spring 2019. This will replace a visa route which was exclusively for graduates, opening it up to all business people.
- A new £2.5 billion Patient Capital Fund to open for business to support UK companies with high growth potential to access long-term investment to grow and go global.
- Two new Tech Hubs launched in Brazil and South Africa. UK companies will be paired with overseas innovation through these hubs, to develop skills, capability and business networks in these markets, and facilitate partnerships.
- The opening up of the Ordnance Survey's valuable geospatial data to small businesses for free to boost competition in the digital economy.

Source:

<https://www.gov.uk/government/news/huge-boost-to-uks-data-capability-as-big-business-backs-world-first-ai-talent-scheme-and-chair-of-data-ethics-and-innovation-centre-is-confirmed>

UK Government Emphasizes Importance of AI Safety, Ethicacy & Governance

The UK Government is putting AI and Data at the heart of its Industrial Strategy alongside the other Grand Challenges. In April, the House of Lords Artificial Intelligence Select Committee produced its own report on the nation's ambitions to lead in ethical AI. The government has issued a 41-page response via the Department for Business, Innovation and Skills (BIS).

Chris Middleton looked at how Whitehall aims to control AI, ensure its fair use, and put controls in place to make sure that everyone benefits from the technology. Middleton wrote that the response came from BIS – rather than the Department for Digital, Culture, Media, and Sport (DCMS) – reveals one of the biggest challenges facing the UK at a crunch time for the nation. Government's management of AI policy, and other technologies such as robotics and autonomous systems, is diffuse, spread thinly among a confusing mix of different departments and briefs.

The government needs a convincing, informed digital champion who understands both the business application and the social impact. It doesn't have one in its current mix of competent administrators (but poor communicators), and ministers who would turn up to the opening of an envelope. The government should fold all of its technology responsibilities into a single, laser-focused department, and create an ambassadorial relationship between that and other bodies, such as BEIS and BIS – two acronyms that are themselves confusing.

Access to data is essential to the present surge in AI technology adding that there are “many arguments to be made” for opening up data sources, especially in the public sector, in a fair and ethical way. The government accepts that achieving full technical transparency is difficult, and perhaps even impossible, in certain kinds of AI systems – presumably referring to neural nets and so-called ‘black box’ solutions. The government acknowledges, too, that bias is a real danger in a data-fuelled and AI-enhanced world.

The first step the UK government should take in clarifying its approach to AI, robotics, the IoT, and digital transformation, is to recognise that its own internal complexity on these issues is unhelpful, and unsuited for purpose.

Chapter II:

UK Government Strategy on Artificial Intelligence



Department for
Business, Energy
& Industrial Strategy



Department for
Digital, Culture
Media & Sport

Key Highlights

- Key Points of the UK Government AI Sector Deal include:
 - Government-Industry initiative
 - Funded to the tune of over £1 billion
 - £603 million in newly allocated funding
 - £342 million funding from existing budget
 - £300 million in new private sector investments
 - 1000 new government-funded AI PhDs by 2025
 - 8000 new specialist computer science teachers
 - Launch of Turing Fellowship programme to attract the best minds in AI to the UK.
- More than 50 UK companies are involved in the AI Sector Deal.
- The UK Government believes that by capitalising on the potential of their AI Industry, the nation can generate up to £232 billion in new revenue, boosting the UK GDP by 10% by 2030.
- Commenting on the importance of the UK AI Sector Deal, UK Digital Secretary Matt Hancock [noted](#) that "Artificial Intelligence is at the centre of our plans to make the UK the best place in the world to start and grow a digital business. We have a great track record and are home to some of the world's biggest names in AI like Deepmind, Swiftkey and Babylon, but there is so much more we can do. By boosting AI skills and data driven technologies we will make sure that we continue to build a Britain that is shaping the future."
- Likewise, UK Business and Energy Secretary Greg Clark has [stated](#) that "Artificial intelligence provides limitless opportunities to develop new, efficient and accessible products and services which transform the way we live and work. Today's new deal with industry will ensure we have the right investment, infrastructure and highly-skilled workforce to establish the UK as a driving force in the development and commercial use of artificial intelligence technologies. As with all innovation there is also the potential for misuse which puts the whole sector under scrutiny and undermines public confidence. That is why we are establishing a new world-leading body, to ensure the ethical use of data in AI applications for the benefit of all."

AI is Number One Priority of National Industrial Strategy

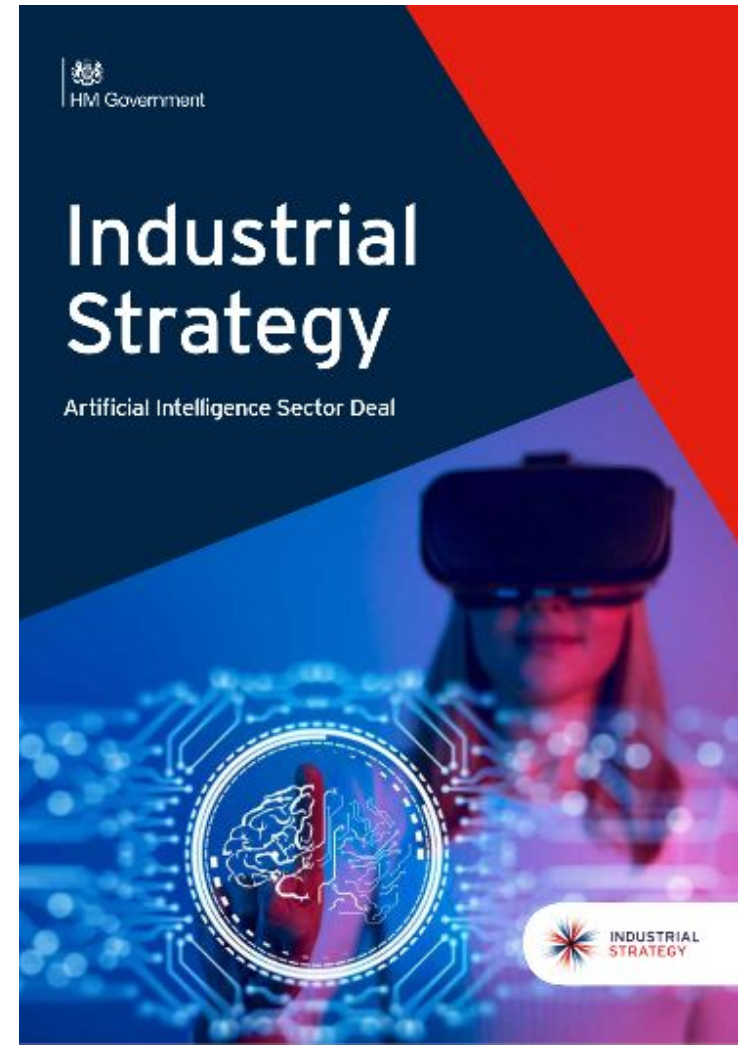
In April 2018, the UK government confirmed its commitment to keep up with other countries in the AI race through a very large government initiative worth £1 billion Titled the AI Sector Deal, the deal between government and industry (involving over 50 leading UK tech companies) was announced by Business Secretary Greg Clark and Digital Secretary Matt Hancock, and will involve more than £300 million in new private sector investment, as well as 1000 new government-funded AI PhDs. Commenting on the initiative, UK Digital Secretary Matt Hancock noted that "Artificial Intelligence is at the centre of our plans to make the UK the best place in the world to start and grow a digital business. We have a great track record and are home to some of the world's biggest names in AI like Deepmind, Swiftkey and Babylon, but there is so much more we can do. By boosting AI skills and data driven technologies we will make sure that we continue to build a Britain that is shaping the future." In a press release on the topic of the initiative, the UK government noted that "The deal will help establish the UK as a research hotspot, with measures to ensure the innovators and tech entrepreneurs of tomorrow are based in the UK, with investment in the high-level post-graduate skills needed to capitalise on technology's huge potential. It includes money for training for 8,000 specialist computer science teachers, 1,000 government-funded AI PhDs by 2025 and a commitment to develop a prestigious global Turing Fellowship programme to attract and retain the best research talent in AI to the UK."

Source: <https://www.gov.uk/government/publications/artificial-intelligence-sector-deal>;

<https://www.gov.uk/government/news/tech-sector-backs-british-ai-industry-with-multi-million-pound-investment--2>;

<https://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges#artificial-intelligence>

<https://www.gov.uk/government/topical-events/the-uks-industrial-strategy>



4 Grand Challenges of UK Government

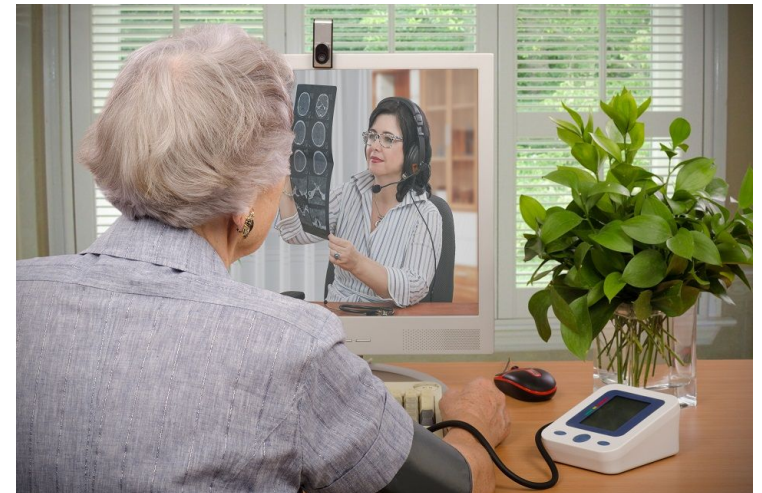
The **4 Grand Challenges** are focused on the global trends which will transform our future:

- **Artificial Intelligence and data**
- **Ageing society**
- Clean growth
- Future of mobility

Artificial Intelligence and data - 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.



Ageing society - The UK population is ageing, as it is across the industrialised world. The prospect of longer lives will require people to plan their careers and retirement differently. Ageing populations will create new demands for technologies, products and services, including new care technologies, new housing models and innovative savings products for retirement. We have an obligation to help our older citizens lead independent, fulfilled lives, continuing to contribute to society.



4 Grand Challenges of UK Government

Clean growth - We will maximise the advantages for UK industry from the global shift to clean growth – through leading the world in the development, manufacture and use of low carbon technologies, systems and services that cost less than high carbon alternatives.

The move to cleaner economic growth – through low carbon technologies and the efficient use of resources – is one of the greatest industrial opportunities of our time. By one estimate, the UK's clean economy could grow at four times the rate of GDP. Whole new industries will be created and existing industries transformed as we move towards a low carbon, more resource-efficient economy.



Future of mobility - We will become a world leader in shaping the future of mobility. We are on the cusp of a profound change in how we move people, goods and services around our towns, cities and countryside. This is driven by extraordinary innovation in engineering, technology and business models.

The UK's road and rail network could dramatically reduce carbon emissions and other pollutants, congestion could be reduced through higher-density use of road space enabled by automated vehicles, and mobility could be available when we want it, where we want it and how we want it.



The Sector Deal - UK Government Strategy on Artificial Intelligence

The Sector Deal is the first commitment from government and industry to realise this technology's potential, outlining a package of up to £0.95 billion of support for the sector, which includes government, industry and academic contributions up to £603 million in newly allocated funding, and up to £342 million from within existing budgets, alongside £250 million for Connected and Autonomous Vehicles. This support complements and leverages some of the £1.7 billion that has been announced under the cross-sectoral Industrial Strategy Challenge Fund so far, with 5 challenges having AI components that AI businesses will be able to bid into through future competitions.

This Sector Deal sets out actions to promote the adoption and use of AI in the UK, and delivers on the recommendations of the independent AI review, 'Growing the AI industry in the UK', led by Professor Dame Wendy Hall and Jérôme Pesenti. Their review, published in October 2017, engaged widely with businesses, academia, investors and other stakeholders on ways to boost the UK's emerging AI sector at home and across the world. It sets out proposals to improve the institutions that support AI in the United Kingdom, to build a skilled workforce, and to stimulate access to data – collectively the lifeblood of any AI business.

This Sector Deal reinforces the 5 foundations of the Industrial Strategy:

- ideas
- people
- infrastructure
- business environment
- places

It also draws on the government's Digital Strategy, which focuses on reinforcing our strengths in telecoms, data and enterprise. A key ambition of the industrial strategy is for the UK to be the world's most innovative economy – this Sector Deal aims to attract and retain both domestic and global AI talent; deliver major upgrades to our digital and data infrastructure; ensure that the UK is the best place to start and grow an AI business; and contribute to communities' prosperity by spreading the benefits of AI across the country.

Source: <https://www.gov.uk/government/publications/artificial-intelligence-sector-deal/ai-sector-deal>

UK Government Strategy on Artificial Intelligence - Focus on Ideas

The government set out a vision in the Industrial Strategy to make the UK the world's most innovative economy. To achieve this, the government is committed to work with the private sector to boost research and development (R&D) spending to 2.4% by 2027, and 3% over the longer term.

This begins with a £725 million investment through the Industrial Strategy Challenge Fund competition, designed to capture the value of innovation by commercialising a great idea in the lab to a successful business. For example, one early commitment is the £210 million Challenge on research into the early diagnosis of chronic illness – including a substantial investment in AI diagnostics technique.

The use of AI is central to this work, which includes programmes applying AI to raise output in sectors of the economy that have struggled with productivity, from reducing crop disease in the agriculture sector, to delivering services digitally in the public sector.

The government will work with academia, the broader research community, industry and end users to integrate AI into future Industrial Strategy Challenge Fund challenges.

As well a £93 million investment from the Industrial Strategy Challenge Fund into the robotics and AI in extreme environments programme, towards the research and development of robotics and AI technologies for use in industries such as offshore and nuclear energy, space and deep mining, with the aim of supporting safer working practices for people in extreme environments that could prevent potential harm and increase productivity.

Industry will provide match funding for AI solutions across key sectors: services, life sciences, agriculture and the public sector. Also commit to £69 million of industry funding to support the development of robotics and AI in extreme environments.

UK Government Strategy on Artificial Intelligence - Focus on Ideas

As the home of 4 of the top 10 universities in the world, UK is a magnet for the highest calibre researchers in artificial intelligence and related disciplines. The Government's vision in the Industrial Strategy - for the UK to be the world's most innovative economy - is supported by a very significant increase in R&D spending between the government and industry.

DeepMind, a prominent UK-based AI firm developed out of leading universities, not only created AlphaGo, (the programme that defeated the world's greatest player of Go, a fiendishly complex board game) but created a new version which taught itself to defeat the original programme. Alphabet, the parent company of Google and DeepMind – and a world leader in AI – is building a new headquarters in London that will be home to 7,000 staff: a significant vote of confidence in the UK's strength in R&D.

Amazon is similarly building its UK base, increasing its staff by almost a fifth in 2017 to 24,000, including a major expansion of its R&D workforce to around 1,500. This includes a new development centre in Cambridge (the company's second in the city), to add to existing development centres in Edinburgh and London.

The UK has also produced other globally recognised AI firms such as Improbable, which specialises in using AI for virtual reality (VR), and has developed simulation technology with the potential to model the behaviour of millions of people. In 2017, Japanese telecommunications corporation SoftBank invested \$500 million in Improbable, raising the value of the startup to over \$1 billion. Onfido, which was founded 5 years ago to make identity verification checks quicker and easier for businesses, has developed machine learning technology used by businesses all over the world to help hire staff more quickly and easily.

The measures announced through this Sector Deal, alongside the government's vision to be a leader in meeting the challenges posed by AI and data, will lead to further major investments in UK AI from businesses around the world.

UK Government Strategy on Artificial Intelligence - Focus on People

The Industrial Strategy has people at its core: it is focused on creating good jobs and greater earning power for all people in the UK. To do this, the Government must equip citizens for jobs shaped by next generation technology.

Growing the AI industry in the UK outlined the fast-growing demand for expertise to develop and apply AI technologies, and proposed ways to increase the supply of skills at different levels. Building on these recommendations and the commitments in the Industrial Strategy and Digital Strategy to grow science, technology, engineering and maths (STEM) and digital skills training, this Sector Deal sets out how the government, universities and industry will work together to greatly improve the supply of skills. It also sets out how the Government will attract the best, and most diverse, global AI talent to the UK.

The government will refer to The Alan Turing Institute's upcoming reviews on the application of AI to sectors in the UK to inform future strategic thinking on the adoption of AI in industry and government. Increasing diversity in the AI workforce is vital to ensure that everyone with the potential to participate has the opportunity to do so. It is essential that AI developed in the UK reflects the needs and make-up of society as a whole and that industry and the public sector are able to access the greatest supply of talent in terms of numbers. The government will work with the AI Council to promote diversity in the AI workforce.

As well it was mentioned that Sage is running a pilot programme for 150 under-18s across the UK, to encourage people to think about a career in the AI sector. The 'Sage FutureMakers Labs' will teach a broad range of skills required to work in the field of AI - including machine learning, natural language processing, problem solving and other cognitive techniques, as well as an understanding of the ethical considerations that surround AI. The aim is to show the leaders of tomorrow that AI is a career choice open to all that can be accessed through classroom or on-the job learning.

UK Government Strategy on Artificial Intelligence - Focus on People

Demand for AI talent in AI techniques, such as machine learning, is increasing rapidly. Action is needed now to ensure the skills pipeline can meet the needs of industry now and in the future. By one estimate, the market value of AI technologies is expected to increase at a compound annual growth rate of over 60% to 2022.

In 2017 there were 26 UK universities offering undergraduate courses in AI and more than 30 graduate programmes running across 20 universities. A recent government consultation with AI academics highlighted the gap between supply and demand for university places, with one institution turning down 13 viable candidates per available masters place.

