THE Bessemer SOCIETY

Rapid flows the Don

The State of Advanced Manufacturing & Technology in the Don Valley Corridor linking Sheffield and Rotherham

A Bessemer Society Report | July 2026



Preface & Acknowledgements

This report is the result of a meeting of minds at a pub in Sheffield when 14 CEOs and founders of companies who are engaged in fields of advanced manufacturing met to share their trials, tribulations, excitement and opportunities. In short, their businesses and their industries, which we encouraged them to think about as clusters of innovation.

"Look what we have here!" they said. And yet..who knows? Andy Richardson, Managing Director of Special Melted Products Limited, stepped forward to propose that the excitement and opportunity ought to be captured in a report that would make this excitement and the opportunities widely known, and reach not only local government, but Whitehall, policy makers, legislators, potential investors into the region, partners and collaborators.

So, here it is, after much input and support from the initial core of companies who not only contributed their time but made a financial contribution. They are listed in the Core Cluster Group.

As a core group within the cluster it can make a valuable contribution to how the region is seen, and how it can grow its high value manufacturing eco system, which includes the acquisition of skills, the inflow of talent and the creation of new jobs.

Core Cluster Group

1. Andy Richardson – Managing Director, Special Melted Products Ltd
2. Martin McKervey – Director, AESSEAL Ltd
3. Shaun Smith – Commercial Director, Castings Technology Ltd
4. Martin Baker – Innovation Director, Gripple Ltd (Glide Group)
5. Tom Clayton – CEO, IntelliAM plc
6. Tim Craggs – CEO, Exciting Instruments Ltd
7. Scott Dufferweil, CEO, Aegiq Ltd
8. John Schofield – CEO, Acantecs Ltd
9. Jamie Hinton – Managing Director, RAZOR Ltd
10. Jim Heley – CEO, A3L Ltd
11. Mark Wallace – CEO, Tribosonics Ltd

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"You can't offshore courage.
You can't outsource ingenuity.
And you can't deindustrialise ambition."

Michael LeGoff,
Founder of Plessey Semiconductors and
Lifetime Fellow of the Bessemer Society

Foreword

Restoring pride and purpose

Today, Sheffield and the wider region stand at another historic inflection point. The rise of Artificial Intelligence and deepening geopolitical fissures threaten to undermine the foundations of the global economy and challenge the very definition of security.

As in previous upheavals, the role of advanced manufacturing and Sheffield are emerging as a key to our national economic, social and environmental security. After a long, misleading national narrative of industrial decline, South Yorkshire's manufacturers are writing their own alternative script. One that plays to their strengths, is confident and expansive. Winning global contracts and plaudits and attracting major inward investment in people and places.

Global markets, national security

Operating at connected nodes in complex global supply chains, these entrepreneurs form an increasingly powerful cluster of synergistic companies whose collective process engineering knowledge adds up to much more than the sum of its parts.

Our research reveals how their global reach connects the UK with allies and friends while being equally critical to our own national security and growth: defence, aerospace and energy.

Entrepreneurs in this cluster can also be seen delivering up and downstream technologies across increasingly complete local supply chains, offering inward investors access to a one-stop-shop in disciplines spanning the manufacture of complex super alloys, forging, titanium casting and additive materials, through to the precision machining of complex final components.

The industrial backbone and brain of Sheffield

These entrepreneurs are the backbone and brains of the region's industrial economy. They are ripe for growth and are now being joined by a new breed of hard and deep tech engineering entrepreneurs emerging from research faculties focused on microelectronic design, compound semiconductor-based electronics, and medical imaging. Their shared ambition is creating what Andy Haldane, Chancellor of the University of Sheffield, called a 'supercluster' of advanced manufacturing and tech talent.

This is the community we serve and promote through the work of the Bessemer Society.

Alex Stewart,
Founder of The Bessemer Society

Introduction

"South Yorkshire's core strengths in developing practical solutions to complex problems such as the Bessemer Converter put the region at the forefront of the industrial revolution. The region needs to reinvest and reindustrialise to seize the opportunities of the next."

Andy Haldane and Oliver Coppard,
Yorkshire Post (November 2025)

Advanced manufacturing is a centrepiece of the UK's Modern Industrial Strategy with the intention to nearly double annual investment in the sector from £21 billion to £39 billion by 2035. This is a fundamental bet on the sector.

When we add to this the promised defence spending uplift to 3% of GDP, with talk of a further rise to 5%, it is clear that South Yorkshire's advanced manufacturing and tech communities are strongly positioned to benefit from this significant investment. Indeed, South Yorkshire was one of only six regions in the country to share a slice of the £250m Defence Growth Deal pilot announced in April. And it was the first advanced manufacturing Investment Zone established by the previous government in July 2023.

The Don Valley Corridor, launched in March 2026 by South Yorkshire Mayor Oliver Coppard, spans the Olympic Legacy Park through to the embryonic Innovation Spine connecting the city's two universities.

It then follows the River Don, down through the very heart of the corridor, where the materials, forging, casting and machining industries are concentrated. This is the engine room of established industrial growth. Here, along with its aspiring Olympic athletes and basketball stars, are a cluster of companies all too familiar with receiving medals. Only last year, two brilliant industrials highlighted in this report, Gripple and AML, won the King's Awards for Enterprise in Innovation.

Entrepreneur-led innovation, backed by public policy and private investment

The process engineering and science knowledge embedded in these clusters of tech and manufacturing excellence is centuries in the making. Hard won. Hard to replicate. And hard to import. Such knowledge is constantly evolving, powered by a restless spirit of innovation woven into the DNA of its entrepreneurs.

Exactly the culture and capabilities that the Modern Industrial Strategy and the Defence Industrial Strategy will need if the UK is to deliver on its promise of growth and security.

What we came to find in our interviews is that innovation is not, as can sometimes seem, the primary preserve of universities. Instead the most powerful drivers of innovation are often the shop floor challenges of enterprises and the marketplaces they serve.

As Harry Brearley said in 1920 when receiving the Bessemer Gold Medal for his discovery of Stainless Steel: "Dependence on the willing help of others is the part of all who successfully direct a laboratory for industrial research…the individual, best qualified by experience to study the problem, and to solve it, might be some workman who is engaged on the job day after day. It is the investigator's greatest achievement to inspire interest in such men to make them confederates to his plan. I am proud to confess my life-long indebtedness to scores of friends, with hard hands and black faces, who toil at laborious tasks in mills and forges."

It may be no coincidence that the origins and early development of the AMRC were formed by men in the Brearley mould, a combination of the shop floor and the lab, whose researchers were brought up on shop floor machining challenges. There must be better recognition of the roots of innovation. For those we interviewed the clear sense is that national R&D funding is tilted heavily to universities rather than to entrepreneurs and shop floors.

Seven sector-specific strengths: doing it on purpose

Research for the report identified seven sectors where the Don Valley Corridor's existing and emerging industrial strengths can be found. Strengths that form a powerful platform for growth in the advanced manufacturing, defence and medical arenas. These are, advanced alloys and metals – the foundational base of advanced manufacturing; forging and casting; precision machining; materials, composites and additive; clean energy; AI and digital manufacturing; and medical technologies.

The Shenzhen of aerospace engineering

We also discovered that this list is much more than a collection of discrete technologies and industrial capabilities. Pan out from the company level and what we see forming, link by link, is a super cluster of companies and capabilities that adds up to much more than the sum of its parts. What one precision engineer likened to an emerging 'Shenzhen of aerospace engineering.' Driving this forward we see the emergence of a strong and resilient value chain of intermediate but integrated processes and products that feed into the global defence, aerospace and MedTech markets.

Eyes on the prize: scaling new industries, new jobs

While several of the industrial entrepreneurs identified in this report lead companies that have histories dating back more than a century, we are also seeing the impact of a new generation of hard and deep tech entrepreneurs. Though small in number, they point to a vibrant future cluster of companies concentrated in what policy makers are calling the 'Innovation Spine' at the heart of Sheffield.

The report looks in detail at the emergence of this new science and technology based cluster, including a special reference to the experience of Sheffield's sister city, Pittsburgh. A decade and more ahead of Sheffield, the former US steel and coal city today boasts seven fully fledged unicorns, with a strong focus on robotics and MedTech. We also look at the Cambridge Phenomenon, which dates back to the 1960s. Both of these examples speak to the need for ambition and commitment over the long term, along with a laser-like focus on the strengths the region has and which can be or are already world-class.

To quantum and beyond

Three such harbingers of these new industries are Phlux Technology, a University of Sheffield spin-out, which raised £9 million to commercialise infrared sensors 12x more sensitive than current alternatives. These have applications across LiDAR, autonomous vehicles and defence. Aegiq, another spin-out, is building full-stack photonic quantum computing systems, and recently secured a place in the National Quantum Computing Centre's £30 million testbed programme. A more recent spinout is Pixel-Flo with a highly novel process for manufacturing microLEDs, solving an issue that has hindered their mass adoption. These companies are benefiting from the more open and dynamic way in which the universities are encouraging and supporting spinouts. Investors from the Golden Triangle and beyond are taking notice.

