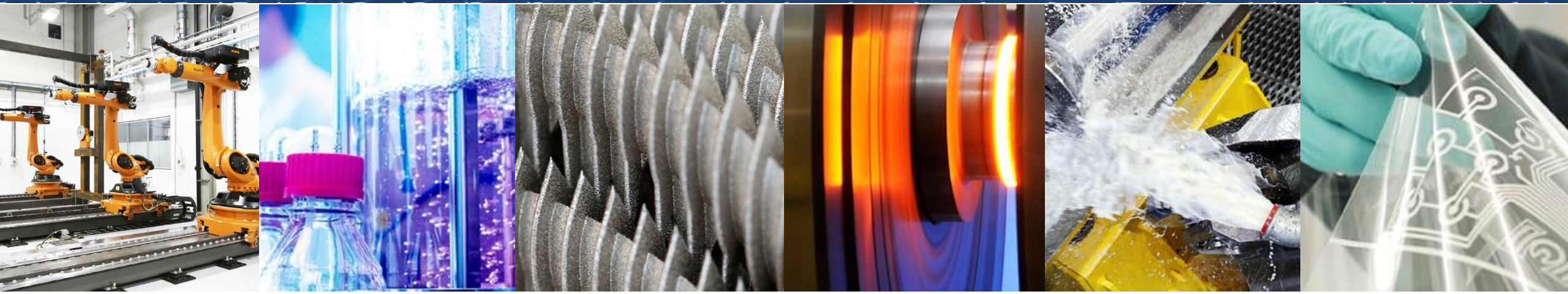
The changing face of UK manufacturing

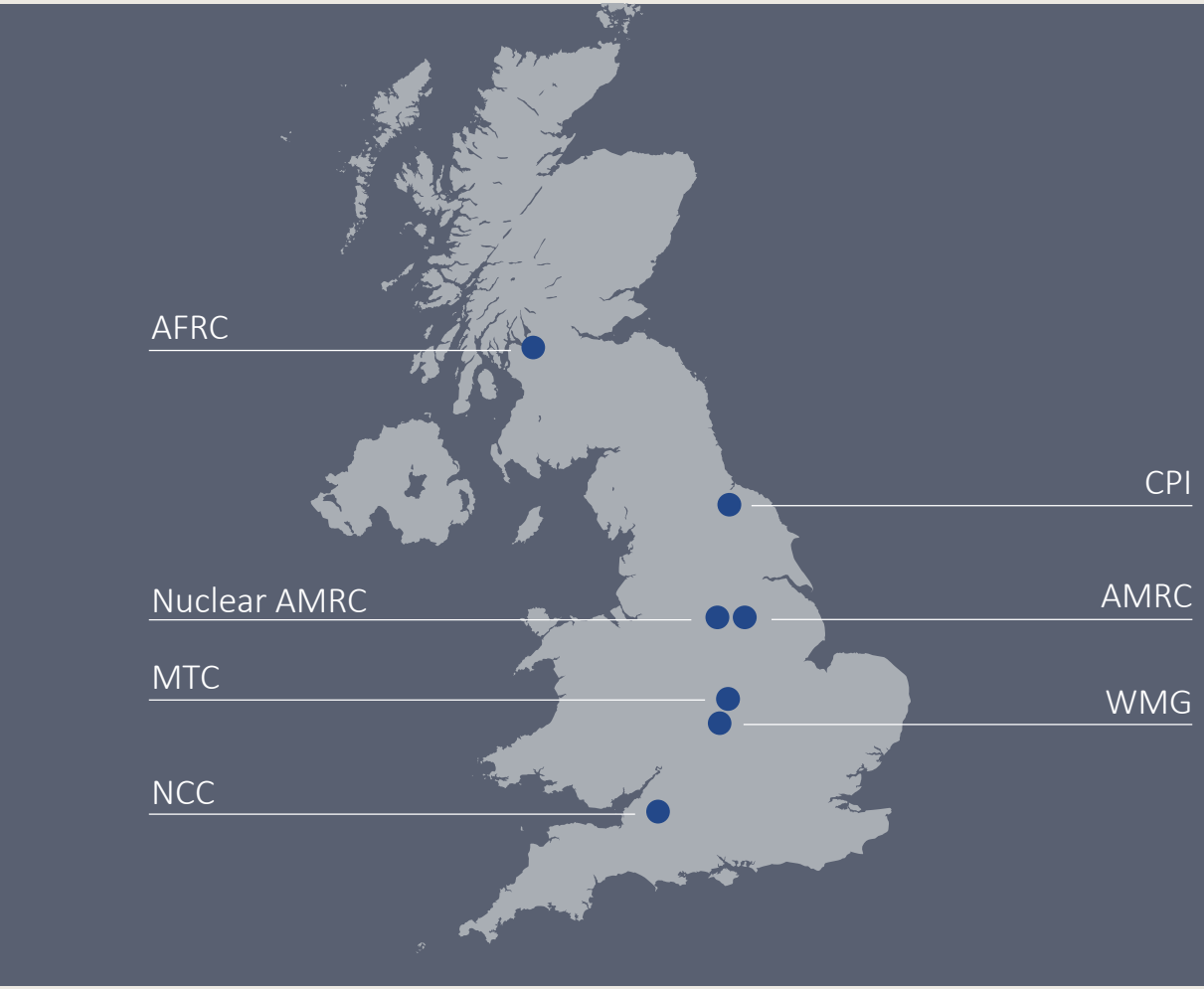
Sam Turner
CTO
HVM Catapult

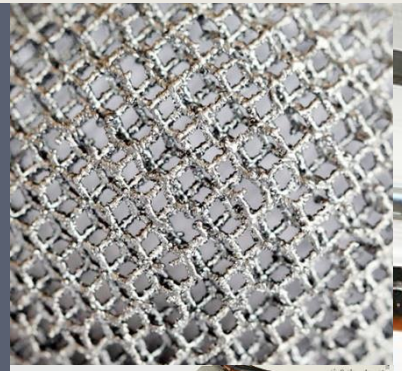
6 December, 2017



HVM Catapult centres

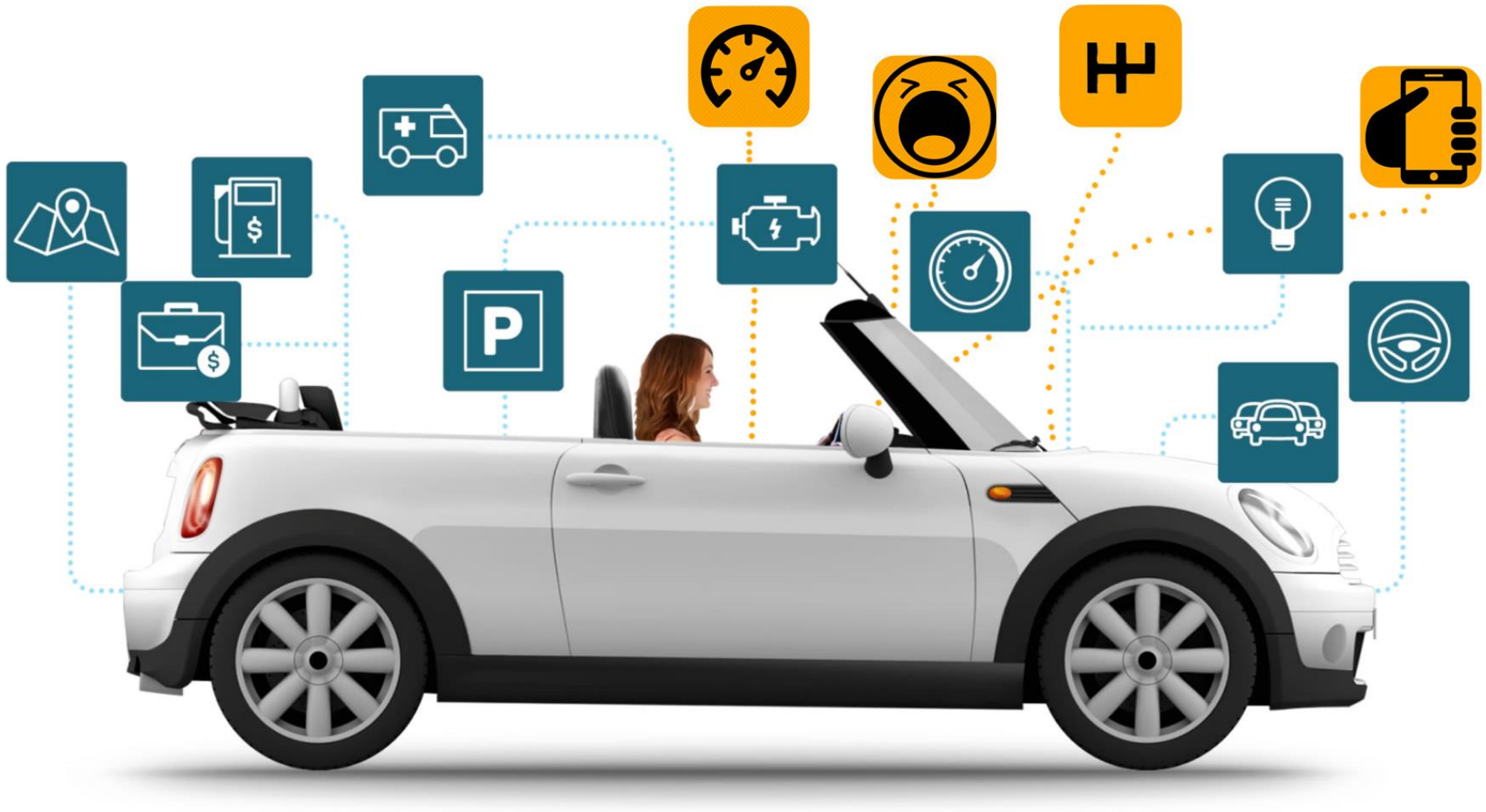
CATAPULT
High Value Manufacturing





DIRECTION

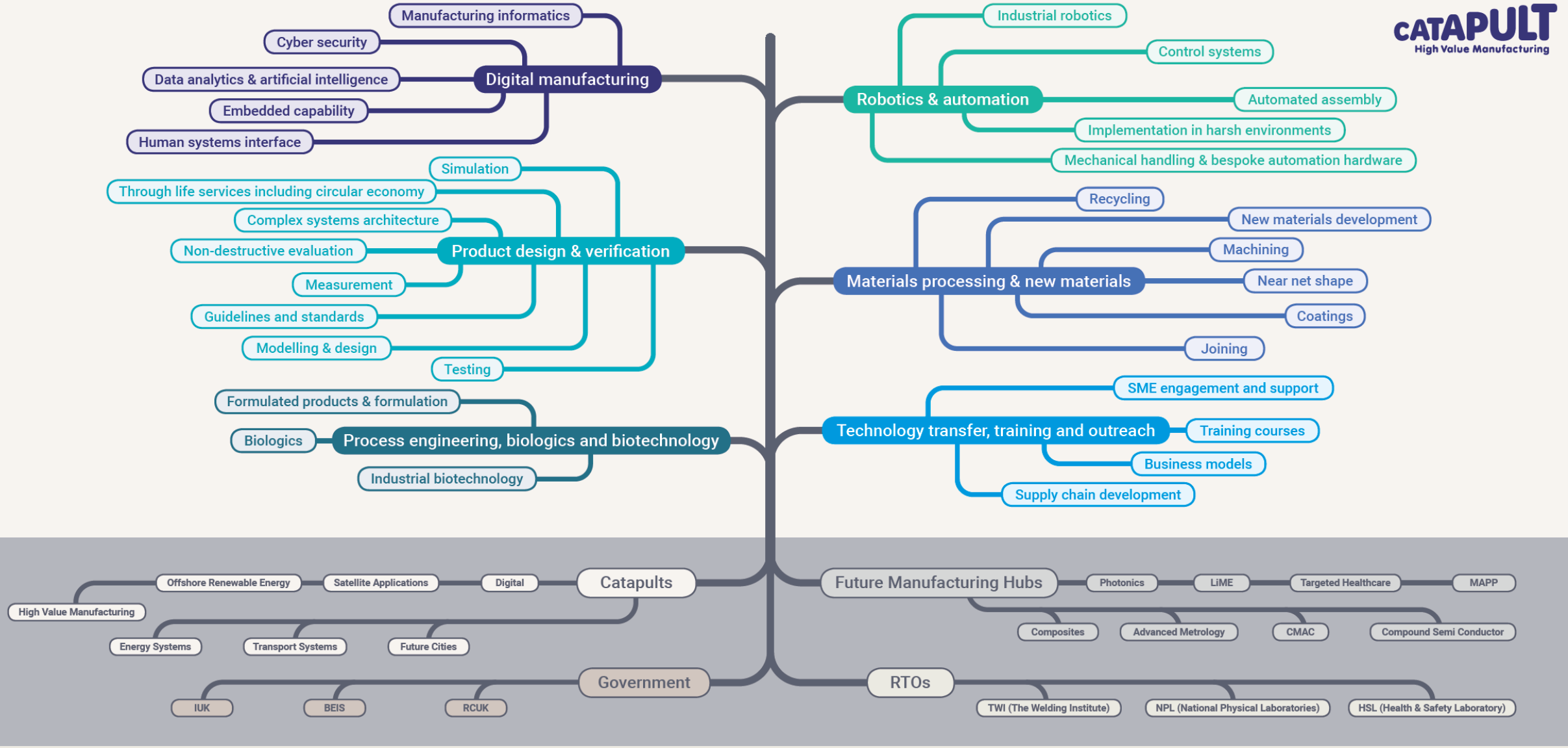
airbnb



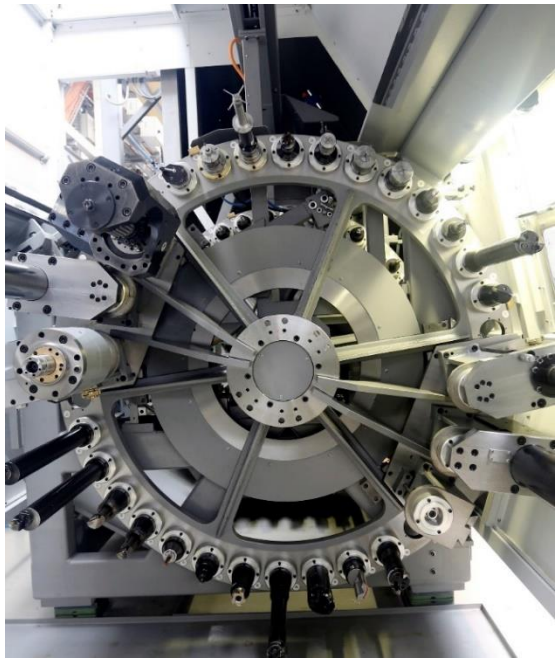
THE TECHNOLOGIES

High level technology map

