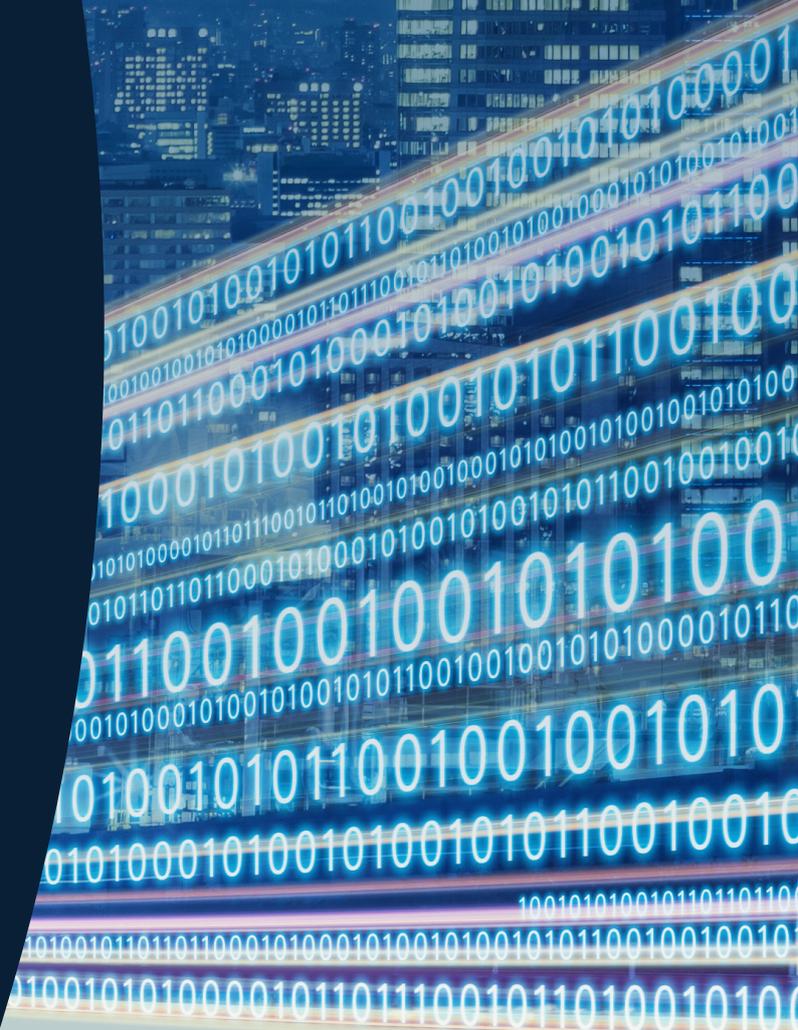


Digital Capabilities

**JOINING FORCES
TO CREATE
SOLUTIONS**



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INTRODUCTION

The Digital Future

The digital revolution has initiated the Fourth Industrial Revolution, disrupting all industry sectors and fundamentally altering the way we live and work. The Government's Digital Strategy, embedded within the wider Industrial Strategy outlines how to put our country at the forefront of that revolution and continue being a world leader in key technologies.

As pioneers of research and product development, and education of a future-proofed workforce, universities are vital to securing the country's place as a global digital leader. Working as a partnership of six innovative and entrepreneurial universities, Midlands Enterprise Universities brings together our expertise to meet the challenges of the digital future and to deliver the ambitions of the Industrial Strategy and Midlands Engine's vision.

Joining forces to create solutions

With over 136,000 students, 18,000 staff, and an estimated economic impact of £3.1 billion, we're committed to driving growth and the development of digital skills across the region.

Our 7,000 academics work in some of the best international research groups in the country, with many classified as world leading. With disciplines ranging from maths to computer science, and from ethics to linguistics, our applied research is transforming business models and identifying better ways of doing complex tasks.

Our key strength is in interdisciplinary working. Today we are facing societal challenges and industrial change of an unprecedented scale. Sector specific approaches are no longer enough to design the solutions we need.

Thus, multi-disciplinary and cross-sector collaboration has become a key driver. Universities are great enablers of this creating safe spaces that nurture thinking beyond borders.

We work with businesses of all sizes, and at any stage of growth. We listen to their needs and develop tailored solutions to solve their problems. Our collaborative approach makes us a leader in developing and applying digital technology in key areas, including health, transport, the built environment, agritech and education.

We work closely with local and regional partners, including Local Enterprise Partnerships and Growth Hubs, attracting matched funding to support business growth.

Embedded in our local communities and with a strong civic reputation, our universities have the capacity to bring about greater prosperity for the people in the Midlands in a digitally driven economy.

Working with us

This brochure gives an overview of our partnership's digital expertise and related services.

We invite stakeholders to join us to cultivate the Midlands' strengths in digital innovation to contribute to the local and national economy.

We invite businesses to contact us, so we can develop solutions to your organisation's needs.

Midlands Enterprise Universities

- Birmingham City University
- Coventry University
- University of Derby
- University of Lincoln
- Nottingham Trent University
- University of Wolverhampton

“Digital is transformational; put simply its adoption will boost productivity, support UK businesses to create good jobs and increase the earning power of people in many industries.”

UK Industrial Strategy, 2018

“The UK’s global competitiveness will increasingly depend on not just a flourishing digital sector, but on all our businesses using the best digital technology and data to drive innovation and productivity. We need to help all businesses become as productive and competitive as those who are in the vanguard: adopting digital technologies will be crucial to this.”

UK Digital Strategy, 2018



OUR EXPERTISE

Our universities have a wide range of digital and technological expertise and often work in partnership and across departments to solve key challenges. We also work closely with businesses to further innovations in:

- Applied computing
- Health and social care
- Transport, engineering and the built environment
- Agriculture and manufacturing
- Business, skills, and digital culture

Table 1: Summary of MEU Digital Capabilities

	Birmingham City University	Coventry University	University of Derby	University of Lincoln	Nottingham Trent University	University of Wolverhampton
Blockchain Using networks of incorruptible records which are linked using cryptography.						
CAD & rapid prototyping Techniques used to quickly fabricate a scale model of a physical part.						
Connected devices/IoT A system of interrelated smart devices linked to automated systems.						
Cyber security & ethical hacking Technologies, processes and controls that are designed to protect systems, networks and data from cyber attacks.						
Data mining & big data analytics Extracting usable data from a larger set of raw data, to uncover information such as market trends.						
Human-computer interaction The design of computer technology focussing on the interaction between humans and computers.						
Quantum technologies Using the principles of quantum to develop new generation computers and business applications.						
Machine & deep learning (AI) Enabling machines/computers to learn complex tasks.						
Robotics and automation Using computer software, machines or other technology to carry out a task which would otherwise be done by a human worker.						
Virtual reality/simulation Creation of a three-dimensional, computer-generated environment which a person can interact with.						

APPLIED COMPUTING

Applied computing underpins all aspects of digital activity, fuelling development in emerging areas such as robotics, autonomous systems and connected devices.

Our academic teams are addressing many business challenges affecting a wide range of sectors by generating multiple solutions across university departments.

For example, the University of Derby's multi-disciplinary Health Technology Specialist Interest Group is integrating IoT in medical devices for rehabilitation. The University of Wolverhampton's Research Institute for Linguistics and Language Processing brings together computational linguistics and statistical cybermetrics, allowing people to communicate using instant speech recognition and translation software.

Our key capabilities

- Artificial intelligence and machine learning
- Cyber security
- Big data analysis

How we are using our research

- Deploying machine learning in the development of cancer therapies
- Using IoT devices for smart care homes
- Using big data analytics to understand climate change
- Developing autonomous systems for transport manufacturing
- Using robots in agricultural test environments
- Protecting our air traffic and road networks through cyber security applications
- Developing unmanned autonomous vehicles

NETWORK

PROCESSING

02
// HACK ATTE

CONNECTED

USER SA

AI and machine learning

From developing new ways to detect cancer, to creating the next generation of cybersecurity tools, machine learning is driving many of the advances in digital technology.

Midlands Enterprise Universities' expertise is advancing areas as diverse as robotics for fruit picking, intelligent transport, and the media for next generation audiences.

We have a successful track record of developing partnerships to drive the development of innovative digital applications. For example, serious games research at Coventry University is done in collaboration with a range of universities and institutes across Europe. A game for the treatment of ADHD was sponsored by Janssen Pharmaceutica in Belgium and won Best Health Game 2017 at the Fun and Serious Game Festival.