What is clear is that for a cluster to flourish the ingredients must include: a vibrant and disruptive entrepreneurial spirit; the willing sharing of brain power; a purpose-driven, collaborative ambition; and the presence of long-term, patient investors backed by a business, political, civic and educational alliance committed to a shared vision.

CHAPTER ONE:

The seven pillars of industry

"The Don Valley Corridor today is home to a cluster of engineering companies whose mastery of world-class forging, casting, forming and machining technologies makes South Yorkshire critical to global aerospace, space, security, defence and energy markets."

Andy Richardson,
CEO Special Melted Products

Sheffield today is home to one of the world's most advanced manufacturing clusters. After decades of being miscast as a post-industrial city, the evidence on the ground tells a different story: rising investment, growing export contracts, a cluster of collaborative companies scaling at pace, and rising demand for both research and technical talent.

The cluster's next phase is being propelled from a platform built on a combination of world class manufacturing R&D, ambitious entrepreneurial talent, inward investment and strategic public support. Fuelling this trajectory is a powerful combination of strategic demand — defence, aerospace, space and energy security — and a deep base of engineering capability.

The scale of the opportunity and the opportunity to scale

The opportunities are concrete and immediate: manufacturing components and armaments for the defence of Ukraine and an uncertain world of fracturing alliances and over-stretched supply chains; forging reactor pressure vessels for the US, UK and Australian nuclear-powered submarines (AUKUS); producing complex titanium components for next-generation commercial and strategic aero-engines (Rolls-Royce supply chain); and deploying AI to make niche manufacturing supply chain manufacturers smarter and more competitive. The region's MedTech scene, while less established perhaps, is rapidly growing in strength.

Sheffield and South Yorkshire are home to the UK's fourth-largest advanced manufacturing cluster, contributing £3.7 billion a year to the regional economy. An unpublished report by the High Value Manufacturing Catapult, commissioned by Sheffield City Council, suggests this could rise to £5.3 billion by 2030.

The entrepreneurs and manufacturers highlighted in this report are critical to achieving that bold ambition and are keen to help create a collaborative vision and mission for the Don Valley Corridor.

Deep rooted process engineering knowledge

The Don Valley Corridor cluster is rooted in Sheffield's process engineering skills across seven closely related manufacturing capabilities:

1. **Advanced alloys and metals** – the foundational base of advanced manufacturing
2. **Forging and casting** – shaping the future of aerospace, defence and clean energy
3. **Machining** – precision engineering of complex components
4. **Materials** – composites and additive
5. **AI and digital manufacturing** - the rocket fuel of industrial innovation
6. **Clean energy** – green hydrogen, civil nuclear and offshore wind.
7. **MedTech** - healthier people, healthier economy.

In this chapter we take a deeper dive into these, often hidden, capabilities, spotlighting manufacturing frontier firms who invest in people, process and productivity.

1. Advanced alloys and metals

The science and manufacture of innovative alloys are a core Sheffield capability, with roots stretching back beyond Bessemer's revolution in steelmaking of the 1850s. Here we highlight two companies that are investing heavily in people and technology, playing to the enduring strengths of the city region.

Special Melted Products

The first is Special Melted Products (SMP) in which Taiwanese corporation, Walsin Lihwa, has invested £142m to acquire control. With a revenue of £4.3 billion, Walsin's investment in SMP is part of a rapid series of acquisitions enabling it to become a vertically integrated global player in the stainless steel and nickel superalloy markets.

Prior to the investment, SMP's expertise had already positioned Sheffield as a global centre of excellence for nickel-based superalloys — high integrity materials that comprise around 50% of every civil and military jet engine by material value. SMP's customers span aerospace, civil nuclear and energy.

Moreover, the company's facilities include some of the Europe's most advanced vacuum induction melting and forging capabilities. With three closely clustered sites along the Don Valley Corridor it is a one-stop-shop for multiple melted alloys and components. As a result, the combined Walsin-backed cluster in South Yorkshire is now one of the most advanced materials hubs for aerospace, defence and nuclear energy in the world.

Marcegaglia Sheffield

The second company is Marcegaglia Sheffield – the Italian corporation's Sheffield acquisition has deep roots going back to Harry Brearley's discovery of stainless steel of the 1920s.

Today its Italian parent is a global manufacturing powerhouse with revenues of approximately €9.6 billion. The company is investing £50 million in a significant electric arc furnace upgrade which will make Sheffield home to one of Europe's most modern stainless steel melt shops, increasing capacity by 60% and positioning the Don Valley Corridor as a critical node in European supply chains for automotive, construction, energy and specialist industrial markets.

Marcegaglia, which is a pioneer green steel producer, is now helping develop E. ON's district heat network in Sheffield's Lower Don Valley, utilising waste heat as a by-product of the stainless steel melting process. This will play a crucial role in enhancing the resilience of the Lower Don Valley's energy infrastructure, while contributing to Sheffield City Council's decarbonisation goals. It is a powerful example of industrial symbiosis — the steel plant's heat becoming a community energy asset.

Sheffield needs to drive its industrial growth faster by seizing on the amazing global manufacturing platform we already have today. A platform that can open doors to huge inward investments, generate high value-added skills and deliver inclusive wealth that everyone can share in.

Andy Richardson,
CEO, Special Melted Products

2. Forging and casting

Aerospace and defence accounts for 51.6% of all titanium consumed globally, and the reasons are clear: the Airbus A350 and Boeing 787 families incorporate circa 20 metric tonnes of titanium per plane. Multi-year production schedules anchor predictable demand.

Given the global order backlog of over 17,000 commercial aircraft —more than a decade of production at current rates — demand for titanium in airframes, landing gear and engine systems is a huge opportunity for the Don Valley Corridor companies.

Rolls-Royce's Advanced Blade Casting Facility (ABCF) at the Rotherham end of the Don Valley Corridor, is the result of a £110 million investment resulting from the success of its R&D partnership with the AMRC. It is now one of the most technologically sophisticated casting plants in the world.

The facility employs more than 300 people and casts, machines, and inspects intermediate and high-pressure turbine blades for the Trent XWB-84, powering the Airbus A350 and the Trent 1000XE, powering the Boeing 787.

Output to double by 2030

In March 2026, Rolls-Royce announced another major investment in the Rotherham facility, following a £2 million grant from the South Yorkshire Mayoral Combined Authority (SYMCA). The firm's £19.3m spend should enable the facility to double its output to 210,000 blades per annum by 2030 in anticipation of the rise in global demand.

"Our incredible team are making components every day that push the boundaries of science. This is a vote of confidence in them and in the capability of the wider region to stay at the forefront of advanced manufacturing. We look forward to future collaborations that will help keep these valuable skills in the community."

Nigel Bird,
Executive Vice President, Turbine Systems, Rolls-Royce

From closure threat to secure £18 million investment

A brilliant example of the clustering effect in the Don Valley is the presence of Castings Technology, a Management Buy Out (MBO) from the University of Sheffield. The Castings Technology team and its kit were the brainchild of AMRC founder Keith Ridgway. Built with the support of £15m of funding from the Aerospace Technology Institute (ATI). Two forces that will feature frequently in the pages of this report.

Shortly after Ridgway left the AMRC in 2019, the University decided to close Castings Technology with the loss of 70 highly skilled staff. The intervention of veteran Labour MPs averted this outcome, leading to an MBO.

Today, CEO Richard Cook and Chair Kevin Parkin, have created a world-beating titanium castings enterprise that last year secured £18m of private capital finance from the City to move to a 195,000 sq ft production facility in Sheffield.

Since the threat of closure, the business had grown from 65 employees in 2024 to 103 by end of 2025. With demand from the global aerospace industry a further 20 hires are planned, taking the workforce to 123 by the end of 2026. Its specialisms span titanium casting and super duplex steels for critical, high-duty aerospace applications.