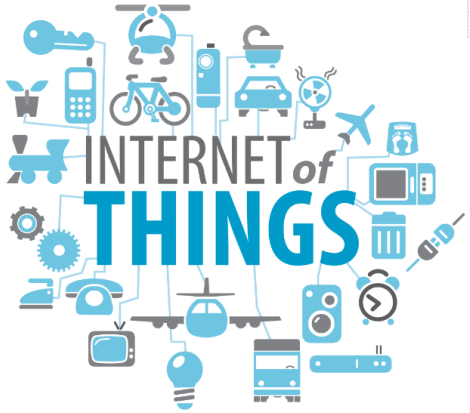
CATAPULT

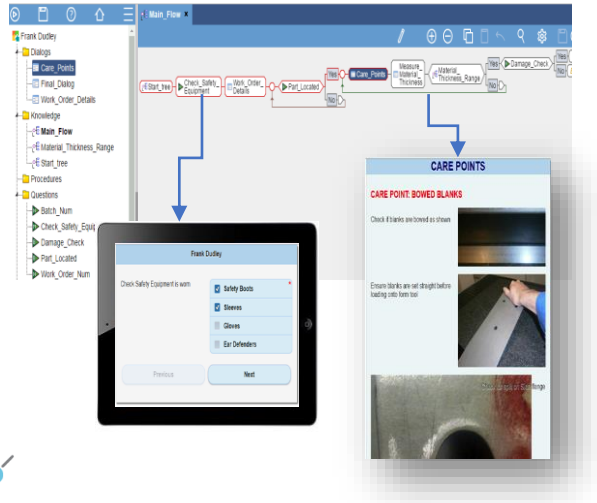


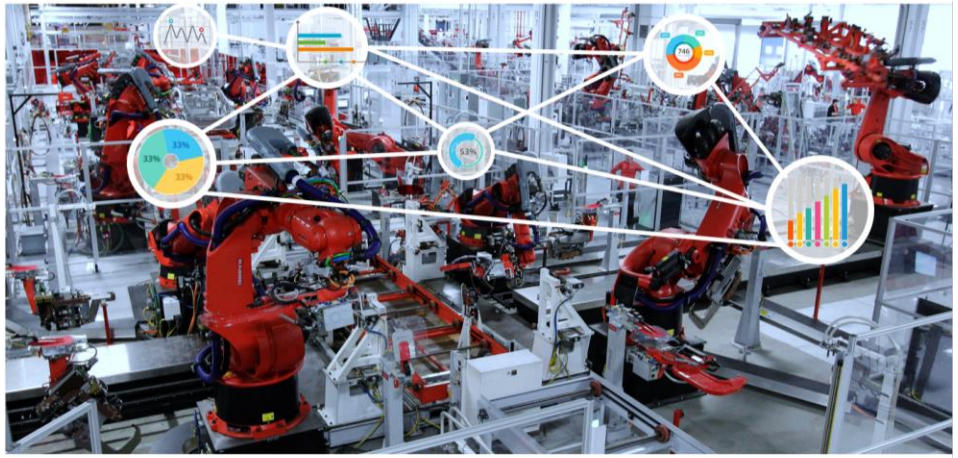

KUKA




SCHULER


INTERNET of
THINGS


Main_Flow
Frank Dudley
Dialogs
Care_Points
Final_Dialog
Work_Order_Details
Knowledge
Main_Flow
Material_Thickness_Range
Start_tree
Procedures
Questions
Batch_Num
Check_Safety_Equip
Damage_Check
Part_Located
Work_Order_Num
Start_tree
Check_Safety_Equipment
Work_Order_Details
Part_Located
Care_Points