Case study: Sensor technology for autonomous vehicles at the University of Lincoln

The UK Government has challenged academia and industry to develop artificial intelligence (AI) and control systems that put the UK at the forefront of the driverless cars revolution. With predicted growth of £63 billion by 2035, the sector is vital to its Industrial Strategy.

New collaborative R&D programmes will develop the next generation of AI and control systems. So far, the Government has announced nearly £40 million for collaborative projects involving UK businesses and researchers.

The University of Lincoln's Centre for Autonomous Systems (L-CAS) has applied AI, computer vision,

robotics, and neuroscience to develop sensor processing technology for autonomous vehicles. It allows both short and long-distance perception, inspired by the swarming and fast reaction time of insects.

Working with academic and industry partners from Germany, Japan and China, including Visomorphic Technology and Dino Robotics, the team have successfully scaled up and optimised the sensors for real-world testing.

Crucially, the technology's brain-inspired object recognition and identification capability can be applied to other autonomous robotic solutions beyond autonomous vehicles.

"Autonomous vehicles, although still in the early stages of development, have demonstrated huge potential for shaping our future lifestyles – sending children to school, driving commuters to work, delivering packages to households, and distributing goods to warehouses, shops or remote areas. But to be functional on a daily basis there is one critical issue to solve: trustworthy collision detection."

Shigang Yue, Project Leader and Professor of Computer Science at the University of Lincoln



“The new centre will firmly establish Skylon Park as a natural home for cyber security research and innovation, putting us at the cutting edge of this pioneering field. We already have a cluster of businesses working within the growing cyber security sector and the centre will be vital to building on this expertise in the coming years.”

Andrew Manning Cox
Chairman of the Hereford Enterprise Zone



Big data analysis

Big data analytics examines large amounts of data to uncover hidden patterns, correlations and other insights.

Whether their focus is on climate change, healthcare or autonomous vehicles, our researchers are using data analytics to answer challenging questions. For example, NTU is applying big data science to computation modelling and advanced eye technologies to assess the effects of ageing on vision.

Case study: Virtual prototypes speed up production at the University of Derby

Traditional design processes can be expensive and time consuming, especially for something as complicated as an engine. Every modification needs a prototype built and tested for the desired effect.

The University of Derby's big data researchers have a different method. They can create a data view of an engine, then use that data to power a virtual reality model. Their algorithms can control output or check things like predictive maintenance and any changes take just minutes, not months.

The large manufacturing company involved in the project gets something much more valuable than numbers from their data. They obtain something tangible and visible that helps them innovate at record speed.

And the future? The next step for the research team is to use data-generating devices as more than just sources. If those devices could become computers to process that data, the possibilities are even more exciting.

“This will allow us to not only capture the data, but also process it at the source in real time. The biggest bottleneck in processing data is not the algorithms we use; it is that there is too much redundant data collected in the first place, so being able to process it at the source would allow us to filter out everything that is weak, noisy or simply not required. And if the data is good, we will be able to produce something truly useful.”

Professor Ashiq Anjum, Professor of Distributed Systems, University of Derby

Cyber security

As cities, vehicles and services become increasingly interconnected, security is becoming more important than ever. A fusion of technologies known as cyber-physical systems will provide the foundation of our critical infrastructure, form the basis of emerging and future smart services, and improve our quality of life in many areas.

Our researchers are working across departments and specialist institutes like Birmingham City University's Centre for Cyber Security. Joining expertise in cryptography, mathematics, network communications and AI, BCU's academics are tackling challenges in smart cities, connected vehicles and healthcare technologies.

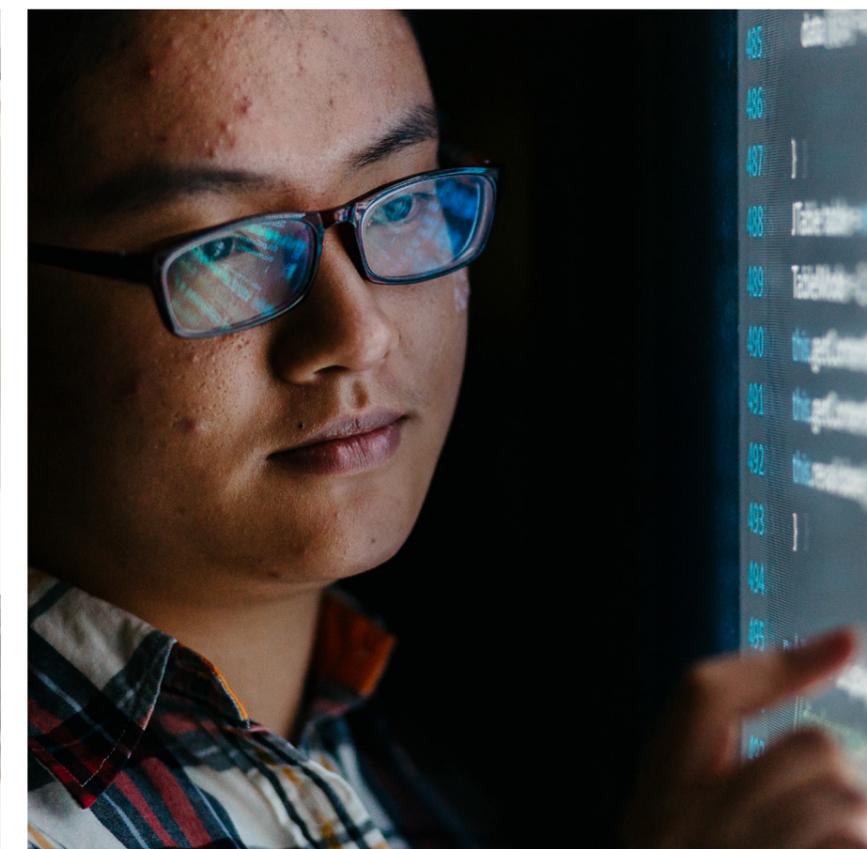
Case study: The University of Wolverhampton's new cyber security hub in Hereford

A large-scale co-ordinated attack on a safety-critical system could be devastating. Everything from power grids to aeronautical communications is at risk. Healthcare, transport and infrastructure systems all need to be secured to protect public safety.

The Wolverhampton Cyber Research Institute (WCRI) joins together 20 academics from mathematics and computer science. With partners, the interdisciplinary group develops innovative solutions to major challenges in cyber security, AI, and cyber-physical systems.

The research includes security protocols, attack prediction, and secure embedded systems. Using state-of-the-art labs with sophisticated analytics software and advanced emulation, they evaluate systems, risks and solutions.

The institute is already expanding with the new Hereford Centre for Cyber Security due to open in 2020. This facility will give the industry access to specialist equipment to work with experts on new ideas before applying them for real.



HEALTH AND SOCIAL CARE

The Industrial Strategy identifies our ageing society as one of its Grand Challenges. Longer life expectancy and lower birth rates mean that one in three children born in the UK today can expect to live to 100*. That will create demands in health and social care for new products and practices.

Through its Healthy Ageing programme, the Government aims to bring together businesses and researchers to develop ways to tackle loneliness and increase independence and wellbeing.