The government recognises that to provide the advanced skills needed for creating AI algorithms, the work begins in schools. That is why it has announced a major reform of technical education with the launch of T levels and investment in STEM subjects. The government announced in the 2017 Autumn Budget £84 million of new funding to deliver a comprehensive 4 year programme to improve computing education and drive up participation in computer science, including upskilling up to 8,000 computer science teachers, to ensure there is a suitably qualified GCSE teacher in every school. The government has also supported the creation of Ada, the National College of Digital Skills, which will train up to 5,000 students over the next 7 years for a wide range of digital careers. At a higher level, industry will be investing to fund a Masters degree programme with an integrated internship, targeting an initial cohort of 200 students per year.

The government has doubled the number of available Tier 1 visas for 'Exceptional Talent' – including specialists in AI – from 1,000 to 2,000 per year. This presents a great opportunity to ensure the UK attracts the best and brightest talent in AI, alongside world leaders in science, digital technology, engineering, arts and creative sectors. The government will work with Tech Nation to explore how to promote this and other visa routes to AI specialists to maximise the growth of AI in the UK.

UK Government Strategy on Artificial Intelligence - Focus on Infrastructure

As part of the Industrial Strategy, the Government is investing over £1 billion to create a country with world class digital capabilities: from 5G mobile networks to full-fibre broadband. Equally important is the availability of data, which is required on a vast scale to train machine learning systems.

The government and public bodies are already leading the way in making public datasets open and available. But there remain significant challenges to sharing private sector datasets. Through this Sector Deal, the Government will tackle both the practical and cultural barriers to sharing both publicly and privately held data. As part of this it will explore data sharing frameworks such as Data Trusts – mechanisms where parties have defined rights and responsibilities with respect to shared data – in order to protect sensitive data, facilitate access to data, and ensure accountability. This will allow and ensure fair and equitable data sharing between organisations in the private sector, and between the private and public sectors.

The Government will establish the Geospatial Commission to determine how best to improve access to geospatial data to a wider range of users, including businesses using and innovating with AI technologies. As well provide legal certainty over the sharing and use of data in accordance with the UK's strengthened Data Protection Bill. The Alan Turing Institute and the Information Commissioner's Office will work together to develop guidance to assist in explaining AI decisions.

The Industry will work towards interoperable and, where possible, open data standards like AI developers to enhance and define technical standards that allow interoperability between AI systems, and collaborate with the government on a framework of standards to underpin this. As well strengthen and deliver telecommunications and digital infrastructure. More than £1 billion is being invested to develop 5G mobile networks and extend the full-fibre rollout, capable of providing a highly reliable connection and speeds exceeding 1 Gigabit per second.

Source: <https://www.gov.uk/government/publications/artificial-intelligence-sector-deal/ai-sector-deal>

UK Government Strategy on Artificial Intelligence - Focus on Infrastructure

Without access to good quality data from a range of sources (whether privately or publicly held), AI technologies cannot deliver on their promise of better, more efficient and seamless services. Open data published by organisations across a range of sectors have enabled other businesses to innovate and build new services, which in turn can make significant contributions to the economy. Transport apps such as CityMapper, for example, make journeys more efficient and have led to the creation of 'pop-up' bus routes for commonly made journeys that were previously unserved.

Similarly, open environmental data has been used to create flood risk and water quality apps. To test the autonomous vehicles of the future we will need good quality 3D topographic data on road conditions and roadside obstacles.

The government is committed to opening up more data in a way that makes it reusable and easily accessible. To further boost the digital economy, the government is working with the Ordnance Survey (OS) and the Geospatial Commission to establish how to open up freely the OS MasterMap data to UK-based small businesses in particular. Geospatial data is a key enabler for AI technologies.

In addition, the eInfrastructure Advisory Board (eAB) has recently been set up by UKRI with the purpose of advising the CEO of UKRI on High Performance Computing (HPC) Research infrastructure, and will be developing an eInfrastructure development roadmap, as well as other HPC related projects, going forward.

In the 2017 Autumn Budget, the government announced a range of initiatives to ensure the infrastructure of the UK is wholly digitally connected. This included funding from the National Productivity Investment Fund to launch the £190 million Challenge Fund for Local Full Fibre Networks and provide a further £159 million for the 5G Testbeds and Trials programme. This will close down digital coldspots, ensuring AI businesses can thrive anywhere in the UK.

Source: <https://www.gov.uk/government/publications/artificial-intelligence-sector-deal/ai-sector-deal>

UK Government Strategy on Artificial Intelligence - Focus on Business Environment

The UK Government's intention is to be the best place to start and grow a business in the world. With a new business starting up every 75 seconds in the UK, and a massive increase in the finance available to knowledge-intensive and innovative firms – such as those developing AI – through the British Business Bank, UK is in a strong starting position.

As at September 2017, over £350 million has been invested in 243 technology companies through the British Business Bank's venture capital programmes.

AI is emerging in its own right as a nascent industry with the potential to raise the productivity of diverse sectors and create entirely new jobs. To maximise this potential, this deal will increase promotion of AI businesses globally and take steps to attract AI entrepreneurs to the UK. A recent report by Oxford Insights ranked the UK top for government readiness to implement AI, and these measures will allow to capitalise on the UK's world class R&D and tech entrepreneur base.

The government will work closely with the new AI Council to expand export and investment support for AI businesses in the UK including through promoting AI businesses at trade missions. As well to increase its export support for innovative AI and data businesses, and the Global Entrepreneur Programme will look to increase its focus on attracting AI and data-led businesses to establish headquarters in the UK.

Industry will work closely with the government, through the AI Council, on broader questions related to AI such as data ethics and the role of AI in the public sector. Also it will continue to develop the broader ecosystem that will drive trade and attract AI investment to the UK, including through participating in trade missions, AI exhibitions and international conferences.

Hewlett Packard Enterprise recently announced new offerings to help customers ramp up, optimise and scale AI usage across business functions to drive outcomes such as better demand forecasting, improved operational efficiency and increased sales.

Source: <https://www.gov.uk/government/publications/artificial-intelligence-sector-deal/ai-sector-deal>

UK Government Strategy on Artificial Intelligence - Focus on Business Environment

The UK government is committed to helping AI businesses succeed globally. And, as part of the government's broader commitment to increasing investment and exports, AI will benefit from the nine new Trade Commissioners responsible for leading export promotion, inward and outward direct investment, and trade policy overseas. The fruits of this effort are already showing – as demonstrated through the commitments by Element AI and others to establish bases in the UK.

In addition, government's Venture Capital Unit has supported international companies – such as Global Brain, who committed to establishing their European HQ in London – and continue to work with venture capitalists looking to invest in the UK. Along with UK's commitments to a visa system that welcomes the best talent, the government will establish the UK as the go-to place to headquarter an AI business.

The government is committed to improving the financing of growth in highly innovative businesses. To do this the government is:

- establishing a new £2.5 billion Investment Fund incubated in the British Business Bank
- investing in a series of private sector fund of funds of scale – the British Business Bank will seed the first wave of investment with up to £500 million, unlocking double its investment in private capital
- doubling the annual allowance for people investing in knowledge intensive businesses through the Enterprise Investment Scheme (EIS) to £2 million a year
- backing overseas investment in UK venture capital, expected to release £1 billion of investment
- supporting long-term investment by giving pension funds confidence that they can invest in assets supporting innovative businesses as part of a diverse portfolio
- changing the qualifying rules in Entrepreneurs' Relief to remove the disincentive to accept external investment and consulting on the detailed implementation of that change
- increasing the rate of the R&D expenditure credit from 11% to 12%

UK Government Strategy on Artificial Intelligence - Focus on Places

The Industrial Strategy set out the goal of helping communities prosper throughout the UK. Growing the AI industry in the UK outlined the thriving AI ecosystem that already exists.

London is the European capital of AI, while significant clusters exist in places such as Edinburgh, Belfast, Bristol and Cambridge. As important as the growth of these clusters of expertise is, the Government's ambition is for AI to be adopted by businesses across the country.

This deal will help businesses around the UK to grow using AI, and is supported by the government's backing for the expansion of Tech City UK and Tech North into the national network Tech Nation, alongside its Scale Up campaign. At the same time, the Government is expanding the academic commitment to AI across the UK as universities partner with The Alan Turing Institute, the national institute for data science and AI.

Following a recommendation made in the AI Review techUK, the Royal Academy of Engineering and the Digital Catapult are working together to provide practical guidance and tools to support the effective and responsible use of AI by businesses across the UK. It is also working with Digital Catapult centres across London, North East and Tees Valley, Northern Ireland, Brighton and Yorkshire to help businesses adopt AI effectively.

As the UK's longest established AI research centre, the University of Edinburgh has been the home for many spin-out businesses, such as Skyscanner, while the Edinburgh Centre for Robotics recently won a £36 million grant for research into offshore robotics. Additionally, data driven innovation and AI technologies underpin the £1.1 billion Scottish and UK government funded Edinburgh City Region Deal. Meanwhile, BT is opening a £29 million R&D facility in Belfast, and partnering with Ulster University to research future technologies such as the Internet of Things, AI, data analytics, cybersecurity and 5G. Welsh company IQE has been at the forefront of the compound semiconductor industry for more than 25 years, and has joined with Cardiff University to invest in developing a compound semiconductor cluster in the area as part of the £1.2 billion City Deal agreed between local authorities, Welsh and UK governments.

Pepper

In October 2018 Pepper the robot answered questions from the Education Committee on the Fourth Industrial Revolution and the implications for education of developments in artificial intelligence.

Pepper is part of an international research project developing the world's first culturally aware robots aimed at assisting with care for older people. The Committee heard about her work with students across the faculties at Middlesex University, including a project involving teaching primary level children, and what role increased automation and robotics might play in the workplace and classroom of the future.



After a demonstration by Pepper, the Committee explored with witnesses, including those from Middlesex University, how robots can be used to support learning, and the skills needed to adapt to the growth in artificial intelligence and automation.

The Committee first questioned a panel of experts on the suitability of the current school curriculum, the importance of re-skilling and lifelong learning and the effect of the Fourth Industrial Revolution on social justice.

Source:

<https://www.parliament.uk/business/committees/committees-a-z/commons-select/education-committee/news-parliament-2017/fourth-industrial-revolution-pepper-robot-evidence-17-19/>

Chapter III:

Key Persons about AI industry in UK

Key Highlights

- Growing the UK AI Industry will reap more effects than just an increase in the nation's GDP. It will also have myriad social and socioeconomic impacts that need to be properly envisioned, foreseen, and proactively accounted for.
- Due to the powerful nature of AI, its massive potential for penetration into nearly all industry sectors, and the strategic impact it has on a nation's geopolitical aims, the safe and ethical development of AI requires input from many public and private stakeholders to a greater extent than perhaps any other technology.
- Think-Tanks will play an increasingly important role in the ongoing development of the UK's AI Industry because they bring together participants from Government and Industry in order to harmonize the ambitions of legislators and policy-makers, who necessarily lack fundamental technical knowledge on AI, with technical experts in a position to better inform policies and legislation in the context of the technological realities of AI.
- One of the most pressing and pervasive concerns regarding AI is its potential to displace workers through job automation.
- While AI also has the power to create new jobs, care needs to be taken in order to shape the industry's development in such a way as to actively promote the development of new jobs through investment into both traditional as well as continuing education programs, helping the nation's workforce learn how to use AI to their advantage in the course of their regular operating procedures.

Why The AI Revolution Needs its Own Government Overseer

A UK cross-political party group has produced some interesting and compelling recommendations around AI policy that could be usefully adapted at home and internationally.

In 2017 legislators and policymakers around the world have become more and more interested in the societal and economic implications of the AI revolution, resulting in a myriad of programs to explore the consequences and come up with recommendations.

Such a Minister would have 5 job objectives, suggests the AAG AI:

- To bring forward the roadmap which will turn AI from a Grand Challenge to a tool for untapping UK's economic and social potential across the UK.
- To lead the steering and coordination of: a new Government Office for AI, a new industry-led AI Council, a new Centre for Data Ethics and Innovation, a new GovTech Catalyst, a new Future Sectors Team, and a new Tech Nation (an expansion of Tech City UK).
- To oversee and champion the implementation and deployment of AI across government and the UK.
- To keep public faith high in these emerging technologies.
- To ensure the UK's global competitiveness as a leader in developing AI technologies and capitalising on their benefits.

The AI revolution is going to be enormous and it demands the concentrated attention of a dedicated legislator at the top of government.

"Access to computation power is amongst the significant barriers to innovation around machine learning and AI".

Source: <http://www.appg-ai.org/library/ai-revolution-needs-government-overseer/>
<http://uk.businessinsider.com/uk-government-gives-ai-startups-access-to-computation-power-2017-12>

AI in UK: Experts recommendations

“The UK should “lead by example” and focus on building a national infrastructure and investing in government competency in respect to AI. For best practices, UK can look at Canada. I recommend that the UK government retain its leadership developing AI for the common good working with other countries and groups with a similar commitment.”



Allan Dafoe

Research Fellow at Future of Humanity Institute at the University of Oxford and Assistant Professor of Political Science at Yale University

“Although UK is a hotbed for academic research, this is not enough in order to reap the full benefits of AI. CEO Parry Malm from Phrasee called for government to build policies that ensures the future workforce represents diverse groups, opens borders to innovation and new talent, and incentivises R&D. The UK’s history of innovation built an economic and social power. However, right now, all anyone talks about are short term blips, like Brexit and inflation. Instead, we need to talk about long-term challenges the UK is facing – in particular, a protracted under-investment in innovation. Today, my evidence, much of which cites Canadian policy as an exemplar, will focus on what the UK needs to do to become a leader in the digital economy of tomorrow.”



Parry Malm

CEO at Phrasee

“Historically, UK standards have always had a major impact on international standard committees. In fact, 95% of global standards (not regulations) are derived from British standards. The UK has the opportunity to lead the world in standardisation once again. To drive the economy and society forward, UK can provide a vehicle for thought leadership looking into the implications of AI and other emerging technologies. If we don’t act quick in creating AI standards and a Code of Practice for ethical design, other countries will. UK is well placed at the moment for this challenge, and must take this opportunity.”



Scott Steedman

Director of Standards, BSI Group

AI in UK: Inequality, Education, Skills, and Jobs

“If technological unemployment is coming, it will be preceded by a panic. If we do nothing now, the resulting panic would lead to appalling political consequences. We have recently seen populist triumphs in the UK and the US. A panic over technological unemployment would usher in something far, far worse than President Pinocchio. Fascism is not the worst possible outcome. We must avoid that. Calum Chace asked for the UK government to invest in think tanks to research the risks and opportunities of AI, and use this evidence to pave the path for how society can overcome a likely period of transition and panic.”



Calum Chace

Author of ‘The Economic Singularity: Artificial Intelligence and the Death of Capitalism’ and ‘Surviving AI: The Promise and Peril of Artificial Intelligence’

“Our analysis suggests that up to 30% of UK jobs could potentially be at high risk of automation by the early 2030s, lower than the US (38%) or Germany (35%), but higher than Japan (21%). PwC’s recent findings showed that the economic opportunities (it is estimated that AI will boost the UK economy by 10% by 2030) but also the disruption that is anticipated to take place (30% of UK jobs are in risk of being automated). He recognised that disruption will not affect all social groups and/or regions equally, and we need to realise that AI will create clear winners and losers. He recommended: vocational training for young people, investment in life-long learning, and the rethinking of a welfare system with a stronger safer net.”



John Hawksworth
Chief UK economist

“At every level, from getting people online for the first time, to attracting and training the world’s top coding talent, Britain needs stronger digital skills if we are to thrive in the years ahead.”

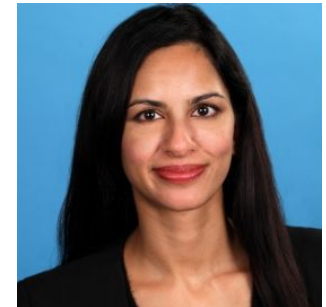


Matt Hancock
British politician of the Conservative Party

Source: http://www.appg-ai.org/wp-content/uploads/2017/12/appgai_theme-report-6.pdf

Governance, Social and Organisational Perspective for AI

Krishna Sood, a Senior Technology Lawyer for Microsoft has recommended that the UK government promote the free movement of data and implement General Data Protection Regulation (GDPR), as well as promote data-relevant skills across all generations. She has also recommended that the UK Government implement a GDPR via the Data Protection Bill, and create a successor to its existing Privacy Shield following Brexit.



Krishna Sood
Senior Technology Lawyer,
Microsoft

Miles Brundage, an AI Policy Research Fellow at the University of Oxford's Future of Humanity Institute, has suggested that the UK Government commit to developing its AI industry in a way that has broad benefits for humanity, and to explore international cooperation in order to avoid the competitive development of AI at a reckless pace that makes it harder for regulations to keep up with innovation. He also suggests that the UK improve its AI specialist recruitment and retention activities.



Miles Brundage
AI Policy Research Fellow,
Oxford Future for Humanity
Institute, University of Oxford

Joanna Bryson, an Affiliate, Center for Information Technology Policy at Princeton University, has also suggested that the UK increase its efforts to enable international cooperation, noting that the EU is currently the leader of AI and data policy, which may be part and parcel of its reputation for fostering transnational economic and legal cooperation.



Dr Joanna Bryson
Department of Computer Science,
University of Bath; and Affiliate,
Center for Information Technology
Policy at Princeton University

Source: http://www.appg-ai.org/wp-content/uploads/2017/12/appgai_theme-report-5.pdf

The Impact of AI in UK Constituencies: Where will automation hit hardest?

“AI is a huge economic opportunity for the UK but automation supercharged by AI could also greatly amplify geographic inequalities. There will be great reward for whichever party gets this right.” - **Olly Buston**, CEO of Future Advocacy.

