Written evidence submitted by Microsoft (ALG0072)

Executive Summary

1. Microsoft welcomes the opportunity to respond to the Science and Technology’s Committee’s inquiry into algorithms in decision-making. We are enthusiastic about the potential of algorithms – and the technologies such as artificial intelligence that they underpin – to assist societies in addressing their greatest challenges.

2. Microsoft has a rich history in such technologies, and a clear vision for the future. Our approach centres on using algorithmic decision-making to augment innate human traits such as creativity and sensitivity, allowing people to be more productive in completing tasks.

3. Algorithmic technologies have significant potential. But they also raise challenges that society must address. In response, Microsoft believes that the use of algorithms in decision-making should be grounded in a core set of principles to ensure that technology is built with intelligence that is transparent and secure, and that sets the highest bar for privacy protections, while also being inclusive and respectful of all.

4. Ultimately, we believe that the use of data-driven technologies like computing algorithms and artificial intelligence will be increasingly common in organisations of all sizes, delivering significant benefits to individuals and society as a whole. In responding to the creation of this new wave of technologies, and what certain people are referring to as the ‘fourth industrial revolution,’ Microsoft encourages the Government to draw on lessons from the first industrial revolution, where the UK successfully positioned itself at the forefront of new technologies, leading the way in delivering a significant uplift in humanity’s productive capacity. The open political environment that the Government of the day created, and the culture of innovation it facilitated, was key to its success. We believe that by encouraging the building and adoption of technologies like AI, underpinned by an established set of guiding principles, the UK can once again, successfully drive a new wave of technological development.

The extent of current and future use of algorithms in decision-making in Government and public bodies, businesses and others, and the corresponding risks and opportunities

5. An algorithm is a set of instructions that takes an input and delivers an output in a systematised fashion. As such, algorithms have been used in the context of decision-making for some time. For instance, in the hiring process, employers account for inputs such as educational performance and years worked when selecting candidates to interview; and judges look at factors such as the severity of the crime, past behaviour and legal precedent during sentencing. And although certain complex algorithms have only recently graduated from the status of an obscure technical term used mostly in computer science to a place in common parlance, they have long played a role in computing, designed to provide humans with greater predictive and analytical capacity. These complex algorithms enable people to derive insights from the large amounts of data now being generated and stored as part of our connected world.
6. These algorithms are at the heart of technologies commonly referred to as artificial intelligence or AI, a set of computing tools that perform perception, learning, reasoning and decision-making, aimed at improving the ability of people to solve complex and challenging problems.

7. Microsoft believes that the use of such tools will become increasingly common in organisations of all size in both the public and private sector. AI technology available today can already save thousands of lives and improve the performance of many systems. Key opportunities include healthcare, transportation, education, agriculture, manufacturing, and accessibility for those with special needs. AI can also enhance the resilience and capacity of critical infrastructure, including the electrical power grid and road network. In healthcare, AI can reduce hospital readmission, enhance the quality of care for managing chronic disorders, and keep hospitals safe and efficient. In the US, the Institute of Medicine released a study in May 2016 which estimated that preventable errors in hospitals are the third leading cause of death in the United States, trailing only heart disease and cancer. The number of deaths is estimated to exceed 250,000 patients per year. Algorithm-driven systems have been developed to catch errors by recognizing anomalies in best clinical practices, saving thousands of patients per year.

8. Despite its potential benefits, AI raises several concerns, including the economic disruptions and job displacements that could accompany fast-paced automation, and the possibility that technologies may develop in ways that amplify and further entrench society’s existing biases.

9. Microsoft’s vision for AI is one in which machines and humans work together to enable greater societal progress and equality. We believe that the computational power of algorithms can augment human creativity, allowing an increase in productivity by enabling people to make more accurate decisions, more quickly. Microsoft’s CEO, Satya Nadella, outlined this vision of a ‘human-centred’ AI in a recent Slate article, highlighting our belief in a future where machines augment and extend human abilities and experiences, empowering every individual to realise his or her full potential, and enabling new socio-economic opportunities.

10. As AI plays a greater role in mediating people’s lives online and offline, appropriate design, economic and social choices are essential to ensuring that the technologies be deemed trustworthy by individuals and society at large – and be regarded as respectful and inclusive, helping society to progress by empowering all peoples and organizations. The computational power and learning capabilities of machines must be coupled with the sensitivity and emotional intelligence of humans.