Measure_Material_Thickness
Material_Thickness_Range
Damage_Check
Yes
No
Frank Dudley
Check Safety Equipment is worn
Safety Boots
Sleeves
Gloves
Ear Defenders
Previous
Next
CARE POINTS
CARE POINT: BOWED BLANKS
Check if blanks are bowed as shown
Ensure blanks are set straight before loading onto form tool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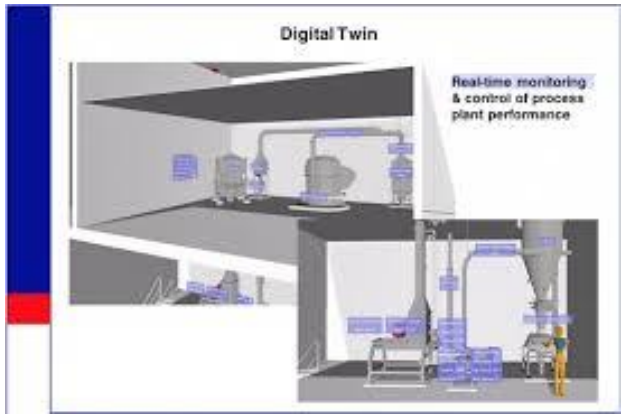
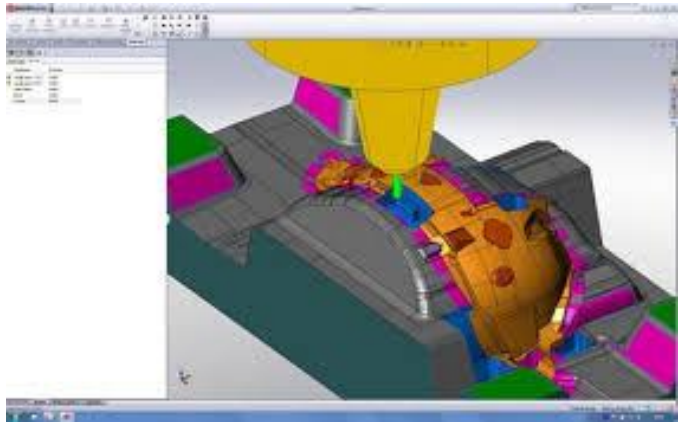
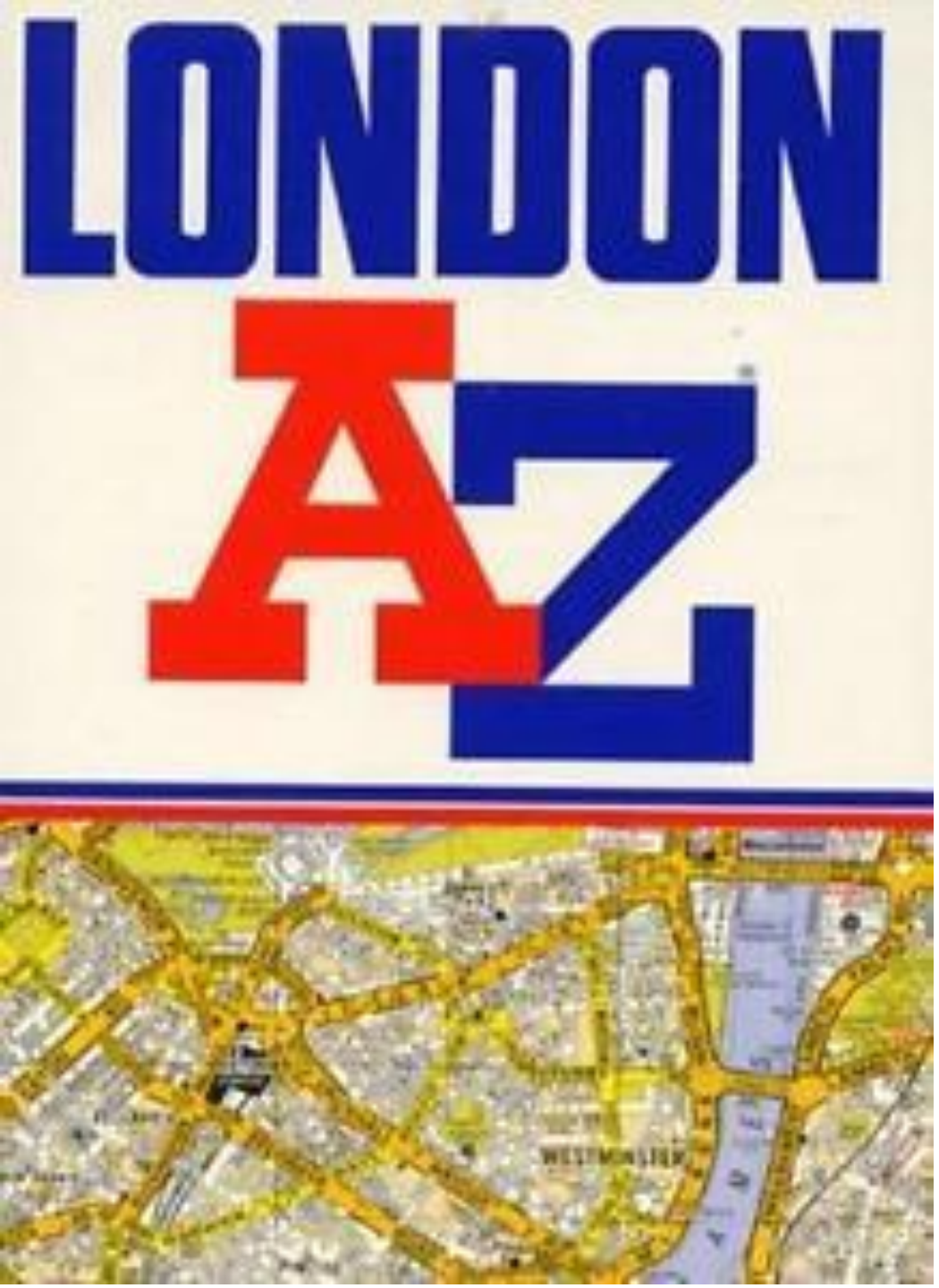
746