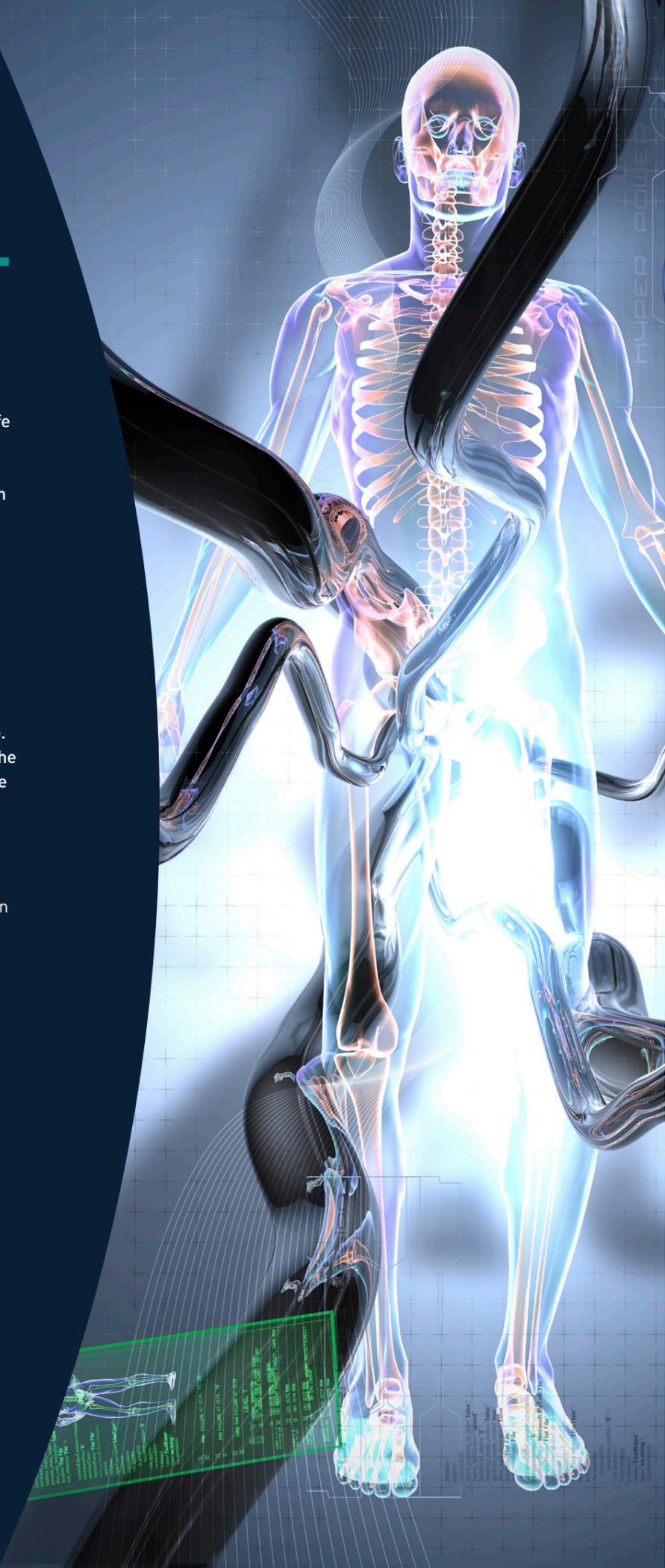
Our universities have invested in a wide range of expertise in innovative technologies to enhance health and social care practices in the digital age. We want to harness this expertise to help meet the ambitions of the Industrial Strategy and make the Midlands a better place to live.

Our key capabilities

- VR and simulation for training and rehabilitation
- Wearable technologies
- Smart diagnosis and treatment

Our research applications

- Training future healthcare professionals through simulation
- Diagnosis using VR
- Testing treatments with AI and big data-powered simulation
- Identifying cancer through digital imaging
- Using data to understand complex brain signals and muscle responses
- 3D printing prosthetics
- IoT sensor and motion capture analytics in medical and sports rehabilitation
- Smart labelling to monitor pharmaceuticals
- Connected sensors for health and living environments



VR and simulation for training and rehabilitation

Simulated learning combines people and immersive technology to replicate real-life situations to train students. Scenarios include mental health therapies, drugs administration, the introduction to usage of wheelchairs, surgeries, and post-operative rehabilitation. For example, at the University of Lincoln, the interactive lab supports new wheelchair users through a combination of serious games and mobile virtual reality technologies.

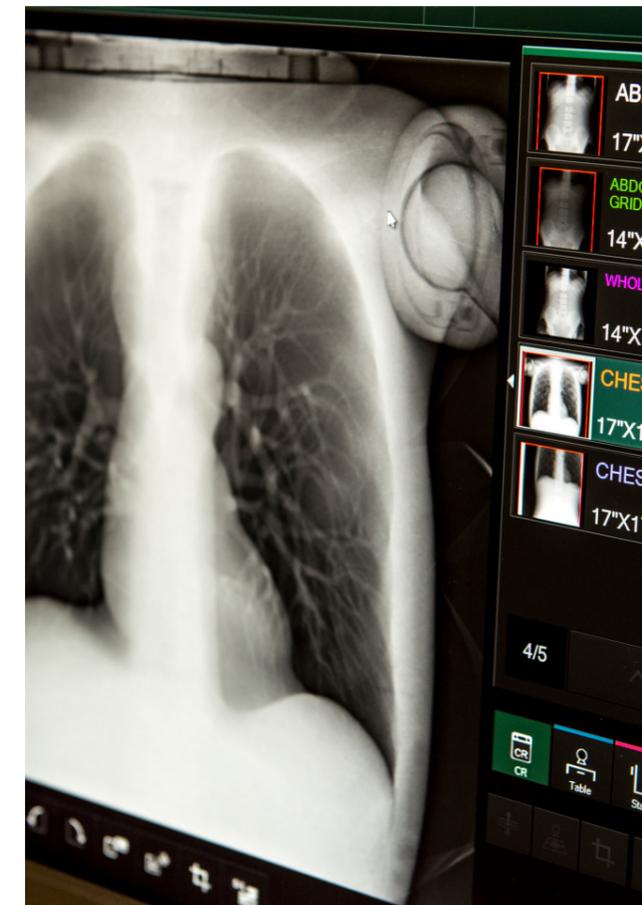
Case study: Training the future stars of healthcare at Coventry University

Coventry University's Alison Gingell Building prepares future healthcare professionals to care for a patient at every stage of their healthcare experience. The university can simulate the whole patient journey: paramedics arriving at someone's house, their subsequent ambulance journey and their stay in hospital, all the way through to their discharge and rehabilitation at home.

The five-storey building has simulated houses, an ambulance cab, an operating theatre, a ward and various laboratories. From paramedic intervention to occupational therapy, the state-of-the-art simulation-based training centre allows students to test out their risk-taking and trouble-shooting skills without compromising patient safety.

"When choosing a university, the facilities were really important, and knowing that the new Science and Health Building was coming to Coventry was a big draw. The labs that offer simulation are really important in preparing us for our placements, and I've not visited anywhere else with facilities that rival what we'll have access to in the new building."

Joshua Price, Adult Nursing BSc (Hons) student



Wearable technologies

Assistive and wearable technology means older generations can live and work longer – independently and safely. Smart diabetic insoles, tools to help people with dementia to stay socially connected, or clothes with in-built healthcare sensors all benefit people with healthcare needs.

For example, through the EU-wide Designing for People with Dementia project, the University of Wolverhampton is helping people with dementia stay socially connected with wearable technology components.

Case study: University of Derby's smart insole for diabetics

Because diabetes can affect blood supply to the nerves, patients are at high risk of getting ulcers. Researchers at the University of Derby are working with a professor at the Royal Derby Hospital to find out whether an intelligent shoe insole could help.

The novel insole contains sensors which screen the foot. It's made from a smart material, and when it receives an instruction from an intelligent closed-loop control system it supports a particular area of the foot.

The team are currently working on which combination of sensors and data processing works best, and what data is the most useful to monitor foot health and prevent serious conditions. The closed loop control system will integrate smart sensing, intelligent signal processing, and decision support.

This approach could both reduce the number of appointments needed and advise the patient when it's time to see a specialist. Data collected over time from the insoles could also support longer term diagnosis and treatment decisions.

“The development of foot ulcers in people with diabetes is a source of great misery to sufferers and cost to the NHS. This exciting technology could prevent ulcers occurring in people with diabetes who are at high risk because nerve damage means they can't feel their feet. A system which senses changes and provides feedback could give people with diabetes the reassurance that their feet are safe.”

Professor Frances Game, Consultant Diabetologist, Royal Derby Hospital



Smart diagnosis and treatment

Early diagnosis and precision medicine are key to dealing with the Grand Challenge of our ageing society. Smart diagnosis and effective treatments will save lives while putting the UK at the forefront of a growing global market in diagnostics.

Our researchers are working across a huge number of applications, including imaging of brain signals and profiling genetic markers. Our technology is contributing to real-life treatments, with successes from 3D-printed heart valves to optimised dialysis. For example, at BCU, the Digital Media Technology Lab uses data sonification, which tracks the passage of sound waves through human tissue, to diagnose cancer.

Case study: Smart muscle monitoring for a speedy recovery at Nottingham Trent University

The rehabilitation options for people with facial palsy are limited. Specialist services are few and far between, and patients are often told to practise exercises in front of a mirror.