The UK Government should:

- Commission and support further detailed research to assess which employees are most at risk of job displacement by automation.
- Develop smart, targeted strategies to address future job displacement, based on the results of research into the differential impact of automation by sector, region and demographic group in the UK.
- Draft a White Paper on adapting the education system to maximise the opportunities and minimise the risks created by AI.
- Make the AI opportunity a central pillar of the UK's Industrial strategy and of the trade deals that the UK must negotiate post-Brexit.
- Ensure that the migration policy in place following Brexit will still allow UK-based companies and universities to attract the brightest and best AI and robotics talent from all over the world.
- Conduct research into alternative income and taxation models that result in fairer distribution of the wealth that these technologies will create.

The jobs in transport, warehousing and associated industries that coalesce around Heathrow and Gatwick may be at high risk of displacement by automation by the early 2030s. Along with the attention paid by academic, commercial, third-sector, and other institutions, there has been increasing political interest in both AI and the potential consequences of automation. Firstly, it is important that the Government learns the lessons that the recent history of manufacturing, mining and similar industries in the UK have taught us. Secondly, it is important to implement policies that recognise the likely unequal distribution of the impact of automation - 'one-size-fits-all' policies will be not be sufficient. Therefore, policymakers thinking about the impacts of automation should ensure that adequate funding and trained staff are available to provide psychological and similar support in those areas identified as being likely to suffer the highest rates of job displacement.

Growing the Artificial Intelligence Industry in the UK

“Artificial intelligence presents us with a unique opportunity to build on our strengths and track record of research excellence by leading the development and deployment of this transformational technology. We will continue to work with the sector in the coming months to secure a Comprehensive Sector Deal that make the UK the go to place for AI and helps us grasp the opportunities that lie ahead.”



Greg Clark
Secretary of State for
Business, Energy and
Industrial Strategy

It has been estimated that AI could add an additional USD \$814 billion (£630bn) to the UK economy by 2035, increasing the annual growth rate of GVA from 2.5 to 3.9%. To continue developing and applying AI, the UK will need to increase ease of access to data in a wider range of sectors. Skilled experts are needed to develop AI, and they are in short supply. To develop more AI, the UK will need a larger workforce with deep AI expertise, and more development of lower level skills to work with AI.

“In our AI review, we focused on recommendations that are both practicable and deliverable. By following these recommendations, government, academia and industry can help strengthen the UK’s position in the global AI market. Our proposals are deliberately specific and boil down to three fundamentals – enable better access to data, create a greater supply of AI skills and promote the uptake of AI. I am looking forward to working with government, academia and industry to drive these changes.”



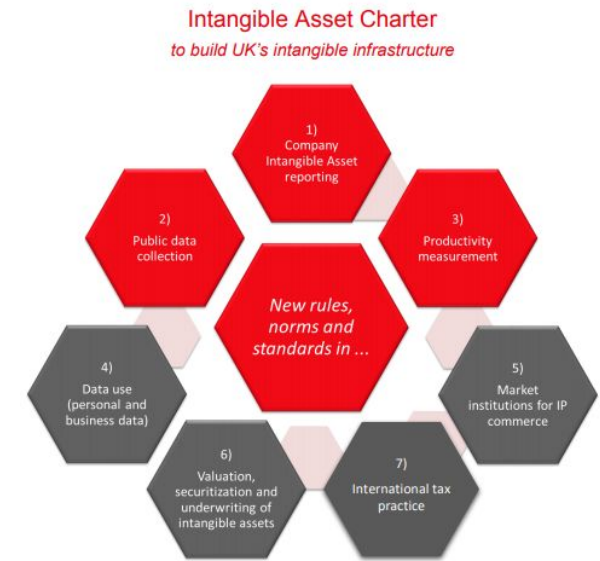
Jérôme Pesenti
CEO of BenevolentTech

Source:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/652097/Growing_the_artificial_intelligence_industry_in_the_UK.pdf

Building Britain's Intangible Infrastructure

In a report released by Big Innovation Centre entitled "Policy Proposition Think Piece Intangible Asset Reporting and an Intangible Assets Charter The Intangible Gold Project: Building Britain's Intangible Infrastructure", they note that British business is generally subject to lack of knowledge regarding intangibles and their impact on product quality, business processes and general economic dynamism, and that there is a growing consensus opinion that traditional accounting methodologies, which have remained largely the same in terms of core principles since the industrial revolution and post-war assembly line paradigm, no longer fit their purpose and create a bottleneck for embracing change. The report highlights the need to formulate better reporting methods and measures for intangibles.



© Big Innovation Centre

“Big Innovation Centre is a hub of innovative companies and organisations, thought leaders, universities and ‘what works’ open innovators. Together we test and realise our commercial and public-purpose ideas to promote company and national innovative capabilities in a noncompetitive and neutral environment. We act as catalysts in co-shaping innovation and business model strategies that are both practical and intellectually grounded. Our vision is to help make the UK a Global Open Innovation and Investment Hub by 2025, and to build similar initiatives internationally.”



Birgitte Andersen
CEO, BIG INNOVATION CENTRE

Source: http://www.appq-ai.org/wp-content/uploads/2017/07/ig_intangible-asset-charter_060717.pdf

Growing the Artificial Intelligence Industry in UK

Education is on the first place

Jérôme Pesenti, from BenevolentAI, and Wendy Hall, a computer scientist at the University of Southampton, say “*there should be **greater training and access to data** if the UK is going to compete with other countries around the world on AI*”.

It has been estimated that AI could add an additional USD \$814 billion (£630bn) to the UK economy by 2035, increasing the annual growth rate of GVA from 2.5 to 3.9%. The vision is for the UK to become the best place in the world for businesses developing and deploying AI to start, grow and thrive, to realise all the benefits the technology offers.

Key factors have combined to increase the capability of AI in recent years, in particular:

- New and larger volumes of data;
- Supply of experts with the specific high level skills;
- Availability of increasingly powerful computing capacity. The barriers to achieving performance have fallen significantly, and continue to fall.

Skilled experts are needed to develop AI, and they are in short supply. To develop more AI, the UK will need a larger workforce with deep AI expertise, and more development of lower level skills to work with AI. This Review recommends:

- An industry-funded Masters programme in AI;
- Market research to develop conversion courses in AI that meet employers' needs;
- 200 more PhD places in AI at leading UK universities, attracting candidates from diverse backgrounds and from around the world;
- Credit-bearing AI online courses and continuing professional development leading to MScs;
- Greater diversity in the AI workforce;
- An international AI Fellowship Programme for the UK.



Jérôme Pesenti
VP of AI at Facebook
CEO of BenevolentTech

Growing the Artificial Intelligence Industry in UK

Education is on the first place

“Most proposals I see [for investment] involve using machine learning. But, 90% of these don’t really have AI. The other 5% have not tried their solution in the real world yet and the last 5% are real. AI is still hard to do. The number of people who can do it is low. There is also a very strong first mover advantage in investing in AI now. Whoever gets going first has an advantage.”

Mike Lynch of Invoke Capital has offered his recommendations to the APPG AI Chairman, Conservative MP Stephen Metcalfe, with regards to how AI will impact the UK economy, and highlighted the fact that there are many companies claiming to utilize AI, but which often employ AI in a very passive way, such as via process automation or for rudimentary responsive capabilities.



Mike Lynch,
Invoke Capital

He also highlighted the fact that some company's systems are high quality, but break down in complex, real-world situations, and that their capabilities cannot be extrapolated in a linear way. Speaking from his experience as an investor in machine learning companies, he stated that roughly 5% of the AI companies he has looked at personally qualify as "real AI". His most pressing point to the APPG AI Chairman was that a strong focus on legal due diligence is a must.

‘It is the second that is having an impact and AI is just shorthand for machine learning. Expert systems are not shaking the world up,’ he summed up.

A New Company Every Week: Inside The UK's AI Revolution

The UK's artificial intelligence sector is booming and the technology is transforming how businesses of all sizes operate. Five of the world's biggest technology companies have bought UK AI businesses in recent years, including DeepMind, which was acquired by Google for a reported \$400m in 2015, SwiftKey (bought by Microsoft for an estimated \$250m) and Magic Pony Technology (acquired by Twitter for \$150m). Analysis by MMC Ventures shows the number of AI companies founded in the UK doubled in 2014-16, compared with 2011-13. Over the past three years, a new AI company has been launched almost every week.

As technology advances, AI will continue to push the boundaries. Research by consultancy firm Accenture shows that realising the UK's potential in this sector would add £654bn to the economy by 2035. Siemens UK chief executive Juergen Maier warned that AI is vital to the UK staying competitive.

AI is already redesigning how entire industries operate – from chatbots providing customer service support, automated virtual assistants, and art recommendations, to the machine learning that powers self-driving cars and platforms that can diagnose skin cancer.

AI firms are changing how brands engage with customers. SoDash, a UK-based software company founded by Daniel Winterstein and Joe Halliwell in 2011, enables companies to work with social media at scale and is used by brands such as Virgin Trains to analyse messages, prioritise customer service issues and isolate irrelevant social chatter. This year, Winterstein and Halliwell developed Orla, a bot that helps small businesses improve their reach on Twitter.

“Traditionally with a social automation tool, you tell it broadly who you want to interact with, turn the key, and hope,” Winterstein says. “Not only is this highly risky, it’s an insincere and deceptive method of interaction.”



Daniel Winterstein
Good-Loop CTO &
SoDash founder

Source: <http://www.appg-ai.org/library/new-company-every-week-inside-uks-ai-revolution/>

Artificial Intelligence and Equity

'The UK has internationally leading activity in Machine Learning – DeepMind is the world leader, and several UK universities have world-class groups. The main opportunity for the UK is in leveraging this advantage, particularly in the start-up sector.' - Professor Michael Wooldridge

Current technology in legal practice in England mainly involves working with documents since this is the most time- consuming part of a practicing lawyer's job. It broadly operates in two main areas: document automation and information retrieval from structured and unstructured documents. The technology is currently suitable for procedural or mundane tasks. It uses weak AI, role of senior practitioners is not much changed and continues to involve exercising judgment based on experience and an understanding of commercial parties' positions and market practice. If strong AI is developed, it will change this analysis significantly. There is no expectation that strong AI will be available to lawyers in the immediate future, however. This still leaves open questions arising from foreseeable advances in weak AI.

Equity in a legal context refers to doctrines and remedies originally developed by the English courts of equity. As Hanbury & Martin: Modern Equity (Sweet & Maxwell, 2015) notes: 'It is not synonymous with justice in a broad sense.' It suggests that AI could be programmed to follow rules of equity: if there are rules to be followed then AI could follow them.

Clearly, there is no conclusion, except that lawyers in all disciplines should look further than the practical applications of AI to what it means for theory (and to start measuring and collecting more and better data). In the UK we do, however, have world- leading technologists and an expedient political desire to develop the country's technology (including AI) sector far beyond its current size.



Michael Wooldridge,
Head of Department of
Computer Science at the
University of Oxford.

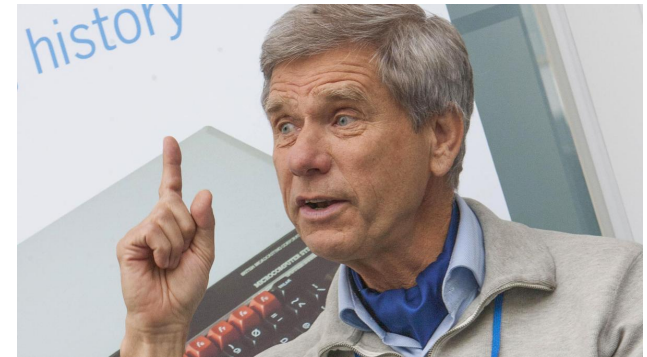
Source: <http://www.appg-ai.org/library/artificial-intelligence-equity/>

The Big Gap

Tech guru Hermann Hauser says drug giants are in denial.

The founder of ARM Holdings, believes big pharma is poised for its own “Kodak moment” as healthcare moves away from drugs and towards artificial intelligence.

Big pharma was “hardly” reacting at all, keeping its best people in developing new drugs. “They know this is coming, but their heart isn’t in it,” he said. “That’s why start-ups are so important, because many of these ideas are crazy and will fail. But that’s why we need more venture capitalists.



Source: The Sunday Times

- The major progress in these technologies is coming not from biotech side but from IT side.
- Those Bio Pharma companies that do not accept AI will repeat the mistakes of Kodak, who were once the leader of their industry, but went to bankruptcy because they failed to embrace digital photography as the disruptive trend it was, even despite the fact that the digital camera was invented inside Kodak labs.
- Banks and IT-giants are snapping up the best AI specialists and startups and it is inevitable that Pharma will require the same scarce technology and talent. Biopharma must recruit advanced deep learning teams (as Google did with Deep Mind).

The role of Think Tanks in AI development and implementation

“Government and policymakers are not technology experts,” argued Professor Birgitte Andersen, CEO of Big Innovation Centre. “Practical, accessible examples of AI in action provides a real-time understanding of the impact and implications of AI for our business and society. More informed decision-making allows the UK to get AI-ready as a leading global innovator.”

In March 2018, the APPG on AI held a workshop in coordination with tech giant NVIDIA and the Big Innovation Center to train a group of MPs on the workings of neural networks, in an attempt to educate policymakers on how AI can be used to the benefit of businesses and local communities.



Birgitte Andersen,
CEO of
Big Innovation Centre

By getting government staff to grips with the concepts behind neural networks, the partnership between NVIDIA, UCL, APPG-AI, and the Big Innovation Centre provided officials with unprecedented insights into the workings of AI.

There still exists a fundamental gap between technology-oriented policy formulation, implementation and execution, and the pace of technological advancements. We are necessarily in a position where the groups tasked with formulating and executing policy proposals are not experts or specialists in the technologies being governed.

It is for this reason that the role of Think Tanks in the process of policy formation and implementation becomes ever more pressing as the pace of technological development accelerates. Think Tanks are in a position to coordinate a dialogue between experts, specialists and scientists on the one hand and policy-makers on the other, in order to gain joint insight into technologies' societal and economic impact, and to formulate reasonable policy recommendations in light of such insights.

Source: <https://aibusiness.com/the-uk-ai-neural-networks-mps/>



The Big Innovation Centre exists to help businesses, public agencies and universities put their open innovation principles into practice. Acting as an open innovation hub, Big Innovation Centre convenes a network of representative global companies in every sector, plus national public agencies and some of the best universities. Through this coalition BIC is building world-class innovation ecosystems and co-creating global innovation and investment hubs. Its aim is to help rebalance and grow national and regional economies.

BIC's partners pool and share resources – technology, IP, data, skills, space, entrepreneurial finance – so its people can work together as co-catalysts to solve the grand challenges. Big Innovation Centre enlarges the innovative capability of its partner organizations, and itself becomes a 'go-to' place where commercial and public sector ideas are shared, tested and realized

BIC creates a trusted space for people from cutting edge companies, universities and public agencies to meet and co-create a better world.

Chapter IV:

All-Party Parliamentary Group on Artificial Intelligence

Key Highlights

- The All-Party Parliamentary Group (APPG) founded in January 2017 to explore practical steps for how government, industry, and the wider society can address AI implications.
- The APPG on AI have prioritized six key areas being impacted by AI to explore initially, including:
 - data,
 - skills,
 - accountability,
 - innovation &
 - entrepreneurship, infrastructure, and trade.
- APPG on AI Sponsors include: Big Innovation Centre, Barclays, Deloitte, KPMG, PricewaterhouseCoopers, Microsoft, BP, EDF Energy, CMS, University of Oxford, EY, BSI, and Accenture.
- Their 2018 Schedule includes Receptions and Stakeholder Dinners on 4 key areas:
 - Future of Jobs
 - Future of Engineering
 - Future of Smart Cities and
 - Future of Finance

APPG AI Officers



**Stephen Metcalfe
MP Chair**



**Lord Clement-Jones
Chair**



**The Lord Bishop of
Oxford Treasurer**



**Chris Green MP
Secretary**



**Baroness
McGregor-Smith Vice
Chair**



**Lord Willets Vice
Chair**



**Lord Holmes of
Richmond Vice
Chair**



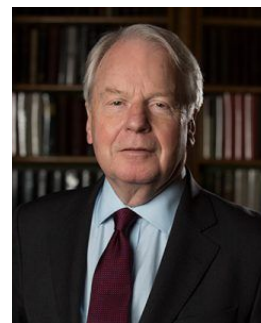
**Carol
Monaghan MP
Vice Chair**



**Mark Hendrick
MP Vice Chair**



**Lord Broers Vice
Chair**



**Lord Janvrin
Vice Chair**



**Baroness
Susan Kramer
Vice Chair**

Introduction

The All-Party Parliamentary Group on Artificial Intelligence (APPG AI) was set up in January 2017 with the aim to explore the impact and implications of Artificial Intelligence, including Machine Learning. The group will explore practical steps for how government, industry, and the wider society can address AI implications.

APPG AI hopes to serve as a platform for a diverse audience to share knowledge and co-create solutions for the future. In the end, the group plans to compile a toolkit for Parliamentarians and other key stakeholders to use when shaping policies, regulations, and budgets.

In 2018, the APPG AI has decided to focus on building a roadmap to understand the practical steps for addressing key AI implications. The group has prioritised six focus areas to explore and, through each Evidence Meetings, hopes to generate pragmatic solutions with clearly defined steps for how they can be reached. Each meeting will explore the respective economic, social, and ethical implications.

In 2018, there will also be two Receptions (one Spring Party at Milbank Tower and one AI Christmas reception in Cholmondeley Room & Terrace) and four Futures Dinners in Parliament. There will be quarterly advisory board meetings to co-set strategy on topics and feedback on the output of activities.