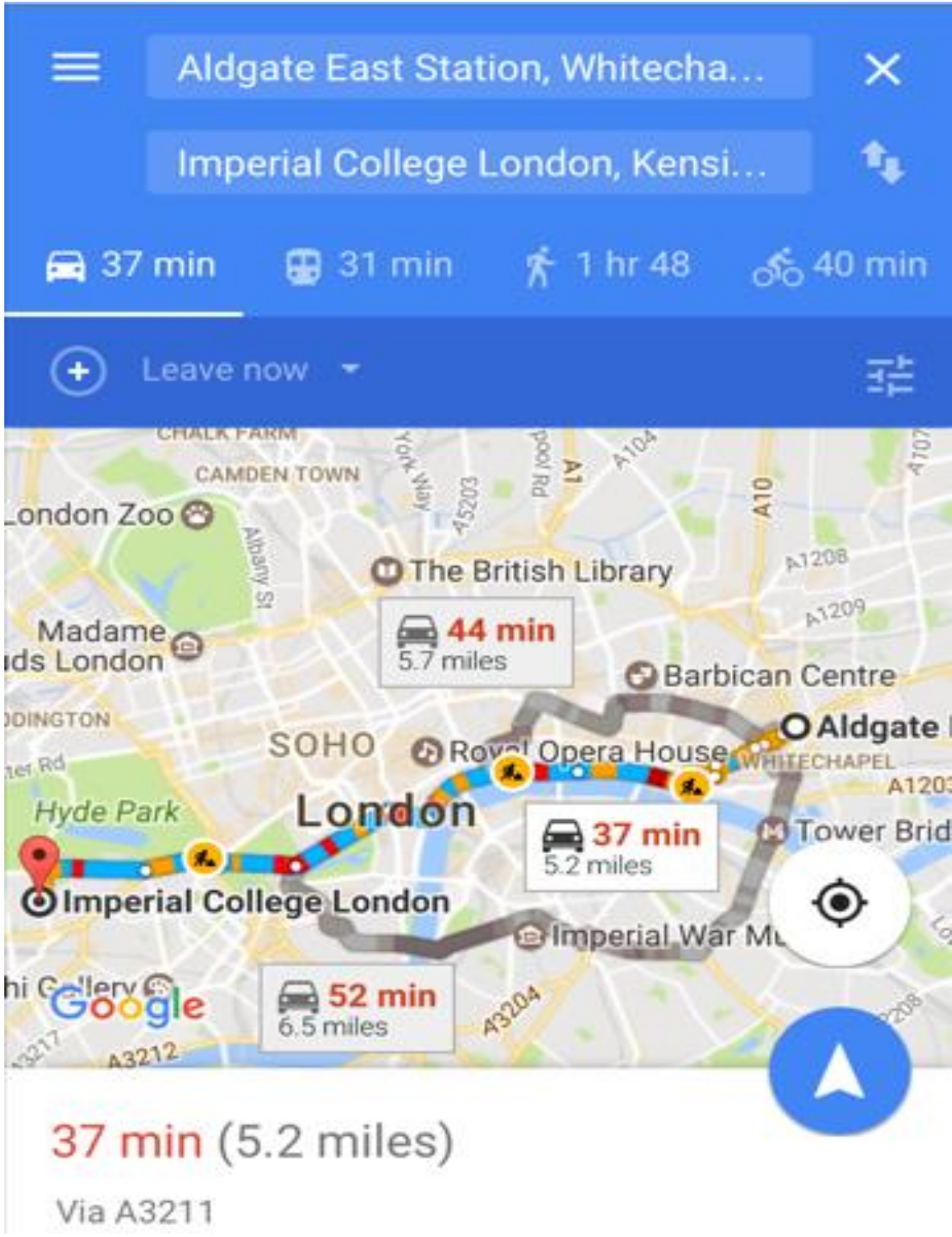
http://www.officechai.com/stories/the-robot-factories-of-china/