Working with their own reflection can remind people of their condition, often discouraging them, and sometimes even causing psychological issues. Technology that provides real-time muscle information could revolutionise the condition.

At Nottingham Trent University a team of academics are developing FRAME: Facial Remote Activity Monitoring Eyewear. The inconspicuous,

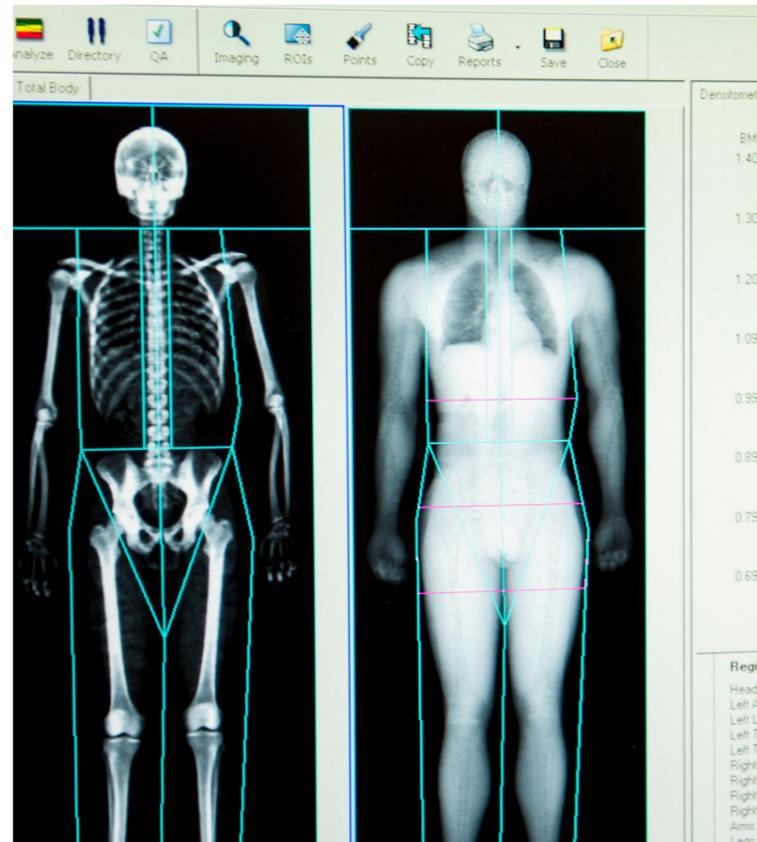
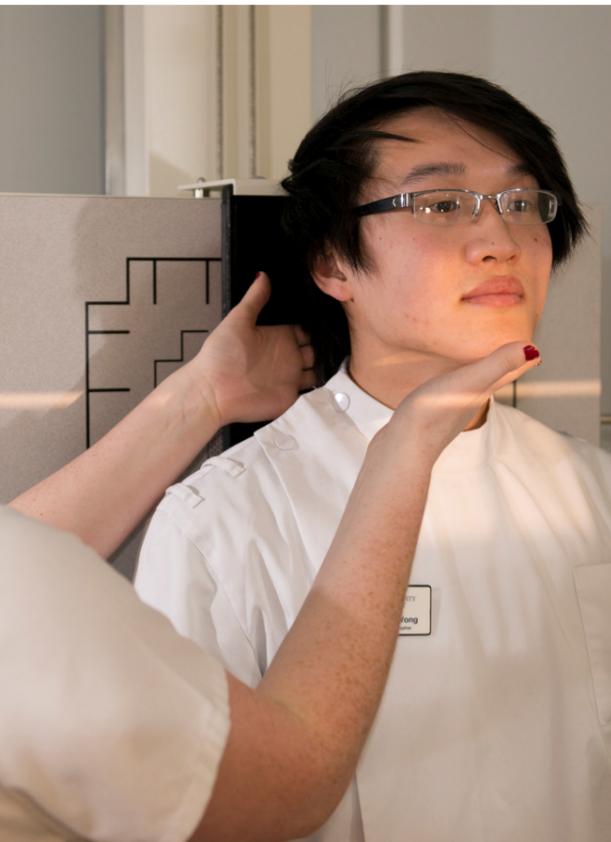
non-invasive device resembles a pair of glasses but has sensor arrays embedded in key areas.

FRAME will provide feedback on facial muscle movements, helping people practise their exercises continuously to significantly speed up recovery. The project involves surgeons, speech therapists and manufacturers all committed to developing and testing a working prototype.

Not only will the technology improve the quality of life for people with facial palsy, it will also provide the NHS with direct cost and time savings.

“Facial paralysis can lead to significant functional, social and psychological consequences. Providing real-time facial expression could be a game changer, especially if started early before abnormal movement patterns become entrenched. However, developing a wearable that is sensitive, lightweight and comfortable requires a multi-disciplinary approach. We feel that this technology could make a real difference for patients – and may have wider uses.”

Mr Charles Nduka, Reconstructive Surgeon, Queen Victoria Hospital



TRANSPORT, ENGINEERING AND THE BUILT ENVIRONMENT

The UK Industrial Strategy sets out ambitions for the automotive, aerospace and construction industries to shift to clean energy sources and efficient new materials. The Government wants the UK to become a world leader in shaping the future of mobility, leading the development of driverless vehicles and connected transport systems.

Our researchers are working at the cutting edge of industrial developments to support these ambitions. In partnerships with organisations like Rolls-Royce, Siemens and Roche, we're working on projects as diverse as the modernisation of rail services and programming intelligent transport and logistics systems.

Our key capabilities

- Design of next-generation and autonomous vehicles
- Smart cities and 5G
- Digital for engineering and the built environment

Where our work is making an impact

- Testing smart cities, logistics and transport through VR
- Designing and testing factory equipment using simulation
- Rapid prototyping vehicles with CAD/E
- Developing next-generation human-computer systems for vehicles
- Machine-learning-powered autonomous vehicles, smart logistics and automated manufacturing
- Developing IoT sensors for transport, buildings and cities

Design of next-generation and autonomous vehicles

With tools like CAD and 3D printing, new ideas can be developed and tested in record time.

From the most complex component to revolutionary new concepts, our academic experts are solving engineering challenges related to next-generation vehicles.

We are using digital capabilities to explore all aspects of vehicle design, production and operation, including designing the architecture to control driverless cars. For example, the Lincoln Centre for Autonomous Vehicles is developing technologies for decision making, control and interaction in intelligent transport.

Case study: Collaborating with Coventry University to solve the sector's big challenges

The automotive industry is going through dramatic changes. Consumer expectations are changing, and governments are looking for new ways to cope with rising urban density.

The National Transport Design Centre (NTDC) at Coventry University is a hub for designers, technologists, artists and materials experts to explore these issues and advance the concept-to-production process.

Leading facilities let the researchers explore robust solutions to the industry's challenges. An interactive power wall lets them test designs in VR. Clay and CNC milling machines allow them to create precise models. And 3D scanners can reverse engineer products for vital clues.

By 2022, the NTDC will work with around 250 businesses. One of the very first partnerships involved Roland DG Academy:

"Our partnership with Coventry University is a great opportunity for Roland DG. We get a fantastic new space to run our future courses, providing us with a new location for the convenience of our customers. Of course, seeing our machinery used in such a state-of-the-art facility to develop impressive products is a testament to the technology."

Joe Wigzell, Roland DG





“Working with BCU gives us access to insights and skills that help us shape policy and create innovative public sector solutions. Building a long-term co-operation also ensures that we transfer knowledge to our core staff.”

Andrew Radford
Principal Transportation Officer, TfWM, BCC

Digital for engineering and the built environment

The Industrial Strategy aims to halve the energy use of new buildings by 2030. Use of artificial intelligence and data science, new materials and energy sources will support the built environment sector to meet those goals, transforming the home and workplace and addressing challenges related to an ageing society.

Technology is ushering in a new era in the way we plan our communities and construct buildings. Developing smart devices and applying the latest research methods, our academics are working with industry to improve everything, from remote maintenance to staff training. For example, the University of Wolverhampton is researching the benefits of applying digital technology in built environment training, construction management and engineering.

Case study: Harnessing an untapped source of cheap power with Nottingham Trent University

Abandoned coal mines are often flooded with water. Being underground in a stable environment, that water has a well-regulated temperature – ideal for heat extraction. And across the UK there is an estimated one billion cubic metres of it.