Throughout the year, APPG AI will also partner with organisations and individuals to host ad-hoc workshops aimed to brief MPs and Peers on specific areas of AI. The workshops will include tangible output which the MPs can use in their constituencies to raise awareness and educate targeted groups (i.e. local schools, hospitals, etc.) on AI implications.



2018 EVIDENCE MEETING 1 – DATA – OVERVIEW

22 January 2018

The All-Party Parliamentary Group on Artificial Intelligence (APPG AI) was set up by co-chairs Stephen Metcalfe MP and Lord Clement-Jones CBE to explore the impact and implications of Artificial Intelligence.

In 2018, the APPG AI has decided to focus on building a roadmap to understand the practical steps for addressing key AI implications. The group has prioritised six policy areas: data, skills, accountability, innovation & entrepreneurship, infrastructure, and trade. Each meeting will explore one of the six policy areas' respective economic, social, and ethical implications.



2018 EVIDENCE MEETING 2 – SKILLS

26 February 2018



2018 EVIDENCE MEETING 3 – ACCOUNTABILITY – TRACEY GROVES – WRITTEN EVIDENCE

12 March 2018



2018 EVIDENCE MEETING 5 – INFRASTRUCTURE

9 July 2018



Expert Felicity Burch from CBI talks at APPG AI Evidence Meeting on AI and Entrepreneurship on 11th June 2018.



The All-Party Group on Artificial Intelligence meets for its second advisory board meeting, chaired by Stephen Metcalfe MP.

APPG AI

Reports and Evidence Meetings



All Party Parliamentary Group on
Artificial Intelligence

Key Highlights

- In January 2017 the [All-Party Parliamentary Group on AI](#) was established with the aim of addressing “the economic, social, and ethical implications of developing and implementing Artificial Intelligence (including machine learning, natural language understanding, automated reasoning, autonomous systems, etc).”
- [In their own words](#), the APPG on AI seeks to “unpack the term [AI], to gather evidence to better understand it, to assess its impact, and, ultimately, to empower decision-makers to make policies in the sphere. Without being too technical, we will try to understand how AI will impact the lives of UK citizens and organisations, and subsequently, whether and how it should be regulated. Bringing together government, business, and academia we will share evidence and assist in setting an agenda for how the UK should address AI moving forward. There is a lot to explore and evidence is key shaping the future.”
- Throughout 2018 the APPG on AI has held 7 [Evidence Meetings in Parliament](#) to flesh out their roadmap for a safe, ethical and effective AI Industry in the UK.
- The explicit aim of the APPG on AI for 2018 is to "focus on building a roadmap to turn AI from a Grand Challenge to a tool for unlocking economic and social benefits across the UK", and to explore "practical steps for how government, industry, and the wider society can address AI implications."
- The APPG on AI has identified six areas have been prioritised for the group to unpack as a result of the Evidence Meetings they held in 2017, including :data, skills, accountability, innovation & entrepreneurship, infrastructure, and trade.
- The present chapter summarizes the key findings produced during the course of the APPG on AI's 7 Evidence Meetings held so far throughout 2018.

What is AI? (1st Meeting of the APPG AI)

What is AI? is a theme report based on the first meeting of the All-Party Parliamentary Group on Artificial Intelligence (APPG AI) held on 20 March 2017 at the House of Commons. This meeting was chaired by Stephen Metcalfe MP.

The aim of the first APPG AI meeting was to discuss the different meanings that Artificial Intelligence can have depending on its use, application and sector. The meeting instilled a positive view of what AI means for the UK, and the global, future. As long as important issues related to employment, inequality, and privacy are addressed, the APPG AI concluded that the opportunities linked with AI far outweigh the risks.

Four key themes can be extracted from the discussion and are further explored in the report:

1. **AI is Multi-Faceted.** The reality is that AI has multiple meanings- depending on the specific context. There are two types of AI, strong and weak, examples of which can be seen in various sectors, including consultancy and legal, finance and insurance, health, energy, fast- moving consumer goods, high valued manufacturing, military, research and education, transport, IT, software, and media and communications.
2. **AI is Opportunity.** AI has already had positive impact in society; and, has the potential of opening doors to economic, social, and environmental opportunity in the upcoming years.
3. **AI is Transformative.** AI has transformed, and will continue to transform, what we know as the status quo. The job market will be altered, the concept of privacy reframed, and industry structures redesigned.
4. **AI is the Road Ahead.** The UK can be one of the leaders in the AI movement; however, critical steps have to be made to seize the opportunity:
 - Need to build public engagement and trust
 - Need to sustain and foster an AI-friendly environment
 - Need to capitalize on AI initiatives

Ethics and Legal in AI: Decision Making and Moral Issues (2nd Meeting of the APPG AI)

Ethics and Legal in AI: Decision Making and Moral Issues is a theme report based on the second meeting of the All-Party Parliamentary Group on Artificial Intelligence (APPG AI) held on 27 March 2017 at the House of Lords. This meeting was chaired by Lord Tim Clement-Jones.

Following the discussion from the first meeting, the APPG AI decided to zoom in the focus of the subsequent gatherings to really probe and tackle specific layers of artificial intelligence. Henceforth, the aim of the second APPG AI meeting centred on the ethical and legal dimensions in AI, particularly in regards to decision-making and moral issues.

In the 2nd APPG AI Evidence Giving Meeting, individuals from government, business, academia, and the wider public gathered to discuss the key issues pivotal to the subject matter. First, six experts in the AI sector shared their thoughts on decision-making and AI. Second, in an open discourse environment, the entire group of 100 engaged in an active conversation on the topic.

Three main issues were referred to repeatedly:

- delegation of decisions,
- transparency and rationale in the decision-making process,
- and the creation of accountability and liability frameworks.

The 2nd APPG AI Evidence Giving Meeting acknowledging the issue of decision-making and AI, concluded that there should always be a human factor involved in the process. Also, the group recognized that this issues crosses national boundaries and the international community needs to work together in order to adequately address the issue. Through clear guidelines about what machines can and cannot do and also guidelines on unintended consequences, we can help society build trust in the AI Revolution.

Ethics and Legal in AI: Data Capitalism (3rd Meeting of the APPG AI)

Ethics and Legal in AI: Data Capitalism is a theme report based on the third meeting of the All-Party Parliamentary Group on Artificial Intelligence (APPG AI) held on 26 June 2017 at the House of Lords. This meeting was chaired by Stephen Metcalfe MP and Lord Tim Clement-Jones. The aim of the third APPG AI Evidence Giving meeting centred on the ethical and legal dimensions in AI, particularly in regards to data capitalism.

The group acknowledges the urgency to rethink data governance. There were two alternative approaches offered on how the UK should change the way data is collected, used, and managed. The first approach – the hard approach – called for a change in legislation. The second approach – the soft approach – called for the use of soft-structures (new and old) to address the issues of data capitalism. This report is divided into five sections in which it discusses the transformation of data governance, considers different approaches moving forward, and, lastly, makes some pragmatic and urgent recommendations.

1. **Data is AI's key ingredient.** Data is now one of the most valuable resources. It is now more than a knowledge asset and has become a key commodity worldwide. It is the key ingredient for AI. Data fuels AI technologies and, in turn, AI technologies curate more data.
2. **Data collection, use, and management are vastly transforming.** Throughout history, data has always been collected, used, and managed by different actors for different purposes. However, we have now entered a period of data capitalism – in which the volume and velocity of data has skyrocketed. The create use of data has completely transformed industries, routines at work and the way we live our lives. Social notions are with people, machines, and software.
3. **Data governance needs a hard approach?** One view is that current legislation is outdated considering the transformations that have occurred. This report summarize the evidence of a call for a change in laws and policies to unlock the value that can be created with data in the AI era.
4. **Data governance needs a soft approach?** Another view is that soft-structures are enough to unlock the value data can create in the AI era. On this front, the report explores several issues.
5. **Data governance needs an evidence-based, guidance framework.** Two critical steps should be taken moving forward: (1) An analysis of the current legislation landscape in place and (2) The creation of a set of standards on how data should be collected, used, and managed with social purpose.

Markets and AI-Enabled Business Models (4th Meeting of the APPG AI)

Markets and AI-Enabled Business Models is a theme report based on the fourth meeting of the All-Party Parliamentary Group on Artificial Intelligence (APPG AI) held on 10 July 2017 at the House of Commons. This meeting was chaired by Stephen Metcalfe MP. The aim of the fourth APPG AI Evidence Giving meeting centred on understanding AI's impact on markets and business models.

All six members of the Panel discussed how AI is transforming value creation, introducing completely new forms of value generation and, also, restructuring existing models. Five key trends were extracted from the meeting:

1. **AI is creating new products and services.** The opportunities to adapt AI quickly and create new products or services means high potential for new market entries, new leaders, and an overall reconstructing of current industry landscapes. Companies that will benefit most are those that manage to take advantage of the interplay of technologies.
2. **AI is increasing efficiency.** AI is transforming how products and services are generated, delivered and used or consumed. AI has the power to replicate labour at a much greater scale and speed, with the same or better quality. Cost and time are reduced while quality and variety are all enhanced.
3. **AI is forming new business models.** Companies are changing their business models to reap the full benefits of the Fourth Industrial Revolution with AI. Two common systems are the vertical model and the horizontal model. With AI there is also the formation of a third model made up of a horizontal system with vertical openings.
4. **AI is providing broader access to more personalised products and services.** The products and services enabled by AI-technologies all share two key characteristics:
 - They are accessible to a broader group of individuals, spanning previous geographic and social borders.
 - They can be tailored to the personalised needs and/or preferences of each customer (also called mass customisation).
5. **AI is redefining success.** Changing the factors of competitive advantage and the criteria investors look for. Data access, platform control, and AI capabilities become more important in the competitive spheres than the products and services themselves.

Governance, Social and Organisational Perspective for AI (5th Meeting of the APPG AI)

Governance, Social and Organisational Perspective for AI is a theme report based on the fifth meeting of the All-Party Parliamentary Group on Artificial Intelligence (APPG AI) held on 11 September 2017 at the House of Commons. This meeting was chaired by Lord Tim Clement-Jones. The aim of the fifth APPG AI Evidence Meeting centred on understanding the social and organisational implications of AI technologies - and how they should be governed.

The APPG AI's fifth Evidence Meeting extracted five main themes in the discussion exploring what the impacts of AI on social and organisational structures are and how AI should be governed in both the private and public realms looking ahead.

1. **AI is resurfacing existing issues in our social and organisational structures.** Concerns about increasing inequality gaps, stereotypes and biases, shortages of skills, and abuse of power have existed in our society for centuries now. AI is not the creator of these problems, AI is simply resurfacing prevailing problems and urging society to acknowledge their existence and provide solutions.
2. **AI is creating a new set of issues for society to address.** AI technologies are of such high impact and progress at such rapid speeds that some issues developing are authentically new. Some of these include increasingly automated decision-making, potentially catastrophic security threats, technological unemployment, and transformations in current notions of privacy, agency, consent, and accountability.
3. **Governance is necessary to build public confidence in AI.** The combination of existing problems put back in the spotlight and the emergence of a new set of challenges is creating social turbulences. Most people are not well informed of AI implications and, in consequence, there is a growing sense of uncertainty, fear, and mistrust building around AI.
4. **AI governance depends on corporate responsible innovation.** The private sector shares responsibility for creating AI that is made and used for the benefit of humanity. Therefore, companies must be encouraged to create AI with social value and to consider the ethical and social consequences of the technologies they deploy.
5. **AI governance relies on forward- looking policies and regulation.** The government must act quick in guiding the norms and standards for AI and set the appropriate regulation where need be. Furthermore, Government must evolve with technology to harness the opportunities and protect society from the risks.

Inequality, Education, Skills, and Jobs (6th Meeting of the APPG AI)

Inequality, Education, Skills, and Jobs is a theme report based on the sixth meeting of the All-Party Parliamentary Group on Artificial Intelligence (APPG AI) held on 16 October 2017 at the House of Lords. This meeting was co-chaired by Stephen Metcalfe MP and Lord Tim Clement-Jones. The aim of the sixth APPG AI Evidence Giving meeting centred on AI's impact on (in)equality, education, skills, and jobs. Eight experts were invited to provide evidence reflecting their views on (i) how the benefits of AI can be distributed across all members of society in a fair and inclusive way, and (ii) how the society can be best prepared with the skills for the future.

1. **AI changes the demand side of labour.** AI technologies are creating new pressures on the labour market, misaligning the demand and labour sides of the equation. Precisely, the demand side of labour is changing in three ways: jobs losses, job creation, and job transformation. As AI technologies have the power to automate increasingly more tasks, cheaper and faster, there is growing concern that jobs across levels and sectors will be at risk of automation. New technologies are also creating new jobs, but this means employers are demanding a completely new type of employee with specific qualifications.
2. **AI changes the supply side of labour.** The supply side of labour needs to have the skills needed to compete and succeed in the AI era. Two broad categories of skills have been identified that the Government must encourage:
 - STEM (science, technology, engineering, and mathematics), computing, data science, and digital
 - problem-solving, creativity, interpersonal, and adaptability skills
3. **AI changes (in)equality.** AI has impact on inequalities related to income, gender, race, and regional disparities. The benefits of AI don't appear to be distributed across all members of society in a fair and inclusive way. Tech giants are benefiting most of all as others are pushing to adapt and reskill. Furthermore, the impacts of AI will vary across the country. Job automation is likely to take a different form in different regions, and some constituencies are at much higher risk of automation than others.
4. **AI needs a new approach to education.** The education pillar needs to be restructured to prepare future generations and retrain the current workforce with the skills needed in the today's labour market. Primary education needs to include basic skills for how to live with AI and how to use AI. Higher education must boost its curriculums with special data management and neural-networks degrees to ensure UK remains competitive in making the AI technologies shaping our future.

International Perspective and Exemplars (7th Meeting of the APPG AI)

International Perspective and Exemplars is a theme report based on the seventh meeting of the All-Party Parliamentary Group on Artificial Intelligence (APPG AI) held on 30 October 2017 at the House of Lords. This meeting was chaired by Stephen Metcalfe MP. The aim of the seventh APPG AI Evidence Meeting looked at AI issues through an international lens and explored best practices from different countries.

Nine experts were invited to provide evidence reflecting their views on (i) how the international arena is preparing for AI, and (ii) whether AI is a national or international issue. Providing best practice exemplars, the group discussed what the ideal AI strategy for the UK should look like. Second, it considers whether AI issues should be addressed at a national or international scale. Third, it reflects on UK's position in the global arena and how UK can lead the world in shaping the rules, norms and AI standards for safe and ethical innovation and commercialization and trade using AI.

1. **AI Exemplars: A Dive into International Use Cases.** Governments across the globe are seeking to understand AI's implications and the scale and scope of the changes which are coming upon us. However, at this stage, the international arena is lacking the mechanisms and processes to steer, deploy, and champion AI technologies. Governments must be agile to create these structures in order to untap AI's mass potential. This section explored how South Korea, Canada, Singapore and the European Union are embracing AI.
2. **AI: A national or international issue?** AI raises many concerns, related to matters that have to do with security, inequality, privacy, employment, and education. The technological revolution of today is of scale, speed, and complexity like no other in the past. And, hence, many believe that global coordination is essential to truly address the heart of these concerns. This section contemplates how AI issues can be addressed at both a national and an international level.
3. **UK's position in the AI global ecosystem.** A challenging race to make most of the opportunities posed by AI has begun. China, the US, Russia, Canada, Japan, and many more countries have passed ambitious strategies in which they have put AI as a priority in their political agendas. This section focuses on UK's opportunity to convene in the international governance of the rules, norms and standards in AI and, hence, lead the ethical and safe deployment of AI technologies in society.

Chapter V:

AI in London: Mayor and
Assembly in AI development in
London

Key Highlights

- A 2018 report produced for the Mayor of London in coordination with CognitionX, has identify London as the [AI Growth Capital of Europe](#), home to more AI start-ups than any other single European Country.
- The report serves to uncover the opportunities to unlock innovation and investment in London in order to maximise the economic impact of AI on the city, and to support the Mayor's ambition to make London a world-leading Smart City.
- The report's key findings echo sentiments found in our own analysis, in particular regarding London being a leading AI tech hub, which we argue is one of the factors behind the recent increase of investments into UK tech startups, as well as the trend of international tech specialists flocking to the UK, namely, because this interconnectedness and the synergy between financial hubs, tech hubs and scientific development hubs in the UK creates a highly favourable ecosystem for convergent technology development, as exemplified by London, which brings together a high density of tech hubs with a strong international reputation as a financial epicenter and the intellectual and academic prowess of the London-Oxford-Cambridge triangle.
- Some of the report's key findings include:
 - 758 AI companies specialising on over 30 distinct industries are located in London, which is double the total of Paris and Berlin combined.
 - Investment raised by London's AI companies grew by more than 50 per cent in 2017, reaching over £200m.
 - London's AI startup scene features a high degree of diversity, with 25 percent of London's AI suppliers having at least one female founder, compared to just 17 per cent of global start-ups, and 43 per cent having at least one non-UK founder.

London: The AI Growth Capital of Europe

According to London's deputy mayor Rajesh Agrawal London is a global hub for AI and leads Europe in AI growth.

The report found that small to medium-sized businesses were the driving force behind making London such a hub for AI. Produced for the Mayor by CognitionX, the AI advice platform, the report will help to uncover the opportunities to unlock innovation and investment in London in order to maximise the economic impact of AI on the city, and to support the Mayor's ambition to make London a world-leading Smart City.



