COME CREATE THE FUTURE

Industry 4.0

INTRODUCTION

A thriving economy and strong business cluster

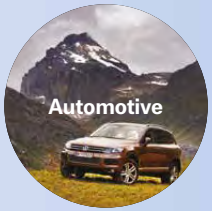
Manchester generates £62.8 billion GVA annually as part of a £140bn regional economy.

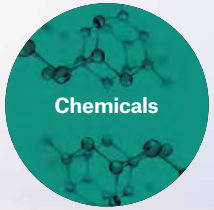
Manchester is home to a wealth of global businesses drawing on local supply chains and expertise. It is home to a large proportion of the FTSE 100 companies and over 2,000 foreign owned firms.

The city offers businesses access to a range of innovation assets such as world leading universities, supporting businesses to develop and commercialise new Industry 4.0 technologies.

A Strong Market Opportunity

The strength of the manufacturing industry in Greater Manchester makes the city the ideal location for serving regional and national market opportunities. The area's strengths are in industries who will benefit the most from digital technologies, including:





Access to a large and growing pool of labour

Manchester is the fastest growing city in the UK, with 149% population growth in the city centre over the last ten years. Currently 2.8 million people live in Manchester.

Just under 2 million of Manchester's residents are of working age and a further 5.0 million workers live within an hour's commute of the city offering a large pool of talent.

A MANUFACTURING & TECHNOLOGY POWERHOUSE

Digital technologies are transforming industry, with the World Economic Forum identifying it as a $100 trillion opportunity for industry and society through the adoption of these technologies.

Since the days of the industrial revolution, Manchester has played an important role in shaping the UK's economy, but Manchester isn't a city to rely only on its past achievements. Its growing expertise in areas such as cyber security and robotics, positions it as a key location for companies developing Industry 4.0 technologies and access to large market opportunities

Technology and innovation in fields such as AI, robotics, additive manufacturing, Virtual & Augmented Reality, the Internet of Things - and the convergence of these technologies can make a considerable impact on increasing the competitiveness of the manufacturing industry. 87% of manufacturers state they are ready to invest in new digital technologies to boost productivity (PwC, The Manufacturer 2018).

Companies with a presence in Greater Manchester include;

- AECOM
- Albany International
- Arm
- Jaguar Land Rover
- Komatsu
- MBDA
- Northrop Grumman
- Raytheon UK
- Siemens
- Tech Mahindra
- Thales

And major manufacturers in the region include;

- Airbus
- BAE Systems
- Bentley
- PSA Vauxhall
- Rolls Royce
- Safran

STRENGTHS IN SECTORS DRIVING THE TAKE-UP

Manchester has strengths in the sectors creating the most demand for Industry 4.0 technologies; ranging from aerospace & defence, food & drink to advanced manufacturing.

This places Manchester as a strategic location for serving local, national and international opportunities.

Aerospace & Defence

The UK is a global leader in aerospace and defence. There is an estimated £30bn opportunity for the UK aerospace and defence sectors through the adoption of Industry 4.0 technologies. As a result, this sector is already at the forefront of adopting Industry 4.0.

Manchester is located at the centre of the region's aerospace industry, with proximity to BAE Systems, the UK's biggest defence contractor and Airbus in Flintshire. BAE Systems Military Air and Information has two key manufacturing sites in the region.

Food & Drink Manufacturing

There is an estimated £55.8 billion opportunity for the food and drink sector in developing Industry 4.0 technologies.

Manchester has important strengths in food manufacturing, an industry that employs 20,000 locally. Large manufacturers include Associated British Foods, (AB World Foods and Westmill), Bakkavor, Kellogg's, Heineken, United Biscuits, Warburtons and Heinz.

Life Sciences

The pharmaceutical and medtech sector is a key industry set to maximise from the benefits of Industry 4.0 technologies, with an estimated £40bn opportunity for UK life sciences manufacturing using these technologies in the next ten years.

Manchester is home to 260 biomedical companies as well as MedTech companies including Kratos Analytical (a Shimadzu Group company) and Waters (mass-spectrometry).

