

Focus on the data economy

Response to BEIS' 'Building our Industrial Strategy Green Paper'

About us

The Royal Statistical Society (RSS) is a learned society and a professional body, with more than 8000 members in the UK and across the world. In keeping with our strategic and charitable goals to support more effective use of data and statistics, our [Data Manifesto](#) highlights data as a driver of prosperity.

Summary of response

We support the government's [Industrial Strategy Green Paper](#) and its focus on the drivers of economic prosperity in Britain. Our submission highlights that the future economy is a data economy, for which we make the following recommendations:

- Within the strategy, we believe much stronger emphasis should be given to the importance of data science, statistics and artificial intelligence in our present and future economy. For the future, we recommend that data science should be considered as a potential industry sector that cuts across all others.
- Strong growth in the data economy is unfortunately accompanied by major skills shortages. We recommend strengthening education and training pathways for analytical and data science roles. In addition to this, everyone's basic skills for working with data will also need to improve, as many other jobs will have a data element to them. Activity in this area should include, but not be limited to, ensuring sufficient data skills and statistical skills in the new 'T-levels' (apprenticeships and technical education), in higher-level education, and through encouraging employer-driven professional development.
- With the growth of 'big data', digital technology, and new data sources, the potential to innovate with statistics, data science and artificial intelligence (AI) is assured. However, research councils and research institutions all share a pressing need to provide fundamental support for this. We therefore recommend that statistics, data science and AI needs to be a national priority for research and development, coordinated by the new UK Research and Innovation (UKRI).
- There is a great deal that can be done by government in support of data infrastructure. As Brexit takes effect, how we as a country follow up on the newly implemented General Data Protection Regulation will play a crucial part in this. The government should drive forward strong standards and expectations for data access and use of data, both for public benefit and as a basis for economic activity.
- We need broad and representative participation in the data economy. However, there is a lack of public trust and support for some uses of data, analytics and artificial intelligence. To more substantially address the public concerns in this area, we have recommended the establishment of a national Council for Data Ethics.

Full response

The ten 'pillars' set out in the Green Paper could very much help to make progress on several of the recommendations set out in our [Data Manifesto](#), from increasing investment in our science and research base, to ensuring that data is easily accessible for use in our economy, and skilling up the nation by ensuring that more people are taught how to handle and interpret real data.¹ However, within the strategy, we believe that **much stronger emphasis should be given to the importance of data science, statistics and artificial intelligence in our present and future economy**. The future economy is a data economy, and data will be of pivotal importance to UK economic growth. For example, global consultancy firm McKinsey now estimate that flows of data and information generate more economic value than the global goods trade (they estimate that \$2.8 trillion was contributed to global GDP from data flows in 2014, compared to \$2.7 trillion from flows of goods).²

To form its industrial strategy, government rightly does not want to place bets on the future performance of individual firms. However, data is a growing resource and a foundation for activity, which many different sectors and industries need. We therefore recommend that **data science should be considered as a potential industry sector which cuts across all others**.

Recognition and support should, as the Green Paper says, allow companies to collaborate on projects or underpin work that could not be undertaken by one company on its own. This could help to align the interests of educators and employers, and could also help to address issues of diversity in the sector, by recruiting more women and minorities into technical analytical roles, and to diversify the institutions and regions from which employers recruit. The RSS has recently set up a new Data Science Section,³ and opportunities for data science are also being taken forward by other bodies, such as the new Alan Turing Institute. Recognition as a cross cutting sector could help to substantially strengthen such collaboration, across the whole of the UK.

In their reporting on the global economy, McKinsey have pointed out that very few of the countries participating in global data flows have adequately supported their workers and communities to participate as the economy changes in this regard, and they strongly recommend developing clearer paths to new roles.⁴ Along similar lines, we recommend **strengthening education and training pathways for analytical and data science roles. In addition to this, everyone's basic skills for working with data will also need to improve**, starting early in school, and continuing in colleges and universities and into the world of work, as many jobs will have a data element.⁵

As indicated by the [Green Paper](#), the forthcoming review by Professor Sir Adrian Smith will address very important aspects of education provision, by considering how to improve participation in mathematical education in England, addressing regional differences.⁶ We can also boost preparation for new data industries via teaching in the sciences, social sciences, humanities and the arts. We think that priorities across education should include, but not be limited to, ensuring sufficient data skills and statistical skills in the new 'T-levels' (apprenticeships and technical education), in higher-level education, and through encouraging employer-driven professional development. Data skills could be defined as 'core' skills, additional and complementary to

numeracy, and would combine well with the new emphasis on core 'digital skills' for technical education.