The key findings in the report “London: The AI Growth Capital of Europe”, include:

- London is home to 758 AI companies – double the total of Paris and Berlin combined. They specialise in more than 30 industries with particular strengths in insurance, finance and law. Some 645 of these companies have a headquarters in the capital.
- Investment raised by London's AI companies grew by more than 50 per cent in 2017, reaching over £200m. This represented approximately 10 per cent of the record £2.45bn raised by London's technology firms in 2017. This includes big deals for companies such as Babylon Health (£47.56m), Callsign (£26.92m) and Starship Technologies (£13.95m)
- 43 per cent of London's AI suppliers have at least one non-UK founder. 32 per cent have at least one founder who are from Black, Asian, and minority ethnic backgrounds.
- 25 per cent of London's AI suppliers have at least one female founder, compared to just 17 per cent of global start-ups. The report says that London has an opportunity to build on the current levels of female founders and provide a start-up environment that encourages higher levels of female participation in AI and across the technology sector.

Sources: https://www.london.gov.uk/sites/default/files/london_theaigrowthcapitalofeurope.pdf
<https://www.londonandpartners.com/media-centre/press-releases/2018/london-named-artificial-intelligence-ai-capital-of-europe-by-new-report>

London: The AI Growth Capital of Europe

CognitionX was commissioned by the Mayor of London to map AI innovation across London and identify the capital's unique strengths as a global hub of Artificial Intelligence. The findings of this research will inform the actions the Mayor will take to support the future growth of AI across different industries to drive innovation, productivity and growth. AI is a huge opportunity.

As the AI growth capital of Europe, London is well placed to maximise the substantial economic benefits of AI over the long term.

With 758 companies, 645 of which have a London headquarters, London has an AI supplier base that is double the size of Paris and Berlin combined. London has stronger global positions in AI in its leading industries, especially finance, insurance, and law. The rate of new AI supplier formation in London is 42% per annum, significantly faster than the global rate of 24% per annum. London's skilled talent pool provides the capital's AI suppliers and their customers with a pipeline of technical and entrepreneurial talent.

London's open, tolerant and multicultural society is a powerful draw for AI founders, talent and investors who see the city as a great place to live and work. This is reflected in the fact that 43% of London AI suppliers have a non-UK national as a founder. Community and peer support for London's start-up community is the best in Europe and London's founders enjoy strong connections with international entrepreneurs, second only to Silicon Valley.

Sources: https://www.london.gov.uk/sites/default/files/london_theaigrowthcapitalofeurope.pdf

London Touts Itself As The AI Capital Of Europe

A new survey commissioned by Sadiq Khan, Mayor of the city of London, claims to show that London is the AI capital of Europe, with investments on London-based AI companies exceeding £200 million in 2017, up 50% from the previous year, which represents roughly 10% of the £2.45 billion (\$3.3 billion) raised by all London tech companies put together in 2017. It also identified identified 758 AI companies operating in London, 645 of which London-based headquarters.

Speaking on the topic of the report at CogX, Sadiq Khan stated:

“There are few areas of innovation that have the power to define our future economy and society more than artificial intelligence. As Mayor, it is my goal to ensure both that London is at the forefront of developing and capitalising on these new technologies, and that all Londoners can benefit from the opportunities that they create. The research describes a city with a rich technology ecosystem, a strong pipeline of AI innovation and an academic and investment base set up for the long term. These strengths will also support my ambitions to make London a world leading smart city, in which public data and AI will open doors for the public and private sectors to work together to improve the way that Londoners experience our city on a daily basis. London’s unique global status as a capital of finance, business, government and technology is our standout asset. Everything entrepreneurs need is here in one place - not least access to clients.”



Source: <https://www.forbes.com/sites/parmyolson/2018/06/11/london-ai-europe-sadiq-khan/#691e3291c01d>
<https://www.londonandpartners.com/media-centre/press-releases/2018/london-named-artificial-intelligence-ai-capital-of-europe-by-new-report>
https://www.london.gov.uk/sites/default/files/london_theaigrowthcapitalofeurope_9june.pdf

London Touts Itself As The AI Capital Of Europe

London is a major hub for artificial intelligence. The city's Mayor, Sadiq Khan, promoted a survey he'd commissioned that suggested London was the "capital" of AI for Europe.

Khan's AI report was pulled together by CognitionX, a London-based AI advice service. The report found that investment into "AI companies" in London had exceeded £200 million in 2017, a year-on-year increase of more than 50%. That represented about 10% of the £2.45 billion (\$3.3 billion) raised by London tech firms last year.

Large businesses are increasingly being encouraged to incorporate AI into their services, and it's becoming easier to do so thanks to off-the-shelf machine-learning tools they can license from cloud providers like Google Cloud (TensorFlow) or Amazon Web Services (Sage Maker and DeepLens).

In April 2018 the British government led by Theresa May announced a flurry of public-private partnerships related to AI that it said were worth more than £1 billion (\$1.3 billion).

The big AI showcase may be down to pressure on Khan to show that London is very much open for business and cutting-edge technology, despite the central government's dithering over a Brexit deal with the European Union.

"London has twice as many AI companies as Paris and Berlin combined. London's unique global status as a capital of finance, business, government and technology is our standout asset" Khan said, adding that this wasn't going to change even after Brexit.

Chapter VI:

Fundamental Papers/Reports on AI in UK

Key Highlights

- The All-Party Parliamentary Group on AI has curated a number of key reports produced throughout 2017-2018 by a number of groups including:
 - Deloitte
 - PricewaterhouseCooper
 - The Royal Society
 - Numis and MMC Ventures
 - The Store WPP in partnership with IBM
 - GSMA
 - Big Innovation Centre
 - IBA (International Bar Association)
 - Tractica
 - Doteveryone
 - Recruitment & Employment Confederation
- The present chapter offers brief summaries of the key findings from these previous reports.

All Party Parliamentary Group on AI / 2017-2018 Reports

1. People, Power and Technology: The 2018 Digital Attitudes Report
2. The Malicious use of Artificial Intelligence: Forecasting, Prevention, and Mitigation
3. Power Up: UK Skills
4. The Future of Jobs
5. Towards a Reskilling Revolution
6. Gsma Global Mobile Radar: Spotlight on Artificial Intelligence
7. Will Robots Really Steal Our Jobs?
8. Oxford Insight's Government AI Readiness Index
9. Independent Review: Growing the Artificial Intelligence Industry in the UK
10. The State of AI 2017: Inflection Point
11. AI now 2017 report
12. The Impact of AI in the UK Constituencies: Where Will Automation Hit Hardest?
13. The Rsa Report: The Age of Automation
14. The Future of Skills: Employment in 2030
15. How Artificial Intelligence is Transforming the Retail Conversation
16. Pwc's Global Artificial Intelligence Study: Exploiting the AI Revolution
17. Policy Proposition Think Piece: Intangible Asset Reporting and an Intangible Assets Charter
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People, Power and Technology: The 2018 Digital Attitudes Report

People, Power
and Technology:

The 2018 Digital
Attitudes Report



Publication Date	February 23, 2018
Authors	Doteveryone (Catherine Miller, Ollie Sheldrick, Alex Lemon)
Link	http://www.appg-ai.org/wp-content/uploads/2018/02/people-power-and-technology-doteveryone-digital-attitudes-report-2018.pdf
Executive Summary	<p>This new research from Doteveryone looks beyond internet usage and explores how the British public thinks and feels about the internet technologies shaping our world and changing our lives. It is based on a nationally representative survey of 2,000 people online and 500 by phone, backed by in-depth conversations in focus groups, which are quoted in this report.</p> <p>This report highlights:</p> <ul style="list-style-type: none">• The internet has had a strongly positive impact on our lives as individuals, but people are less convinced it has been beneficial for society as a whole. 50% say it has made life a lot better for people like themselves, only 12% say it's had a very positive impact on society.• There is a major understanding gap around technologies. Only a third of people are aware that data they have not actively chosen to share has been collected. A quarter have no idea how internet companies make their money.• People feel disempowered by a lack of transparency in how online products and services operate. 89% want clearer terms and conditions, half would like to know how their data is used but can't find out.• There is a public demand for greater accountability from technology companies. Two thirds say government should be helping ensure companies treat their customers, staff and society fairly.

The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation



Publication Date	February 2018
Authors	Miles Brundage, Shahar Avin, Jack Clark, Helen Toner, Peter Eckersley, Ben Garfinkel, Allan Dafoe, Paul Scharre, Thomas Zeitzoff, Bobby Filar, Hyrum Anderson, Heather Roff, Gregory C. Allen, Jacob Steinhardt, Carrick Flynn, Sean O Helgeartaigh, Simon Beard, Haydn Belfield, Sebastian Farquhar, Clare Lyle, Rebecca Crootof, Owain Evans, Michael Page, Joanna Bryson, Roman Yampolskiy, and Dario Amodei.
Link	http://www.appg-ai.org/wp-content/uploads/2018/02/malicious_ai_report_final.pdf
Executive Summary	<p>This report surveys the landscape of potential security threats from malicious use of artificial intelligence technologies, and proposes ways to better forecast, prevent, and mitigate these threats. This report focuses on what sorts of attacks we are likely to see soon if adequate defenses are not developed.</p> <p>As AI capabilities become more powerful and widespread, it is expected the growing use of AI systems to lead to changes in the landscape of threats as: expansion of existing ones, introduction of new threats and change to the typical character of threats.</p> <p>This report proposes the exploration of several open questions and potential interventions within four priority research areas:</p> <ul style="list-style-type: none">• Learning from and with the cybersecurity community.• Exploring different openness models.• Promoting a culture of responsibility.• Developing technological and policy solutions. <p>The proposed interventions require attention and action not just from AI researchers and companies but also from legislators, civil servants, regulators, security researchers and educators.</p>

Power Up: UK Skills



Publication Date	2017
Authors	Deloitte
Link	http://www.appg-ai.org/wp-content/uploads/2018/02/deloitte-uk-power-up-uk-skills.pdf
Executive Summary	<p>There is a great deal of uncertainty about which of today's jobs will continue to exist in the near future. The number of people employed in 44 per cent of occupations in the UK is declining. If the predictions of technology disrupting entire industries come to pass, workers will need the ability to move into different types of jobs and at different points in their career, and apply underlying transferable "human" skills to different contexts.</p> <p>We should build and make better use of the transferable skills required to adapt to changing demands in the workplace, preconceptions about traditional career pathways based on academic achievement and expertise need to be challenged. Instead, more should be done to identify transferable skills across all parts of the workforce and create pathways for workers to transition between industries and different roles.</p> <p>Recognizing these skills in a more open-minded way, and helping young people and existing workers to strengthen them will improve worker mobility and make the UK labour force resilient in the face of significant change.</p>

The Future of Jobs



Publication Date	October 2017
Authors	Recruitment & Employment Confederation
Link	http://www.appg-ai.org/wp-content/uploads/2018/02/rec-future-of-jobs-report-web-13.10.17.pdf
Executive Summary	<p>“The best way to pre-empt the future is to create it. Let’s make the UK the best jobs market in the world.”</p> <p>The world of work is rapidly changing, and many of the jobs being undertaken today will simply not exist in seven years. At the same time, many new jobs are emerging – driven by the advancement of new technologies such as artificial intelligence, 3D printing, and robotics. Many of these new jobs will require skills very different from today’s requirements. In an era of disruption, there is a need of an agile labour market that is also underpinned by good hiring and management practices.</p> <p>The commission examined what this aspirational vision of a future jobs market means for three specific audiences: individuals, employers, and the government.</p> <p>The REC is committed to playing a leading role in effectively measuring and reviewing progress towards a shared goal of creating the best jobs market in the world by 2025.</p>

Towards a Reskilling Revolution



Publication Date	January 22, 2018
Authors	World Economic Forum
Link	http://www.appg-ai.org/wp-content/uploads/2018/02/wef_fow_reskilling_revolution.pdf
Executive Summary	<p>Towards a Reskilling Revolution aims to provide one key building block for workers looking to find their place in the future of work and for business leaders and governments looking to build more prosperous companies and productive economies and societies. the report introduces an innovative, big data approach built on conventional labour market information systems as well as online job postings. It demonstrates the power of data-driven approaches for finding solutions to job disruptions, including job transition pathways and reskilling opportunities that might not be immediately apparent.</p> <p>There is a sense that the rise of artificial intelligence, robotics and other digital developments is upending the primacy of human expertise in the economy. The individuals who will succeed in the economy of the future will be those who can complement the work done by mechanical or algorithmic technologies, and ‘work with the machines’. For both individuals and employers facing these disruptions—and for governments and other stakeholders seeking to support them—is how to better anticipate and proactively manage the current realignments and transitions of the labour market to shape a future of work that expands economic growth and opportunities for all.</p>

GSMA Global Mobile Radar: Spotlight on Artificial Intelligence



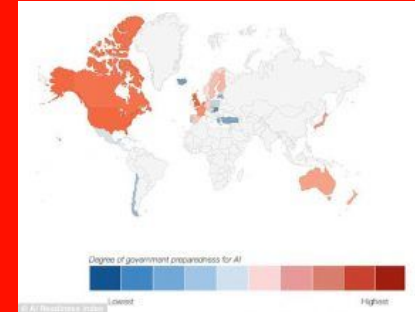
Publication Date	September 14, 2017
Authors	GSMA
Link	http://www.appg-ai.org/wp-content/uploads/2017/12/gsma_ai-webinar.pdf
Executive Summary	<p>Global Mobile Radar is an exclusive and interactive community for industry strategic foresight. Big tech platforms are leading the race on AI ; strategies differ on their approach to data privacy & data ecosystems. AI is driving the next and deepest wave of disruption across the ecosystem.</p> <p><i>“Gone is the era of PC, and soon will we say goodbye to the era of mobile internet – we believe that coming is the era of AI”</i> - Robin Li, CEO, Baidu</p> <p>At this webinar were discussed the following points:</p> <ul style="list-style-type: none">● AI as reality, not myth● AI is a technology, not a product● The ecosystem is moving to an AI first strategy● AI will drive the next wave of ecosystem disruption● Economic and social impact could be significant

Will Robots Really Steal Our Jobs?



Publication Date	February 6, 2018
Authors	PwC
Link	http://www.appg-ai.org/wp-content/uploads/2018/02/international-impact-of-automation-feb-2018.pdf
Executive Summary	<p>Over the past few years, fears of technology-driven job losses have re-emerged with advances in ‘smart automation’ – the combination of AI, robotics and other digital technologies that is already producing innovations like driverless cars and trucks, intelligent virtual assistants like Siri, Alexa and Cortana, and Japanese healthcare robots.</p> <p>While traditional machines, including fixed location industrial robots, replaced our muscles (and those of other animals like horses and oxen), these new smart machines have the potential to replace our minds and to move around freely in the world driven by a combination of advanced sensors, GPS tracking systems and deep learning - if not now, then probably within the next decade or two.</p> <p>Businesses need to consider now how successive waves of AI-related technologies might further break down barriers to entry in their sector and challenge existing business models. Individuals also need to be more entrepreneurial, taking responsibility for their lifelong learning and seeking to generate their own intellectual property and start new businesses. Businesses and governments can help to maximise the benefits of AI and robotics while minimising as far as possible the negative impacts of these disruptive technologies.</p>

Oxford Insight's Government AI Readiness Index



Publication Date	
Authors	Richard Stirling, Hannah Miller and Emma Martinho-Truswell
Link	https://www.oxfordinsights.com/government-ai-readiness-index/
Executive Summary	<p>Artificial intelligence will revolutionise public service delivery. Governments around the world are starting to see its enormous potential: for their economies, their societies, and their own public services. Although the UK has great starting conditions for AI development, it faces stiff competition from other countries seeking to be top of the global rankings. China, the US, Russia and Canada have all announced plans to be world leaders in AI. If the UK wishes to retain its high ranking in our capacity index, the government will need to continue to invest in order to remain competitive in future years. The US lags behind the UK on measures including digital skills and data quality. Our index highlights a number of key areas for investment if the US is to prepare better for the AI revolution, such as a stronger focus on digital skills training and data infrastructure.</p> <p>There is no clear geographical clustering in terms of AI readiness: the top five ranked countries are from North America, Europe and Asia. It is now up to governments to ensure that they are well placed to take best possible advantage of the AI revolution.</p>

Independent Review: Growing the Artificial Intelligence Industry in the UK

GROWING THE ARTIFICIAL
INTELLIGENCE INDUSTRY IN THE UK
Professor Dame Wendy Hall and Jérôme Pesenti

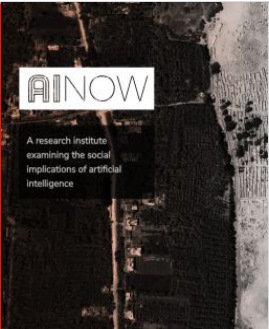
Publication Date	October 15, 2017
Authors	Professor Dame Wendy Hall and Jérôme Pesenti
Link	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/652097/Growing_the_artificial_intelligence_industry_in_the_UK.pdf
Executive Summary	<p>Increased use of Artificial Intelligence can bring major social and economic benefits to the UK. AI, computers can analyse and learn from information at higher accuracy and speed than humans can. It has been estimated that AI could add an additional USD \$814 billion (£630bn) to the UK economy by 2035, increasing the annual growth rate of GVA from 2.5 to 3.9%.</p> <p>To develop more AI, the UK will need a larger workforce with deep AI expertise, and more development of lower level skills to work with AI.</p> <p>This review recommends:</p> <ul style="list-style-type: none">- An industry-funded Masters programme in AI- Market research to develop conversion courses in AI that meet employers' needs- 200 more PhD places in AI at leading UK universities, attracting candidates from diverse backgrounds and from around the world.- Credit-bearing online AI courses and continuing professional development leading to MScs- Greater diversity in the AI workforce- An international AI Fellowship Programme for the UK.