Chemicals

The region's chemical industry is significant, representing an employee base of 20,000 staff. The diverse company base includes BASF, Unilever, Ineos, Cargill, Growhow and LyondellBasell. Digitalisation in the chemicals sector has the scope to reduce costs by up to 3.9% within 5 years, with further improvements beyond.

Automotive

The UK leads in automotive innovation. There is an estimated £8.6bn opportunity for the UK's automotive sector to embrace digital manufacturing in the next twenty years.

The region is home to global manufacturers including Bentley Motors, Jaguar Land Rover and PSA Vauxhall. This has created a diverse supply chain which can also benefit from Industry 4.0 technologies.

Energy & the Environment

The energy and environment sector, such as renewables provides an opportunity to stimulate new local supply chains with a high rate of adoption of digital technologies.

With companies like Electricity North West and United Utilities headquartered regionally, Industry 4.0 represents a significant opportunity for their supply chains.

MANCHESTER'S TRACK RECORD & EXPERTISE

Manchester is now leading the way in areas of Industry 4.0 expertise, notably:

- Digital technology, robotics and autonomous systems
- Additive manufacturing & advanced materials – specialisms in light alloys, composites and world-leading in graphene and 2D materials

The base of companies developing new technologies is diverse, ranging from global companies to small to medium sized businesses and innovative start-ups.

Manchester has particular strengths in the following areas:

Digital & Automation Expertise

Manchester has notable strengths in automation, with key companies in this field including Siemens Automation & Drive Technologies, Honeywell Controls, B&R Automation (ABB), Emerson Process Automation and Brooks Automation. These companies serve a wide range of industries from automotive and chemical to aerospace, food and wind energy.

Cyber Security

Manchester is an emerging cyber security centre. The city is home to international cyber security firms such as NCC Group and Raytheon UK, a major supplier to the U.K. Ministry of Defence.

GCHQ (the UK's Government a security and intelligence organisation) has recently established a tech centre in the city.

Immersive Technologies (AR/VR)

Manchester is home to a number of companies with virtual and augmented reality expertise, such as Ferranti Technologies, EDM and Eon Reality. The latter has its European HQ based in Manchester.

Robotics & Autonomous Systems

Manchester has growing strengths in commercial robotics activity including R.U.Robots, who are developing advanced robotics, flexible automation, Human Robot Interaction (HRI) and operator performance. The combined strengths of digital, engineering and manufacturing capabilities combined with academic expertise makes Manchester an ideal location for new robotics companies.

- B&R Industrial Automation
- Brooks Automation
- Emerson Automation Solutions
- Eon Reality
- Ferranti Technnologies
- GCHQ
- Honeywell
- Mettler Toledo Safeline
- NCC Group
- Raytheon
- RURobots
- Siemens

MANCHESTER: A SKILLED WORKFORCE

Manchester's broad manufacturing and engineering base means that there is a large experienced pool of labour that companies can tap into.

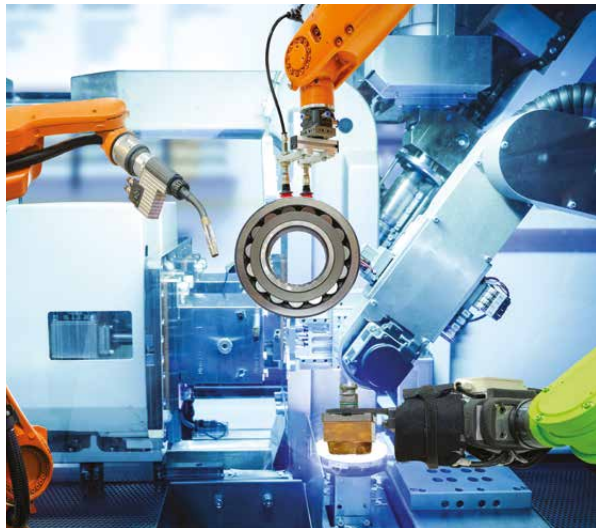
There are 107,000 people employed in manufacturing, with this skills base enhanced by a significant number of people working in computer programming, totalling 27,000. In addition there are 16,000 employees working in the field of engineering activities and technical consultancy.

