



What are the implications of artificial intelligence?

ICAEW welcomes the opportunity to comment on the call for evidence *What are the implications of artificial intelligence?* published by House of Lords Select Committee on Artificial Intelligence on 19 July 2017, a copy of which is available from this [link](#)

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MAJOR POINTS

1. We believe that machine learning (our focus in artificial intelligence, or 'AI') is potentially a very powerful tool for society. We emphasise three particular capabilities of machine learning in this regard – learning from enormous amounts of data, building complex and changing patterns from data and achieving high levels of consistency. These powers can 'turbo charge' human capabilities and enable significantly better decisions. Whether AI will deliver on its promises in practice, though, remains to be seen, as it is still in early stages of mainstream adoption.
2. The accountancy sector will be able to deliver more value to organisations and the economy because of AI. AI-based systems and tools can potentially improve the efficiency of accountants, enable them to focus on areas of highest business risk, and improve the quality of business decisions. AI may also enable them to measure and analyse a wider range of business activities, and improve other areas of decision making and accountability.
3. For many people, the most direct impact of AI will be on their jobs. We take a positive view of the future and believe that humans will continue to find many ways to contribute to economies and societies, alongside machines. However, there will be significant changes to the business and employment environments. This will change the skills that younger generations need and the education system needs to recognise that. Life-long learning will also become vital, and our training infrastructures must be updated to cope with this shift.
4. We do not believe that it is possible to regulate a technology such as 'AI' in isolation. There is no common definition of what AI is. Furthermore, it increasingly just permeates across many activities in our lives. However, existing regulators urgently need to consider the impact of AI-based systems (now and in the future) on their sector. They need to encourage investment where it will deliver improvements to the sector, and decide how to manage the risks.

RESPONSES TO SPECIFIC QUESTIONS

Q1: What is the current state of artificial intelligence and what factors have contributed to this? How is it likely to develop over the next 5, 10 and 20 years? What factors, technical or societal, will accelerate or hinder this development?

5. While Artificial Intelligence (AI) is a broad field, we primarily focus on machine learning techniques. We characterise the current state of machine learning in the following way:
 - a) There have been great improvements in the accuracy of machine learning in recent years, primarily due to two factors - high volumes of data and greatly improved processing power. The combination of these factors has led to far higher levels of accuracy in the predictions made by machine learning models, making them more useable in the real world.
 - b) Mainstream business adoption is still in early stages. While companies in the internet sector, and some parts of financial services, have been developing and using these techniques for some years, we must not lose sight of the reality of most businesses, who are a long way behind in their adoption of many technology trends, including AI.
6. When looking to the future, two different aspects need to be considered. Technology capabilities will of course be important, and there will be many technical challenges to overcome, such as continuing improvements to processing power, and the ability of computers to cope with even greater volumes of data.
7. However, actual adoption and use will be driven by a wide variety of factors, including:
 - a) Practical application – for example, identifying the most relevant use cases, having appropriate software on the market, having enough good quality data for accurate results and changing processes to maximise the benefits.
 - b) Economics – building business cases for the development and adoption of AI systems.
 - c) People – in particular, ensuring trust in the systems and their outputs, and having enough skilled people to develop, implement and use systems.
8. We broadly see two models of adoption – conscious adoption of AI systems to solve specific business problems, which will require significant resources and skill; and unconscious adoption of AI, whereby AI capabilities are simply integrated into existing business software (primarily based in the cloud). These different models will help smaller businesses to benefit from AI capabilities, without needing the skills and resources of larger businesses. However, we do see great uncertainty about the timeline for change and the extent of adoption.

Q2: Is the current level of excitement which surrounds artificial intelligence warranted?

