Russell Group universities supporting the Industrial Strategy Grand Challenges

The Industrial Strategy sets out 4 Grand Challenges to put the UK at the forefront of the industries of the future and to help us tackle some of the major challenges facing the modern world. These challenges are: artificial intelligence and data, ageing society, clean growth and the future of mobility.

Our universities are leading the way in helping society anticipate and face these challenges. A selection of examples of how Russell Group universities are using their strengths in teaching, research and innovation to support each of the Grand Challenges is highlighted below.

1.   Artificial Intelligence and data

It is estimated that artificial intelligence (AI), could boost the UK economy by £232 billion by 2030, equivalent to 10% of the UK's GDP. This is because AI can help us automate complex and often repetitive tasks, helping to boost productivity. Russell Group universities are at the forefront of teaching the next generation of students the skills needed to realise the benefits of AI, through undergraduate and postgraduate courses, including PhDs in machine learning, programming and data science.

At the **University of Cambridge**, new software developed by a university spin-out company, VocalIQ, is transforming voice recognition by allowing for back-and-forth dialogue between humans and machines. This technology is now used to power Apple's Siri. VocalIQ's software, which is based on more than 10 years of research supported by Cambridge University, offers users the ability to speak more naturally with their smart devices and is now being developed for use in cars.

Researchers working collaboratively from the **Universities of Manchester**, **Oxford, Liverpool, Sheffield, Nottingham and Bristol** are leading a new multimillion pound robotic and AI programme to clean up the world's nuclear waste. The programme has already successfully tested robots at facilities such as Sellafield and in hazardous environments like Fukushima in Japan.

In the area of big data, **Cardiff University** has established the Data Innovation Research Institute, focused on accelerating the impact of big data in areas such as medicine, social sciences, life sciences and engineering. The institute also hosts a Centre for Doctoral Training in data intensive science in order to train the next generation of data scientists and is involved in the development and teaching of a range of data intensive masters courses at the university. The **University of Edinburgh** is also a central partner in the City Deal which seeks to make Edinburgh and its surrounding region the European leader for applying data science to products and services.

2.   Ageing society

The number of people across the world aged 60 and over has tripled since 1950, making the development of age-friendly policies and living spaces more important than ever. Our universities train over 82% of the UK's graduates in medicine and dentistry needed to treat this growing population and are leading the way in developing innovative solutions to help communities adapt to an ageing society.

Newcastle University's Institute for Ageing brings together a network of over 500 researchers across all three main faculties to develop multi-disciplinary solutions to major problems related to ageing. Through its 'Changing Age for Business' programme the university supports the development of companies with a focus on issues relating to ageing. Projects include the DemTalk programme, a free web-based toolkit to

support communication with dementia patients and the design of specialist products to allow older people to remain independent for longer.

The **University of Manchester** is part of the Ambition for Ageing project, a £10 million programme to be delivered over the next five years. In collaboration with the Greater Manchester Centre for Voluntary Organisation, the university is working with a range of government agencies and community groups to help build age-friendly local communities. This includes advising local government on how to build transport systems that better address the needs of older users, as well as conducting research into how to address loneliness in the older population.

In the area of public health, **King's College London** and the **University of Birmingham** have led research which shows exercise amongst older people can halt the loss of muscle mass and strength associated with ageing. This work could help prevent the need for hip and knee replacements (approximately 160,000 each year) in future through improved advice on exercise and healthy ageing. Their work shows regular exercise in older people acts as a powerful halt to the ageing process, providing protection from illnesses such as arthritis and potentially cancer.

3. Clean growth

The Industrial Strategy sets out the aim for the UK to be a leader in clean growth technology. Russell Group universities are leading the way in providing the skills base to enable the UK to be at the forefront of this important area. A few examples include the **University of Exeter's** BSc in Renewable Energy, which is backed by a range of energy companies and builds on the university's research strengths in wave power, energy policy and finance; a masters course at the **University of Leeds** in Electrical Engineering and Renewable Energy Systems, which equips students with both theoretical and hands-on practical experience in renewable technologies; or the **University of York's** masters course in Green Chemistry and its application in sustainable industrial technologies, the first course of its kind to be accredited by the Royal Society of Chemistry, with a key focus on commercialisation and business links.

Durham University has been pioneering research into how warm water in abandoned coal mines can be harnessed to provide central heating for houses. This work could provide the UK with an alternative low-carbon solution for heating, which has been recognised by the Minister for Energy and Clean Growth as an "incredibly interesting" opportunity.

Russell Group experts from the **Universities of Oxford and Cambridge** are also providing valuable advice through their appointment as members of the Government's Green Finance Taskforce, which has been set up to provide practical policy recommendations that will help deliver the investment needed to meet the UK's Industrial Strategy and Clean Growth Strategy.

4. Future of mobility

The ways in which people, goods and services move are changing rapidly, driven by high-tech research and innovation around autonomous vehicles and low-carbon transport, amongst other areas. Russell Group universities are at the heart of developing cutting-edge new technologies and inventions.

The **University of Warwick,** in partnership with Transport for West Midlands and others, is leading the Midlands Future Mobility project, a multi-million programme focused on enabling the accelerated introduction of autonomous vehicles onto UK roads by 2021 in order to facilitate the movement of goods and people across the country. The University is also offering a brand-new masters course starting from October 2018 in Smart, Connected and Autonomous Vehicles, with extensive industry support, including from Jaguar Land Rover.

The universities of **Birmingham, Newcastle, Nottingham, Sheffield** and **Southampton** are spearheading research into rail infrastructure as part of a £92m partnership between the rail industry and academia. The partnership – part of the newly created UK Railway Research and Innovation Network (UKRRIN) is leading research into new innovations and rail-related technologies in order to deliver a step-change in the UK rail network's productivity and performance, as well as the performance of rail networks worldwide. Recent projects include the HydroFlex programme at the **University of Birmingham,** aimed at delivering the UK's first hydrogen powered train. The development of such trains is crucial to help the rail network reach its objective of removing diesel-only trains from the UK by 2040.