

1. Introduction

Big Innovation Centre - established in 2011 – is working to build a global innovation and investment hub by 2025, create great companies and make the world more purposeful and inclusive through the enormous potential of technology, creativity and innovation.

As part of its core activities, **Big Innovation Centre** has been **appointed Secretariat for the All-Party Parliamentary Group on Artificial Intelligence (APPG AI)** launched in January 2017. The group aims to explore the impact and implications of Artificial Intelligence, including Machine Learning. Prior to this, we have been active in the field of AI through different initiatives such as big data project with our corporate partners and public agents.

Big Innovation Centre is also (i) leading a reporting and valuation project on the intangible economy, entitled Intangible Gold (working group includes researchers from Bank of England, Office of National Statistics and Oxford University) and (ii) building and piloting a digital platform and AI analytics tools to audit the UK economy and innovation supply system (entitled The National Innovation Audit).

In response to the Select Committee's call for evidence, Big Innovation Centre will be using the evidence gathered from ongoing and recent projects, including:

Evidence	Big Innovation Centre projects	Documentation
Evidence 1	APPG AI: Four High-Level Parliamentary Meetings to date (i) to unpack the term 'Artificial Intelligence'; (ii) to gather evidence to understand it better; (iii) to assess its impact; and, ultimately (iv) to empower decision-makers to make policies in the sphere.	<ul style="list-style-type: none"> • Theme Report 1: What is AI? (2017) • Theme Report 2: Ethics and Legal in AI: Decision Making and Moral Issues (2017) • Theme Reports 3: Ethics and Legal: Data Capitalism (Forthcoming 2017) • Theme Report 4: Markets and AI-Enabled Business Models (Forthcoming 2017) <p>All reports and minutes from meetings can be downloaded from the APPG AI web site: www.appg-ai.org</p>
Evidence 2	Intangible Gold research programme	<ul style="list-style-type: none"> • Intangible Asset Reporting and an Intangible Assets Charter (2017) • Intangible Asset Reporting: Defining Britain's Real Treasures 2017 <p>Both reports can be downloaded from BIC web site: http://biginnovationcentre.com/publications</p>
Evidence 3	The Future of Trade Think-Piece - prepared for Innovate UK in July 2017, to understand 'who, what, where & how' automation and Artificial Intelligence are disrupting the marketplace	<ul style="list-style-type: none"> • The Future of Trade (2017) <p>Report can be downloaded from BIC web site : http://biginnovationcentre.com/publications</p>
Evidence 4	The National Innovation Audit – a project under development and implementation, aiming to illustrate the UK innovation ecosystem through an online platforms and advanced data analytics.	<ul style="list-style-type: none"> • Pilot work described in background document for The Innovators Board (January 2017) <p>Report can be downloaded from BIC web site: http://biginnovationcentre.com/publications</p>
Evidence 5	Big Innovation Centre big data report and hack day with Camden Council featuring	<ul style="list-style-type: none"> • Lessons Learnt From a Hackathon (2013) <p>Report can be downloaded from BIC web site: http://biginnovationcentre.com/publications</p> <p>Guardian features from 2013: first "Councils call in the geeks to help them solve local problems" and later "Big data: Camden Council leads the digital revolution".</p>

AI Definition (see Evidence 1 and Evidence 3):

To respond to the questions posed by the Select Committee, we are adopting the more broad, general definition of Artificial Intelligence (AI). Hence, from this point onwards, we will be referring to AI as an umbrella term to describe several advances in technology (as opposed to market products), in fields such as Machine Learning, Deep Learning, robotics, autonomous decision-making, natural language understanding, and neural networking.

Furthermore, we will be focusing on the implications of Narrow AI (otherwise known as weak or non-sentient AI) rather than General AI. Our evidence shows that most advances happening now and in the short-term horizon are examples of the former category, a type of AI that is successful at performing a single task but unable to understand and reason with the environment as a human would. For point of reference, in our *Theme Report 1: What is AI?*, we have included excerpts from thought leaders in the space explaining what AI is to them.

2. Industry - How can the data-based monopolies of some large corporations, and the ‘winnertakes-all’ economies associated with them, be addressed? How can data be managed and safeguarded to ensure it contributes to the public good and a well-functioning economy? (Q7)

Big Innovation Centre’s vision for a Data Charter (see Evidence 2 and evidence 5):

Background: Opportunities for public services as incentive for big data sharing

Big Innovation Centre co-hosted an all-day hackathon with Camden Council, big corporates and computer scientists in 2013. It was in relation to how big data could make public services more efficient with respect to repair services on council housing, crime and the ambulance service, and featured in the Guardian at the time (“Councils call in the geeks to help them solve local problems”¹ and later “Big data: Camden Council leads the digital revolution”).²

We were also inspired by the New York City Mayor’s Geek Squad that opened-up the archives of their boilers and sprinkler systems, the state of their local taxes, the number of heart attacks and fires that occur inside their buildings and whether they have ever logged complaints about roaches or construction noise. Additional data was gathered about their businesses, their commuting habits and more including parking meters and those receiving tickets, and much more.