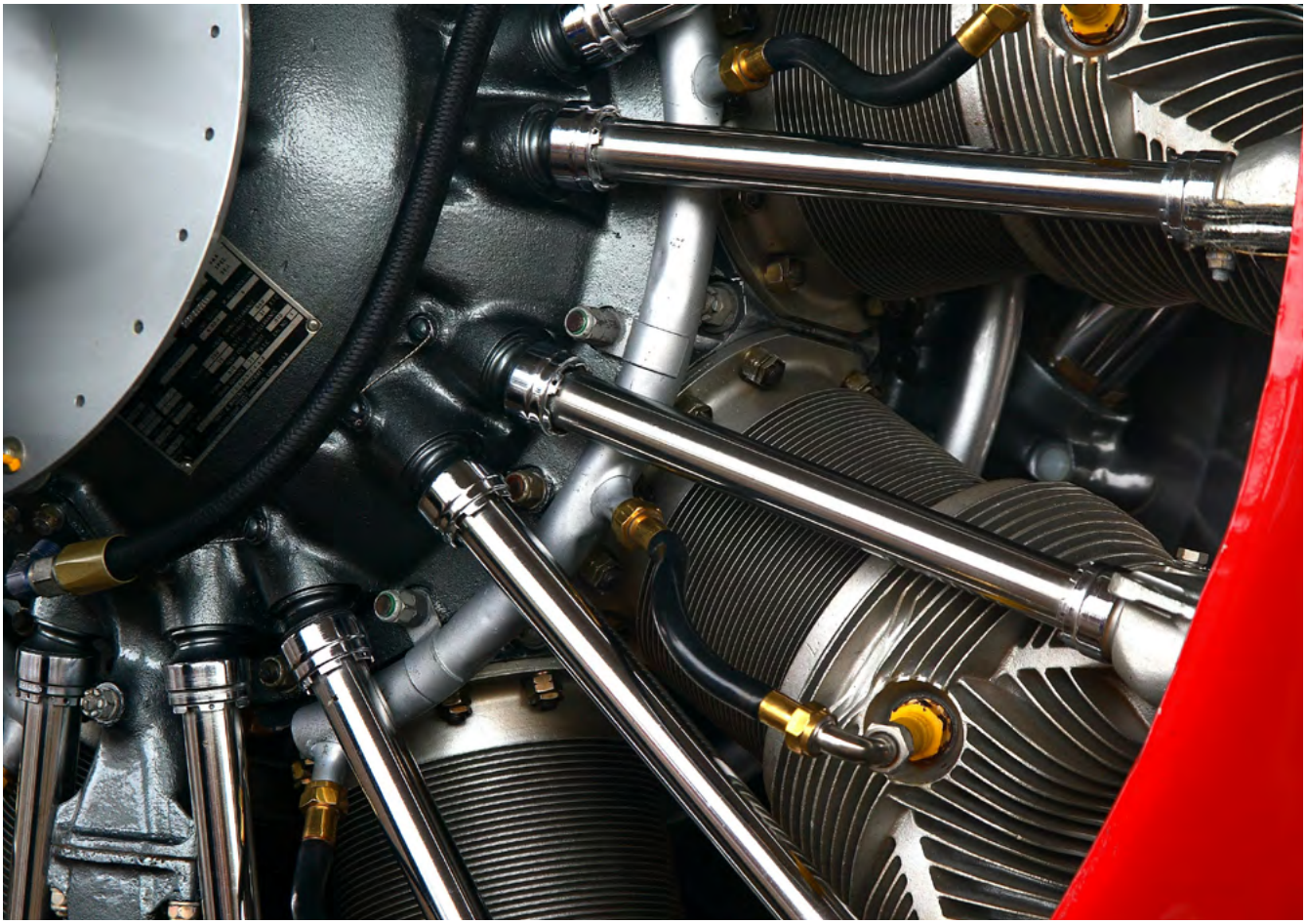
3. Precision machining

As the previous section revealed, Rolls-Royce is often found to be the anchor at the end of a complex supply chain providing Boeing and Airbus with the engines that power more than 35 types of commercial aircraft and with more than 13,000 engines in service around the world. The precision engineering talents found along the Don Valley Corridor are critical links in that supply chain.

Here we look at two precision machining firms whose stories illustrate the commitment of Rolls-Royce, both to enduring partnerships and to engaging with disruptive start-ups and spinouts. The first is:

CW Fletcher's "Sterling Works" in Rotherham, has one of the longest-standing relationships with Rolls-Royce, dating back to the Second World War, when its skilled workers manufactured the Merlin engine for the Spitfire and Lancaster aircraft. Four decades later the company delivered the first components for the Trent and V2500 engines and has been a continuous Trent family supplier since then. In 2019 it secured a £160m contract to supply Rolls-Royce with precision engineered parts over the next decade.

The company is now embarking on a continuous digitalisation journey, initially with the support of a Knowledge Transfer Partner (KTP), Rufino Bolado-Gomez from the University of Sheffield AMRC. A computational neuroscientist, Rufino rapidly became key to the business bringing new ideas and processes on board. This is a small but telling example of how KTPs can help provide the people to "diffuse" innovation and technology across a growing industrial cluster.



Clocking in at AML Sheffield

From the moment the AMRC took flight with Boeing in 2001 its two founders, Adrian Allen and Keith Ridgway knew they would need to create an early spinout if they were to keep pace with the precision engineering needs of its global aerospace and energy manufacturing partners. They were that good. And confident.

The choice of Gareth Morgan to lead was obvious. As early as 2002, the founders had earmarked the lacrosse-playing Morgan as a natural successor. They had sent him to Canada in 2005 to sit at the feet of machining chatter guru, Professor Yusuf Altintas. He returned with no rivals.

More California than Catcliffe

What began in 2008 as a two-man band in a shed (more California than Catcliffe) has grown to a talented team of more than a hundred machining engineers operating within earshot of the AMRC. Using advanced 5-axis CNC machining, turning and milling, AML today produces seriously complex components — discs shafts and aerofoil, parts — for global clients, including Rolls-Royce, Siemens and G.E.. It doesn't come more demanding.

In recognition of its manufacturing excellence AML won the King's Award for Enterprise Innovation last year. It has also attracted substantial investment from the new owners of SMP, Walsin Lihwa, enabling a major uplift in growth and capacity. As Gareth told The Manufacturer following the award: "The customer was exploring multiple manufacturing innovations, from novel design elements to new materials and technologies to achieve the improvements in performance, weight and emissions levels being demanded by aircraft manufacturers.

AML has also won further recognition from Siemens Energy in recent months, winning a Collaboration Award against fierce multinational Tier 1 competition in 2025 to supply a large portion of the discs, shafts and blades for their aeroderivative gas turbines, which is a rapidly growing market for green energy and data centre grid support across the globe.

The confidence to rise to the challenge

"This combination of high demand and challenging technical requirements from an existing customer presented a fantastic opportunity to develop a new aerofoil manufacturing process that met the stringent demands of the next generation of business aircraft engines. It took us into the relatively unknown territory of automation and robotics, but our long-term relationship with the AMRC gave us the confidence to rise to the challenge."

The shot clock drives results

Gareth also noted the importance of good parents: "As the first spin-out from the AMRC it was inevitable that innovation would be woven throughout our DNA. As a member of the founding AMRC team – and being a passionate lacrosse player at the time – I quickly came to understand the power of the "shot clock" in creating a results driven culture where every team member has a crucial role to play in putting the ball in the net.

4. Materials - Composites and additive manufacturing

Perhaps the most striking image of South Yorkshire's competency in composites was the sight of a McLaren Senna performing doughnuts on the factory floor some days before the Royal opening of its £50m Composites Research Centre by the Duke and Duchess of Cambridge in 2019.

Unlike West Yorkshire, with its deep skills in wool and textiles, its southern neighbour's reputation is held aloft by steel and alloys. That began to change, however, with the partnership between the AMRC and Boeing. There was an industry wide aircraft lightweighting drive. This meant not just more titanium parts in its aircraft, which played to the region's forging, casting and machining strengths, but also lighter aerostructures using composites. Could Keith Ridgway and his AMRC team weave their magic on composite structures, his Boeing partners asked?

The power of the Boeing partnership

What happened next is an example of why close personal links between industry and its R&D partners are key to radical innovation and the growth of high-performing clusters. In this case Boeing seconded several senior figures from its in-house composite team to be embedded in the AMRC. This enabled the rapid transfer of Boeing's competencies in composites, to the AMRC in the Don Valley Corridor.

The AMRC's composite R&D work began in earnest in 2006 and was housed in a warehouse on an industrial estate in a small village between Rotherham and Sheffield. A decade later, with substantial support from the Aerospace Technology Institute (ATI), a 3D weaving machine, braiding rig, jacquard and a tailored fibre placement machine were acquired for cutting-edge research into automated production, composite machining, advanced curing, novel material processes and dry fibre technologies.

McLaren's investment a little over a decade later was a massive signal that the Don Valley Corridor was now home to a truly world class capability in the manufacture of composite structures. This is proof of how the ATI's consistent approach to aerospace funding and its close partnership with the AMRC and its co-founding partner, Boeing, has helped form the kernel of a resilient advanced manufacturing innovation cluster.

"From an industry where narrow-body production rates must jump from 30 shipsets a month to 100, traditional manual layup is a bottleneck we can no longer afford. COMPASS bridges this gap by combining the AMRC's expertise in composites and digital manufacturing. By proving these high-rate methods at technology readiness level (TRL) six, we are ensuring the next generation of aircraft isn't just designed in the UK but manufactured here."