9. We believe that machine learning is potentially a very powerful tool for society, and emphasise three particular capabilities in this regard.
- a) Machine learning systems can process enormous amounts of data, far beyond human capabilities, offering opportunities to develop much better learning and knowledge. AI, in this context, becomes an essential tool to help us make sense of all the data being generated today and in the future.
 - b) Machines can learn far more complex and changing patterns than we can and therefore be far more effective in environments that we see as unpredictable.
 - c) The consistency of decision making by algorithm can also improve the quality of decision making and take out many human biases (although we note the risks of models perpetuating systemic bias based on historic data).
10. These powers can ‘turbo charge’ human capabilities and enable better, quicker and more consistent decisions. Whether AI will deliver on its promises in practice, though, remains to be seen. As stated earlier, mainstream business use of AI is still in early stages, and there are many open questions about its real world effectiveness across different domains.

Q3 How can the general public best be prepared for more widespread use of artificial intelligence?

11. For many people, the most direct impact of AI will be on their jobs. We take a positive view of the future and believe that humans will continue to find many ways to contribute to economies and societies, alongside machines. However, there will be significant change in the business and employment environments. While there is nothing new about technology impacting jobs, we must not downplay the level of disruption likely to be experienced in many individuals’ jobs and lives, and policy makers should be thinking about how to mitigate the effects of this. While we do not necessarily subscribe to solutions such as Universal Basic Income, there is an urgent need for greater debate between policy makers, and across society as a whole, of the potential impact of AI on jobs and mitigating actions.
12. It is very likely that AI will lead to significant changes in the skills demanded by employers and this will require rethinking at two levels:
- a) Younger generations will need to build the right skills to work in this changing environment. Being able to work effectively with technical specialists, and doing a certain amount of technical and analytical work, will become central to more business jobs. There will also be greater emphasis on the uniquely human skills that will complement computers, such as empathy, story-telling, persuasion, critical thinking and creativity.
 - b) There will need to be greater focus on reskilling and retraining throughout our lives. Technology will continue to change very fast and humans will need high levels of adaptability and resilience, as well as the acquisition of new skills, to keep up. Life-long learning will become vital, and training infrastructures must be updated to cope with this change.
13. We are already experiencing significant change in accountancy jobs and skills because of technology, and AI will amplify those. We see, for example, reduced transactional accounting work and greater emphasis on gaining and applying new insights from data. This typically needs more skills in data, and we are continually updating our qualifications to incorporate more technology and data skills in response to market demands. We also emphasise personal and professional skills such as critical thinking and communication.

Q4 Who in society is gaining the most from the development and use of artificial intelligence and data? Who is gaining the least? How can potential disparities be mitigated?

14. No comment

Q5 Should efforts be made to improve the public’s understanding of, and engagement with, artificial intelligence? If so?

15. No comment

Q6 What are the key sectors that stand to benefit from the development and use of artificial intelligence? Which sectors do not?

16. We focus our comments on the accountancy sector, based on our recent report [Artificial intelligence and the future of accountancy](#). We believe that the accountancy sector will be able to deliver more value to organisations and the economy as a result of AI. The profession supports and improves business and investment decision making through processing, organising, analysing and communicating information. Therefore, machine learning should be a powerful tool for the profession.
17. Use of machine learning in accountancy is still in early stages and builds on existing capabilities around big data and data analytics. Some large firms and finance functions are investing heavily in these new technologies. Smaller firms and businesses are generally some way behind. Examples of the kind of use cases being discussed include:
 - a) using machine learning to model 'normal' transactions and therefore identify 'abnormal' transactions more easily in forensic accounting and audit – this can focus resources on areas of greatest risk
 - b) using deep learning capabilities around text to analyse contracts and identify specific risks or liability – this can increase efficiency and enable more analysis of text-based documents
 - c) improving financial forecasting and planning through machine learning models - this can improve business decision making
 - d) using machine learning to automatically code account entries in accounting systems - this can free up the time of accountants to focus on more value-adding, advisory work
18. These examples therefore cross all aspects of the profession, have relevance to organisations of all sizes, and provide a range of potential benefits.
19. In the longer run, AI, combined with many new sources of data, gives accountants the opportunity to use their skills in new areas and contribute more to the economy. Accountants currently only measure and analyse a small subset of business activities, due to lack of data in areas such as intangibles. Improvements in data and technology provide opportunities for the profession to measure, analyse and improve decisions in many other areas, for example activity related to the UN Global Sustainability Goals.