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1[http://www.slate.com/articles/technology/future_tense/2016/06/microsoft_ceo_satya_nadella_humans_and_ai_can_work_together_to_solve_society.html](http://www.slate.com/articles/technology/future_tense/2016/06/microsoft_ceo_satya_nadella_humans_and_ai_can_work_together_to_solve_society.html)
Whether 'good practice' in algorithmic decision-making can be identified and spread, including in terms of:

The scope for algorithmic decision-making to eliminate, introduce or amplify biases or discrimination, and how any such bias can be detected and overcome

11. Microsoft believes that all aspects of society, including government, academia and business should come together to create a set of shared principles by which to guide the use of algorithms and AI. These principles should be aimed at creating a best practice and address numerous potential challenges, including limiting bias. Based on our work in this area, Microsoft suggests that AI should:

1. Be designed to assist humanity;
2. Be transparent;
3. Maximize efficiencies without destroying the dignity of people;
4. Be designed for privacy;
5. Have algorithmic accountability so that humans can undo unintended harm;
6. Guard against bias.

12. Complementing the above are considerations for everyone developing, deploying and using these technologies:

1. Empathy;
2. Education (knowledge and skills);
3. Creativity;

13. A common vision, with shared principles, will enable all stakeholders involved to shape the future of AI. A first step was taken in September 2016, when Amazon, DeepMind/Google, Facebook, IBM and Microsoft came together to form the Partnership on AI (PAI) to address opportunities and challenges with AI to benefit people and society. Since then, Apple has also joined as a founding member. PAI’s mission is to “study and formulate best practices on AI technologies, to advance the public’s understanding of AI, and to serve as an open platform for discussion and engagement about AI and its influences on people and society.” The companies involved agreed to a set of shared tenets that center on the foregoing principles. PAI is guided by a Board of Trustees that includes academics, an economist, a civil society and a foundation, in

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2 http://www.partnershiponai.org/
3 http://www.partnershiponai.org/tenets
4 https://www.partnershiponai.org/board-of-trustees/
addition to the founding companies. Moreover, PAI is expanding its membership, and will soon include additional companies from around the world.

14. Microsoft has set out a series of broader considerations for policymakers as part of our new book *A Cloud for Global Good*[^1], to help realise the immense potential of technology while also mitigating some of the potential challenges. As part of this work, Microsoft is making a series of recommendations around how the UK can position itself at the forefront of the AI revolution by creating an environment conducive to innovation and experimentation, including in relation to data-driven technologies like AI. Relevant recommendations include the following:

- **Adopt a set of shared principles to guide the development of AI technologies;**
- **Continue broad dialogues between governments, business, researchers, civil society and others on how AI can be shaped to maximize its potential and mitigate its risks and impacts;**
- **Encourage the application of AI to address public and social challenges, and the adoption of AI in government;**
- **Fund short- and long-term research and development of humanistic AI technologies that augment human abilities and positively benefit society, while minimizing negative impacts;**
- **Develop shared public data sets and environments for AI training and testing, to enable broader experimentation with AI and comparisons of alternative solutions to address ethical concerns;**
- **Modernize data access and privacy laws and practices to enable AI;**
- **Invest in skills training for people whose jobs may be displaced by AI-based technologies.**
- **Broaden the UK’s copyright exception on Text and Data mining, bringing it into line with that of the USA, Japan and Canada and ensuring that the UK is well placed to be at the forefront of data analytics.**

15. In addition to this activity, with specific reference to the health space, Microsoft has also engaged in a collaboration with the Digital Ethics Lab at the Oxford Internet Institute, the University of Oxford and the Data Ethics Group at the Alan Turing Institute on a new project on the ‘The Ethics of Medical Data & Advanced Analytics’[^2]. The project aims to foster research around the ethics of health data across Europe with a view to establishing best practices for the ethical use of such data, as well as helping mitigate any risk of unethical consequences.

[^1]: https://news.microsoft.com/cloudforgood/
Whether and how algorithmic decision-making can be conducted in a ‘transparent’ or ‘accountable’ way, and the scope for decisions made by an algorithm to be fully understood and challenged

16. Microsoft believes that there should be accountability around the use of algorithms. While we understand the increased focus around transparency as a means to achieve accountability, we believe more thinking needs to be done to identify the best approach.