Digital Twin
Real-time monitoring
& control of process
plant performance



Factory scenarios:
Autonomous
Reconfigurable


LONDON
AZ


Aldgate East Station, Whitecha...
Imperial College London, Kensi...
37 min
31 min
1 hr 48
40 min
Leave now
CHALK FARM
CAMDEN TOWN
London Zoo
The British Library
44 min
5.7 miles
Madame
Barbican Centre
SOHO
Royal Opera House
Aldgate
WHITECHAPEL
Hyde Park
London
37 min
5.2 miles
Tower Brid
Imperial College London
Imperial War
52 min
6.5 miles
Google
37 min (5.2 miles)
Via A3211

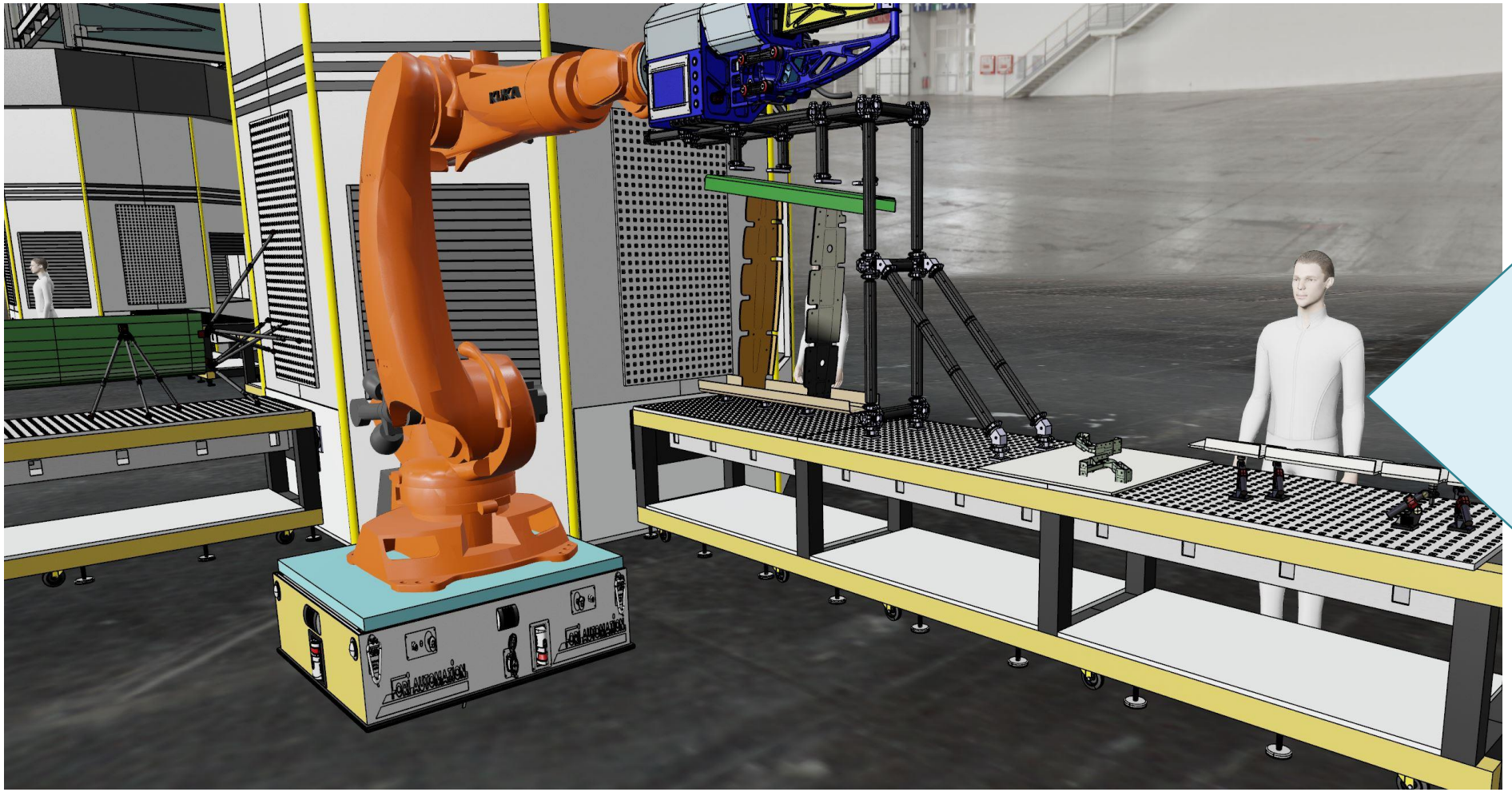
SWARM

Factory Concept Storyboard

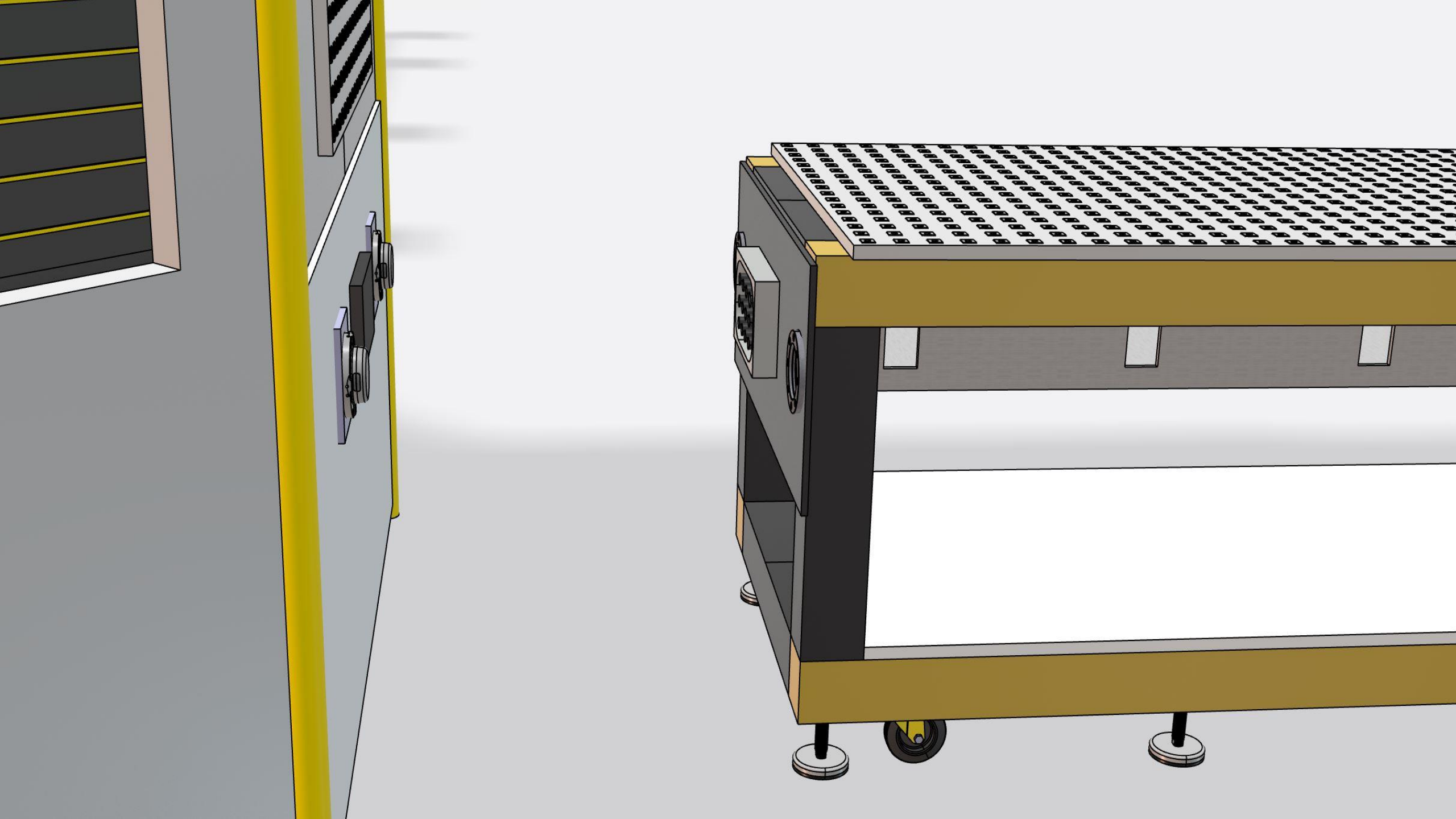
- Factory floor is populated with manufacturing ‘Hives’.
- Each Hive is equipped with:
  - Electrical, pneumatic and vacuum mains connection points.
  - Manual & automatic process tools. Lightweight, wireless tools to be developed
  - Reconfigurable fixturing flags, datums and pick-ups.
  - Safety devices e.g. floor scanners.
  - Advanced visualisation technology for dynamic work instruction e.g Hololens.
  - Hard docking points for fixtures and automation.
  - Data harvesting technologies
- Central scheduling system determines what products are to be manufactured in each Hive to match demand