We found that despite the obvious opportunities of big data (public data!) they could not be opened to combat the investigation in sufficient details, and online public data access and text mining from the web or other AI tools can only get us so far. Worse, data was not reported on central topics, e.g. in relation to social housing. Three to four years on, nothing, or very little, have changed, despite the Shakespeare Review and the subsequent government’s data strategy citing our work at the time. With the recent Grenfell tower tragedy, the situation has become much more urgent.

The solution: Big Innovation Centre proposes a ‘Data Charter’ on the uses of personal and business data, including a ‘Fair Use’ and an ‘Opt In Unless You Opt Out’ approach to data disclosure.

Policy is around data protection and exclusive rights on data, but what is needed now is regulation around data use providing incentives to share. UK policies enabling a trusted sharing of personal and business data is essential for new and innovative business models (digital entrepreneurship) to take off in the UK. It is also the only way for individuals to reach the benefits from Big Data, Internet of Things, Artificial Intelligence (AI) and most other digitally enabled disruptive innovations. We need to make the smarter society a reality, and public sector should lead. One estimate in a report - *The Value of the Digital Economy* - by the consultancy BCG is that the applications created with personal data have the potential to generate as much as €1tn of value in Europe annually by 2020, with a third of the total flowing to private and public organisations and two-thirds accruing to consumers. But for this value to be unlocked, the public and consumers need to feel comfortable about sharing their personal information. They need confidence and trust in the organisations that hold their data, in particular, that the conflicts of interest, privacy and ethical issues will be addressed, and that proper redress is available when there are problems, transgressions or

¹ <https://www.theguardian.com/local-government-network/2013/apr/26/councils-hack-day-geek-squad-problem-solving>

² <https://www.theguardian.com/local-government-network/2013/nov/11/big-data-camden-council-digital-revolution>

grievances.

By introducing a 'Data Charter' on what can be done with personal and business data, everyone will know how their data is used, which in turn increases trust and creates incentives to allow data to be shared. This Charter would mean a shift from policies around controlling the data itself to how the data is governed. As a first for Europe, the Data Charter should actively send proposals to the European Union to advance into EU Data Protection legislation and harmonisation across borders.

The Data Charter should be used as a reference for AI Ethics Boards in companies to set transparent principles on how data will be governed. It could also become the basis for a Consumer Data Watchdog dealing with data issues around which consumers can unite enforcing trading standards surrounding their data. In this context, we go as far as proposing an international code of ethics that the UK can take leadership in establishing and then promoting at a global level. Data use is clearly central, but the ethics of AI use is a broader subject. There have already been works in this area, such as the Asilomar AI Principles created last year.³ However, these principles should be further developed to ensure their practicality. The Code of Ethics should build on the Data Charter and further set forth the standards for how AI technologies can ensure social impact. They need to be created with the collaboration from policy-makers, corporates (big and small), academics, and the wider public.

Such a Data Charter should also introduce 'fair use' of personal and business data if people are not competing with the owners of the data or harming their ability to monetize it. This 'fair use of data would create a genuinely free space to innovate by supporting entrepreneurship from the data revolution.

There should be equal access to data platforms or shared information systems on which AI data be retrieved in a user-friendly way by the public, so people can know their public record and benefit from knowing information about themselves in a structured way.

Finally, the Data Charter should also adopt an 'opt-in unless you opt-out' approach to personal and business data disclosure. Allowing citizens from birth to be born into a data sharing revolution (in which there is a Data Charter governing the use of data including how business can deploy private data) will empower each citizen. Just as there is no point in being the only one with a telephone or on Facebook, people and companies could only capitalise on the opportunity from personal data when it is shared.

The solution: APPG AI's call for a UK landscape review (see Evidence 1).

In the need for change in data governance, the APPG AI recommends an analysis of the current legislation landscape in regards to data-related issues, including the General Data and Protection Regulation (GDPR) that is to be put in force by March 2018.

3. The Role of Government - What role should the Government take in the development and use of Artificial Intelligence in the United Kingdom? Should Artificial Intelligence be regulated? If so, how? (Q10)

The UK should have an ambitious and trusted 21st Century UK data infrastructure, which supports the growth of the AI based economy to benefit the private and public sector alike (see Evidence 2 and Evidence 4).

Background: The UK's industrial strategy, regional strategies, and infrastructure investment is operating without diagnostic tools or proper context. There are reasons for government analytics to become a lead user on AI.

