The Industrial Digitalisation Review, published last month, lays out a series of proposals to boost the UK’s economy through the deployment of advanced digital technologies.

The commission, set up by the UK government, was chaired by Siemens UK CEO Juergen Maier.

It said the application of technologies such as robotics, 3D printing, augmented and virtual reality and artificial intelligence could boost the UK’s manufacturing economy by up to £455 billion.

The report – ‘Made Smarter’ – found the UK economy would benefit from investment in digital technology, but warned that Government and industry would need to work more closely if Britain was to put itself at the forefront of these new technologies and associated markets.

“If successful, the economy could see a productivity boost, as well as a potential net gain of 175,000 highly skilled, better paid jobs,” said Maier.

The Review pulled together comments from more than 200 stakeholders, ranging from companies like Rolls Royce and IBM to SMEs, academic institutions, R&D centres of excellence and the High Value Manufacturing Catapult, which helped to draw up the proposals.

According to Maier: “Our proposals will help business understand, better deploy and create the latest digital technologies, helping to secure more homegrown R&D and the creation of new industries.”

As part of its remit, the Review looked at issues around adoption, innovation and leadership and the final report called for the building of a national and more visible digital ecosystem, with a National Adoption Programme focused on increasing the capacity of existing growth hubs and providing more targeted support.

Other key findings included the re-focusing of the existing landscape with the creation of 12 ‘Digital Innovation Hubs’, eight large scale demonstrators and five digital research centres focused on developing new technologies as part of a new National Innovation Programme. The report also urged the establishment of a national body – the Made Smarter UK (MSUK) Commission – to drive industrial digitalisation technologies and skills.

Commenting on the report Sean Redmond, CEO of Vertizan, a digital and software SME, said: “Smaller businesses that are growing at scale, especially industrial companies, need support learning about how digitalisation can help their business grow. We want to make industrial digitalisation accessible, understandable and practically useful to firms up and down the country.”

The AMRC’s Factory 2050 is the UK’s first state of the art factory that is dedicated to conducting collaborative research into digital assembly and flexible component manufacturing. By Neil Tyler

AMRC
The Advanced Manufacturing Research Centre (AMRC) was established back in 2001, as a £15 million collaboration between the University of Sheffield and aerospace giant Boeing.

Set up by Professor Keith Ridgway and local businessman Adrian Allen, it was intended to build on the region’s experience and leadership in metallurgy and engineering research.

Part of a cluster of centres for industry-focused research and the development of technologies used in high-value manufacturing sectors, the AMRC Group was set up to help companies overcome manufacturing problems through collaborative research.

According to CTO Stuart Dawson, the AMRC’s mission is to: “Maintain a world class community where research, design, manufacture and study interact effectively to put technology into practice.”
The AMRC Group has specialist expertise in machining, casting, welding, additive manufacturing, composites, designing for manufacturing, testing and training and, over the past 15 years, has developed a global reputation for helping companies overcome their manufacturing problems, providing a blueprint for successful collaborative research involving universities, academics and industry, worldwide.

Further expansion is underway with a new Advanced Manufacturing Campus on the nearby Sheffield Business Park.

“We have numerous core capabilities and our research projects fall under three categories,” explains Ben Morgan, head of the Integrated Manufacturing Group/Factory 2050. “This includes generic research carried out on behalf of the AMRC partnership, with results distributed to all our members; specific research for individual companies and innovative projects looking at technologies and processes at earlier stage of development.”

That type of project tends to be funded by the EPSRC, Innovate UK, EC or other bodies, and may involve collaboration with external research and industrial partners, explains Morgan.

Sub-centres include the Rolls-Royce Factory of the Future, the AMRC Training Centre, Knowledge Transfer Centre, AMRC Castings, the Medical AMRC, The National Metals Technology Centre and Factory 2050, among others.

“Businesses can work with us on a one-off project, or join us as a member for long-term collaboration,” explains Morgan.

“The AMRC now employs around 500 highly qualified researchers and engineers from around the globe, on the Advanced Manufacturing Park in South Yorkshire and our operations are continuing to grow significantly.”

Factory 2050
Factory 2050 is the UK’s first state of the art factory. Dedicated to conducting collaborative research into reconfigurable digitally assisted assembly, component manufacturing and machining technologies, it can switch production rapidly between different high-value components and one-off parts. In essence, it’s Industry 4.0 in a ‘nutshell’.

The facility is the first building to be completed on the University of Sheffield’s new Advanced Manufacturing Campus and, at 6730m², is home to the AMRC’s Integrated Manufacturing Group.