SWARM

Factory Concept Storyboard



- ‘SWARM’ of mobile assets are instructed by central scheduling system, via Smart Devices to attend specific ‘Hive’ to conduct assembly tasks.
- ‘SWARM’ assets include:
  - Human operatives.
  - Mobile robotic platforms.
  - Mobile fixture frames.
  - Kitting carts.
- All assets are tracked as part of a dynamic safety control system (re: MTC RoCoCo project) .
- Dynamic safety system allows humans and automation to work simultaneously in the same area.
- Central scheduling system delivers real-time work instruction to the ‘SWARM’ via advanced visualisation technology.
- Dynamic safety zone. Level of Human/Auto collaboration set by what process is being done.



Trends & Influence

Industrial Strategy White Paper

IS GRAND CHALLENGES:

AI, clean growth, future mobility, ageing population

"The High-Value Manufacturing Catapult is a particular success story. Since inception in 2012 it has tripled the impact of government spending – generating £655m of additional income from industry by working with over 3,000 businesses every year to bring new technology to market.

It has established a strong track record of helping UK manufacturing businesses of all sizes connect better with their customers and supply chains and boost their competitiveness by applying new technologies that enable faster and cheaper production of products and components."

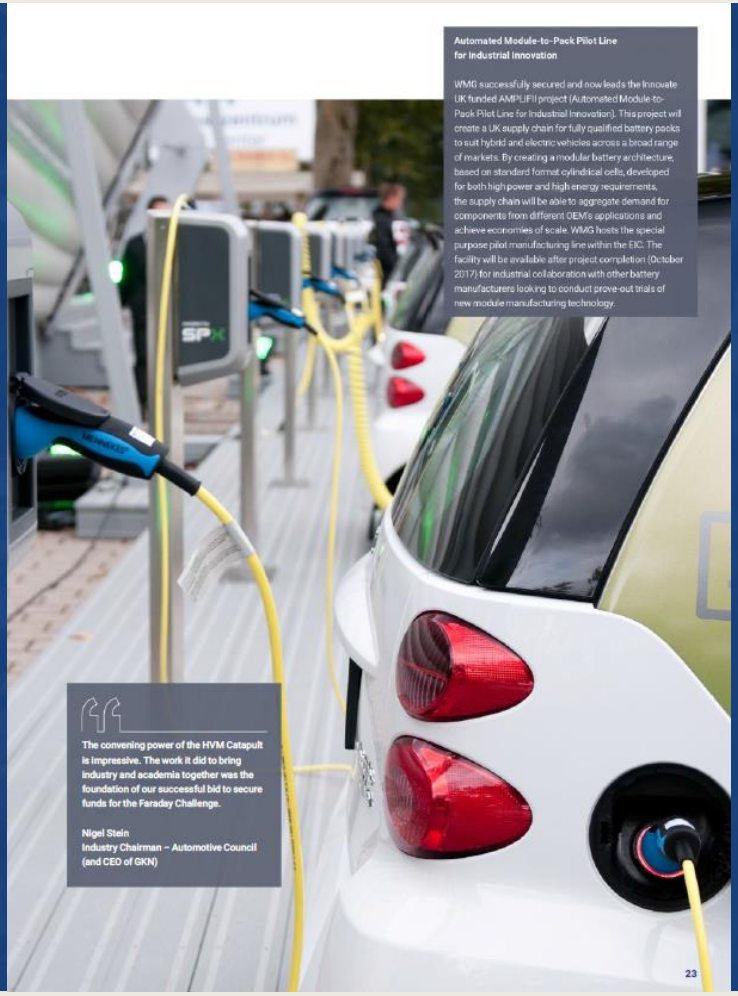
Electrification

Faraday Challenge

Build and secure UK capability for battery manufacture

HVMC has helped to convene Automotive industry and Auto Council

£250 million funding secured



Digital Manufacturing

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HVMC shaping national strategy

Demonstrators — Hubs and spokes

e.g. Factory 2050

SME support

Transformational demonstrators: — Digital twin for product acceleration, Connected supply chain

Advancing state of the art: — **Robotics, AI, Visualisation, Connectivity, AM**

Composites Manufacturing

HVMC shaping strategy

Supporting Composites Leadership Forum

Affordable composites supply chain for automotive- Large Scale Project

NCMC

UK strength in design and simulation

Wings, high end automotive

New Technologies and Markets

The UK Opportunity

Consultation with the UK composites supply chain has shown that the UK has the opportunity to grow its current £2.3bn composite product market to £12.bn by 2030. [UK Composites Market Study*]

Percentage figures are Compound Annual Growth Rate (CAGR). The forecast figures reflect the view of UK supply chain companies in research carried out by the NCC in mid-2015.

With the right support, a **paradigm shift** will be achieved in the UK to capture the **growing global opportunities** for the application of composite materials in multiple sectors.

2015 £2,290 → **2020** £4,670 15% CAGR → **2030** £12,480 12% CAGR

*Refer to the back page for further details.

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High Value Manufacturing

DIGITAL , WHERE TO START?