Stephen Beecher,
Senior sector engagement manager for aerospace at the AMRC

More recently, these composite skills were the centrepiece of another ATI funded project (£35 million), backed by additional funds from SYMCA and Sheffield City Council (£14 million). The COMPASS Project (Composites at Speed and Scale) now has a home, the kit inside, and a specialist industry partner, Loop Technologies, who have established a footprint on the Advanced Manufacturing Park.

Sixfold increase in composite aerospace market

The ATI reports that composites now account for more than 50% of the weight of the Airbus A350 and Boeing 787, compared with just 6% on the Boeing 747, and project that the global aerospace market for composites will grow from $16bn in 2022 to $34bn by 2032. The ATI also suggests that the UK could grow its market share sixfold by 2050, with a total addressable market of more than £65bn to 2050 if it can secure work on future ultra-efficient aircraft platforms.

The next generation of Airbus and Boeing single-aisle aircraft is expected to use even more composite material, including carbon-composite wings, making production rate and cost the central challenge. The Sheffield region's opportunity is no longer just to invent better composites, but to crack how they are produced at speed and scale for the next generation of commercial aircraft. This is why the COMPASS programme is so important.

The broader message is that composites are becoming one of the Sheffield region's most scalable opportunities. Boeing's current composite programme in Sheffield is explicitly tied to future aircraft demand and high-rate manufacture, while McLaren's presence shows that the same regional capabilities can be commercialised beyond aerospace. Furthermore, future aircraft are likely to use both more titanium and more composites: titanium where heat, strength and durability are critical, and composites where lightweight structures deliver fuel and emissions savings.

Retaining and expanding R&D gains in the region

The challenge for South Yorkshire's economic growth policy makers is how to ensure that the knowledge gained in projects such as these lead to new industrial facilities located in the region, either as inward investors or new manufacturing businesses.

As the Centre for Cities has reported, much if not most of the R&D carried out by the AMRC benefits regions other than South Yorkshire. Scotland and Northern Ireland are currently the most likely beneficiaries if the Compass needle points in the right direction.

"The AMP's role as a place of innovation and high-skilled activity means that some of the direct economic benefits of the AMP, such as new machining techniques, are realised in other parts of the country where low-cost manufacturing takes place."

Parks and Innovation,
Centre for Cities

Additive manufacturing: Powdering the future

Deep within Sheffield's advanced manufacturing cluster, a quieter revolution is taking shape. Alongside the forges and foundries, a new generation of additive manufacturing companies is emerging — many with roots in one of the world's most influential metal AM research centres.

The Future Manufacturing Hub

The two complementary pillars which uphold AM research are both at the University of Sheffield. The first pillar is Professor Ian Todd's EPSRC-funded MAPP programme and £10 million Future Manufacturing Hub, which has attracted over £20 million in combined public, industry and university investment to develop powder-based manufacturing processes that are lower in energy, cost and waste than conventional routes. Partners include GKN Aerospace, Johnson Matthey and Airbus, with Sheffield leading participation in two £33 million AM programmes aimed at revolutionising how flight-ready components are designed and produced.

Henry Royce Institute

The second pillar is the Henry Royce Institute — the UK's national institute for advanced materials research and innovation. Royce at Sheffield leads on metals processing innovation specifically designed to bridge the gap between small-scale laboratory research and industrial-scale manufacturing, with unique industrial-grade machines capable of delivering research across TRL 1-6.

At its heart are: the Royce Translational Centre (RTC), where research meets industrial application, and the newly built Royce Discovery Centre on the University's city centre campus, where the next generation of materials scientists will train using the very latest technologies in 3D additive manufacturing, digital manufacturing and nano characterisation.

Sitting at the intersection of both pillars is Professor Martin Jackson — Professor of Advanced Metals Processing at Sheffield and the Henry Royce Institute's Research

"Sheffield is an important national hub for advanced manufacturing, building on its historic importance in steelmaking. The Royce will capitalise on the local industry infrastructure and expertise to provide a world-leading centre for advanced metals manufacturing for the next few decades."

Professor Martin Jackson
Professor of Advanced Metals Processing at Sheffield and the Henry Royce Institute's Research Area Lead for Advanced Metals Processing

Area Lead for Advanced Metals Processing. Jackson's career trajectory tells its own story about the depth of Sheffield's materials science ecosystem. A Sheffield graduate who worked for Rolls-Royce before a PhD at Imperial College London, he won the IOM3 Titanium Prize in 2003, was awarded a Royal Academy of Engineering/ EPSRC Fellowship in 2005, and returned to Sheffield in 2008 to develop what has become a globally recognised programme in processing of titanium and light alloys.

FAST forward to sintering

Jackson's signature contribution is FAST-forge — Field Assisted Sintering Technology combined with precision forging — a process that tackles one of advanced manufacturing's most persistent economic problems: the prohibitive cost of titanium. Jackson's central ambition has been to provide a step change in the economics of titanium-based alloys through the development of non-melt consolidation routes, turning surplus AM powders and titanium swarf into high-integrity near-net-shape components.

In June 2025, his group published results on Titanium-S23, a novel β-rich titanium alloy with exceptional tensile toughness produced entirely from recycled Ti-6Al-4V and Ti-5553 powders using FAST — demonstrating that sustainable alloy design and world-class performance are not in tension but can be achieved simultaneously.

The commercial and strategic implications are significant. Titanium is essential to aerospace, defence, medical implants and energy — but its cost has historically constrained adoption. A process that dramatically reduces that cost while recycling waste powder into flight-grade components is not an academic curiosity. It is a manufacturing breakthrough with direct application to many sectors.

From the big players to spin-outs and smart supply chains

What makes Todd's ecosystem distinctive is not just the research — it is what the research produces. Entrepreneurial PhD students are spinning out companies at an accelerating rate, supported by the University's Commercialisation framework and a network of private sector mentors. The results are compelling:

Instruct3D

Led by Henry Saunders, combines physics-based simulation with real-time sensor data to optimise print speeds, manage powder, predict defects and certify parts — effectively making metal AM more reliable and improving commercial viability at scale. The company is in discussions with major market players and is directly supported by DECSAM, a £38 million Airbus-led UK programme the University joined in 2025. For South Yorkshire, Instruct3D represents something strategically significant: an extension of the region's role from metals processing and printing into the higher-value digital infrastructure that next-generation AM supply chains will increasingly depend on.

Wayland Additive

Closely connected to Todd's ecosystem, is taking a different route to the same destination. Its NeuBeam® electron beam technology — born from precision engineering research at Reliance Precision near Huddersfield — overcomes fundamental limitations of laser-based AM, offering greater flexibility for the most demanding industrial applications. Having raised £4.2 million in early 2024, Wayland has already sold machines into aerospace, mining, medical, motorsport and defence markets across America and Europe.

Others have been drawn to invest in the Sheffield AM cluster to access its materials innovation culture:

Rivelin Robotics

Arrived in Sheffield in 2020, drawn by the density of the cluster. Its founder Robert Bush spent two years commuting in a campervan before relocating both himself and the business permanently — a testament to the pull of the ecosystem.

Rivelin's focus is post-processing: the unglamorous but commercially critical challenge of automating the support removal and finishing stages that still make metal AM slow, hazardous and expensive. Its NetShape robotic system, developed as lead partner in Innovate UK's CAMPFIRE Project — alongside others like GKN Aerospace, Siemens Energy and Saint-Gobain — cut processing time by 28% per part in trials.

But Rivelin's ambition extends beyond speed. Its digital thread capability — the unbroken data chain that follows a part from concept to delivery — is what enables AM to be used in safety-critical applications. As Bush puts it: "You cannot deploy additive manufacturing as a production technology in aerospace or medical without that traceability. We are enabling certification — so that you can use it in a turbine blade or a hip implant." He also adds, "Rivelin is much more than metal AM, as we are already moving into casting, forging, and MRO." (Maintenance, Repair and Overhaul).

Fyous

A radically disruptive start-up perfecting what it calls PolyMorphic Manufacturing — a system using tens of thousands of digitally controlled pins to create reconfigurable moulds in minutes, positioning itself as a challenger to both traditional injection moulding and 3D printing.

Founded in 2020 by Joshua Shires and Thomas Bloomfield the company is based in Heeley, Sheffield, and backed by £3.3m in total funding. It also, has angel investment and backing from Scott Crump, inventor of Fused Deposition Modelling and former chairman of NASDAQ-listed Stratasys.

Fyous has a waitlist of manufacturers in the footwear and dental sectors and is building its first polymorphic moulding machine in partnership with Peacocks Medical Group, the UK's largest independent orthotics company. The dental pivot looks strategically shrewd — a sector more receptive to innovation and one that could open the door to further applications at scale.