The State of AI 2017: Inflection Point



Publication Date	October 2017
Authors	Numis and MMC Ventures
Link	https://www.mmcventures.com/wp-content/uploads/2017/10/The-State-of-AI-2017-Inflection-Point-Summary.pdf
Executive Summary	<p>Artificial Intelligence (AI) has been described as “the ultimate breakthrough technology” (Satya Nadella, Microsoft). While the last ten years have been about building a world that is mobile-first, “in the next ten years, we will shift to a world that is AI-first.” (Sundar Pichai, Google). In 2017 AI reached an inflection point, driven by milestones in investment, capability, entrepreneurship and adoption.</p> <p>Every chapter includes actionable recommendations for executives, entrepreneurs and investors.</p> <p>In this report the authors:</p> <ul style="list-style-type: none">• provide an accessible introduction to AI for the non-specialist.• explain the applications, implications and adoption of AI.• explore the ecosystem of early stage AI companies in the UK.• explain how investors can identify promising early stage AI companies.

AI Now 2017 Report



Publication Date	October 2017
Authors	Alex Campolo; Madelyn Sanfilippo; Meredith Whittaker; Kate Crawford
Link	https://assets.contentful.com/8wprhvnpc0/1A9c3ZTCZa2KEYM64Wsc2a/8636557c5fb14f2b74b2be64c3ce0c78/_AI_Now_Institute_2017_Report_.pdf
Executive Summary	<p>AI systems are already integrated in everyday technologies like smartphones and personal assistants, making predictions and determinations that help personalize experiences and advertise products. Beyond the familiar, these systems are also being introduced in critical areas like law, finance, policing and the workplace, where they are increasingly used to predict everything from our taste in music to our likelihood of committing a crime to our fitness for a job or an educational opportunity.</p> <p>We must also ask how broader phenomena like widening inequality, an intensification of concentrated geopolitical power and populist political movements will shape and be shaped by the development and application of AI technologies.</p> <p>This report focuses on new developments in four areas: labor and automation, bias and inclusion, rights and liberties, and ethics and governance. We identify emerging challenges in each of these areas and make recommendations to ensure that the benefits of AI will be shared broadly, and that risks can be identified and mitigated.</p> <p>AI is already with us, and we are now faced with important choices on how it will be designed and applied. AI systems are already being integrated in social, political and economic domains, and the implications can be complex and unpredictable.</p>

The Impact of AI in the UK Constituencies: Where Will Automation Hit Hardest?



Publication Date	October 17, 2017
Authors	Matthew Fenech, Cath Elliston, and Olly Buston
Link	https://static1.squarespace.com/static/5621e990e4b07de840c6ea69/t/59e777fcd7bdce3041b57ac3/1508341775530/FutureAdvocacy-GeographicalAI.pdf
Executive Summary	<p>The UK is home to world-beating artificial intelligence (AI) companies and world-class academic centres of AI research. Automation will impact different geographies, genders, and socioeconomic classes differently. The proportion of jobs at high risk of automation by the early 2030s varies from 22% to 39% for different constituencies.</p> <p>A poll data from our annual survey of the UK public's attitudes to AI shows that despite evidence suggesting high levels of automation are coming, the majority of people remain unworried about the impact of automation on their jobs and on jobs in their local area. It seems a deeper public debate about the future of work is urgently required. So far no party has anything like an adequate policy response to maximising the opportunities and minimising the risks that lie ahead.</p> <p>This report offers suggestions to the government of what policies it should implement and explains the necessity to act as quickly as possible.</p>

The RSA Report: The Age of Automation



Publication Date	September 2017
Authors	Benedict Dellot and Fabian Wallace-Stephens
Link	https://www.thersa.org/globalassets/pdfs/reports/rsa_the-age-of-automation-report.pdf
Executive Summary	<p>Public interest in artificial intelligence (AI) and robotics is gathering steam – and for good reason. Alarming newspaper headlines such as ‘Robots will destroy our jobs – and we’re not ready for it’ and ‘Robots will take a third of British jobs by 2030’ are now common. Most studies reveal a technological bias against low-skilled and low-paid workers.</p> <p>We conclude that jobs are more likely to evolve than be eliminated, and that new occupations will emerge in the long run, often of a more valuable and ‘human-centric’ nature. What is less clear is how AI and robotics will change the quality of work. Sales of industrial robots to the UK fell in the period between 2014 and 2015, with the UK purchasing fewer robots than France, the US, Germany, Spain and Italy. Today the UK has just 33 robot units for every 10,000 employees, compared with 93 in the US and 213 in Japan.</p> <p>On average, UK workers are 30 percent less productive than their counterparts in the US. Our problem is not with the number of jobs available today but rather with their quality.</p> <p>We firmly believe there is such a thing as automation on our own terms, and we spell out a positive vision for how this can be achieved.</p>

The Future of Skills: Employment in 2030



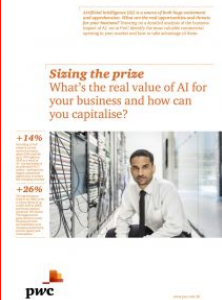
Publication Date	September 28, 2017
Authors	Hasan Bakhshi, Jonathan M. Downing, Michael A. Osborne, Philippe Schneider
Link	https://www.nesta.org.uk/sites/default/files/the_future_of_skills_employment_in_2030_0.pdf
Executive Summary	<p>This report maps out how employment is likely to change in the future – including the implications for skills – and anticipates a number of new occupations. It also shows likely dynamics in different parts of the labour market — from sectors like food and health to manufacturing. It was found that education, health care, and wider public sector occupations are likely to grow. It is also explained why some low-skilled jobs, in fields like construction and agriculture, are less likely to suffer poor labour market outcomes than has been assumed in the past.</p> <p>Crucially, through the report, the authors point to the actions that educators, policymakers and individuals can take to better prepare themselves for the future. Also skills, abilities and knowledge areas that are most likely to be important in the future, as well as the skills investments that will have the greatest impact on occupational demand, provides information that educators, businesses and governments can use for strategic and policy-making purposes.</p> <p>History is a reminder that investments in skills must be at the centre of any long-term strategy for adjusting to structural change. A precondition for this is access to good information on skills needs — without which policymakers risk flying blind.</p>

How Artificial Intelligence is Transforming the Retail Conversation



Publication Date	June 2017
Authors	The Store WPP in partnership with IBM
Link	http://brandz.com/admin/uploads/files/Smart_Shopping_Playbook.pdf
Executive Summary	<p>The rapid digitization of communication, shopping and almost every other aspect of daily life has entirely up-ended consumers' habits and expectations. People are now digitally connected to each other, to brands and even - through the Internet of Things - to their appliances.</p> <p>AI is not a single technology but a range of tools that can perform some of the tasks we've previously thought of as being exclusively human. These tools can understand natural language, and learn from text, images, videos and sound.</p> <p>Advanced AI systems like Watson can absorb vast amounts of information in seconds and minutes, learning in similar ways to humans – through sensing, processing information, and experiencing – only much, much faster than people. Then AI can use that learning to make reasoned decisions and recommendations. IBM calls this 'cognitive computing', because it approaches human cognition.</p>

Pwc's Global Artificial Intelligence Study: Exploiting the AI Revolution



Publication Date	
Authors	PwC
Link	https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf
Executive Summary	<p>There's a lot of expectation surrounding artificial intelligence (AI). There's also a significant amount of wariness. In this new series of PwC reports, the goal is to highlight how AI can enhance and augment what enterprises can do, the value potential of which is as large, if not larger, than automation. The analysis carried out for this report gauges the economic potential for AI between now and 2030, including for regional economies and eight commercial sectors worldwide.</p> <p>In this opening report, it is outlined the regional economies that are set to gain the most and the three business areas with the greatest AI potential in each of eight sectors.</p>

Policy Proposition Think Piece: Intangible Asset Reporting and an Intangible Assets Charter



Publication Date	July 2017
Authors	
Link	http://www.appg-ai.org/wp-content/uploads/2017/07/ig_intangible-asset-charter_060717.pdf
Executive Summary	<p>The intangible economy – the universe encompassed by the revolution in technological advances, data, digitalisation, intellectual property and sophisticated services – is now the driving force of economic development.</p> <p>Investment in intangibles ranging from digital information and business processes to intellectual property rights and digitally enabled networks is running at nearly twice the rate of investment in the tangibles of machines and factories. Intangibles are now driving business performance, the organisation of work and competitiveness. Lack of knowledge of intangibles and their impact on product quality, business processes and general economic dynamism is pervasive in British business.</p> <p>The government has indicated that it is aiming to lift infrastructure spending as a pillar in its new Industrial Strategy. Nonetheless, another core objective of Industrial Policy over the next five years should be to unlock the value of intangible assets so they can be the cornerstone of the 21st-century economy – and the charter is the best means to secure that end.</p>

Artificial Intelligence Market Forecasts



Publication Date	May 2017
Authors	Tractica
Link	http://www.appg-ai.org/library/artificial-intelligence-market-forecasts/
Executive Summary	<p>Tractica's market forecast is focused on identifying the software, hardware, and services revenue opportunity for AI, building a bottom-up, use case-based model that classifies and estimates the revenue potential of each use case and rolls it up by industry, technology, and world region to estimate the overall market.</p> <p>This Tractica report provides a quantitative assessment of the market opportunity for AI across the consumer, enterprise, and government sectors. The report includes market sizing, segmentation, and forecasts for 154 specific AI use cases and the 29 industries in which they will play a role. The market forecasts span the period from 2016 through 2025 and include segmentation by the six fundamental AI technologies: machine learning, deep learning, computer vision, NLP, machine reasoning, and strong AI. Revenue forecasts are further segmented by software, hardware, and services, in addition to segmentation by world region.</p>

Intangible Asset Reporting



Publication Date	July 2017
Authors	Birgitte Andersen, Sandra Batten, Richard Heys, David Stroll, Philip Wales, Ruth Yeoman
Link	http://www.appg-ai.org/wp-content/uploads/2017/07/ig_intangible-assets-reporting_060717.pdf
Executive Summary	<p>Intangible assets have become the most significant driver of economic growth and business models alike. The purpose of this report is to assess the multiple definitions of intangibles and develop a workable synthesis of how they can best be defined and measured in order better to analyse and understand them.</p> <p>The Intangible Gold Project's definition of Intangible Assets is a mixture of above, and we believe that it can satisfy all stakeholder criteria. An intangible within a company is an asset if it:</p> <ul style="list-style-type: none">• Creates financial and/or non-financial benefits (such as increased productivity, innovation, purpose, revenue, etc.);• Can be traded' in the marketplace; and/or• Can be controlled' by any stakeholder internal or external to the organization.

Machine Learning: The Power and Promise of Computers that Learn by Example



Publication Date	April 25, 2017
Authors	
Link	https://royalsociety.org/news/2017/04/machine-learning-requires-careful-stewardship-says-royal-society/
Executive Summary	<p>Machine Learning: the power and promise of computers that learn by example comes at a critical time in the rapid development and use of this technology, and the growing debate about how it will reshape the UK economy and people's lives. Crucially the report calls for research funding bodies to support a new wave of machine learning research that goes beyond technical challenges, and into areas aimed at addressing public confidence in machine learning – vital to the UK maintaining its internationally competitive edge at the forefront of this area.</p> <p>The report calls for action in a number of key areas over the next five to ten years to create an environment of “careful stewardship” that can help ensure that the benefits of this technology are felt broadly. Understanding who will be most affected, how the benefits are likely to be distributed, and where the opportunities for growth lie, will be key to designing the most effective interventions to enable people and businesses to adapt to, and take advantage of, the machine learning driven changes to their lives and livelihoods. The report also offers the first evidence about the UK public's views on machine learning, including the application areas about which they are particularly positive, and the need for the real-world data feeding the growth of this technology to be dealt with fairly and securely.</p>

Artificial Intelligence and Robotics and Their Impact on the Workplace

Publication Date	April 2014
Authors	IBA (International Bar Association)
Link	https://www.ibanet.org/Article/NewDetail.aspx?ArticleUid=012a3473-007f-4519-827c-7da56d7e3509
Executive Summary	<p>The present wave of automation, driven by artificial intelligence (AI) – the development of computer systems able to perform tasks normally requiring human intelligence – is creating a gap between current legislation and new laws necessary for an emerging workplace reality.</p> <p>The report focuses on potential future trends of AI, and the likely impact intelligent systems will have on: the labour market, the structures of companies, employees' working time, remuneration and the working environment. In addition to illustrating the thread and importance of law in relation to these areas, the report assesses the law at different points in the automation cycle – from the developmental stage, when computerisation of an industry begins, to what workers may experience as AI becomes more prevalent, through to issues of responsibility when things go wrong. These components are not examined in isolation, but in the context of economics, business and social environment.</p>

Mind Over Machines: New Technology and Employment Relations



Publication Date	June 2017
Authors	Patrick Bri�ne (IPA)
Link	http://www.acas.org.uk/media/pdf/i/9/Minds-over-Machines-New-Technology-and-Employment-Relations.pdf?utm_source=Communicator&utm_medium=Email&utm_content=Link414&utm_campaign=**EXCLUSIVE**+Automation+Breakfast+Briefing
Executive Summary	<p>Most technology is introduced with the expectation that it will in some way increase productivity and we see numerous examples of where the technology has made employees working lives easier, by automating some of their more difficult or tedious tasks, by saving time, by easing physical burdens or by providing helpful data and information. However, we also see ways in which technology can increase the burden of work on employees, by enabling greater work intensification, by increasing the amount of work that needs to be done to analyse reams of new data, provide technical support and cyber security and retrain ways of working, sometimes continuously, to keep abreast of technological changes.</p> <p>The structures of workplaces may themselves change, with flatter management structures being potentially more appropriate for more highly automated environments and line managers themselves facing the potential erosion of parts of their role as they increasingly compete with 'management algorithms' that claim to be able to do their job better. These algorithms pose major dangers in terms of accountability, transparency of decision making and ultimately the ability of humans to retain control of the workplace environment and ensure it is grounded in human values. However, these algorithms promise much greater efficiency of decision making based on the ability to process data far beyond human capabilities.</p>

Why AI Is the Future of Growth?



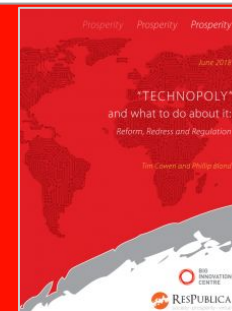
Publication Date	September 2016
Authors	Mark Purdy and Paul Daugherty
Link	https://www.accenture.com/lv-en/_acnmedia/PDF-33/Accenture-Why-AI-is-the-Future-of-Growth.pdf
Executive Summary	<p>There has been marked decline in the ability of increases in capital investment and in labor to propel economic progress. These two levers are the traditional drivers of production, yet they are no longer able to sustain the steady march of prosperity enjoyed in previous decades in most developed economies.</p> <p>With the recent convergence of a transformative set of technologies, economies are entering a new era in which artificial intelligence (AI) has the potential to overcome the physical limitations of capital and labor and open up new sources of value and growth.</p> <p>Policy makers and business leaders must prepare for and work toward a future with artificial intelligence. They must do so not with the idea that AI is simply another productivity enhancer. Rather, they must see AI as the tool that can transform our thinking about how growth is created.</p>

AI and related technologies should create as many jobs as they displace



Publication Date	July 2018
Authors	PwC
Link	https://www.pwc.co.uk/economic-services/ukey/ukey-july18-full-report.pdf
Executive Summary	<p>Artificial Intelligence (AI) and related technologies are projected to create as many jobs as they displace in the UK over the next 20 years, according to new analysis by PwC. In absolute terms, around 7 million existing jobs could be displaced, but around 7.2 million could be created, giving the UK a small net jobs boost of around 0.2 million.</p> <p>The most positive effect of AI is seen in the health and social work sector, where PwC estimates that employment could increase by nearly 1 million, equivalent to around 20% of existing jobs in the sector. On the other hand, PwC estimates the number of jobs in the manufacturing sector could be reduced by around 25%, representing a net loss of nearly 700,000 jobs.</p> <p>PwC's report highlights that how individuals, businesses and the government engage with AI and new technologies will affect how many jobs are created and how much it contributes to the UK economy.</p>

“TECHNOPOLY” and what to do about it: Reform, Redress and Regulation



Publication Date	June 2018
Authors	Tim Cowen and Phillip Blond (ResPublica and Big Innovation Centre)
Link	https://www.respublica.org.uk/wp-content/uploads/2018/06/ResPublica-Report_Technopoly-and-what-to-do-about.pdf
Executive Summary	<p>In “<i>TECHNOPOLY</i>” and <i>what to do about it: Reform, Redress and Regulation</i>, ResPublica, with the support of the Big Innovation Centre, outline proposals for a radical overhaul of current regulation of the technology sector, which they argue is unfit for purpose, incentivises bad behaviour and has failed to address ethical questions around Big Data and its use.</p> <p>The detailed and technical report, warns higher consumer prices are a problem in the sector as well as dominance by internet giants of advertising revenue, data and even the provision of news. This report highlights higher levels of concentration across a range of industries, a rise in economic rent, a fall in new market entry and a corresponding and evidenced threat to innovation.</p> <p>Part I of this paper outlines the issues and problems we face in the broader economic context, followed by proposals for reform in Part II. As highlighted on the right of this page, the authors provide 10 recommendations on changes that can be made to address the problems identified.</p>

Chapter VII:

House of Lords report on Artificial Intelligence and Government Response



Key Highlights

- 16 April 2018, the House of Lords published on a Report of Session 2017–19 “AI in the UK: ready, willing and able?”, with the aim of "with the aim of underlining the fact that AI presents a significant opportunity to solve complex problems and potentially improve productivity".
- In response to this report, the UK Government released a June 2018 report entitled "Government response to House of Lords Artificial Intelligence Select Committee's Report on AI in the UK: Ready, Willing and Able?"
- In their response, the UK Government has stated that "the Office for Artificial Intelligence, the future Centre for Data Ethics and Innovation and the AI Council will work together to create Data Trusts. Data Trusts will ensure that the infrastructure is in place, that data governance is implemented ethically, and in such a way that prioritises the safety and security of data and the public."
- These Governmental bodies and offices will be created in order to account for the issues of AI ethics and safety brought forward by the House of Lords report.
- Speaking on the topic of the new Centre for Data Ethics, UK Prime Minister Theresa May has stated that "This would be a “world-first advisory body which would review the current “governance landscape” and advise the Government on “ethical, safe and innovative uses of data, including AI” and that the centre "will not be a regulatory body, but it will provide the leadership that will shape how artificial intelligence is used," emphasising the UK Government's intention to "ensure that the adoption of AI is accompanied, and in some cases led, by a body similarly set up not just with technical experts who know what can be done but with ethicists who understand what should be done so that the gap between those two questions is not omitted."
- Additionally, the UK will be joining the World Economic Forum's newly-established Council on Artificial Intelligence to help shape global governance around the topic of AI safety and ethics.