We often talk about how Artificial Intelligence (AI) changes businesses and consumer relations. However, we talk less about how AI and these new 'market institutions' affect public services, governments (national and regional), and policy makers making decisions on policy, regulation and the budget. It is in the public sector that some of the biggest new opportunities from AI are to be found, but (as reviewed in above section a on Data Charter) this requires rethinking new rules, norms and standards in how data are collected and used. If the UK is to lead in this revolution,

But the data revolution with artificial intelligence go beyond public services. It is the foundation of our economic planning. Clearly, a 21st-century government reporting framework on the economy, productivity measurements and

³ <https://futureoflife.org/ai-principles/>

the regions, should capture the performance of the current stage of affairs. But the UK data system is technologically outdated, costly to run, and a methodically past. In consequence, the numbers wrong or useless.

As a result, the government cannot properly plan its budget, infrastructure investment, tax levels, public expenditure for research, education, skills and social issues. It also has difficulty in deciding the sectors and technologies around which to develop support strategies. Business leaders cannot even themselves set sound strategies for their investment and performance efficiency challenges.

Firstly, government data collection and measurements do not capture knowledge-based services, new forms of manufacturing, and the digital economy including the effect of new forms of work, automation, smart devices, robotics and artificial intelligence. The conceptual, theoretical and measurement frameworks developed for a physical paradigm and past industrial revolution need re-addressing.

For example, productivity measures used by national income accounting focus on quantities produced and physical measures such as machinery, buildings and hours worked. The dimensions of quality, sustainability and service generated by intangibles are not captured even though they are vital to successful company investment and government policy alike. Productivity measures are outdated, fitting better to the post-war industrial economy than today's knowledge-based digital economy.

For instance, today, energy services are meant to improve sustainability but productivity is still measured by how much energy is physically sold. So while energy providers invest in high-tech, supplier networks and manu-services that help consumers save energy, productivity is still measured by the quantity of energy delivered. Energy firms want to help consumers economise on their bills, but the more successful they are, the slower the growth in sales of electricity and gas. Consequently, the productivity growth as conventionally measured would be slower. Similar for financial services: Productivity measures should not be grounded in the number or size of transactions (loans and cash accounts), but how well the banks manage people's finances or that of the economy. Productivity, in short, needs rethinking.

Energy, health, transport, finance and retail are five major sectors where consumers are expecting improved quality and sustainability as opposed to more quantity. Most contemporary value added to work is the deployment of intellectual capital in production, services and manu-services: here people do not produce more 'stuff', but increase its quality.

Secondly, the design of data collection structures is not fit for purpose, but segmented, analogue, and hold gaps. For example, there is a lack of data input to the Office of National Statistics, Companies House, Treasury, and Bank of England. Data supplied by large multinationals are better captured, but data collected from SMEs and Public Sector organisations are missing or incomplete. The same can be said for data collections from EU data (CIS) and the OECD. Problems are especially around the missing 'innovation systems and intangible asset' data.

Also, data are not collected for a specific purpose – as for example to develop our Industry, start-up or talent systems.

The solution: Artificial Intelligence, with associate analytics and diagnostic tools, should be used as a tool to inform the Industrial strategy and the Budget

A strong data infrastructure means integration of public and private data collection sources on one platform (information system), an upgraded focus on innovation and intangible asset data, and direct link with stakeholder use and purpose.

Economic analytics models should be updated, given that the current ones are modelled on the features of a past economy not taking advantages of the internet and Artificial Intelligence.

There are lessons to be learned from US, India and Europe, but China's vision of economic development from economic data is inspiring.

Transforming our regions and our supply chains to become innovation hubs like Silicon Valley, Boston or Bangalore is a major aspiration for the United Kingdom. There are global exemplars of what works. Whereas Silicon Valley and Boston developed with close links around world class Universities, Bangalore developed with close global supplier links to Silicon Valley until it became a thriving hub in its own right. Eindhoven, located in a much smaller provincial part of Europe, took a different route with Philips Electronics (a big corporate) as the hub – but with a good-enough local university and looking to outsource IP and technology to an innovative supplier network. Philips Electronics crowded in expertise from world class academics – often created a link to the local university - and opened space for entrepreneurs to co-create with them locally. They invested in new buildings and converted outdated factory space 'not fit for purpose'. All the approaches created opportunities for the local regions to upgrade. However British regions have few comparable assets, nor have our own efforts so far shown much success.

China has taken a different, more systemic approach – what it characterises as an ‘Opening up of the system’ approach for regional and economic development, transforming regions and cities with high tech clusters, industrial parks, and taking millions of people out of poverty. The method included development from economic data and ‘achievements from system construction’ (as opposed to classic macro-economics). CEO of Big Innovation Centre has visited six Chinese regions and believes there are lessons to be learned.