Addressing opportunities and barriers to the data economy should help job creation, productivity, and access to the best jobs. Deloitte, for example, have reported that mathematical science is crucial to the UK economy, and is estimated to contribute 16% of UK GVA (£208 bn) and 10% of jobs.⁷ Employers report high and persistent demand for strong numeracy skills that can be applied in a variety of problem solving contexts.⁸ 'Statistical analysis and data mining' was the number one skill most often demanded by UK employers on LinkedIn during 2016.⁹ And Nesta have reported that most regions of the UK have increased high tech, creative and digital employment; this sector's share of jobs is highest in the South East, London, the East, North West, and Scotland, where it accounts for between 10 per cent and 13 per cent of all jobs.¹⁰ In additional research, they found that two thirds of data-active companies struggle to fill at least one data analyst vacancy.¹¹

In addition to creating new jobs and demand for skills, data is an important driver of research and innovation. **With the growth of 'big data', digital technology, and new data sources, the potential to innovate with statistics, data science and AI is assured.** However, research councils and research institutions all share a pressing need to provide fundamental support for this. A wealth of evidence of the skills gap in this area has been summarised in the House of Commons Science and Technology Committee's report on the Digital Skills Crisis, which recommended that "the Government needs to establish an effective pipeline of individuals with specialist skills in data science, coding and a broader scientific workforce that is equipped with a firm grounding in mathematics, data analysis and computing."¹² For example, the overall number of graduates from mathematical science degrees (undergraduate and postgraduate) has declined, and mathematics, statistics and computation have been listed as 'vulnerable capabilities and skills' within the UK's bioscience and biomedical research base.¹³ We would therefore look to UKRI to centrally prioritise research capabilities in data science and AI, and in the mathematical sciences that underpin this, rather than leaving all of this valuable systemic support to individual research councils. **We recommend that statistics, data science and AI needs to be a national cross-cutting priority for research and development, coordinated by the new UKRI.**

A further area that we would emphasise is that **there is a great deal that can be done by government in support of data infrastructure.** Strong UK data infrastructure which connects us to international data flows must be an essential priority for the new data economy. As Brexit takes effect, how we as a country follow up on the newly implemented General Data Protection Regulation will play a crucial part in this.¹⁴ There is also a great deal that could be done within the UK to shape the data collected by government and used by analysts and researchers. As pointed out in our *Data Manifesto*, publishing of open data is a rich source of innovation and economic activity at relatively little cost, especially if it is marked with standard codes for geography, time and other attributes. There is also an enormous range of new *sources* of data coming into play, such as sensor technology and connected appliances which form part of the 'internet of things'. These could soon be widely applied in a variety of fields, including energy, transport, cities, and

healthcare. The government should drive forward strong standards and expectations for data access and use of data, across the public sector and as a basis for economic activity.

Finally, we would highlight that **innovation and participation in the data economy could too easily be compromised by a lack of public trust in how data is used**. Research we undertook with Ipsos MORI in 2014 found that in general the public does not have a high level of trust in organisations to use their data appropriately, and that the media, internet companies, telecommunications companies and insurance companies all come at the bottom of a “trust in data” league table.¹⁵ Public concerns can derail new applications of science and technology (as was the case for example with genetically modified crops), and even those uses of data that are well regarded by the public, such as their use for medical and public health research, can be badly affected by a loss of trust. As we saw with NHS England’s proposed ‘care.data’ linkage of hospital and GPs’ patient records for research, many patients were concerned over how their personal data might be used, and widespread ‘opt-outs’ from the programme followed.

To publicly address ethical concerns that come from advances in data science, we have recommended establishing a national Council for Data Ethics as an important step.¹⁶

Responding to a Commons Science and Technology select committee inquiry that was informed by RSS evidence, the government agreed that ‘a Council for Data Science Ethics should be established [...] to address key ethical challenges for data science and provide technical research and thought leadership on the implications of data science across all sectors’.¹⁷ This could, in our view, work along similar lines to the role that the Nuffield Council for Bioethics takes with regard to genetic technologies, and help data science gain legitimacy with the public that it currently struggles to achieve.