“Our work encompasses: robotics and automation – from industrial robotics to collaborative robots – which is fast becoming an important technological area; integrated large volume metrology; digitally assisted assembly, including vision systems; and manufacturing informatics, which is focused on high power computing and running analytics,” explains Morgan.

Its work involves developing ways of meeting demand for high variation and mass customisation, using intelligent machines and ways of handling and making sense of big data, human machine collaboration and techniques for digitally assisted assembly.

Equipment recently installed includes a KUKA Titan heavy-duty six axis robot, capable of carrying out heavy duty machining of difficult materials and offering a more flexible alternative to traditional machine tools. Also installed was a Siemens 840DSL controller and KUKA omniMove Automated Guided Vehicles (AGVs).

The AGVs, capable of carrying up to 15tonne and believed to be the first installed at any UK R&D facility, are being developed to work more autonomously with the wider ‘smart’ factory setup.

Initial projects at the facility include a programme to take aerospace manufacturing technology into the construction industry, exploring future digital factory technologies for building commercial aeroplanes and investigate digitally assisted assembly technologies.

“The Factory 2050 concept was born out Government research conducted a few years ago,” Morgan explains. “The report looked at manufacturing and found there was a need for facilities that could show
how you could research the mass customisation of products, not just high value, low volume components. Right across industry, there is a focus on personalisation.”

Another important driver behind Factory 2050 was the need to encourage more young adults to take up engineering as a profession.

“With large numbers of engineers retiring, there simply isn’t the knowledge or level of skills necessary for industry. The factory was designed to be open. Made of glass, we wanted people to see what was going on inside.”

While a sense of openness was critical, the facility also provides areas where commercially sensitive research and work can be undertaken.

“The facility is re-configurable,” explains Morgan, “and, while we don’t undertake manufacturing, we provide the de-risking of technology and innovation.

“We have highly trained engineers on hand to help companies overcome manufacturing problems and, as a faculty of the University, the AMRC can access other departments.”

Factory 2050 is about challenging pre-conceived ideas about technology, Morgan explains. “Our role is to confirm or refute ideas about the usefulness of technology. If it works, then we will approach industry and integrators to get them to sell and support a solution into the market.”

According to Morgan, technological change has accelerated since 2006.

“We’ve been working with automation, robotics, vision systems and metrology and are certainly seeing more work with AR.

The advent of Industry 4.0 means more players are entering the market and there’s certainly more disruption.”

More companies are embracing AR and VR, says Morgan, with the likes of Jaguar Land Rover using it to huge advantage.

“There’s certainly a lot of hype around this technology but, by developing the right application to meet a particular challenge, the benefits can be significant.”

However, trying to use new technology with legacy systems can be a challenge for businesses.

“Much will depend on the age of the equipment. Large production lines tend to be well connected and a lot of information and data can be gleaned. It’s much harder for smaller companies with older equipment; then we look at retrofitting low cost sensor solutions.”

Morgan made the point that, while fitting sensors to collect data is valuable, “you only have to look at the huge impact data and analytics have had in the IT world, where Amazon and Google have used it to great effect, to see how manufacturing could benefit.

“However, it will need the right analytics deployed in the right applications, where you can get the most value. Crucially, any analysis will have to be done in a stable environment if you are to generate consistent and usable outputs – without that, data collection is pointless.”

UK plc

While the UK has a lot of ground to make up, Morgan believes it’s not all doom and gloom.

“Yes, we’re innovative and yes, we’ve tended to fail to capitalise on that. But we’re working hard to bring a number of innovations to maturity. Just take a look around the AMRC: within a few miles, we have facilities owned by Boeing, McLaren and Rolls Royce, the latter is one of the most advanced jet engine facilities anywhere.

“That said, there are plenty of economies where the uptake of automation puts the UK to shame.”

When it comes to embracing new technologies, companies need to assess the enterprise architecture and understand the flow of data from machine to machine.

“Our advice is to start discretely; monitor what level of data you can generate and whether it is useful. Only by trying and doing, will you find out.

“We say that it’s better to fail fast and to fail virtually. Do it only once and in a simulated environment – you’ll learn a lot quicker.”

Beyond that, Morgan makes the point that to truly benefit from Industry 4.0, the technology needs to be backed up by an incredibly good infrastructure.

“Only by extending Industry 4.0 to bring in the entire supply chain will we really unlock the benefits identified in Maier’s report,” he concludes.