“AI in the UK: ready, willing and able?”

16 April 2018, the House of Lords published on a Report of Session 2017–19 “AI in the UK: ready, willing and able?”. The Select Committee on Artificial Intelligence published the Report with the aim of underlining the fact that AI presents a significant opportunity to solve complex problems and potentially improve productivity. Additionally, they stated that the UK currently enjoys the position of being one of the best countries in the world in which to develop artificial intelligence.

Britain contains many leading AI companies, a dynamic academic research culture, a vigorous start-up ecosystem and a constellation of legal, ethical, financial and linguistic strengths located in close proximity to one another. Artificial intelligence, handled carefully, could be a great opportunity for the British economy.

The report “AI in the UK: ready, willing and able?” covers following topics, and we the analytical department of Deep Knowledge Ventures considers the most important:

1. Ethics AI - a new priority of AI development in the UK.
2. Share of data. Large companies must not restrict SME access to data or prevent the growth of an AI developer sector.
3. Personal data protection.
4. Establishing The AI Council, the Government Office for AI and Centre for Data Ethics and Innovation.

The state has an important role in supporting AI research through the research councils and other mechanisms, and should be mindful to ensure that the UK’s advantages in AI R&D are maintained. The UK Government and its universities have an important role to play in supporting diverse subfields of AI research, beyond the now well-funded area of deep learning, in order to ensure that the UK remains at the cutting edge of AI developments.

AI and Ethics

Data and AI are interconnected, and there is no AI without data. AI will be used to either assist or replace humans at making certain types of decisions, and if AI starts to make ethical and political decisions for us, then this means that the study of ethics and ethics training are now more important than ever. In light of these concerns, the government is putting ethics at the core of how the United Kingdom develops and harnesses the power of AI and automation.

Birgitte Andersen, Chief Executive of the Big Innovation Centre, considers data sharing as a part of the “social contract” between each person and their society.

“Just as we require a driving licence and car insurance to drive a car, so users of a driverless car should be required to share their data for everyone’s collective good.”, said Birgitte Andersen.

The Big Innovation Centre asserted that the government must establish a stakeholder data charter stating what can be realized with personal and business data, thus everyone can operate with it.

UK Government raised the problem of ethics in report **AI in the UK: ready, willing and able?** It is said that:

1. Artificial intelligence should be developed for the common good and benefit of humanity.
2. Artificial intelligence should operate on principles of intelligibility and fairness.
3. Artificial intelligence should not be used to diminish the data rights or privacy of individuals, families, or communities.
4. All citizens should have the right to be educated to enable them to flourish mentally, emotionally, and economically alongside artificial intelligence.
5. The autonomous power to hurt, destroy, or deceive human beings should never be vested in artificial intelligence.

Source:

<http://www.cityam.com/276828/data-fuel-ai-so-lets-ensure-we-get-ethics-right>

<https://www.technologyreview.com/the-download/610892/uk-lawmakers-want-to-bring-good-old-british-decorum-to-the-ai-industry/>

Centre for Data Ethics and Innovation

In January 2018, the Prime Minister, Theresa May, announced at the World Economic Forum in Davos that she wanted to establish *“the rules and standards that can make the most of artificial intelligence in a responsible way”*, and emphasised that the Centre for Data Ethics and Innovation would work with international partners on this project, and that the UK would be joining the World Economic Forum’s new council on artificial intelligence, which aims to help shape global governance in the area.

“This would be a “world-first advisory body” which would review the current “governance landscape” and advise the Government on “ethical, safe and innovative uses of data, including AI”.

The centre *“will not be a regulatory body, but it will provide the leadership that will shape how artificial intelligence is used”*. The Minister also noted that the Government wanted *“to ensure that the adoption of AI is accompanied, and in some cases led, by a body similarly set up not just with technical experts who know what can be done but with ethicists who understand what should be done so that the gap between those two questions is not omitted”*.

“The Government plans to adopt the Hall-Pesenti Review recommendation that ‘data trusts’ be established to facilitate the ethical sharing of data between organisations. However, under the current proposals, individuals who have their personal data contained within these trusts would have no means by which they could make their views heard, or shape the decisions of these trusts. We therefore recommend that as data trusts are developed under the guidance of the Centre for Data Ethics and Innovation, provision should be made for the representation of people whose data is stored, whether this be via processes of regular consultation, personal data representatives, or other means.”

China declared its goal to become the global leader in AI by 2030. Two months later, Vladimir Putin announced that the nation that leads in AI *“will be the ruler of the world.”* AI is now a key element of May’s *“industrial strategy”*, the Keynesian plan to foster growth through central planning. To compete, the UK government needs to free up data wherever possible.

Source: <https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf>

The AI Council and the Government Office for AI

The Hall-Pesenti Review recommended that the “*Government should work with industry and experts to establish a UK AI Council to help coordinate and grow AI in the UK.*” This recommendation was based on the perceived need to facilitate engagement between industry, academia, Government and the public, as “*AI in the UK will need to build trust and confidence in AI-enabled complex systems*”.

In the Industrial Strategy, the Government announced that they were taking forward this recommendation, and “*working with industry to establish an industry-led AI Council that can take a leadership role across sectors*”. It was announced that the Council would be supported by a new Government Office for AI. The Industrial Strategy stated that both these bodies would:

- champion research and innovation;
- stimulate demand and accelerate uptake across all sectors of the economy;
- increase awareness of the advantages of advanced data analytic technologies; and
- promote greater diversity in the AI workforce.

Source: <https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf>

The Alan Turing Institute is the national institute for data science and artificial intelligence, headquartered in the British Library, London. It is named in honour of **Alan Turing** (23 June 1912 – 7 June 1954), whose pioneering work in theoretical and applied mathematics, engineering and computing are considered to be the key disciplines comprising the fields of data science and artificial intelligence. Five founding universities – Cambridge, Edinburgh, Oxford, UCL and Warwick – and the UK Engineering and Physical Sciences Research Council created The Alan Turing Institute in 2015 as the national institute for data science. In 2017, as a result of a government recommendation, ATI added artificial intelligence to their remit.

The Alan Turing Institute is interested in research which tackles the big challenges in data science with lasting effects for science, the economy and the world. Core areas of its research range from data-centric engineering, high-performance computing and cyber-security, to smart cities, health, the economy, government and data ethics.

In the “AI in the UK: ready, willing and able?” report Alan Turing Institute is mentioned for several times as a recommended for artificial intelligence development tool:

- *“The UK has an excellent track record of academic research in the field of artificial intelligence, but there is a long-standing issue with converting such research into commercially viable products. We recommend that the Alan Turing Institute, as the National Centre for AI Research, should develop this concept into concrete policy advice for universities in the UK, looking to examples from other fields and from other nations, to help start to address this long-standing problem.”*
- *“We recommend that the Government ensures that publically-funded PhDs in AI and machine learning are made available to a diverse population, more representative of wider society. To achieve this, we call for the Alan Turing Institute and Government Office for AI to devise mechanisms to attract more female and ethnic minority students from academic disciplines which require similar skillsets, but have more representative student populations, to participate in the Government-backed PhD programme.”*

Source: <https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf>
<https://www.turing.ac.uk/>

- *“The potential for well-meaning AI research to be used by others to cause harm is significant. AI researchers and developers must be alive to the potential ethical implications of their work. The Centre for Data Ethics and Innovation and the Alan Turing Institute are well placed to advise researchers on the potential implications of their work, and the steps they can take to ensure that such work is not misused. However, we believe additional measures are required.”*
- *“We welcome the new focus for the Alan Turing Institute as the national research centre for artificial intelligence. We want it to be able to fulfil this role, and believe it has the potential to do so. As such, the new focus must not simply be a matter of rebranding. The successful institutes in Canada and Germany, such as the Vector Institute and the German Research Center for Artificial Intelligence, offer valuable lessons as to how a national research centre should be operated. The Government must ensure that the Alan Turing Institute’s funding and structure is sufficient for it to meet its new expanded remit as the UK’s national research centre for AI. In particular, the Institute’s current secondment-based staffing model should be assessed to ensure its suitability, and steps taken to staff the Institute appropriately to meet the demands now placed upon it.”*
- *“We recommend that a cross-sector ethical code of conduct, or ‘AI code’, suitable for implementation across public and private sector organisations which are developing or adopting AI, be drawn up and promoted by the Centre for Data Ethics and Innovation, with input from the AI Council and the Alan Turing Institute, with a degree of urgency. In some cases, sector-specific variations will need to be created, using similar language and branding. Such a code should include the need to have considered the establishment of ethical advisory boards in companies or organisations which are developing, or using, AI in their work. In time, the AI code could provide the basis for statutory regulation, if and when this is determined to be necessary.”*

Source: <https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf>
<https://www.turing.ac.uk/>

Handling of Personal Data

Authors consider issues of the use and monopolisation of data:

- Recommendation for making a distinction between data more generally, and personal data. While ‘data’ could refer to almost any information (such as temperature readings) on a computer, or which is intended to be held on a computer, ‘personal data’ has a specific meaning under the Data Protection Act 1998, and generally covers any set of information relating to individuals.
- Mechanisms for enabling individual data portability, such as the “Open Banking” initiative (refers to a series of reforms relating to the handling of financial information by banks), and data sharing concepts such as data trusts, will spur the creation of other innovative and context appropriate tools, eventually forming a broad spectrum of options between total data openness and total data privacy.
- Access to data is essential to the present surge in AI technology, and there are many arguments to be made for opening up data sources, especially in the public sector, in a fair and ethical way.
- Legal and technical mechanisms for strengthening personal control over data, and preserving privacy, will become increasingly important as AI becomes more widespread through society.
- Establishment of data trusts and preparation of advice and guidance for data controllers in the public sector to enable them to estimate the value of the data they hold, in order to make best use of it and negotiate fair and evidence-based agreements with private-sector partners. The values contained in this guidance could be based on precedents where public data has been made available and subsequently generated commercial value for public good.

Source: <https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf>

Chapter VIII:

National Healthcare System and AI

Key Highlights

- According to respondents to the State of the Nation survey, as reported in the Autumn 2018 report "[Accelerating Artificial Intelligence in health and care](#)" released by the NHS and the UK Department of Health & Social Care, the top two factors enabling the realisation of AI in health and care are 'engagement of healthcare professionals' and establishing an 'ethical framework to build/ preserve trust and transparency'.
- Lack of access to good quality data was identified as one of the main barriers to the implementation of AI systems in healthcare by Matthew Swindells, National Director of Operations and Information for NHS England.
- The UK Department of Health needs to create a framework ensuring that the NHS enters into private sector agreements in a mutually beneficial and fair way, to safeguard the NHS from being charged extremely high fees by private companies developing algorithms via the use of NHS patent data.
- While AI in healthcare is a booming industry in the UK, actual practical implementations of AI systems in NHS itself are still relatively few to date.
- The NHS still makes heavy use of paper filing systems, and the IT systems that it does use are not based on open and transparent standards, which serve as bottlenecks for the exchange of information across the healthcare system.
- This presents issues in terms of formatting healthcare data in a high-quality, secure and interoperable manner, which is a strict necessity for the use of such data in AI systems.
- The NHS has identified three core near-term use-cases for AI in its operations. These include:
 - Diagnostics,
 - Non-clinical activities (operational and administrative efficiency) and
 - Health promotion and preventative health.

AI in Healthcare Reports

The **AHSN** Network



Accelerating Artificial Intelligence in health and care: results from a state of the nation survey

Autumn 2018

Description

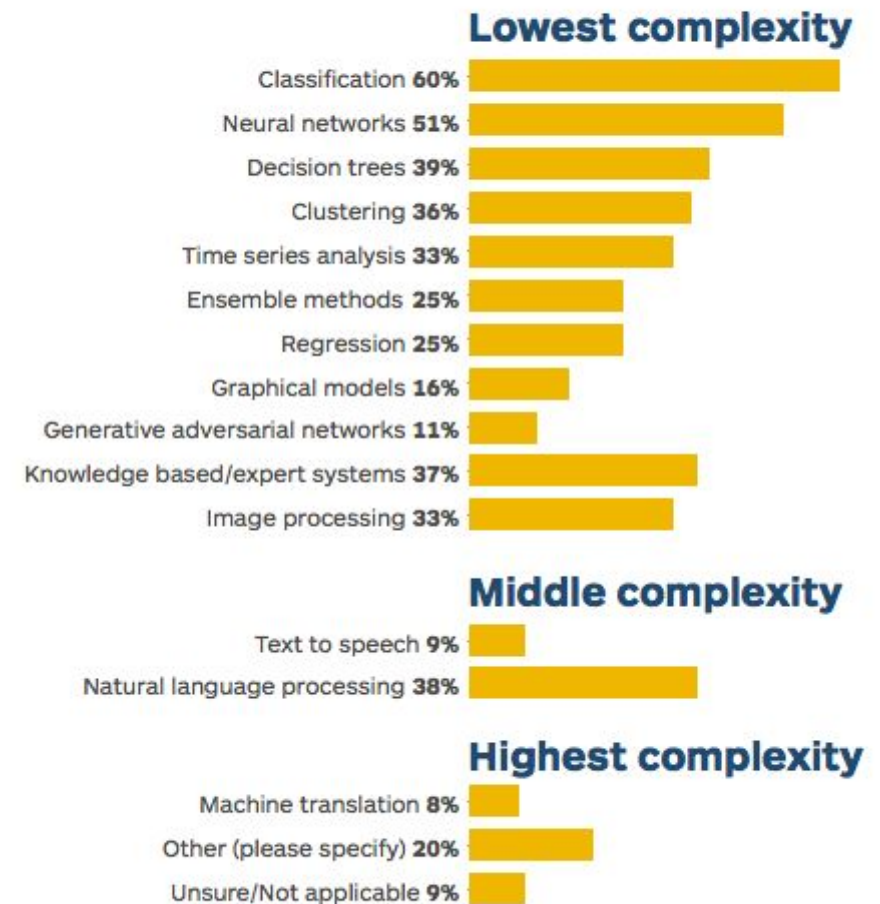
In recent years there have been a number of policy reports published on the potential for artificial intelligence in healthcare. In this report we are not attempting to recreate that content but rather to address some of the concerns raised and outline some of the emerging policy in this arena within the UK. We developed a survey in collaboration with industry, academia and policy makers in an attempt to capture the reality of what technology is actually being developed within the UK health and care sector, and to understand what complexity of artificial intelligent technology is being realised. This survey went live to the nation at the start of 2018 and we have captured throughout this report the initial findings from the 131 responses. In order to present a rich picture of the nation's ecosystem and bring to life the complex and multifaceted aspects of the industry, the report also highlights a number of case studies that set the scene for the work needed to scale up evidence-based solutions that are safe, effective and offer value going forward.

Accelerating Artificial Intelligence in health and care: results from a state of the nation survey

RESULTS OF THE NATIONAL SURVEY ABOUT AI TECHNOLOGIES IN HEALTH AND CARE

As part of the survey we asked respondents to list some of the AI methods employed in their solutions. This enabled them to be categorised in a way that shows how solutions in the AI space vary greatly in terms of complexity. By mapping some of the methods employed by survey respondents against Professor Jeremy Wyatt's complexity scale (see previous section), it can be seen that many of the current solutions are using 'lowest complexity' advanced statistical techniques rather than more complex AI applications. Classification and neural network machine learning methods were by far the most popular techniques, used by 60% and 51% of solutions, respectively. At the highest end of the complexity scale, 8% of solutions employed machine translation methods. 20% of solutions indicated they used 'other' AI methods, including a range of chat bot solutions (considered 'highest complexity' solutions).

The percentage of solutions reporting using a method of AI

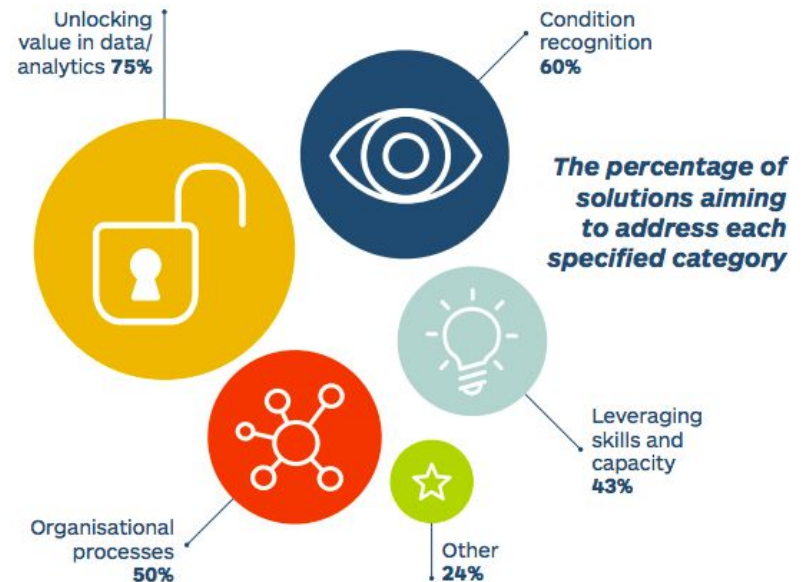


Accelerating Artificial Intelligence in health and care: results from a state of the nation survey

With wide consensus that diagnostics presents some of the strongest early AI use cases, we chose to make it a special focus for this first AI map and survey.