Manchester has a talented workforce with four universities producing over 30,000 graduates annually. Many study STEM (Science, Engineering, Technology and Mathematics) subjects each year providing a high quality talent pool. A further 22 universities are located within an hours drive.

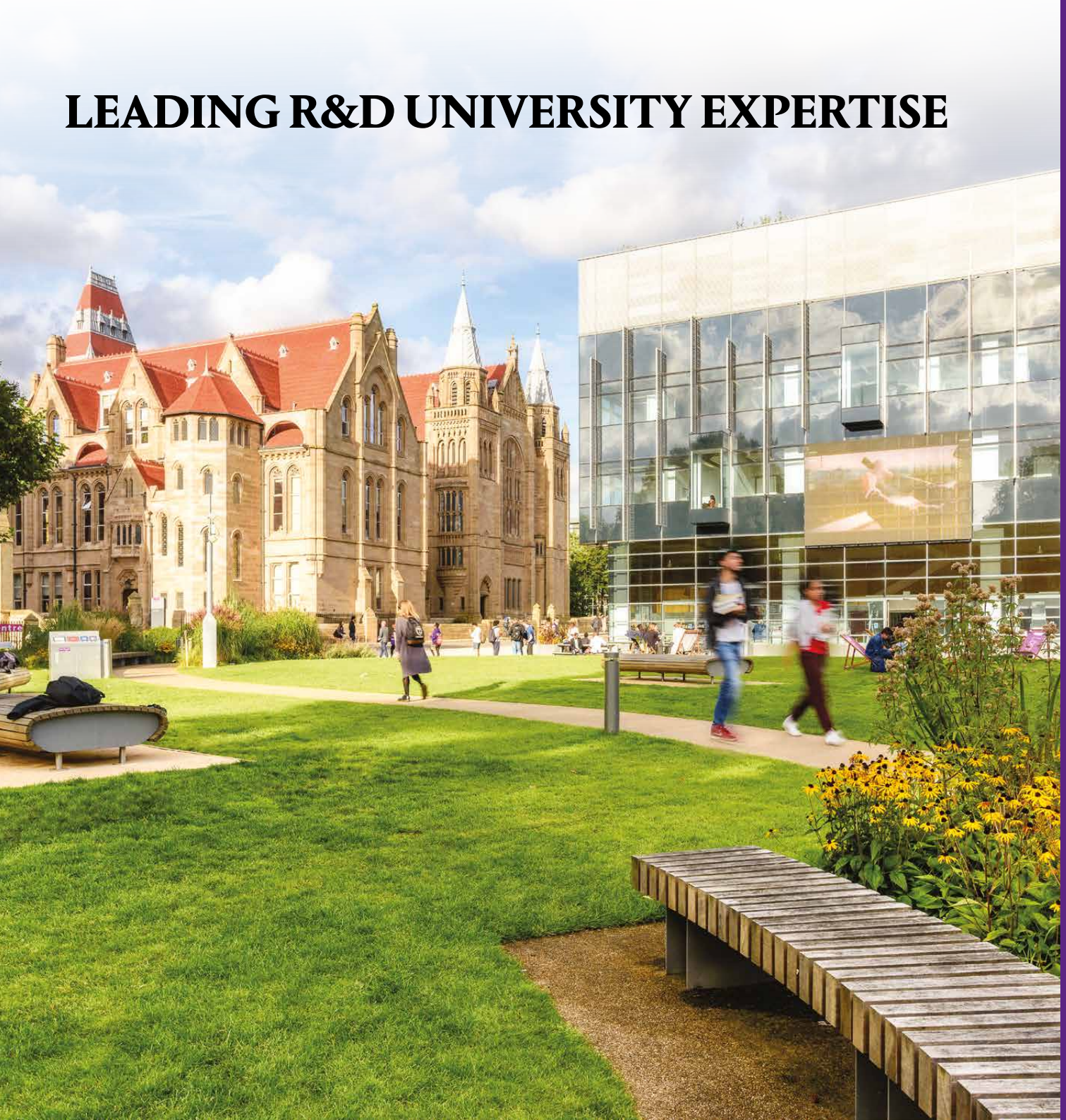
Employment by Selected Standard Industrial Classification (SIC Code)