Made Smarter Review 2017

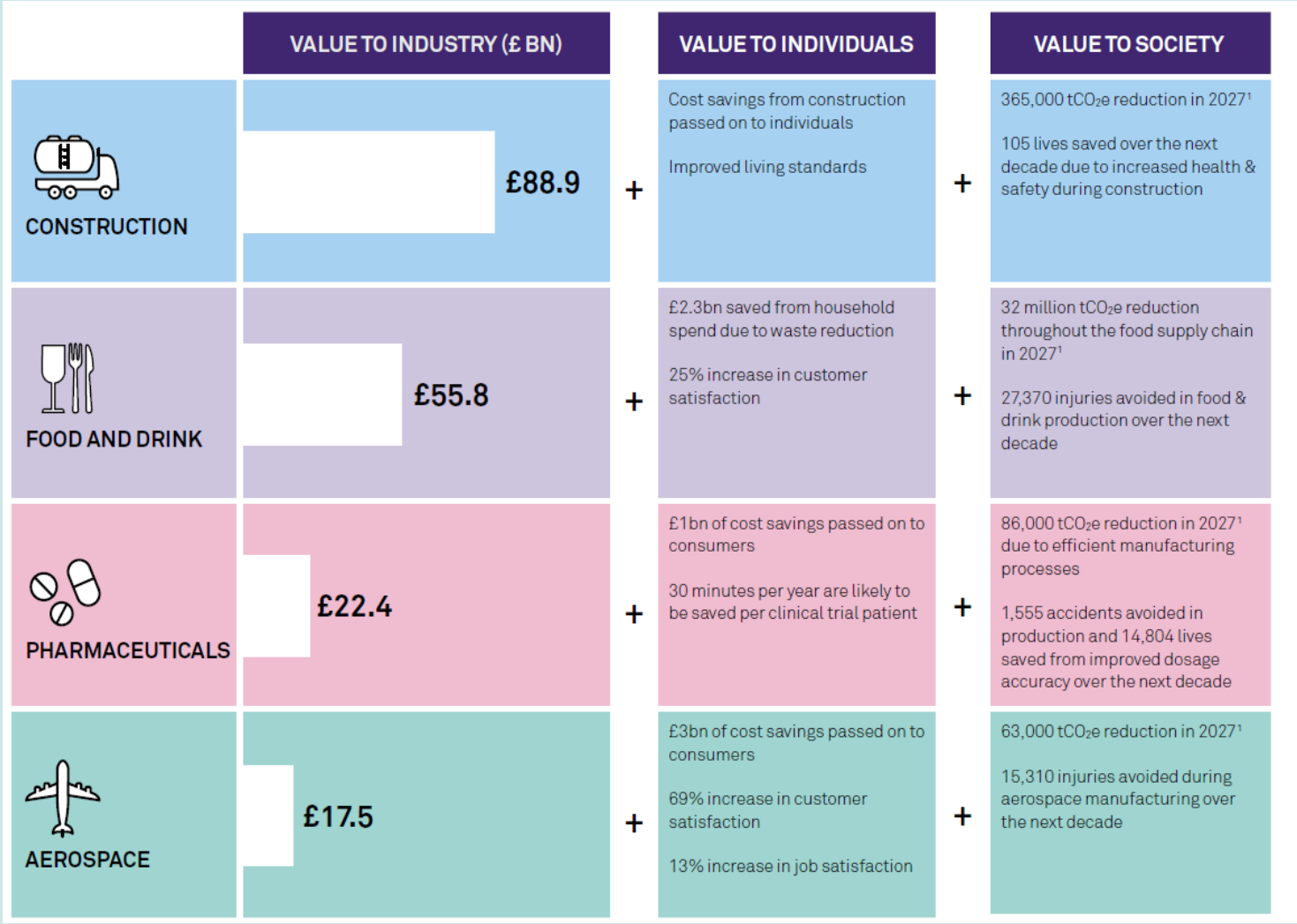
Becoming a global leader in Industrial Digitalisation by 2030

MADE SMARTER.

Huge UK growth potential

The potential size of the prize is huge

- Industrial Digital Technologies (IDTs) offer the promise of recapturing the UK's industrial spirit as a nation of 'creators and makers'
- **£455 billion** positive impact for UK manufacturing of faster innovation and adoption of IDTs over **10 years**
- Net gain of **175,000 jobs** across the economy
- More than **25%** industrial productivity gain by **2025**
- Reduce carbon emissions by **4.5%**



Estimated value for industries not directly studied: Highest growth rate (Aerospace, 21%) applied to the 62% of UK manufacturing GVA not studied, giving **£270bn** extra value at stake. **Value at stake for UK manufacturing:** our studied industries total (£185bn) + remaining industries total (£270bn) = **£455bn**


Creating a digital ecosystem
Accelerating innovation

Creating a digital ecosystem

RECOMMENDATION 1.1

Invest in a new National Adoption Programme (NAP). This would accelerate the development and diffusion of IDT through focused support to small and medium-sized enterprises in the UK regions. The programme will be owned at a regional level by Local Enterprise Partnerships (LEPs) and delivered by accredited regional partners. Investment will be targeted at strengthening both the capability and capacity of regional advisory services in digital technologies. It will provide kick-start funding for companies to leverage assets and expertise within the ecosystem. It will also increase the mentoring offered by industry and strengthen the interaction with upcoming talent within universities through focused projects and placements.

RECOMMENDATION 1.2

Scale the support provided by UK innovation centres through a new national innovation programme. This would bring together a network of existing distributed Digital Innovation Hubs (DIHs), strategically selected to best serve the challenges of each local business community. It will demonstrate, with industry participation, how the industrial and manufacturing sector can be positively transformed by IDTs.

RECOMMENDATION 1.3

Implement large-scale Digital Transformational Demonstrator programmes within the DIHs, co-funded by industry. These would address both sector-specific and key cross-cutting industry challenges and be focused on delivering tangible results in both productivity and sustainability. The demonstrators would be regionally organised and, together with the National Adoption Programme (Recommendation 1.1), would provide a key accelerator for the diffusion of IDTs especially within SMEs.

RECOMMENDATION 1.4

Drive forward the UK's global IDT research and development leadership. Create a network of Digital Research Centres (DRCs) to bring together the country's expertise in, initially, five areas:

1. Artificial intelligence, machine learning and data analytics;
2. Additive manufacturing;
3. Robotics and Automation;
4. Virtual reality and augmented reality;
5. The Industrial Internet of Things (IIoT) and connectivity (5G, LPWAN etc.)

Each DRC would be tasked with advancing state-of-the-art research and innovation for industrial digitalisation in its technology field. The network of DRCs would build on the excellence and infrastructure in the existing UK science and innovation base and work with the tech developer community to drive UK leadership in the technologies that underpin industrial digitalisation.