17. Because of their complexity, algorithmic “transparency” does necessarily enable “accountability.” AI tools are driven by a complex combination of algorithms. Putting this type of complicated code into the public domain for everyone to inspect will likely do little to drive accountability. By way of example, a vulnerability known as the ‘Heartbleed’ vulnerability was introduced into a piece of open source code in 2011. Being open source, this piece of code was publicly available and widely used with thousands of web servers relying on it for security. Thousands of specialist computer scientists worked on the code on a regular basis and yet the vulnerability was not identified until 2014. In this instance, there was total transparency regarding a publicly available algorithmic code, and yet it still took two-plus years to identify an algorithmic vulnerability.

18. Moreover, knowing the workings of a piece of algorithmic code is of little use in understanding its functions unless the algorithm’s inputs, e.g. data source, are also observable. Take for example a social media newsfeed. Such systems are designed to adapt based on user feedback such as clicks and interactions, resulting in a ‘personalised’ newsfeed. ‘Personalisation’ is based not just on your data but a weighting of your data against the data of other users. Accordingly, such a newsfeed is compiled by comparing the data that’s input into the system – via interactions – with the data of other users, so that the search results that surface are statistically relevant to the results that appear for others. Detailed information about the media algorithm alone would be of little value in understanding why the algorithm delivered the outputs it did, and gaining access to the full set of data inputs would present significant questions about user privacy.

19. Rather than focusing exclusively on transparency, which, as noted above, has significant limitations, Microsoft views algorithmic accountability as the preferred approach. But to ensure that algorithms and their users are accountable for their outputs, it is necessary to define the values and principles by which we want technology to be guided. It is very difficult to judge whether algorithmic outputs are ‘fair’ or ‘biased’ unless we have a clear understanding around the meaning of these terms, and the determination of what’s acceptable or desirable.

20. The committee may be interested in a new area of work known as FATML, or ‘fairness, accountability and transparency in machine learning’. A notable recent project in this field concerns the work of a group of computer scientists concerned by how certain hiring algorithms had learned biases based on a skewed set of input data. In response, these scientists renormalized the data so that protected categories such as race and gender

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7 Danah Boyd prepared remarks for a public roundtable in the European Parliament on algorithmic accountability and transparency in the digital economy [https://www.youtube.com/watch?v=VD65fW2PGg](https://www.youtube.com/watch?v=VD65fW2PGg)
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could not be discerned via proxies. To do so, they relied on established legal frameworks that provide definitions of equal opportunity in employment, clearly articulating a conception of ‘fairness’ that can then be incorporated into a piece of code. This type of remedy demonstrates the value of having clear principles and legal frameworks in relation to issues like discrimination by which computer programmers can then be guided. Societies need to make several trade-offs in relation to issues such as freedom of expression vis-a-vis the censoring of hurtful or hateful speech, or offering widespread economic opportunities vis-a-vis preventing equality of economic outcome. These are not trade-offs about which computer programmers are equipped to thoroughly evaluate without reference to broader principles or framework.

Methods for providing regulatory oversight of algorithmic decision-making, such as the rights described in the EU General Data Protection Regulation 2016

21. The EU General Data Protection Regulation (GDPR) includes provisions aimed to entitle an individual to seek “meaningful information about the logic” of an automated decision being made about him or her if that decision would have a “legal” or “similarly significant effect” on her. The Article 29 Working Party has not yet provided guidance on exactly how to interpret these requirements, and the types of decisions that are consequential enough that they’d have a “legal” or “similarly significant effect” on an individual. The ICO is also currently seeking input on the same concerns. Nevertheless, regardless of the specifics, the plain language of the text demonstrates that the law is focused on driving transparency of algorithms that would otherwise be inscrutable.

22. Although Microsoft understands the long-held desire of machine learning technologies and the public to focus on transparency as a potential tool for understanding the limits and benefits of algorithmic decision-making, oversight by regulators should concentrate on the inputs, analysis, and “overall fairness” of the final outcome. And given the potential that algorithmic technologies could provide in helping societies, government should avoid creating technology-specific regulations that might unwittingly curb the likely economic and societal benefits this technology could bring. To that end, we encourage the UK government to learn the lessons of the first industrial revolution, where it positioned itself at the forefront of new technologies by creating an open and liberal policy environment conducive to innovation.

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