Acantecs

Acantecs sits at the deeper end of the materials science spectrum. Founded in 2022 by John Schofield — whose career spans three decades in superalloys, casting, forging, steelmaking, master melting and complex component manufacture — he has turned his focus to hot isostatic pressing, specifically PM-HIP, for the most demanding alloy systems in aerospace and energy.

Collaborative research sits at the heart of the company's model, working with academic institutions and commercial partners to de-risk early-stage development, prove materials viability and translate findings into high-integrity components fit for demanding service environments.

Forg3D

Founded by Richard Mincher, it relocated to the Advanced Manufacturing Park from Scotland in 2024, is developing wire arc additive manufacturing for the in-situ repair of tungsten components inside fusion reactors.

Global fusion brings regional benefits

As the report highlights later, when looking at clean energy there is a strong connection between the additive materials' story and the quest for fusion energy. Of the four companies selected for the UKAEA's prestigious Fusion Futures programme — developing components for the power stations of the future — three are Sheffield-based: Acantecs, AML and Forg3D. This is not a coincidence; it is cluster logic at work.

UKAEA are developing the science and technology behind the realisation of fusion energy through their STEP program (Spherical Tokamak for Energy Production) to design and build the world's first prototype commercial fusion energy power plant. To support this, they have established a first-of-a-kind £20 million test bed at the Advanced Manufacturing Park so that they can work closely with leading manufacturing expertise on the testing and developing of components for commercial fusion machines. There are over 26 regional project partners involved, addressing areas like materials, qualification, manufacturing and welding.

Additive and fusion

These engineering and manufacturing companies show how Sheffield is expanding its materials and science heritage into a platform for the industries of the next half-century. Specialist knowledge is being generated, technology spun out, commercialised and drawn back into the cluster in a self-reinforcing cycle.

"Acantecs is proud to have participated in the UK Fusion Futures programme. By giving us the opportunity to develop novel canister manufacturing techniques alongside our established PM HIP technology and processes, we have opened a new pathway for near-net shape product production. This advancement not only supports the evolving needs of future fusion technologies but also highlights the power of collaborative innovation."

John Schofield,
Founder and CEO of Acantecs

5. AI and the digital imperative

There is a brutal arithmetic at work in manufacturing right now. Were UK manufacturers to close the gap with global technology leaders by increasing the uptake of AI and robotics, Make UK estimates it could add around £150 billion to UK GDP by 2035 — a 5% increase in the size of the economy.

These productivity gains are not theoretical. They are being recorded on factory floors today, just not in the numbers needed to unlock that game-changing economy-wide productivity boost and not enough in South Yorkshire. UK productivity since the 2008 financial crash has slowed from an annual average of 1.9% between 1993 and 2008 to just 0.4% between 2008 and 2023. This is the scale of the challenge.

In the vanguard or among the vanquished

The question for Sheffield and South Yorkshire is not whether AI will transform manufacturing. It will. The question is whether the region's manufacturers and its AI and digital companies will be among those unlocking the benefits of that transformation — or standing on the sidelines watching it happen elsewhere.

Our research suggests the answer is: both. Sheffield has genuine world-class R&D strengths in AI and digital manufacturing. It also has a productivity gap in its SME base that is wide, well-documented and closing too slowly. Understanding both — clearly and without spin — is what allows investors and policymakers to see where the real opportunity lies, and how the blockers can be removed or overcome..

In short, the region needs to achieve two critical goals:

To diffuse AI, automation, robotics and the full suite of digitalisation technologies across the region's industrial base from frontier firms to the long-tail of underperformers.

To accelerate the spin-out, start-up rate of AI and robotics firms emerging from the city's two universities. Today, Sheffield's sister city Pittsburgh is a global leader in robotics with at least one unicorn, Gecko Robotics, in this field. Sheffield needs to follow its lead.

Factory 2050: local or national asset?

The AMRC's Factory 2050 is one of two premier league, robotics and automation research facilities in the UK. The other is MTC, a fellow member of the High Value Manufacturing Catapult.

Its standout project was to create an automated production system for BAE Systems' F-35 Samlesbury facility in Lancashire that accurately machines holes in composite aircraft components using multiple robots to automatically handle composite parts and then countersink high-tolerance pre-drilled fastener holes.

Factory 2050 also developed a smart 'cobotics' workstation for BAE Systems' factory of the future — fitted with a range of digital technologies including operator recognition and a sensor-enabled cobot arm. The workstation was piloted at BAE's Warton site in Lancashire to work safely alongside manufacturers building cutting-edge combat aircraft.

Perhaps the most salient observation about these projects – and others more recently with Rolls-Royce SMR – is that the economic and commercial benefits did not land in Sheffield or South Yorkshire but in Lancashire and Derby. Indeed, the success with BAE Systems resulted in the AMRC being funded to establish a £20 million R&D facility near Preston, on the Samlesbury Aerospace Enterprise Zone alongside BAE.

On the development of Factory 2050's smart workstation there might also be an argument that technologies originated by clever researchers at the AMRC, could be developed into spin-outs for Sheffield and the Don Valley Corridor.

Right out of spin-outs

Here the comparison between Factory 2050 and other robotics/automation centres around the world is instructive. Fraunhofer IPA, based in Stuttgart, clearly surpasses Factory 2050 in scale and breadth in AI-robotics with 50 years of institutional experience. DLR Robotics and Mechatronics Centre — is arguably the world's leading institution for fundamental aerospace robotics research. In the Fraunhofer case, an average of two spinouts a year are created from its R&D. If the AMRC's Factory 2050 were to have matched that number it would now have over 20 AI-robotic and digital start-up companies under its wing. Instead, it has none. What is needed to change this?

Perhaps the American experience provides an answer? Take the ARM Institute (Advanced Robotics for Manufacturing), based in Pittsburgh, Sheffield's sister city. It has close parallels with the mandate of the AMRC, but it also has important differences in governance that deserve closer scrutiny. Structured as a public-private partnership, ARM gives real power to the private sector in governance. By contrast the AMRC is university owned and controlled, hence a much less industrially-focused model.

Industry led advanced manufacturing R&D institutions

In the case of ARM, Brett B Lambert, its Chairman, is Managing Director of the Densmore Group a leading defence and security company. He had been appointed by President Obama as the deputy assistant secretary of Defense for Manufacturing and Industrial Base Policy. He reported to the President on all matters relating to the defence industrial base. A man, in other words, with huge domain experience in the field of defence, surrounded by other figures from industry, academia and government. Very much industry led.



The HVM Catapult network, by contrast, sees four of its six CEOs reporting to University Presidents and Vice Chancellors, often with little or no relevant domain experience. For instance, this role was filled by a Professor whose expertise was natural disasters and landslides. The Midlands based MTC, the only newly created HVM Catapult, puts the private sector in senior leadership roles. As does the North East based CPI, which also has a facility in Scotland.

The Electroimpact connection

When we do see industry taking a starring role, as America's Electroimpact has done with the AMRC both in Wales and in Sheffield, we see a significant uptick in performance and outcomes, for both parties. Electroimpact is not merely a technology provider — it is a co-researcher, lending its patented accuracy technology, its engineering expertise, and its production systems knowledge to the AMRC.

This relationship means Factory 2050 and AMRC Cymru have access to the technical DNA of the world's leading aerospace robotic production integrator, combining it with the AMRC's university-grade research in machine tool dynamics, metrology and materials science. This is a powerful combination, and it substantially strengthens the case that Factory 2050 occupies a position at the frontier of aerospace robotics that few institutions globally can match. How this translates to local impact, however, is less easy to measure.

An entrepreneurial centre of machine intelligence

The impact of the AMRC can also be seen at the University of Sheffield's Centre for Machine Intelligence. This is not a typical university AI centre. Its research portfolio is backed by over £260 million in manufacturing grants and it has strategic collaborations with more than 120 industrial partners including Boeing, Airbus and Rolls-Royce. It connects experts across 30 departments — from speech recognition and computational neuroscience to materials discovery and autonomous machining — with a deliberate mandate to turn research into deployable industrial systems.

Made Smarter: any material difference on the shop floor?

Alongside it, the £5 million Materials Made Smarter Research Centre is developing digital tools, sensors and data-driven manufacturing processes at the materials science frontier. In partnership with Siemens the university also operates a Digital Innovation Zone, designed to accelerate digitalisation across South Yorkshire's manufacturing base. Evidence of this happening on regional shop floors is thin on the ground as much of its focus is on training graduates. However, this should be a valuable route to developing closer partnerships with local SMEs and supply chain companies.

Closing the gap in a two-speed economy

The strength of Sheffield's research and spinout ecosystem makes the gap between the frontier firms and the poorer performing SME manufacturing base more, not less, frustrating — because the tools to close that gap exist. And they are on the doorstep.