Response submitted by RSS’s policy and research manager, 11 April 2017

References and endnotes overleaf

Endnotes

- ¹ RSS *Data manifesto* [PDF] http://www.rss.org.uk/Images/PDF/influencing-change/2016/RSS_Data%20Manifesto_2016_Online.pdf
- ² Box 3. Valuing cross-border data flows' in Manyika, J. Lund, S. Bughin, J. Woetzel, J. Stamenov, K. Dhingra, D. (2016) *Digital globalization: The new era of data flows* [PDF], McKinsey Global Institute. <http://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Digital%20globalization%20The%20new%20era%20of%20global%20flows/MGI-Digital-globalization-Full-report.ashx>
- ³ 'RSS sets up new Section for data science community' [online], *StatsLife*, 30 November 2016. <https://www.statslife.org.uk/news/3113-rss-sets-up-new-section-for-data-science-community>
- ⁴ 'Box 4. The impact of global flows on employment' in Manyika *et al.*, *ibid.*
- ⁵ Royal Statistical Society (2016) 'Education and skills for the data economy' [PDF], *Data manifesto briefing note 10*. <http://www.rss.org.uk/Images/PDF/influencing-change/2016/Manifesto-Briefing-Note-10-Education-skills-data-economy-FINAL-25-Nov-2016.pdf>
- ⁶ "Professor Sir Adrian Smith's independent review of post-16 mathematics will propose measures to improve take up of mathematics and close large regional imbalances in take up of advanced mathematics", p. 47 in the Green Paper, at https://beisgovuk.citizenspace.com/strategy/industrial-strategy/supporting_documents/buildingourindustrialstrategygreenpaper.pdf
- ⁷ Deloitte (2012) *Measuring the Economic Benefits of Mathematical Science Research in the UK* (PDF). <https://www.epsrc.ac.uk/newsevents/pubs/deloitte-measuring-the-economic-benefits-of-mathematical-science-research-in-the-uk/>
- ⁸ CBI (2015) 'Skills emergency could 'starve growth' – CBI/Pearson survey' [webpage], 10 July 2015. <http://www.cbi.org.uk/news/skills-emergency-could-starve-growth-cbi-pearson-survey/>
- ⁹ Slide 16 in Fisher, C. 'LinkedIn Unveils The Top Skills That Can Get You Hired In 2017' [webpage], *LinkedIn Official Blog* 20 October 2016. Available at: <https://blog.linkedin.com/2016/10/20/top-skills-2016-week-of-learning-linkedin>
- ¹⁰ Bakhshi, H. Davies, J. Freeman, A & Higgs, P (2015) *The geography of the UK's creative and high-tech economies* [PDF], London: Nesta. https://www.nesta.org.uk/sites/default/files/geography_uks_creative_high-tech_economieswv20151.pdf
- ¹¹ Mateos-Garcia, J. Bakhshi, H. & Windsor, G. (2015) *Talent and the data revolution* [PDF]. https://www.nesta.org.uk/sites/default/files/skills_of_the_datavores.pdf
- ¹² House of Commons Science and Technology Select Committee (2016) *Digital skills crisis* [PDF]. <https://www.publications.parliament.uk/pa/cm201617/cmselect/cmsctech/270/270.pdf>
- ¹³ 'The UK mathematical sciences people pipeline' in Council for Mathematical Sciences (2016) *Driving the UK economy* [PDF]. http://www.cms.ac.uk/files/News/article_56a756668046f6.43082264.pdf
- ¹⁴ Frontier economics (2017) *The UK digital sectors after Brexit: an independent report commissioned by Tech UK* [PDF]. https://www.techuk.org/index.php?option=com_techuksecurity&task=security.download&file=techUK_Frontier_Economics_-_The_UK_Digital_Sectors_After_Brexit_January_2017.pdf
- ¹⁵ 'RSS research finds 'data trust deficit', with lessons for policymakers' [webpage], *StatsLife*, 22 July 2014. <https://www.statslife.org.uk/news/1672-new-rss-research-finds-data-trust-deficit-with-lessons-for-policymakers>
- ¹⁶ Varley-Winter, O. & Shah, H. 'The opportunities and ethics of big data: practical priorities for a national Council of Data Ethics', *Phil. Trans. R. Soc. A*. 374. <http://rsta.royalsocietypublishing.org/content/374/2083/20160116>
- ¹⁷ Recommendation 14 in 'The big data dilemma: Government Response to the Committee's Fourth Report of Session 2015–16' [webpage], 26 April 2016. Commons Select Committee > Science and Technology. <https://www.publications.parliament.uk/pa/cm201516/cmselect/cmsctech/992/99204.htm>