Employment by Selected Industries, Greater Manchester, 2017	Number of Employees
3 : Manufacturing (C)	107,000
26 : Manufacture of computer, electronic and optical products	4,500
27 : Manufacture of electrical equipment	6,000
62 : Computer programming, consultancy and related activities	27,000
74 : Other professional, scientific and technical activities	6,000
7112 : Engineering activities and related technical consultancy	16,000

Source: Business Employment Register, NOMIS from ONS 2017



LEADING R&D UNIVERSITY EXPERTISE



Manchester is home to four universities - the University of Manchester, the University of Salford, Manchester Metropolitan University (MMU) and the University of Bolton.

These universities have considerable R&D expertise in 4.0 technologies – with capabilities ranging from process modelling, simulation & control to materials characterisation and maintenance to robotics.

In addition, proximity to the Advanced Manufacturing Research Centre, and STFC's Virtual Engineering Centre provides a collaborative innovation environment for companies developing new technologies.

The Advanced Manufacturing Research Centre (AMRC)

The AMRC based in Sheffield focusses on advanced machining and materials research. Their Factory 2050 is entirely dedicated to conducting collaborative research into reconfigurable digitally assisted assembly.

Virtual Engineering Centre, STFC (Science & Technology Facilities Council) Daresbury

This Centre is the UK's leading centre for virtual engineering – specialist laboratories, support AI and robotics developments, VR/AR and frameworks to support digital models and testing.

R&D EXPERTISE IN INDUSTRY 4.0 TECHNOLOGIES

Data Science, Machine Learning & Sensors Expertise

University of Salford

- Salford Innovation Research Centre (SIRC) - The Centre covers all phases and processes from data pre-processing to engineering and visualisation.
- Computer Networking & Telecommunications Research Group

University of Manchester

The University of Manchester has major strengths in Big Data, AI and novel computer architectures. Research centres and groups include:

- The Data Science Institute
- Machine Learning and Optimisation
- National Centre for Text Mining
- Nano Engineering & Storage Technologies
- Sensor Research

Manchester Metropolitan University

- The Informatics Research Centre

Robotics & Autonomous Systems

University of Salford

- Centre for Autonomous Systems and Robotics (one of the largest Robotics groups in UK)

University of Manchester

- Centre for Robotics for Extreme Environments
- Autonomous Systems
- Automation Lab

Advanced Materials & Additive Manufacturing

Manchester has world class expertise in advanced materials, with capabilities including: graphene/2D materials and composites. Key assets at the University of Manchester include the National Graphene Institute, the Graphene Engineering Innovation Centre (GEIC), the Henry Royce Institute and the Digital Fabrication Centre.

Manchester Metropolitan University is home to Print City, an innovation centre specialising in 3D printing and digital manufacturing.

Cyber Security

The University of Manchester, the Manchester Metropolitan University and University of Salford, along with their regional neighbour Lancaster University work together on cyber security to maximise their contributions to regional and national agendas. Areas of expertise include:

- University of Salford - Informatics Research Centre which incorporates Forensic computing, digital investigation while Cyber security is another area of expertise
- Manchester Metropolitan University - Future Networks and Distributed Systems Group
- Lancaster University - the University is an EPSRC/GCHQ Accredited Centre of Excellence for Cyber Security Research. Expertise includes:

Augmented Reality/Virtual Reality

Areas of expertise includes the University of Salford National Centre for Virtual Environments and the Virtual Engineering Centre, STFC Daresbury.

A SUPPORTIVE INFRASTRUCTURE FOR INVESTORS

In addition to world class R&D expertise and facilities, Manchester has a number of Industry 4.0 initiatives. This provides a collaborative environment for companies delivering Industry 4.0 solutions.