The barriers are consistent and well-understood: unclear use cases, upfront cost, skills shortages and — most pervasively — a cultural gap between digital technology providers and the manufacturers they are trying to serve. Too many AI companies speak a language that factory managers don't recognise. Too many manufacturers assume that digitalisation means ripping out legacy machinery and starting again. Neither is true.

IntelliAM's model

IntelliAM's model — deep domain credibility first, AI second — is perhaps the clearest proof of concept for what those communication channels look like. The lesson for the wider ecosystem is direct: the digital community needs to learn to speak the language of manufacturing. And manufacturers need to recognise that the data their machines are already generating — right now, today — is the raw material of a productivity revolution they cannot afford to miss.

As IntelliAM co-founder and CEO Tom Clatyon expressed it: "The UK's existing industrial strengths across diverse high value-added manufacturing domains present an enormous untapped opportunity to dramatically accelerate economic growth."

The core intellectual proposition of IntelliAM is the fusion of condition-based monitoring — traditionally a hardware and inspection discipline — with machine learning models that can read, interpret and act on the data those monitoring systems generate. The company's platform ingests data from existing production line machines and sensors, processes it through its ML models, and returns actionable insights on equipment

A key technical differentiator is the adoption of Unified Namespace (UNS) architecture. Without a unified data layer, the billions of data points that Clayton refers to remain locked in incompatible systems. With it, the platform can ingest, contextualise and model data across entire manufacturing estates in real time, enabling the kind of fleet-level insights that individual machine monitoring cannot deliver.



"The UK's existing industrial strengths across diverse high value-added manufacturing domains present an enormous untapped opportunity to dramatically accelerate economic growth."

Tom Clatyon,
IntelliAM co-founder and CEO

AI and digital start-ups with a manufacturing pedigree or focus

M2i2	Recent university spinout that delivers predictive, physics-based modelling using AI. Involved in many simulation programmes for welding and metal processing.
OLO Robotics (formerly BOW)	Spun-out of the School of Computer Science in 2020, it has developed software that handles the complexities of robotics programming so that it allows developers to focus on innovation and creativity.
FourJaw Manufacturing Analytics	Early spinout from the AMRC, its machine monitoring platform enables a real-time, accurate view of machine performance and energy usage linked to sales and operations planning.
Productive Machines	Spun out from the AMRC, digital twin technology is used to simulate millions of machine settings to arrive at the optimum feed rate and spindle speeds setting for a given process prior to manufacturing.
Kauzalze	Recent spinout from the University; its software goes beyond traditional predictive maintenance to understand why failures happen rather than only identifying symptoms.
DigitalCNC	Recent spinout from the AMRC converts CAD drawings into machine-readable instruction to automate, stimulate, and control machinery like mills, lathes, and routers.
Twinality	New spinout from University improving human-robot interaction for cobots.

6. Clean energy – hydrogen, fission and fusion

Sheffield has ambitions to be a big-league player in the clean energy market. For its manufacturers to capitalise on this opportunity, however will require careful, and even radical new thinking. While the recent government investment in ITM Power is welcome, it is not enough.

Under the leadership of Graham Cooley, the company raised more than five times that from the private sector. Sufficient to enable his successor, Dennis Schulsz, to develop the critical manufacturing capability that has turned a brilliant clean energy technology into a marketable product.

ITM Power

While ITM Power Plc remains the biggest beast in the Sheffield clean energy jungle, there's a growing cluster of companies and research institutions muscling in on the action, as the graphic below illustrates. A major manufacturer of electrolysers for green hydrogen production, ITM is novel in that it spun out from research at Cambridge University more than 20 years ago, migrating to Sheffield to tap into its manufacturing expertise.

Record levels of funding

It was listed in 2004 and later moved its operations from Cambridge to Rotherham. During this time it succeeded in raising record funding as a European clean tech startup, enabling a move to its present gigawatt facility on Bessemer Park in Sheffield.

Most recently it secured £86 million investment from DESNZ and Great British Energy to establish a new 1 GW automated manufacturing line for their next-generation electrolyser stack, Chronos, nearby the AMRC. This will double its manufacturing output and ensure its position as one of the largest electrolyser manufacturers in Europe.

Greening heavy industry and aviation: from tech push to market

Green hydrogen remains central to decarbonising sectors that are difficult to electrify directly, including heavy industry and parts of aviation. That is why South Yorkshire's combination of electrolyser manufacturing, production facilities, industrial users and applied research matters so much. The region is no longer just hosting one flagship company, it is developing a broader hydrogen value chain spanning production technologies, storage and pressure systems, specialist components, industrial applications and transport.

Sheffield Forgemasters is an example of a company that could sit at the customer end of the hydrogen supply chain. They are part of the HYDESS project using green hydrogen to decarbonise steel reheat processing. Along with the AMRC, E.ON, and Chesterfield Special Cylinders they are exploring how hydrogen generation and its use can act as a replacement for natural gas in heavy industrial operations. That matters because one of the biggest question marks hanging over the commercial viability of hydrogen is demand: Forgemasters represents the kind of energy-intensive manufacturer that could help turn hydrogen from a technology push into a market pull.

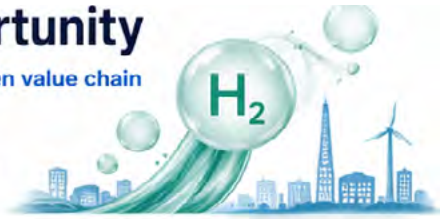
Taking the bus to hydrogen

Magtec sits at the transport end of the wider clean-mobility supply chain. The company is best known for its electric and hybrid drivetrains for trucks, buses, rail and defence vehicles, but it has also been involved in hydrogen-related heavy-transport feasibility work, including a UK-backed programme led by Arcola Energy to design a potential trial of hydrogen fuel cell trucks and associated refuelling infrastructure.

The Energy and Hydrogen Opportunity

How Sheffield and South Yorkshire are building a distinctive hydrogen value chain

Sheffield and South Yorkshire combine manufacturing depth, engineering capability, applied research and clean-energy infrastructure. Anchored by ITM Power and supported by a wider hydrogen ecosystem spanning production, storage, specialist components, industrial use and transport.



£86.5m
ITM Power equity-and-grant package in 2026 for Chronos

1GW
Automated manufacturing line for next-generation electrolyser stacks in Sheffield

£21m
Translational Energy Research Centre (TERC) and wider energy innovation capability

Hydrogen value chain
Production, storage, specialist components, industrial use and transport

Why South Yorkshire matters

- Lower operating costs
- Strong manufacturing capability
- Access to automation expertise
- Deep engineering talent pool
- Applied research + clean-energy infrastructure



Hydrogen ecosystem across the value chain

Production technologies
- ITM Power
- CPH2
- Lhyfe
- GeoPura
- Suiso
- WD HydroTech

→ **Storage & pressure systems**
- Chesterfield Special Cylinders
- Pressure Technologies

→ **Specialist components**
- AESSEAL

→ **Industrial applications**
- Sheffield Forgemasters

→ **Transport & mobility**
- Magtec

Research + innovation enablers
AMRC · University of Sheffield · TERC · Energy Innovation Centre

The region spans production technologies, storage, pressure systems, specialist components, industrial applications and transport.

Company spotlights

ITM POWER (Energy Storage | Clean Fuel)
- PEM green hydrogen electrolysers
- £86.5m package
- Chronos 1GW Sheffield line

CPH2
- Membrane-Free Electrolyser technology
- MFE110 factory acceptance complete in 2025
- MFE220 milestones next

Lhyfe
- Chose Sheffield in 2023
- cited exceptional supply-chain potential and strong industry connections
- project origination base for regional opportunities

GeoPura
- Commercial green hydrogen production in Doncaster
- £56m raised in 2023 after £36m round in 2022
- King's Award for Enterprise in Innovation, 2025

Suiso
- Microwave-driven methane pyrolysis
- £3m raised
- 2025 pilot with University of Sheffield

WD HydroTech
- Affordable modular hydrogen production and compression
- Founded 2021
- Innovate UK-backed breakthrough and demonstration project

CHESTERFIELD SPECIAL CYLINDERS
- High-pressure hydrogen storage
- bp Aberdeen Hydrogen Hub contract, 2025

PRESSURE TECHNOLOGIES
- Hydrogen-storage industrial platform
- rebranded in 2025 around cylinder and hydrogen-storage activities

AESSEAL
- Mechanical seals and support systems
- 175,000 sq ft Factory of the Future
- award winner in 2024

Sheffield Forgemasters
- Potential major industrial hydrogen user
- HYDESS / Blackburn Meadows work
- green hydrogen for steel reheat processing

MAGTEC
- Hydrogen transport systems relevance
- 65,000 sq ft South Yorkshire facility
- 150+ people

Distinctive regional proposition

Manufacturing depth
Established manufacturers and specialist suppliers across the hydrogen value chain.

Engineering capability
World-class engineering, automation expertise and a deep, skilled workforce.