The Energy from Coal Mines project at Nottingham Trent University, in collaboration with Alkane Energy, is a prime example of the Innovative and Sustainable Built Environment Technologies (iSBET) research group’s work to improve quality of life. The unused water could provide a low-cost, environmentally friendly energy source that will help us reduce carbon emissions.

“If this potential can be successfully exploited it will represent a significant new business stream to Alkane. Initial modelling suggests up to 40% improvements in energy consumption and emissions should be achievable.”

Keith Parker,
Project Director at Alkane Energy

The research group has applied its expertise to a number of other projects. Its work is supporting economic competitiveness and contributing to society through areas like renewable energy, green buildings, and innovation in design.

Smart cities and 5G

Smart cities focus on the needs of their citizens, using new technology to make places better to live, study and work.

Key to this concept is applying technology to transform how goods and people move around. Our researchers are working with councils, suppliers and operators to help realise the potential of the smart city concept.

Our universities are also central to the implementation of the Government’s 5G Testbed and Trials Programme. Birmingham City University’s Intelligent Systems and Networks group has already developed a number of concepts for intelligent small-cell networks and dynamic spectrum sharing that will support 5G roll-out by industry.

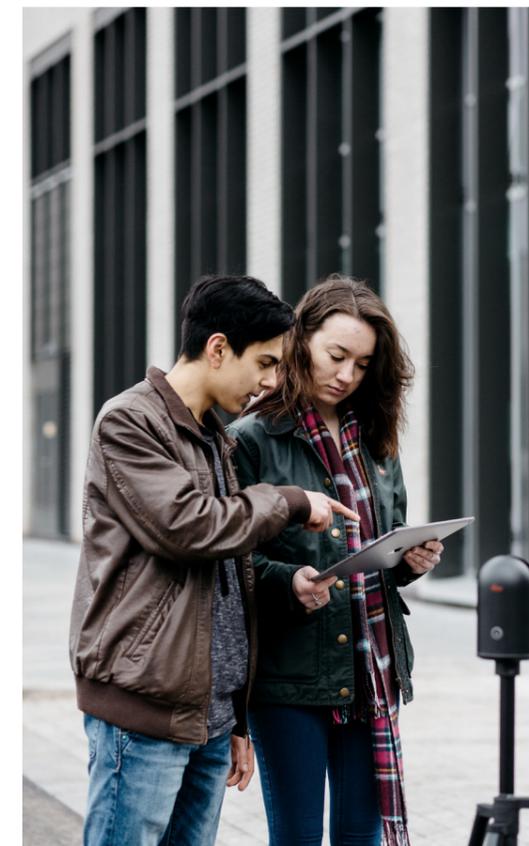
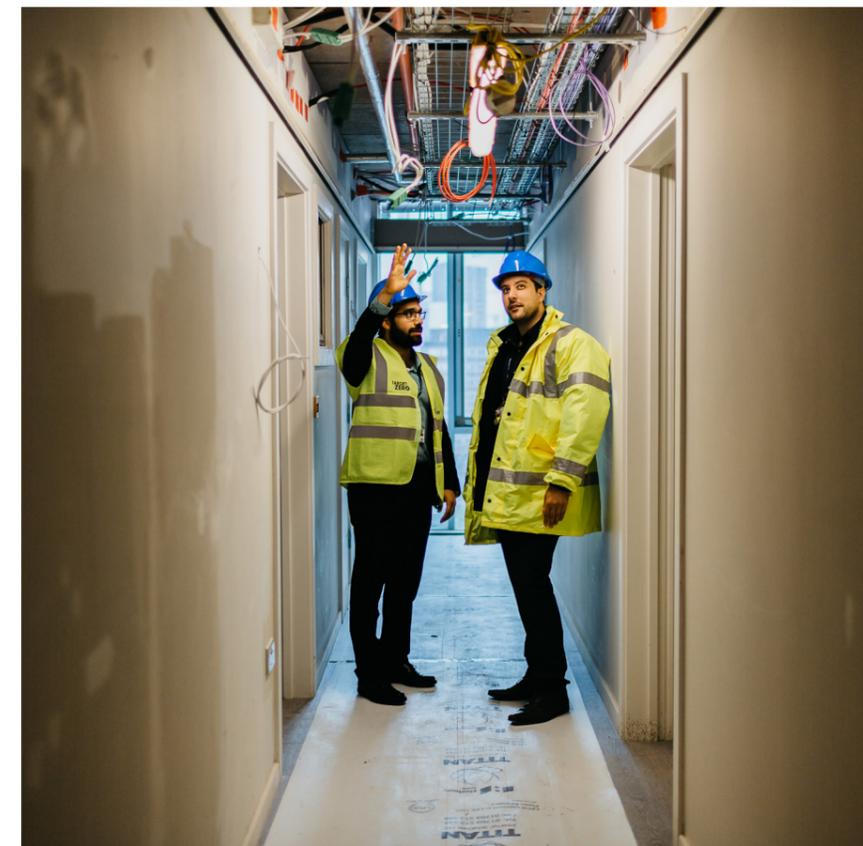
Case study: Using data to identify and resolve traffic problems at Birmingham City University

Congestion and air pollution are increasing in every big city. And Birmingham City University believes technology could hold some of the answers.

They’re working with Birmingham City Council (BCC) and Transport for West Midlands (TfWM) to collect and analyse data from the city’s traffic management system. To generate additional data, the academics tested drones to monitor air quality and introduced low-cost LoRaWAN

internet connectivity across the city. The system can support thousands of devices providing real-time data. And extra sensors are easy to install.

To make the most of all that data, BCU improved the city’s systems, simplifying the process of analysing Birmingham’s traffic. Staff can now detect and manage problems more quickly than ever. The partnership is now focused on the next step of data prediction, modelling and visualisation.



AGRICULTURE AND MANUFACTURING

With the Fourth industrial revolution under way, there are huge opportunities to transform the food sector, manufacturing, and supply chains.

Our universities are deploying their digital capacity to put the UK at the “forefront of the global move to high-efficiency agriculture” as predicted by the Government’s Industrial Strategy. This expertise will help to meet the rising global demand for food. We are helping producers make more for less and transforming food production from farm to fork.

We are tackling long-standing challenges in the manufacturing sector and supply chains. We are working on process optimisation, industrial energy efficiency, and real-time traceability using integrated intelligent digital systems. This will deliver high productivity while minimising waste and reducing the carbon footprint of these processes.

Our key capabilities

- Smart production
- Smart agriculture and food manufacturing

What our research is achieving

- VR testing of production plant to cut costs and optimise performance
- Deploying AI-powered robots for agriculture and production
- Smart packaging to monitor food condition and stop fraud
- Developing the next generation of sensors to monitor crop growing conditions and harvest



“We want to be among the leaders of the Fourth Industrial Revolution, and that’s going to require the combination of business entrepreneurial skills and deep technical know-how. So the creation of the Institute of Advanced Manufacturing and Engineering is going to give us a chance to create industry-ready technology and industry-ready young men and women.”

John Neill
Chairman and Group Chief Executive, Unipart

Smart production

By partnering with businesses in the industry, our universities are a testing ground for revolutionary ideas and techniques.

Our academics are testing and deploying the latest tools across the production process, including automated robots for packaging, AI for operations planning, and IoT for supply. For example, NTU’s School of Architecture, Design and the Built Environment has worked with Pepsico to test automated robots on its packaging production line and VR for factory floor design.

Case study: Teaching University of Coventry students the skills manufacturers need

The world depends on manufacturing. But for such an essential industry there is an alarming shortage of skilled, capable graduate engineers.

The Institute of Advanced Manufacturing and Engineering brings together academia, industry, and research and development in a live environment. In collaboration with Unipart Manufacturing Group, the teaching focuses on developing and applying powertrain technology

for automotive, aerospace, oil and gas, rail, and renewables.

The manufacturing hub is home to some of the most talented engineers in the UK – as well all the latest equipment. From robotic automation to product verification technologies, the building at Unipart’s powertrain applications site gives students the opportunity to use the very tools they’ll need in the working world.

Smart agriculture and food manufacturing

From smart sensors in vertical farms to security analysis of food supply chains, technology is having a big influence on the future of food production.