Made Smarter

This UK Government initiated pilot programme is aimed at implementing Industry 4.0 across manufacturing SMEs. It is being rolled-out throughout the North West and is being delivered by The Growth Company in Manchester. This programme presents a new opportunity for inward investors who are able to deliver digitalisation transformation to SMEs.

This pilot programme follows on from Siemens' Jurgen Maier's 'Made Smarter' report on the future of manufacturing, productivity and Industry 4.0 and is a Government funded programme to benefit industry.

Northern Robotics Network

The universities of Manchester and Salford, and RU Robots, one of the UK's foremost advanced robotics and cognitive science companies were two of the founders of the Northern Robotics Network.

This group works across the North to identify ways in which world-class research, cutting edge companies and innovative application, can help drive the future of robotics in the UK.

The Cyber Foundry

Greater Manchester's four universities are collaborating on Greater Manchester's Cyber Foundry programme, which will deliver cyber security innovation to SMEs in the region.

Robotics and AI in Nuclear (RAIN) Hub

The £12 million RAIN project uses robotic and AI technologies to solve challenges faced by the nuclear industry. RAIN is funded by the Industrial Strategy Challenge Fund (ISCF), part of the government's modern Industrial Strategy.

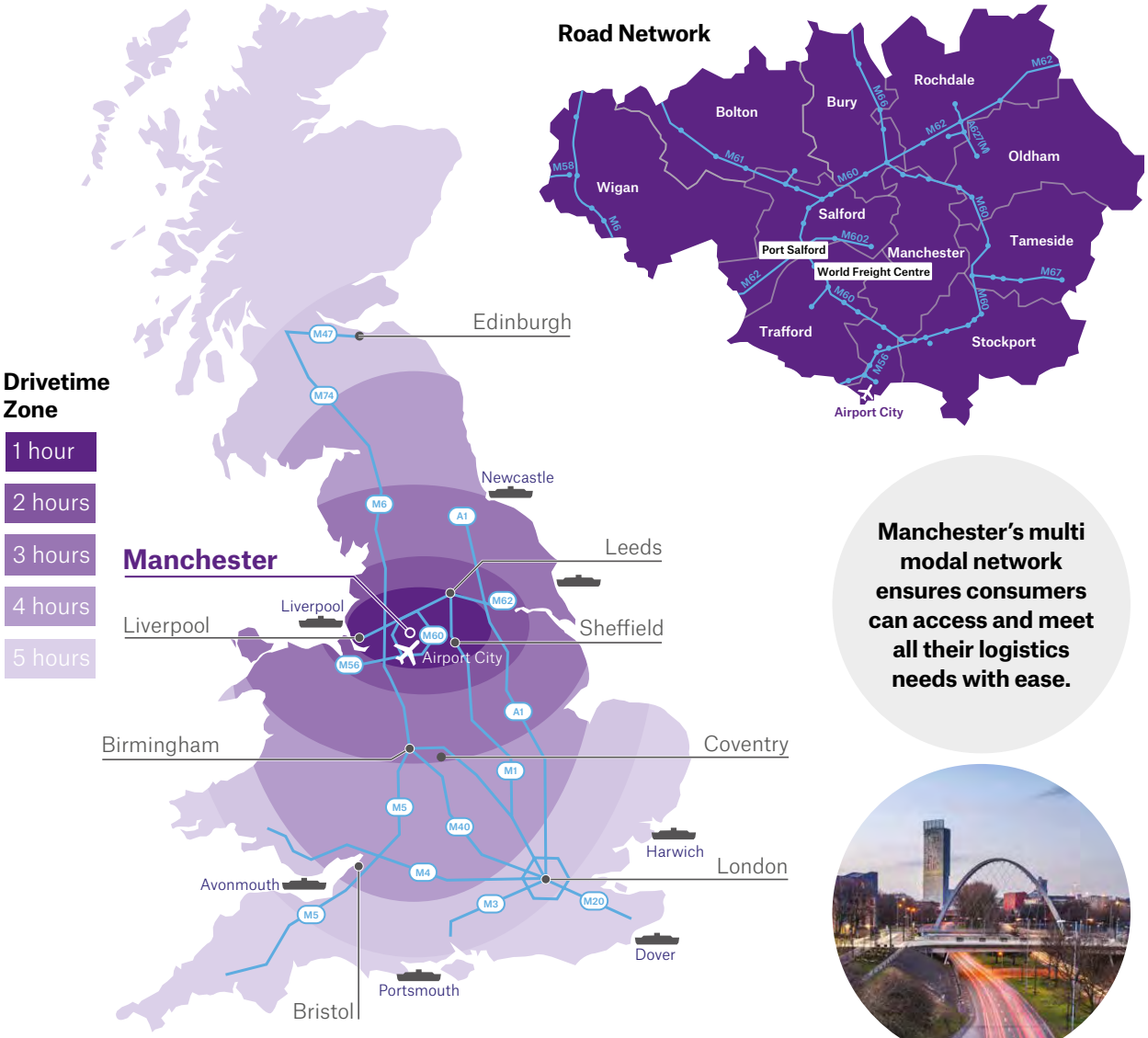
The Centre in Advanced Fluid Engineering for Digital Manufacturing (CAFE4DM)