Clean-energy infrastructure
Research strength, innovation centres and energy assets enabling clean hydrogen at scale.

A place where companies can build, store, move and use hydrogen at scale.

Magtec's move to a 65,000 sq ft South Yorkshire facility and its workforce of 150+ people underline its scale. Its relevance is that hydrogen in transport will depend not only on fuel production, but on vehicle-system integrators capable of bringing new propulsion technologies into commercial vehicles. In this architecture, the electric motor and drivetrain — Magtec's core specialism — is the foundation on which the hydrogen fuel cell sits as a range extender.

Driving of a defence dimension for hydrogen

It should also be noted that Magtec is developing hybrid electric drive systems for military logistics support vehicles, having presented its technology at a Future Armoured Vehicles Power Systems event — to provide a resilient government-funded base that will sustain the business through whatever pace of transition the civilian market ultimately delivers.

This offers a potential read-across to ITM Power's partnership with Rheinmetall to support its plans to build a network of decentralised green hydrogen-based e-fuel plants across Europe, as part of Rheinmetall's Giga PtX programme which plans to deploy several hundred e-fuel plants with around 50MW of electrolyser capacity.

For ITM Power, with its Sheffield Bessemer Park Gigafactory and its newly funded second 1GW automated manufacturing line, the Giga PtX programme represents a potentially sustained order pipeline from one of Europe's most well-capitalised defence primes. This could also play sweetly into the hands of near neighbour Magtec with its electric motors and drive trains for defence.

An embryonic hydrogen value chain.

With just a few miles separating ITM Power and Magtec, we can see the emergence of a hydrogen cluster. ITM Power produces and supplies on-site hydrogen generation systems using its PEM electrolysis technology to make green hydrogen for refuelling fuel cell electric vehicles — the very vehicle class that Magtec and Arcola's programmes are designed to serve.

Civil nuclear energy

The UK has a once-in-a-generation opportunity to reposition itself as a leader in the global nuclear manufacturing sector, particularly in the Small Modular Reactors (SMR) market. The Lower Don Valley could and must play a key role in this. But research for this report reveals there is a serious risk that these opportunities are already heading to Europe, America and Asia. Running in parallel with this, there is a similar risk to the emerging supply opportunity/challenge in the defence sector.

Home benefit or own goal?

The three most technically demanding, highest value-added subsystems of the Rolls-Royce SMR — turbines, nuclear steam generators, and critical pressure boundary components — could all be heading to suppliers in Germany, South Korea and Canada. This would be a systematic transfer of the highest-value nuclear manufacturing work to countries with longer nuclear manufacturing pedigrees — and in the Czech case, a country that is simultaneously a customer and, increasingly, a competitor for that manufacturing work. It makes commercial sense for Rolls-Royce SMR, but not for UK manufacturing. And especially not for the industries in the Don Valley Corridor.

Hard cash contracts to soft commitments

So called "localisation strategies" and "future manufacturing" are soft commitments. They do not specify what proportion of manufacturing value will be retained or built up in the UK, which components are in scope, or by what date UK suppliers need to be qualified to participate. The window in which

these decisions are made — during detailed design, before the first units are ordered — is finite. Once a supply chain is established, qualified, and delivering, it tends to stay established. The first-mover advantage in nuclear manufacturing is as real as it is in nuclear technology. Rolls-Royce SMR alone forecasts that a full SMR fleet could result in a contribution of up to £54 billion to the UK economy between 2025 and 2105, with 40,000 supply chain jobs created by 2050.

Fusion: the future of clean energy at Orgreave

The UKAEA's decision to establish a £20 million test bed facility in Rotherham was hugely influenced by the presence of the AMRC. Originally the plan had been to site the facility on the other side of the Parkway on land owned by the University of Sheffield. The protracted nature of the talks led to discussions with Harworth, landowner and developer of the old Orgreave site, where the core of the AMRC and the AMP is located. The agility shown by Harworth led quickly to the re-location of the proposed facility to the other side of the Parkway.

A key message for policy makers here is the importance of a shared vision for innovation development sites: a small and agile Harworth team quickly bought into the vision for the AMRC to be an anchor for the cluster and were willing to turn investors away who did not fit the carefully curated profile of the emerging cluster.

Fusion futures look local

On the clean energy front, albeit within a much longer time frame, the future of fusion is of planetary significance. Getting there, however, is a step-by-step process. A process the UKAEA is determined will involve local companies, brought together to grow an indigenous supply chain.

The UK Fusion Futures programme has a clear focus on SME development. Four companies are involved in the Programme, three of which are based in Sheffield (AML, Acantecs and Forg3D).

John Schofield, MD of Acantecs, which is featured further in this report, said: "This collaboration has offered a valuable opportunity to explore innovative applications of our existing technologies. By integrating Electroforming as a complementary method of canister manufacturing alongside our established PM HIP technology and processes, we have opened a new pathway for near-net shape product production. This advancement not only supports the evolving needs of future fusion technologies but also highlights the power of collaborative innovation."

For the UKAEA the message is clear: "These crucial Fusion Futures projects enhance industry capability within the growing UK fusion sector whilst supporting SMEs to work together on innovative solutions that will serve the local economy and wider fusion ecosystem now and in the future."

7. Health and MedTech

Among UK universities Sheffield is ranked #1 for medical engineering and imaging; it is the home to the Sheffield Institute for Translational Neuroscience (SITraN), which is a world leader in Motor Neurone Disease and Parkinson's research; it is particularly strong in imaging-AI and advanced diagnostic technologies like PET-MRI and photon-counting CT.

The University is generating a growing number of spinouts in related medical hardware fields. It has even attracted companies like Gold Standard Phantoms, a medical imaging spinout from UCL, to move to Sheffield.

University Health and MedTech Spin-outs

Nasalyser	Breath analyser for gastric cancer
NANOncolytes	Better targeted delivery of drugs
Exciting Instruments	Single molecule detection platform
Unicorn Biotechnologies	Automated hardware and software platforms for cell culture and biomanufacturing
Pyr Optik	Hand-held non-contact optical measurement
SleepCogni	Dynamic vibration for insomnia
Diurnal	Novel drug delivery
Metallobio	Antimicrobials for difficult to treat infections
Mitotype Precision Labs	Biological assays
PHAST	Replacing fossil-based plastic in the supply chain

A sense of excitement

Exciting Instruments has been mentioned already as one of the standout deep tech spinouts. The company's co-founder and CEO, Tim Craggs, engaged in a form of academic wanderlust, hopping between Cambridge, Yale, Oxford, St Andrews and Bristol before settling at the University of Sheffield's Department of Chemistry where the science that became Exciting Instruments was developed in close collaboration with colleagues, including Dr Alison Twelvetrees at Sheffield and Professor Mark Leake at the University of York.

The company's flagship product, the EI-FLEX, is a compact benchtop system that democratises single-molecule fluorescence spectroscopy — a technique previously confined to a handful of specialist laboratories worldwide, requiring expensive equipment and purpose-built facilities. Exciting Instruments puts the same capability on a bench, with software so accessible that non-specialists can run complex experiments and share live data in real time. Technological democracy in action.

Precision optics democratised

Today the instruments are assembled by hand at Pennine Five in Sheffield city centre. Most components are sourced from China, a supply chain decision that reflects the commercial realities of precision optics manufacturing but one that Craggs and his team are actively managing as the business scales. It is a detail that connects Exciting Instruments to a broader challenge facing the UK's hard tech sector: world-class science, assembled in Sheffield, dependent on a global component supply chain that carries its own strategic risks.

In November 2024 the company closed a £4 million seed round led by Northern Gritstone, with co-investors Empirical Ventures, Praetura Ventures and two serial entrepreneurs whose backing carries particular weight:

Bessemer Society regular, Stan Boland — who has founded, led and sold three semiconductor and AI startups — invested alongside Jonathan Milner, one of Cambridge's best known and successful life science serial entrepreneurs.

Boland's verdict was unambiguous: "Exciting Instruments has created compelling new products for a deep market need. Tim and Rob's energy is incredible, and I'm thrilled to play a part in helping them turn their amazing technology into the powerhouse of a huge business that will accelerate the pace of disease detection and drug development for the benefit of us all."

Speaking of energy, Craggs says, "We have to be on the front foot. We don't have the capital or people as London or the Golden Triangle, so we have to be efficient. We will do that by collaborating across stakeholders."

"We have to be on the front foot. We don't have the capital or people as London or the Golden Triangle, so we have to be efficient. We will do that by collaborating across stakeholders."

Tim Craggs,
CEO and co-founder, Exciting Instruments

Where health meets hardware

At the northern tip of the Don Valley Corridor is the Sheffield Olympic Legacy Park built in 1991 on a 35-acre brownfield site to host the World Student Games. What has grown on the site over the past decade is one of the most distinctive health innovation ecosystems in the UK — one that combines world-class applied research, diagnostic technology, preventative healthcare infrastructure and a growing pipeline of medtech spinouts in a single, purposefully designed location.