Across the range of diagnostics categories, AI is already offering opportunities to free up workforce capacity and to dramatically increase diagnostic accuracy. Taking advantage of the convergence across diagnostics, personalised medicine and data science, some organisations on the map are already seeking to mine big data sets to enable identification of individuals at the earliest stage of disease, when interventions have a higher likelihood of success.

Overall, 66% of the initial solutions featured on our map indicated they contained one or more categories of diagnostics. As can be seen below, many early solutions are in diagnostic imaging/ radiology (25%), where digital imaging has been in widespread use for a number of years. This compares to far fewer solutions listed in pathology (9%) and endoscopy (3%), where the digital and AI solutions are only recently starting to emerge.



Accelerating Artificial Intelligence in health and care: results from a state of the nation survey

The best AI-enabled solutions always solve a valuable problem or 'use case', as expressed by users - citizens, carers and professionals. Working with users to understand their needs and then working with them to prototype and test solutions iteratively is key to refining the product's value proposition and ensuring successful uptake and adoption at scale. We asked respondents to identify the areas where the strongest early use cases are. Overall, the views were clear that the main game-changing use cases for AI will be in three key areas in the immediate period:

- Diagnostics
- Non-clinical (operational and administrative efficiency)
- Health promotion and preventative health.

Development in drug discovery and medical research will also be hugely aided by AI. Respondent views ranged from AI being 'ubiquitous', 'pervasive' and 'high impact' that will 'replace front line tasks' to rather less optimistic predictions. Many see AI as a tool to help doctors and all healthcare professionals become more efficient and deliver a higher standard of care at less cost to benefit patients. Most see AI having a key role in helping to make decisions across the board and in better planning for scarce resources.

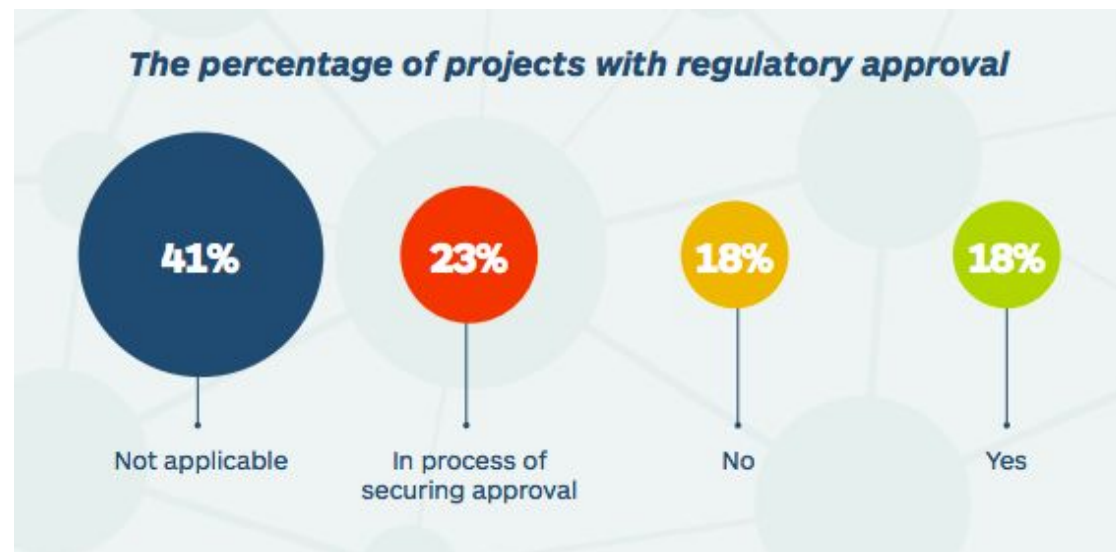
	Health promotion and preventative health	Treatments and interventions (including surgery)	Diagnostics (accurate and early detection)	Non-clinical (e.g. save time with administration)	Keeping up to date with medical research
Extremely important	47%	40%	80%	66%	35%
Very important	31%	28%	14%	23%	30%
Quite important	16%	26%	5%	9%	21%
Somewhat important	5%	5%	1%	2%	10%
Not at all important	1%	2%	0%	0%	4%

Accelerating Artificial Intelligence in health and care: results from a state of the nation survey

Currently, 35% of solutions in the survey have been developed using proprietary (closed source) software, distributed under licensing agreement to named users who are given authorisation to modify, copy and republish applications. The source code for this software is not shared publicly for anyone to look at or modify. Proprietary software developers often pride themselves on product 'usability' and providing a high level of ongoing support for maintenance, security, content updates and training.

In contrast, only 9% of respondents report using one of the following three open source licences – GNU GLPv3, Apache Licence 2.0 and MIT Licence. Open platforms are vendor and technology neutral and are based on open standards, meaning that any application built on an open platform will operate on an open platform. Proponents of open standards, such as the Apperta Foundation, a not-for-profit community interest company supported by NHS England and NHS Digital, maintain that liberating both data and applications and making them portable and interoperable eliminates lock-in, facilitates innovation and competition, and forces vendors to compete on quality, value and service. A downside can include the significant capacity and capability required to run open platform ecosystems.

A further 19% are unsure what licence their computational product uses altogether, and this needs to be explored further to understand the reasons for this.

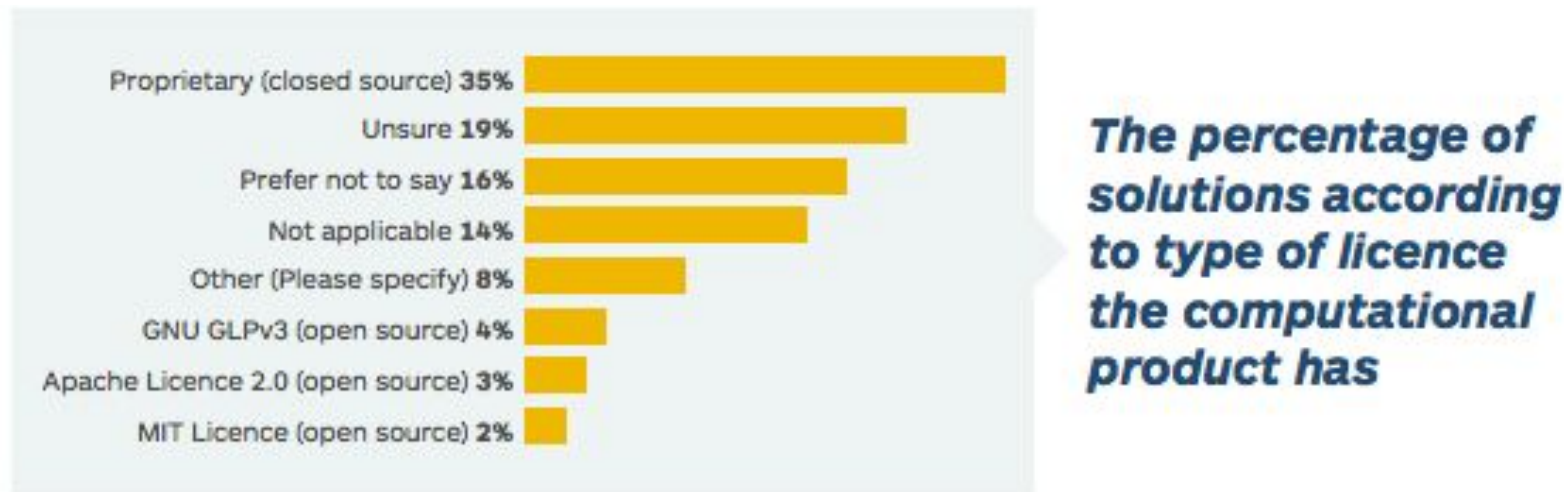


Accelerating Artificial Intelligence in health and care: results from a state of the nation survey

Our survey aimed to capture a full range of AI activity across the health and care ecosystem, ranging from ongoing research projects to fully scaled commercial products and services. With new solutions coming to market regularly, it is important for buyers (including commissioners and consumers) and users of AI to have mechanisms for distinguishing which solutions have the appropriate evidence base and are ready for 'at scale' adoption.

In the UK, medical devices must demonstrate that they meet the requirements set out in the Medical Devices Directive by carrying out a conformity assessment. The assessment route depends on the classification of the device. Devices meeting the requirements can place a CE mark (or logo) on their product to show that the medical device has met the requirements as set out in the conformity assessment. The CE marking also means that the product can be freely marketed anywhere in the EU. In the United States, the Food and Drug Administration (FDA) provides medical device approval.

When we asked our respondents about regulatory status, only 18% of solutions indicated they had secured approval in the UK/EU or abroad. A further 23% indicated they were in the process of securing approval.



Accelerating Artificial Intelligence in health and care: results from a state of the nation survey

According to survey respondents, the top two factors enabling the realisation of AI in health and care are 'engagement of healthcare professionals' and establishing an 'ethical framework to build/ preserve trust and transparency'. Overall, respondents agreed with the need for a clear governance structure to guide decisions and build trust. This needs to be underpinned by a clear ethical framework to address such issues as transparency in algorithm development.

Comments from the respondents include:

- 'There is a need for widespread understanding of augmented intelligence, predictive analytics, deep learning and machine learning'
- 'The speed at which AI will have an impact on healthcare will depend very much on the public's (and therefore the government's) trust in AI and the company using patient data to develop AI. This will not impact all AI products but a significant proportion'
- 'There has to be first an enabling framework within the NHS. This would include ethical considerations, the right for human interpretation of the AI algorithms'
- 'We need transparency of algorithm development'
- '[the potential of AI] is based on the governance structure developed and ability to forge trust'.

Educating healthcare professionals and the public on the potential of AI in a balanced way was also raised as a key issue by survey respondents. This is central to achieving and maintaining trust in an environment where there is much negative media coverage on the risks of AI and its potential impact on workforce. A narrative around data sharing is needed. There is also the need to engage the public actively in order to help define the problems that need solving and co-develop solutions enabled by AI.

Engagement of healthcare professionals

Extremely important	58%
Very important	33%
Quite important	8%
Somewhat important	0%
Not at all important	1%

Ethical framework to build/preserve trust and transparency

Extremely important	61%
Very important	26%
Quite important	9%
Somewhat important	3%
Not at all important	0%

Accelerating Artificial Intelligence in health and care: results from a state of the nation survey

Key comments include:

- We need a narrative around data sharing and trust
- We need public education and enabling regulatory frameworks
- 'It's not enough to 'educate' the public- we need active participation of patients and other interested parties at all stages of the development process'
- Much more needs to be done to educate healthcare professionals, listen to/ understand their concerns, and get their buy in. At the moment the conversation is too polarised between naysayers who say, "AI will never change healthcare significantly" and techno-utopians who say, "AI will replace all doctors and nurses" - the reality is of course much more nuanced than that.

Predictions for the future include:

- Greater public support for AI due to better understanding [of] how AI works'
- There will be a new cohort of healthcare professionals that will be educated to think how to empower their human abilities with AI driven tools'

	Education of healthcare professionals	Education of public
Extremely important	50%	37%
Very important	31%	28%
Quite important	17%	25%
Somewhat important	2%	10%
Not at all important	0%	0%

“Thinking on its own: AI in the NHS” recommendations:

1. *NHS Digital and the 44 Sustainability and Transformation Partnerships should consider producing reviews outlining how AI could be appropriately and gradually integrated to deliver service transformation and better outcomes for patients at a local level.*
2. *NHS England and the National Institute for Health and Care Excellence should set out a clear framework for the procurement of AI systems to ensure that complex to use and unintuitive products are not purchased as they could hamper service transformation and become burdensome of the healthcare professionals.*
3. *The NHS should pursue its efforts to fully digitise its data and ensure that moving forward all data is generated in machine-readable format.*
4. *NHS England and the National Institute for Health and Care Excellence should consider including the user-friendliness of IT systems in the procurement process of data collection systems and favour intelligent systems that flag-up errors in real-time.*
5. *NHS Digital should make submissions to the Data Quality Maturity Index mandatory, to have a better monitoring of data quality across the healthcare system.*
6. *In line with the recommendation of the Wachter review, all healthcare IT suppliers should be required to build interoperability of systems from the start allowing healthcare professionals to migrate data from one system to another. This would allow for compliance with the EU’s General Data Protection Regulation principle of data portability.*
7. *NHS Digital should commission a review seeking to evaluate how data from technologies and devices outside of the health-and-care system, such as wearables and sensors, could be integrated and used within the NHS.*
8. *NHS Digital, the National Data Guardian and the Information Commissioner’s Office, in partnership with industry, should work on developing a digital and interactive solution, such as a chatbot, to help stakeholders navigate the NHS’s data flow and information governance framework.*
9. *NHS Digital should create a list of training datasets, such as clinical imaging datasets, which it should make more easily available to companies who want to train their AI algorithms to deliver better care and improved outcomes. It should also develop a specific framework specifying the conditions to securely access this data.*

“Thinking on its own: AI in the NHS” recommendations:

10. *The Department of Health and the Centre for Data Ethics and Innovation should build a national framework of conditions upon which commercial value is to be generated from patient data in a way that is beneficial to the NHS. The Department of Health should then encourage NHS Digital to work with STPs and trusts to use this framework and ensure industry acts locally as a useful partner to the NHS.*
11. *The Medicine and Healthcare Products Regulatory Agency and NHS Digital should assemble a team dedicated to developing a framework for the ethical and safe applications of AI in the NHS. The framework should include what type of pre-release trials should be carried out and how the AI algorithms should be continuously monitored.*
12. *NHS Digital, the Medicines and Healthcare Products Regulatory Agency and the Caldicott Guardians should work together to create a framework of ‘AI explainability’. This would require every organisation deploying an AI application within the NHS to explain clearly on their website the purpose of their AI application (including the health benefits compared to the current situation), what type of data is being used, how it is being used and how they are protecting anonymity.*
13. *The Medicine and Healthcare Products Regulatory Agency should require as part of its certification procedure access to: data pre-processing procedures and training data.*
14. *The Medicine and Healthcare Products Regulatory Agency Review in partnership with NHS Digital should design a framework for testing for biases in AI systems. It should apply this framework to testing for biases in training data.*
15. *Tech companies operating AI algorithms in the NHS should be held accountable for system failures in the same way that other medical device or drug companies are held accountable under the Medicine and Healthcare Products Regulatory Agency framework.*
16. *The Department of Health in conjunction with the Care Quality Commission and the Medicine and Healthcare Products Regulatory Agency should develop clear guidelines as to how medical staff is to interact with AI as decision-support tools.*

Conclusion

Artificial Intelligence (AI) could help the NHS become more efficient and deliver better outcomes for patients. “*Thinking on its own: AI in the NHS*” report, published in January 2018 by Reform, highlights the main barriers to the implementation of this technology and suggests some potential solutions.

The report mentions that despite the hype around AI in healthcare, examples of it being implemented and deployed in the NHS are sparse. AI could support the delivery of the NHS’s Five Year Forward View, which aims to narrow three gaps in health provision. AI could help address the health and wellbeing gap by predicting which individuals or groups of individuals are at risk of illness and allow the NHS to target treatment more effectively towards them. The reduction of the care and quality gap could be supported by AI tools as they can give all health professionals and patients access to cutting edge diagnostics and treatment tailored to individual need.

The NHS will also need to get data right to truly harness the potential of AI in healthcare. This means collecting the right type of data in the right format, increasing its quality and securely granting access to it. The healthcare system is still heavily reliant on paper files and most of its IT systems are not based on open-standards. This limits the exchange of information across the health system. Increasing the quality of the data collected within the NHS is of crucial importance as the accuracy and fairness of AI algorithms are wholly dependent on the data they are being fed.

Public safety and ethical concerns relating to the usage of AI in the NHS should be a central matter of interest for healthcare regulators such as the National Institute for Health and Care Excellence, the Medicines and Healthcare Products Regulatory Agency and Government. If industry is to use NHS data to design AI, as it does now, the NHS should make sure that it can reap the benefits in the long term. In addition, healthcare is a high-risk area, where the impact of a mistake could have profound consequences on a person’s life. AI systems are not infallible and are not devoid of biases. It is important for current regulations to be updated to make sure that the applications of AI in healthcare lead to a better and more efficient NHS, which reduces variations in the quality of care and healthcare outcomes.

Source: http://www.reform.uk/wp-content/uploads/2018/01/AI-in-Healthcare-report_.pdf

Conclusion

AI presents a great opportunity to help the NHS deliver its service transformation plans. It could also make processes within the healthcare system more efficient and reduce costs. The NHS must consider gradually embedding this technology in future service transformation plans.

Nevertheless, the NHS “has a long way to go before AI can be effectively leveraged”. Both buy-in from patients and healthcare professionals needs to improve. Increasing the user-friendliness and having a clear understanding of human-computer interaction can influence the adoption rate of this technology amongst healthcare professionals.

As highlighted by Matthew Swindells, National Director for Operations and Information at NHS England, one of the main barriers to the implementation of AI systems in healthcare is the “lack of access to ‘good quality data’”. The NHS needs to move forward with its digitisation agenda, increase the interoperability of its current IT systems and make sure that in the future they all adhere to open standards. It should also develop a plan for the integration of new forms of data generated by wearables and sensors at home. AI is not the panacea for these back-end implementation challenges and it will not be possible to reap the benefits of this technology at scale if these barriers are not overcome.

It is crucial that the Department of Health creates a framework to ensure the NHS enters into truly mutually beneficial agreements with the private sector developing these AI systems. It must safeguard the NHS from unfair situations where private companies could charge extremely high fees for the use of algorithms that would have never been developed without the use of NHS patient data.