Jointly funded by Unilever, UKRI, The University of Manchester and Cambridge University, this £6 million Centre aims to address the challenges in understanding, creating and scaling up manufacturing processes for formulated products in fast moving consumer goods (home/personal care and food products), accelerating the route from the laboratory to the marketplace through the increased efficiency of product and process identification and, therefore, a reduction in cost and minimisation of waste.

Biomanufacturing

The University of Manchester's capabilities include state-of-the-art facilities such as the Manchester Institute of Biotechnology and leadership of the Biomedical Materials theme in the Henry Royce Institute, as well as a number of biomaterials experts whose world-class research has wide-reaching impact.

GLOBAL & LOCAL CONNECTIVITY



Manchester's multi modal network ensures consumers can access and meet all their logistics needs with ease.

investinmanchester.com

Air

Manchester airport flies direct to over 200 destinations worldwide and is the global gateway to the North of England. It is the largest UK airport outside of London. The airport and its World Freight Terminal are located directly next to the motorway network.

Rail

Manchester Piccadilly is one of three main stations in Manchester city centre and offers direct services to other major UK cities. There are 60 direct trains a day to London (three an hour) in 2h 08min. The High Speed 2 (HS2) project will reduce travel time to London to roughly 1h18min.

Road

Manchester's central location and extensive motorway network ensures easy access to the rest of the UK. There is also significant investment to upgrade the motorway network around Manchester to a "smart motorway" to help speed up traffic at peak hours

Rail freight

Manchester is directly linked to the West Coast Main Line which is the most important freight route in the UK. About 40 freight trains enter Manchester every day. This is expected to increase to 60 per day by 2030.

Sea & Ship Canal

The Manchester Ship Canal connects Manchester to international shipping and container routes to North America, Europe and the Far east through the Port of Liverpool. This port includes a deep water container terminal – Liverpool2.

SUPPORT FROM MANCHESTER

Manchester is a city committed to supporting new investors and helping existing companies grow.

MIDAS, Manchester's inward investment agency, can signpost businesses towards all the relevant initiatives and provide guidance on funding, to enable growth and develop new products.

MIDAS can help you and your business with relocation and expansion plans. MIDAS has a reputation for understanding diverse business needs and helping to remove any barriers for companies looking to locate or expand into Manchester.

MIDAS's specialist business development team can assist you with a range of free, bespoke packages of confidential support that will make your journey as smooth and simple as possible.

Free Support available:

1. Research support and business case development
2. Introductions to local networks
3. Recruitment and training support and advice
4. Advice on how to access funding for R&D and Innovation
5. Property solutions including advice on enterprise zones and accelerators
6. Relocation advice and assistance

investinmanchester.com

MIDAS

Tel: +44 (0)161 237 4470
Email: info@midas.org.uk
Website: www.investinmanchester.com
Twitter: @MIDAS_MCR

4724