We are providing solutions to critical issues across food and farming which have been bottlenecks for increasing productivity, quality, and traceability. Our researchers are working across university departments, in specialist units such as the University of Lincoln's Institute of Agricultural Technology (LIAT) and NTU's Food Science and Technology Research Group, as well in collaboration with key players in the industry.

Some of our digital platforms are already helping industry automate and monitor processes and install robust traceability. We are bringing down production costs, reducing the carbon footprint and improving tracking from the farm to the shelf.

Case study: Exploring the future of food at the University of Lincoln

Automating food production can help keep costs down while improving safety, quality and efficiency. With funding from Innovate UK, The National Centre for Food Manufacturing (NCFM) is leading the way in robot food production systems.

A recent collaboration with Olympus Automation led to a new robotic chef, APRIL (Automated Processing Robotic Ingredient Loading). NCFM provides business support and product testing and qualification for the project. Andy Riches, Group Operations Projects Director at the Billington Group, explained the challenge:

"The ability to accurately and efficiently prepare, weigh and batch the complex combination of ingredients within our product portfolio really is the engine room of our production

environments... We believe that the use of increased automation and technology to provide enhanced control, accuracy and repeatability will have a massive positive effect."

APRIL works with smaller cooking loads with more variety, greater accuracy, less waste, and lower energy use than larger scale facilities. The project is already making waves, having been shortlisted for the 2018 Food and Drink Federation Innovation Award.

But the work doesn't stop after one successful project. The NCFM team are working with businesses in refrigeration, food safety, processing and supply chain management. Their research is helping create new products and systems across the entire spectrum of food production, from farm to waste management.



BUSINESS, SKILLS AND DIGITAL CULTURE

To raise productivity in the Midlands we need to help businesses harness the benefits of digital innovation. We also need to develop a strong pipeline of specialist skills to drive improvements across the economy.

Through our large student base, we are feeding future digital leaders into the working world. We are working with businesses to give our students the skills their employers will be looking for.

Digital technology has even changed how we approach arts and culture. Something as simple as buying theatre tickets on a phone shows how people are connecting with organisations digitally every day.

Our key competencies

- Business and finance
- Education and skills
- Digital media and arts

How we're transforming the worlds of business, art, and education

- Finding new ways to analyse business performance and support training and marketing
- Trialling VR, serious games, and other digital tools for innovation in business and education
- Developing quantum informatics for modelling financial markets, cyber security and cryptography
- Enhancing course content with immersive technology and virtual learning environments
- Delivering flexible online courses from academies like Cisco, Microsoft, and Oracle
- Exploring technologies like AR and VR in dance, music, theatre, animation, sculpture, art, and product design.
- Training future digital experts in sound engineering, web design and video production



Business and finance

Business innovation depends on the latest technology. We will create a business environment equipped for the challenges and opportunities of new technologies and ways of doing business.

Departments across our universities are using digital tools to analyse financial markets and business performance and create new ways of transforming organisations. For example, The Bloomberg Financial Lab at the University of Derby, and Coventry University's Centre for Financial & Corporate Integrity, use data simulation to test the effect of trade conditions on real-world financial market data.

Case study: A safe way to fail fast with the University of Wolverhampton

Businesses innovate by taking risks. But risks don't always pay off. The Technology Visualisation Centre at the University of Wolverhampton offers another approach.

Multi-touch surfaces, sensing technologies, modelling and design capabilities all help businesses visualise solutions to complex problems. The knowledge transfer approach has already helped many businesses improve productivity and performance.

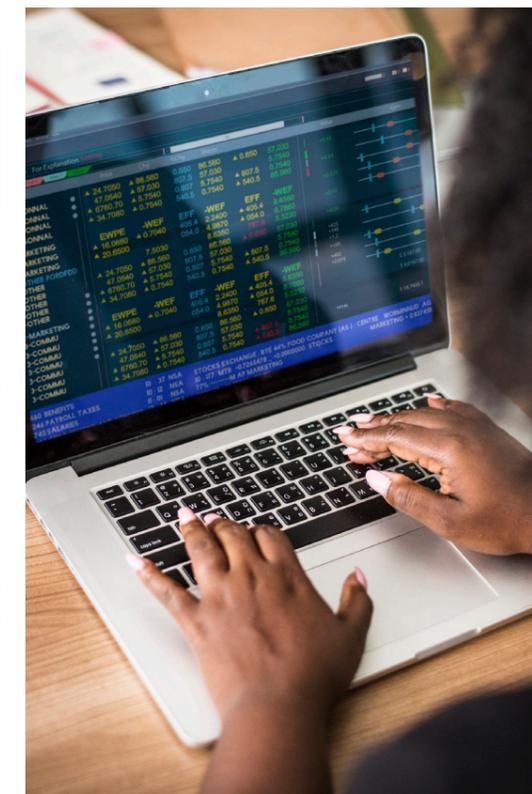
Across the building, equipment is connected and integrated to show

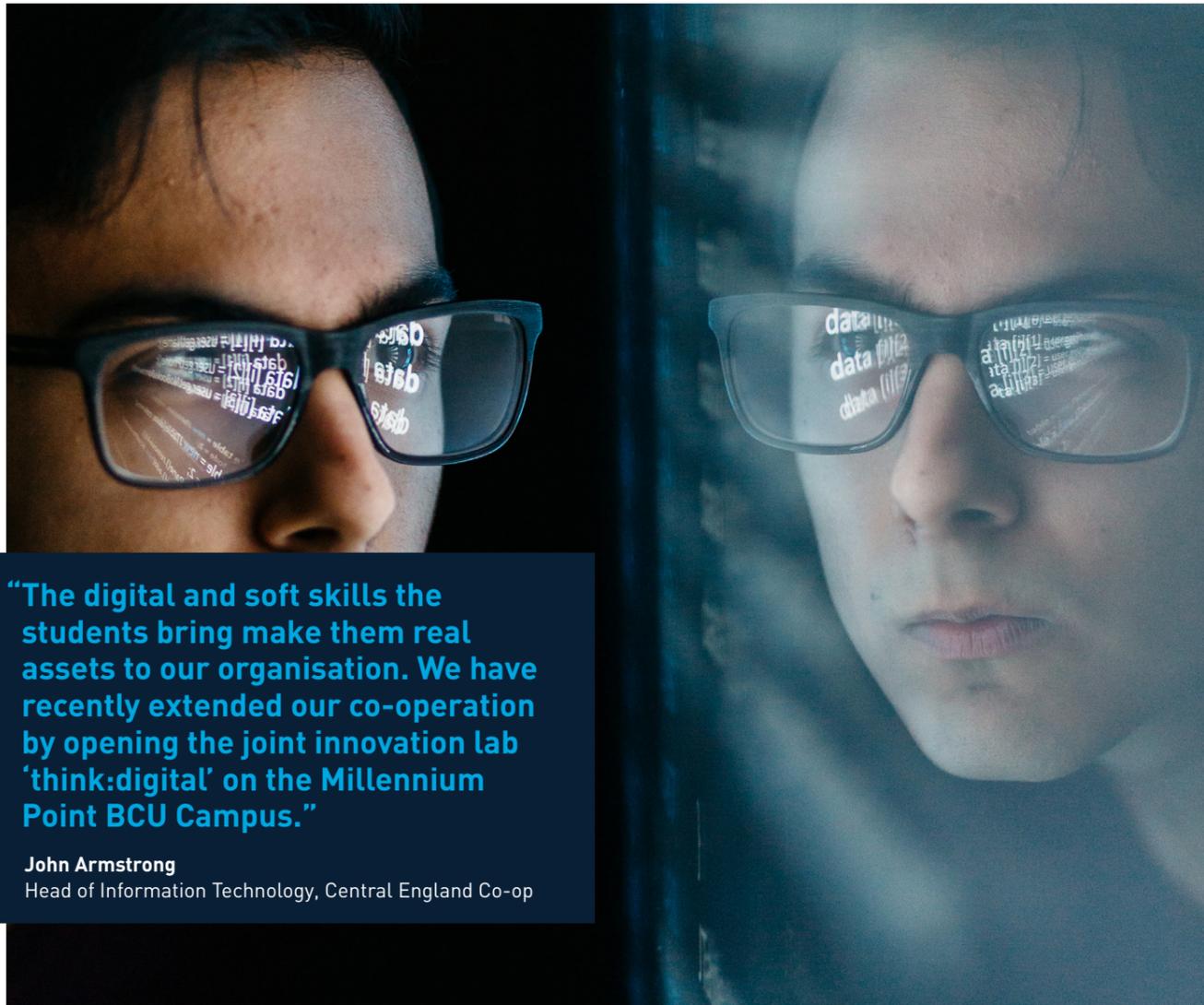
businesses the benefits of joined up tools. Whether it's a projector or a touch screen, it can be monitored for power consumption, heat, or component failure. The whole facility is a demonstration in how clear planning can drive efficiency.