Using the lessons learned from these international models, Big Innovation Centre has piloted diagnostics tools capabilities using artificial intelligence for an online-real-time assessment of the skills-base and the innovation capabilities of the UK regions, across an agreed set of industrial and entrepreneurial segments which supply our business, trade and job base. We also investigate the capabilities of the education and talent system which provide the skills-base for the future. We address the capacities of our transport in travel to work places and infrastructure system as well as highlight areas of deprivation with respect to health, crime, access to opportunity and culture. Do contact us at info@biginnovationcentre.com if you want to know more about this initiative which can lift the capabilities of government agents (national and regional), local businesses, universities, property developers, and investors with enhanced decision- making capabilities.

There is much debate on whether AI should be regulated or not.

The APPG AI community seems to be split on the matter: some calling for changes in legislation and others pushing for the use of soft-structures to address AI-related issues.

Big Innovation Centre advises that before any new regulations are put forward, Government needs to gather fact-based evidence which exhaustively analyses the current impacts and anticipates for future repercussions (short-term and long-term). In this fast-paced environment, the evidence gathering must be quick and practical. The European Parliament, in June 2016, published an overview of EU laws and rules that will be affected by developments in the fields (AI, robotics, cyber-physical systems), identifying 39 EU regulations, directives, declarations and communicates that may need to be revised or adapted.⁴ We propose that the UK adopts a similar methodology to further understand the landscape before deciding which changes in regulations are necessary (if any).

4. Public Perception - Should efforts be made to improve the public’s understanding of, and engagement with, Artificial Intelligence? If so, how? (Q5)

Yes – According to the AI experts from government, business, and academia in the APPG AI community, improving the public’s understanding of what AI is – and what it is not – is crucial at this point in history. AI has already impacted our nation economically and socially, and its effects are anticipated to skyrocket in the upcoming years. In fact, according to a June 2017 report by PwC, UK GDP will be 10.3% higher in 2030 as a result of AI.⁵ However, although AI is likely to be one of the most transformative and disruptive forces of the decade, the public lacks a basic understanding of what it is. Based on the April 2017 survey by the Royal Society, only 9% of the respondents recognised the term ‘Machine Learning’.⁶

The public’s understanding of AI can be improved through various channels. We propose (see Evidence 1):

Education: The UK should introduce the term AI to children from a young age, explaining to them what it is, its opportunities, and its risks. The topic should be included in school curriculums using appropriate language that is inclusive, accessible and accurate. Most importantly, children from an early age should start building STEM (Science, Technology, Engineering, and Mathematics) skills necessary to compete in the modern world of AI technology. Private companies such as NVIDIA are already creating workshops targeted for students to get a basic understanding of how neural networks work. Similar initiatives should be promoted in order for upcoming generations to have the information needed to understand AI and, consequently, make well-informed decisions on its implications. Educational reforms and campaigns should also be used as mechanisms to inform older generations that are already in the workforce or about to enter it. AI should also be embedded with formal and informal curriculums for higher-education and lifelong learning programmes.

Media: The media is another powerful tool to inform and educate the public on AI-related issues. According to the speakers at the APPG AI meetings, most media stories have focused so far on the

⁴ <http://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/artificial-intelligence>

⁵ <https://www.pwc.co.uk/services/economics-policy/insights/the-impact-of-artificial-intelligence-on-the-uk-economy.html>

⁶ <https://royalsociety.org/~media/policy/projects/machine-learning/publications/machine-learning-IPSOS-Mori-summary-report.pdf>

negative implications of AI. People tend to think of AI in terms of science-fiction movies that tell a story of a robot killing mankind or a news article foreshadowing huge amounts of job losses. Media should portray both sides of the conversation, also shedding light on the opportunities and benefits AI technologies will undoubtedly bring to society.

5. Summary

In order to become a global leader in the field, the UK Government must act quickly. We have the power of shaping the future with AI, but first, we need to make sure we propose fact-based, pragmatic solutions. To reap the full benefits of Artificial Intelligence we propose:

- A Data Charter, on what can be used by personal and business data, including a 'Fair Use' and an 'Opt In Unless You Opt Out' approach to data disclosure.
- An international code of ethics, setting guide lines for corporate AI Ethics boards and a consumer AI Watch Dog.
- A review of the current legislative AI landscape in the UK, mirroring work already done with respect to the EU.
- Government to become the lead user of AI, especially with respect to upgrading public services.
- To replace and modernize our economic tools with AI diagnostics, build to inform the Industrial Strategy and the Budget.
- To modernise UK's data collection and reporting infrastructure be fit for purpose in the new 21st century AI based era.
- To introduce AI into both formal (schools) and informal (training) curriculums, and inform the public of AI opportunities through media channels.

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