Q7 How can the data-based monopolies of some large corporations, and the 'winner-takes-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?

20. No comment

Q8 What are the ethical implications of the development and use of artificial intelligence? How can any negative implications be resolved?

21. AI is a decision-orientated technology. It produces predictions that can be used to inform and automate decision-making processes. This, therefore, raises many ethical questions about how decisions are made, who makes them and how to ensure accountability, including:
 - a) Are models producing the expected results, and complying with principles such as fairness and privacy?
 - b) Who is responsible and accountable for decisions made by the models, and how can errors be corrected?
 - c) What is the relationship between models and human judgement, and to what extent can humans override AI systems?
22. There are many documented examples of bias and discrimination in outputs from big data models, or algorithms being relied upon inappropriately, due to factors such as poor understanding of the data being used or a lack of feedback mechanisms. These impacts will be amplified by machine learning and therefore ethics should be emphasised as an integral part of developing and using AI systems.
23. We welcome the efforts within the data science community to develop thinking and frameworks around ethics. The development of models involves many choices about data and algorithms that have ethical dimensions. Therefore embedding ethical thinking into the model-building process is vital.

24. However, the ethical dimension also needs broader discussion. While long-standing principles are unlikely to change, there may need to be fresh thinking about new scenarios or questions raised by AI. Technology can transform ethical dilemmas from theoretical discussions into real world problems. AI, and big data more broadly, has the potential to do this in many areas, from the decisions of autonomous vehicles to the personalisation of insurance coverage.

Q9 In what situations is a relative lack of transparency in artificial intelligence systems (so-called 'black boxing') acceptable? When should it not be permissible?

25. No comment

Q10 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

26. We do not believe that it is possible to regulate a technology such as 'AI' in isolation. There is no common definition of what AI is. Furthermore, it increasingly just permeates across many activities in our lives. However, established regulators urgently need to consider the impact of AI-based systems (now and in the future) on their sector. They need to encourage investment where it will deliver improvements to the sector, and decide how to manage the risks.
27. The risks fall into many categories. They include security and resilience of systems, accuracy and assurance over the outputs, systemic risks where systems are interacting, concerns of consumers around personal data and how to redress wrongs created by AI systems. Clearly, these will vary across industries and regulators needs to build their own understanding of AI in their context.
28. This is not an easy task, as most regulators will lack technical skills in AI and will have to build up their knowledge of the topic, as well as its specific application to their sector. Professional and industry bodies such as ICAEW can play an important role in supporting regulators, gathering insights into how technologies are being used in practice, and providing a more consistent view of experience across the sector. We are keen to contribute further in this area.
29. There are also significant challenges around pace of change. Regulation by its nature is reactive and slow-moving. But we are likely to see a fast pace of change in many sectors and regulators will need to develop more proactive approaches to cope with that, engaging early with innovators to identify issues. The Financial Conduct Authority's 'sandbox' approach to innovation in Fintech has been broadly recognised as one of the reasons behind the UK's success in this field. There may be lessons to learn for other regulators on how to manage early engagement and constructive dialogue with innovators.
30. Regulators should also be investigating ways of using AI themselves to improve their regulatory activities. Many regulators are overwhelmed by greater volumes of data, and AI can provide insights from it as well as enable better predictive capabilities. This can allow better targeting of their resources, as well as earlier identification of issues.
31. More generally, the government should focus on the skills agenda, as highlighted earlier. This includes ensuring the number of specialists in AI grows quickly to meet market demand, ensuring that younger people more broadly are learning the skills they need to operate in a world full of AI, and supporting adults to reskill for the changing business environment.
32. The government can also invest in AI capabilities in public services to improve how they are done. Areas such as healthcare and transport present tremendous opportunities for AI to cope with huge amounts of data and support better decision making at all levels. The government should aim to be an exemplar in these areas, to improve public services, encourage others to adopt the technology and actively support the development of the AI industry in the UK.

Q10 What lessons can be learnt from other countries or international organisations (e.g. the European Union, the World Economic Forum) in their policy approach to artificial intelligence?

33. No comment