Businesses can explore the latest technology, from thermal imaging drones to multi-point video conferencing. The centre's experts can then make recommendations on what tools to take forward.

"A technology specialist discussed my company with me in depth. We talked about our business plan, our capabilities and what we want to do to enhance our organisation. A comprehensive report was then drawn up by the specialist. I find there is too much information to look through on the internet when I do my own research, particularly if I'm not sure what I'm looking for. The facility and report simplified everything and focused on what was relevant to me and my organisation."

Anon Midlands' company





“The digital and soft skills the students bring make them real assets to our organisation. We have recently extended our co-operation by opening the joint innovation lab ‘think:digital’ on the Millennium Point BCU Campus.”

John Armstrong
Head of Information Technology, Central England Co-op

Education and skills

With a student base of over 136,000, Midlands Enterprise Universities are vital to developing the next generation of digital skills.

We are using innovative learning models to deliver teaching. We work with employers to embed digital skills in the curriculum and provide flexible online training to upskill the existing workforce.

Through the £40 million Institute of Coding, Coventry University will be the national lead for digitising the professions. Working with industry partners to develop and deliver a range of courses and training, it aims to widen the participation of women and help hard-to-reach groups gain digital skills.

Case study: Preparing future technology leaders at Birmingham City University

The technology sector is a big part of the West Midlands economy, with over 70,000 jobs in 14,000 businesses. Skilled graduates are always in demand and Birmingham City University (BCU) is responding.

The university’s close ties to industry mean it can equip graduates with the right skills to move straight into the digital sector. With 67% of students coming from Birmingham

and hoping to work in the region, that’s a big pool of talent to draw on.

One of the ways the teaching is adapting to industry is by preparing students for emerging roles like IoT architecture or big data science. The technology courses focus on a mixture of broad subject knowledge, like cyber security, and specialist offers, like digital forensics.

Digital media and arts

Technologies such as virtual reality are changing how we experience the world. The next step for the arts and entertainment is to bring businesses, researchers and technologists together to create accessible new experiences.

Our universities provide facilities for artists, designers and computer scientists to collaborate with business and develop new ideas. From NTU’s Creative and Virtual Technologies Research Lab to BCU’s £59 million Conservatoire, we’re investing in the latest technology to boost artistic expression. BCU is a national lead in music, theatre and media, working closely with industry to ensure students are at the forefront of developments in areas like sound engineering and video production.

Case study: NTU’s Virtual Reconstruction of Nottingham Castle

Nottingham Castle is undergoing a major redevelopment to enable sustainable use, and engage future visitors. The NTU Centre for Architecture, Urbanism and Global Heritage in partnership with Nottingham Castle Trust and Nottingham City Council is developing a virtual resource which charts the Ducal Palace’s historic evolution.

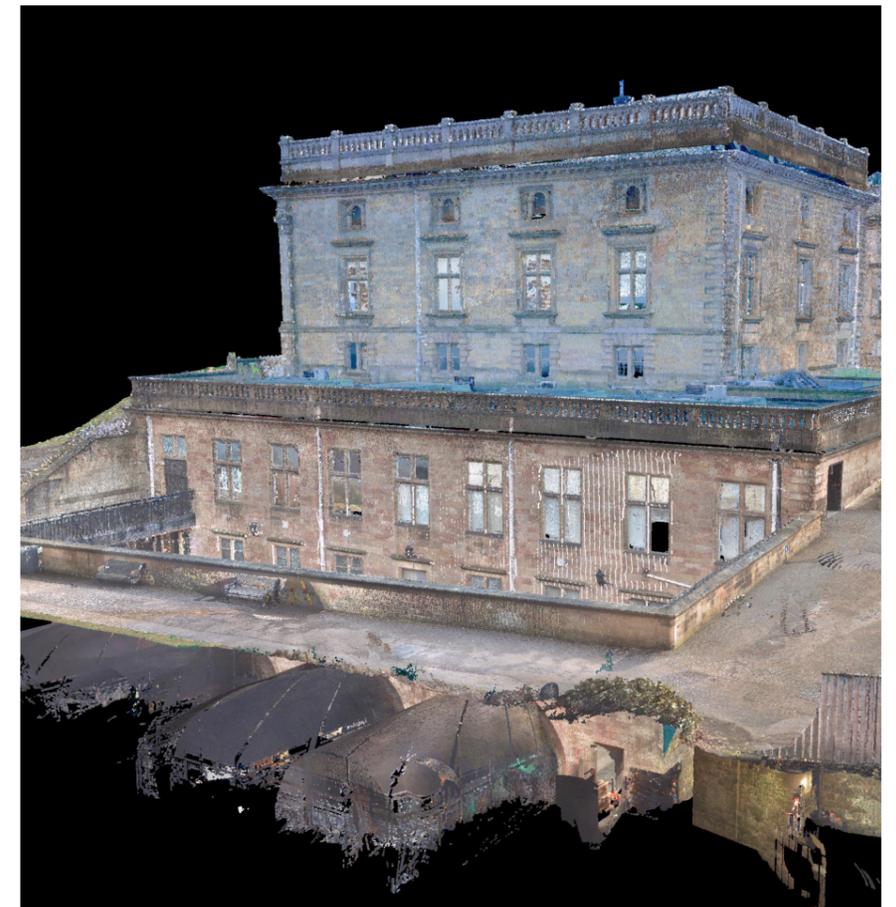
Using archival material, records and laser scanning surveys, the research team has developed a detailed digital

model and virtual experience. Collated in the form of point-cloud and mesh, this digital model has enabled the development of innovative virtual tour of the Ducal Palace and the castle art galleries, which was recently showcased at the Digital Heritage 2018 Exhibition in San Francisco.

This novel state-of-the-art interactive platform for digital and virtual heritage platforms will advance the role of virtual museums in the future.

“Our site has evolved over many centuries, and can seem difficult to understand, at first glance, however, the VR modelling enables us to interrogate the historic layers of this building and site. It will enable historians, curators, artists, writers and performers to look at new ways in which we can use digital technology to augment the Castle’s galleries and enhance visitors understanding.”

Cal Warren, Nottingham Castle Project Programme Manager

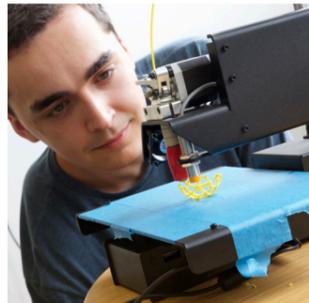


OUR FACILITIES

We have a range of outstanding facilities, and working with partners we continue to invest in digital innovation for the benefit of students, businesses and the community. These facilities include:



NTU's Future Factory Research and Consultancy Centre brings innovative research, multidisciplinary expertise and state-of-the-art equipment including robotic arms, 3D printing and virtual reality.



NTU's new **£23 million Department of Engineering**, housing the new Institute of Industrial Digitalisation, Robotics and Automation.



Curzon Street Studios at BCU, housing four TV and six radio studios for hire in a **new £29 million building**.



Centre for the Built and Natural Environment at Coventry University, working to close the design versus as-built performance gap found in the built environment.



The Lincoln Institute for Agri-Food Technology solving challenges across the food chain 'from farm to fork' and working with partners in industry and academia locally, nationally and internationally.



The Alan Turing Building at the University of Wolverhampton, home to the University Faculty of Science and Engineering, including the Wolverhampton Cyber Research Institute.



The Institute for Innovation in Sustainable Engineering at the University of Derby provides a dedicated gateway and facilities for advanced manufacturing and engineering businesses.



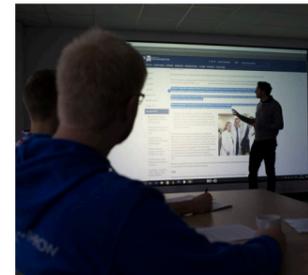
The National Centre for Food Manufacturing in Lincolnshire, leading in part-time study for food industry employees and innovation with businesses.