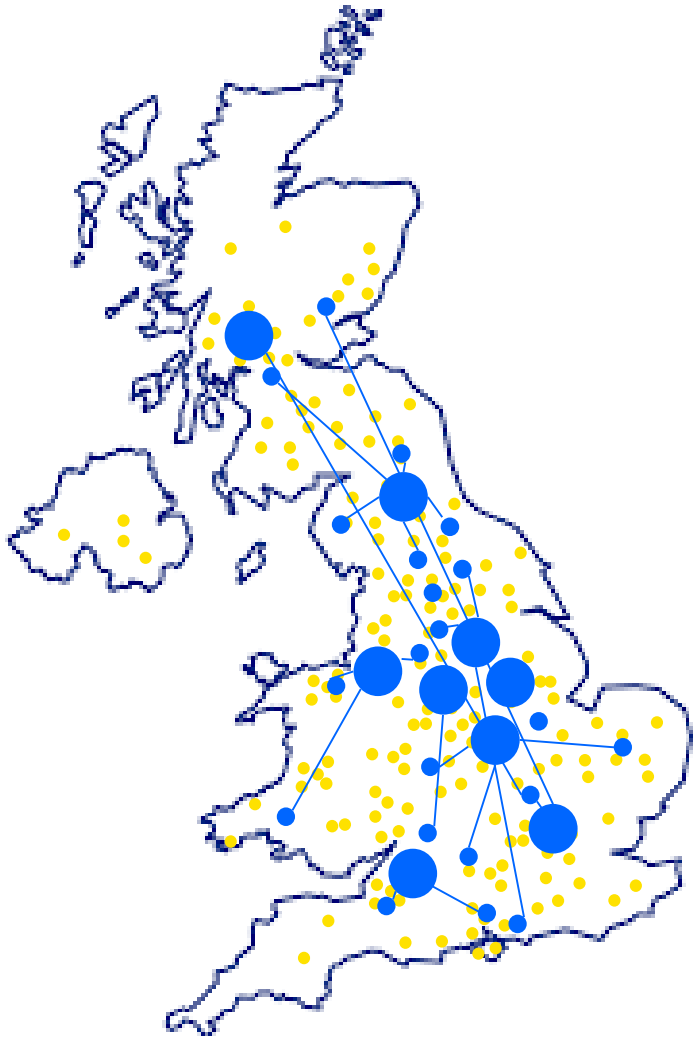
Strategic Outcomes

North West pilot

- Increase GVA by 15% over a 3-year period – delivering an estimated £70 million benefit.
- 20 emerging technology start-ups working directly with industry on new projects.
- 20,000 businesses supported by DIH
- Increase in GVA by £1.2bn
- 40 new Digital Innovator spin outs
- Increase in R&D investment >£400m,

National rollout

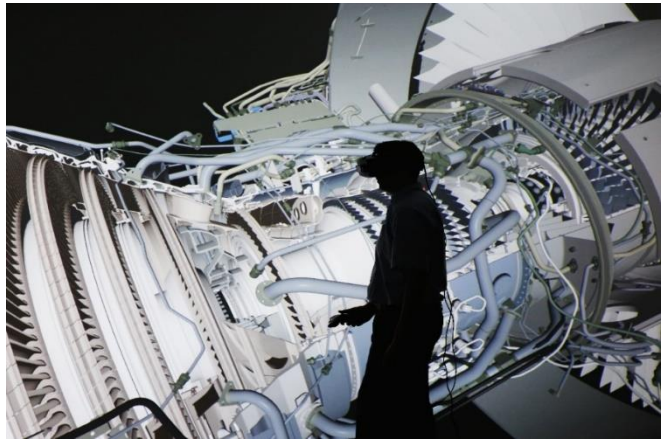
- GVA increase £770 million.
- 220 emerging technology start-ups.



Digital Innovation Hubs

- House demonstrators
- Explore and test
- Innovation projects

TRANSFORMATIONAL DEMONSTRATORS



27 technologies

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Advanced Assembly


Automation


Biologics

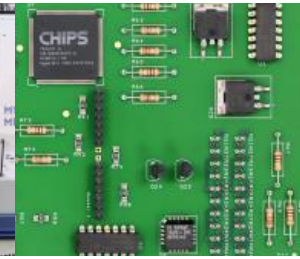

Biotechnology


Casting


Composites


Design


Digital Manufacturing



Electronics

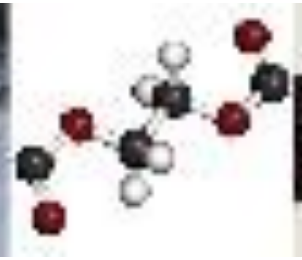

Flexible Manufacturing


Formulation


High Temperature Processing


Joining

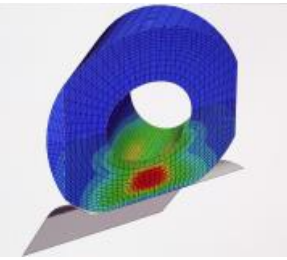

Machining


Polymers


Materials Characterisation


Metal Forming and Forging

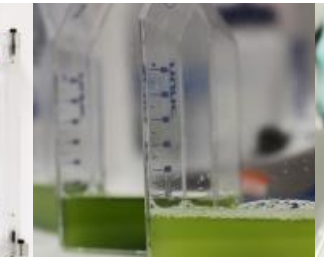

Metrology

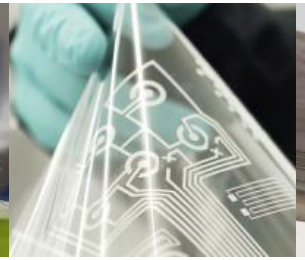

Modeling and Simulation


Netshape and Additive Manufacturing

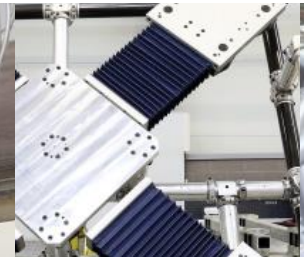

Powder Technology


Power and Energy Storage


Resource Efficient and Sustainable Manufacturing

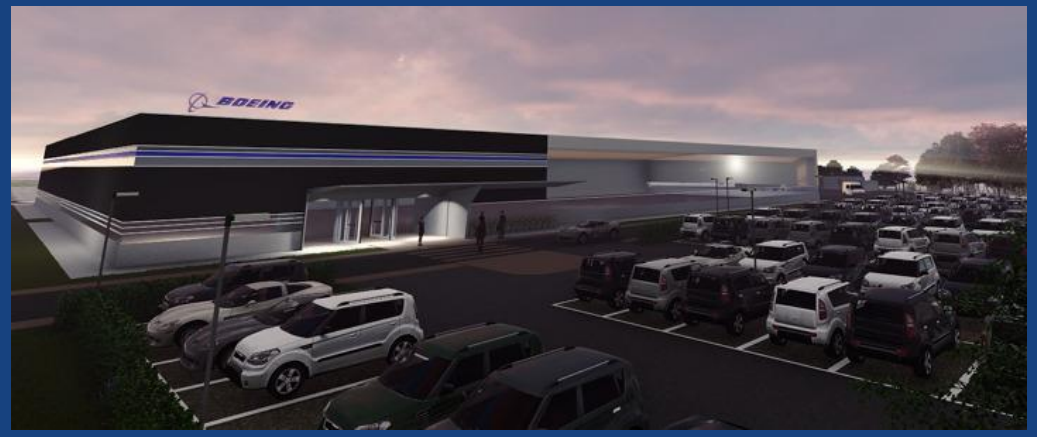

Printable Electronics


Surface Engineering


Toolings and Fixtures


VR and Virtualisation

Recent announcements in Sheffield – McLaren and Boeing



Images courtesy of University of Sheffield

The 2075 Factory?

- Pace of change faster than ever
- Innovation rather than technology can differentiate

- REPETITVE ADVANTAGE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High Value Manufacturing
SCHULER