The National Transport Design Centre at Coventry University, joining up VR, simulation, CAD and 3D printing to prototype new transport design and the development of connected and autonomous vehicles.



The £55 million Institute of Advanced Manufacturing and Engineering, providing a faculty on the factory floor at Coventry University in partnership with Unipart.



Two Visualisation Centres at the University of Wolverhampton, showcasing innovative technologies to businesses including rapid prototyping.



The £40 million Institute of Coding at Coventry University, developing the next generation of digital talent at degree level and above.



NTU's **22 million Medical Technologies Innovation Facility**, providing support to medical technology businesses in concept and product development.



The Isaac Newton Building at the University of Lincoln, a **£28 million** engineering building hosting the Siemens partnership.



Coventry University's planned **£29m Engineering and Computing building**, featuring a range of next-generation facilities including a gaming and virtual reality studio.



BCU STEAMhouse, currently offering prototyping and lab space for SMEs. Phase 2 is a **£50 million** investment with 100 desks for businesses to use.



The University of Derby's Markeaton Street Campus provides a mix of Digital facilities from **high-performance computing facilities** and a **state-of-the-art Data Visualisation Laboratory** to recording studios and anechoic chamber.



The £59 million Science and Health Building at Coventry University, providing state of the art simulation technology.



A **£9 million** centre to fight cyber crime as a joint venture between Herefordshire Council and the University of Wolverhampton.

OUR SERVICES

Our universities are employer-led and informed. Our aim is to share our experience and expertise to drive the digital innovation agenda. We understand the challenges that businesses are facing and by bringing together our collective resources we can help them succeed.

Specialist spaces and services

Many of the facilities featured in this brochure, relating to science, technology, food manufacturing and engineering as well as media and design, are available for businesses to access and hire.

Development & innovation

We are keen to work with businesses of all sizes, and at all stages of growth, who may be able to benefit from our **extensive digital expertise**. This brochure highlights a few examples – for further information please get in touch.

Our universities also offer **Knowledge Transfer Partnerships** (KTP). KTPs are a UK-wide initiative that help businesses improve their competitiveness through better use of knowledge, technology and skills that reside within universities.

Incubation and support

All our universities have virtual and physical offices for pre-start, new and developing businesses, many of which are sector-specific. We offer a range of business support including **access to training, advice and mentoring**.

Funding

Our universities have worked with local and national organisations, including Siemens, Pepsico, Jaguar Land Rover, nPower and BASF, on successful funding proposals. By bringing together our collective resources we can help develop proposals, often including matched funding. Since 2016 we have won over **£30 million** European Structural Funds and offer a wide range of business support programmes.

Talent development

Our universities offer continued professional development, short courses, executive training, postgraduate degrees and bespoke courses, through a range of **flexible learning opportunities**.

Apprenticeships

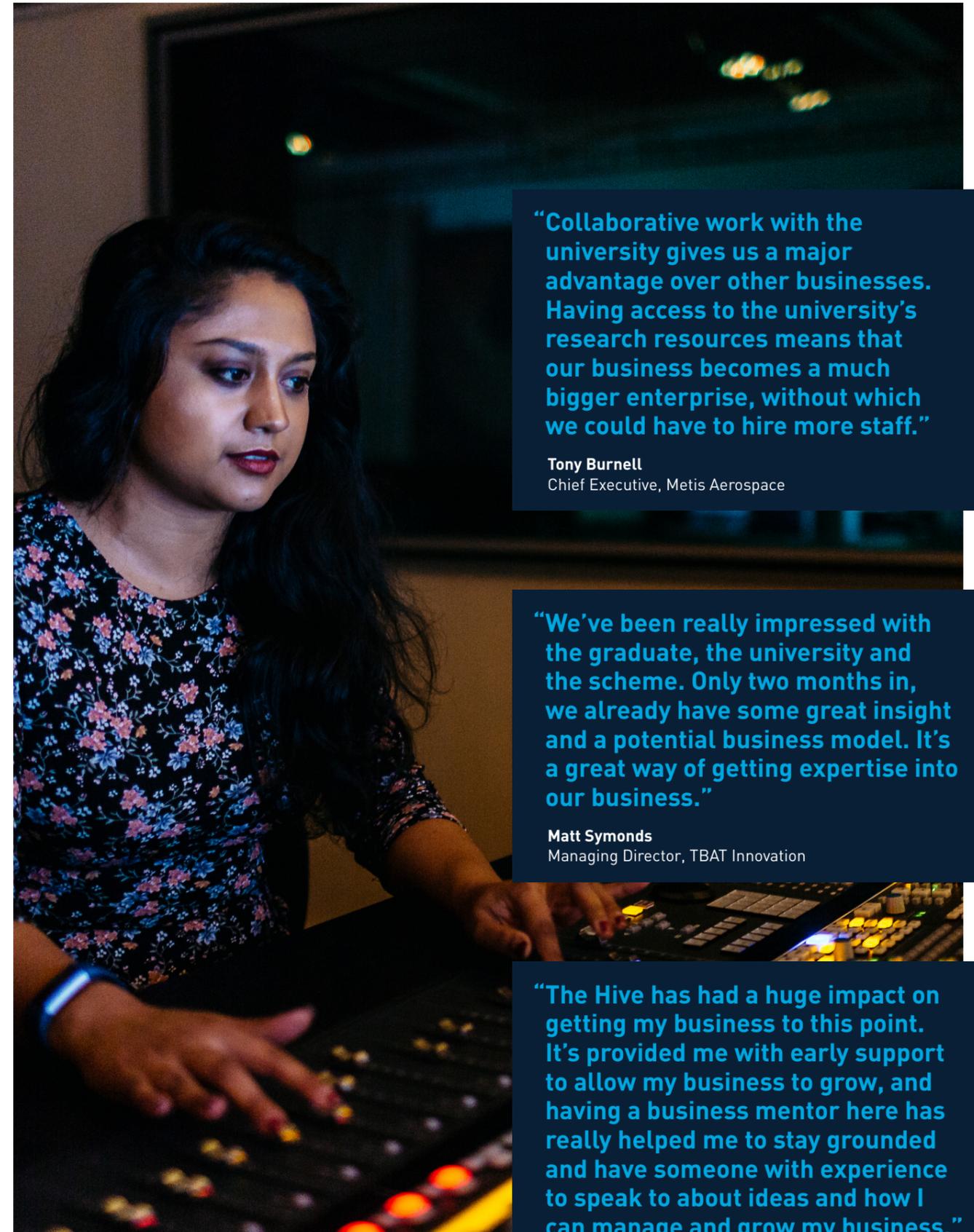
We are at the forefront of developing and delivering higher and degree apprenticeships, including those for the digital industry. **Degree apprenticeships** give students the flexibility to combine learning with full-time work, as well as allowing employers to grow their own talent and nurture the employees that will go on to play a key role within their business.

Connecting to students

Our **136,000 students and graduates** represent a skilled and ambitious talent pool that will inject new ideas and fresh energy into businesses. As well as support with recruitment, a range of funding schemes is available for placements and internships, giving businesses the chance to see what a potential future employee can do.

Partnerships

Our universities have strong, strategic partnerships developed through **long-lasting collaborations** across private, public and third sectors. Collaborating with businesses of all sizes is integral to our way of working. We also work with a wide network of **international partners** to recruit students, deliver education and **collaborate on applied research and innovation**. Collectively we can bring these connections together to benefit our local communities, cities and the region.



“Collaborative work with the university gives us a major advantage over other businesses. Having access to the university’s research resources means that our business becomes a much bigger enterprise, without which we could have to hire more staff.”

Tony Burnell
Chief Executive, Metis Aerospace

“We’ve been really impressed with the graduate, the university and the scheme. Only two months in, we already have some great insight and a potential business model. It’s a great way of getting expertise into our business.”

Matt Symonds
Managing Director, TBAT Innovation

“The Hive has had a huge impact on getting my business to this point. It’s provided me with early support to allow my business to grow, and having a business mentor here has really helped me to stay grounded and have someone with experience to speak to about ideas and how I can manage and grow my business.”

Ben Spray
We Are Marketable

CONTACT US

For further information, or to discuss working with Midlands Enterprise Universities, please email info@MEU.ac.uk

Alternatively, you can contact one of our universities directly:

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