The anchor institution is Sheffield Hallam University's Advanced Wellbeing Research Centre (AWRC) inspired by, and created in collaboration with, the founders of the AMRC. Based in Attercliffe, the AWRC provides access to state-of-the-art, fully instrumented indoor and outdoor laboratories. Its strategic partners include Canon Medical Systems, Westfield Health and parkrun — an unusual combination that reflects the AWRC's distinctive positioning at the intersection of elite sport science, population health and consumer technology.

The most visible recent addition to the OLP is the Canon Medical Arena. With an integrated Medical Diagnostic Centre it provides health researchers access to advanced Canon Medical imaging systems including AI-assisted CT and MRI scanners, ultrasound, digital X-ray and fluoroscopy, plus consulting rooms and a minor surgery operating theatre. Canon Medical Arena is also a showcase for Canon Medical's advanced imaging products and an AI incubation hub for research and development, focusing on health screening and disease prevention.

Expanding preventative health care

Underpinning the clinical and commercial activity is a deepening research infrastructure. The £4 million South Yorkshire Digital Health Hub, based at the AWRC is led jointly by the University of Sheffield and Sheffield Hallam University, and supported by the EPSRC to transform how patients are treated across a region of 1.4 million people affected by high levels of disease and health inequality. Google has invested in the Hub as an industry partner — a signal that the digital health opportunity Sheffield is building is attracting serious commercial attention beyond the region.

Institutional architecture for MedTech to grow

What is taking shape at the Sheffield Olympic Legacy Park is not yet a medtech cluster of the scale of Cambridge or Edinburgh, but it has the institutional architecture — clinical, academic, manufacturing and commercial — that those clusters needed decades to assemble. The establishment of a National Centre for Child Health Technology will expand the MedTech cluster. The Child Health Tech accelerator, launched by Sheffield Children's NHS Foundation Trust in partnership with UP Ventures and Par Equity (now PXN), is already identifying the next generation of investable companies. Sheffield's medtech moment is approaching.



CHAPTER TWO:

From start-ups to scale ups

"Cities like Cambridge and Bristol are medium-sized but had strong engineering-based universities with specialisms. You have people with an idea, and they put the concentration of talent in a particular place. I can see that Sheffield has some of the same characteristics. The university is very strong in engineering and attracted some very talented 'profs' and researchers."

Stan Boland,
Founder and funder of deep tech firms, Quoted in Yorkshire Business Insider

Sheffield's Hard and Deep Tech Universe

Sheffield's Hard & Deep Tech companies tend to be funded by venture capital rather than debt, developing technologies that solve difficult problems or enable magnitudes higher performance. They serve therefore as enabling technologies, often embedded in a larger system, and which can be transformational.

A cluster that has a strong hard & deep tech community can innovate more rapidly and deliver solutions that keep it ahead of its competitors. Successive governments have recognised that innovation of this type is central to the success of a modern economy, especially to an advanced manufacturing cluster.

Deep tech requires fundamental engineering knowledge that relies on mathematics, physical sciences and computer sciences. Such disciplines provide the core capabilities behind valuable technologies such as machine learning, AI, cryptography, semiconductors and AR/VR.

What Bessemer Society regular, Stan Boland, is seeing in Sheffield is not a software cluster or a digital agency scene, but the early formation of a genuine cluster built on physics, materials science, and engineering — the kind of cluster that nurtured his own career in and around Cambridge.

The challenge for Sheffield is whether it can attract enough capital, retain the right talent, and build a robust hard and deep tech institutional ecosystem to reach the critical mass that converts good research into durable companies rather than seeing its best spinouts exit or relocate southward to the Golden Triangle.

It is worth recalling a December 2025 interview with Amadeus Capital Partners where Boland set out the philosophy underpinning his own investment approach. He argued that hard technical problems attract the best people, raise the bar for competitors, and create advantages that compound over time. He also argues that world-class engineering can scale in the UK when supported by decisive leadership, the right capital and thoughtful go-to-market design.

Boland's investment in Phlux Technology is a paradigm case of his thesis: a company tackling a genuinely hard materials science problem (antimony-based infrared sensors, unsolved for over two decades) that emerged from world-class specialist research at the University of Sheffield's III-V semiconductor research department. The problem is hard enough that the competitive moat, once the technology is commercialised, is substantial. The researchers involved spent over ten years on the underlying science.

Today Sheffield outfits like Phlux, Exciting Instruments, Aegiq, Sitehop and Opteran are the vanguard of this deep and hard tech movement. To help support it further, the Royal Academy of Engineering, which has enterprise hubs in six cities outside London, has established one in Sheffield with the express aim to "support local engineering and technology innovators and entrepreneurs with equity-free funding, smart and flexible training and mentoring from industry experts."

Sheffield's Deep and Hard Tech vanguard

- **Exciting Instruments** - A spin-out from spectroscopy collaboration at Sheffield University, the company has devised a method for single-molecule detection.
- **Aegiq** - Founded in 2019, is a photonic quantum computing specialist, utilising over 20 years of research in quantum photonics from the Department of Physics and Astronomy and the Department of Electronic and Electrical Engineering.
- **Tribosonics** - Founded in 2006, it has automated sensing technology for valves, seals and pumps to reduce friction-induced wear.
- **Phlux Technology** - Spun out in 2020, it has developed unique infrared sensing technologies for the communications industry.
- **M2i2** - Recent spinout that delivers predictive, physics-based modelling using AI. It works with Rolls-Royce, Airbus and GKN.
- **Opteran Technologies** - University spinout that develops 'natural intelligence' autonomy software for robots and drones by mimicking insect brains.
- **Cumulus Energy** - Startup founded in 2012, has developed a rechargeable copper/zinc battery technology for grid-scale power storage.
- **AmpliSi** - New spinout developing a porous silicon anode to replace graphite in Li-ion batteries
- **Pixel-Flo** - Recent spinout with a groundbreaking process for making micro-LEDs more manufacturable at mass-market price points.
- **SiteHop** - A Sheffield-based cyber startup that has developed security measures to protect against future types of cyber-attacks.

Quantum leap

Aegiq's journey is a good example of how Sheffield's innovation ecosystem can support a deep tech company from its research foundations through to commercial scale-up. The company emerged from the University's world-class quantum photonics and semiconductor expertise, and Technology Parks provided an important stepping stone from an academic environment to an independent commercial operation. The move allowed Aegiq to stay close to the University's research base, with its specialist facilities and talent pipeline, while building the infrastructure, customer relationships and operational capability needed to serve global markets.

With its recent move to a new headquarters facility nearby it enters the next phase of the journey. This was facilitated by financial support from the South Yorkshire Mayoral Combined Authority, which recognises the importance of helping high profile technology success stories to become established. As a result, it now has the larger space and facilities it needs to scale. The next step is to complete a Series A expansion plan which will enable the company to grow towards a team of around 65 people.

"The ambition", says its co-founder and CEO, Scott Dufferweil, "is to build globally competitive quantum computing systems from Sheffield, using the UK's strengths in photonics, compound semiconductors and advanced manufacturing to deliver real-world impact."

Tribology meets data

In several cases the founder is a post-doc, such as Dr Phil Harper, who founded the company in 2006 based on his PhD research in ultrasonics. Sheffield is a leading centre in this field and Harper one of its leading experts. The company combines

industrial sensing, tribology, and digital data measurement for companies that need to capture information about the performance of their assets. This is particularly relevant for large process plant, like chemical facilities and offshore oil and gas installations where costs of breakdown or malfunction are very high. Many of its customers are in the USA.

The company's main product, acoustoSENSE, is a pressure relief device (PRD), which helps pressure loss from valves and similar. With a total addressable market of 38 million PRD's in industrial applications, Tribosonics has a rare opportunity to scale the business globally.

Tribosonics carries out the design, development and testing of the required acoustic emissions sensors, electronics, firmware, software and data analytics. Component and sub-assembly manufacturing is done in-house in the early stages before scaling through supply chain partners.

Its CEO, Mark Wallace, finds Sheffield a great place for the business, and the UK in general with its rich technological heritage, but scaling early stage hard-tech businesses in the UK remains a problem. This, as he adds, includes "regional capital distortions and exit paths."

State of Phlux

Dr Ben White completed his PhD at Sheffield in 2016, researching semiconductor materials for photodetectors. Recognizing that traditional silicon-based sensors (used in LiDAR) had reached a performance plateau, he and his co-founders identified that by using Antimony-based materials the team could break the 20-year technology bottleneck in infrared sensing, with a long-term goal of becoming the "Nvidia of the sensor market". In 2020, he was awarded a Royal Academy of Engineering Enterprise Fellowship. This helped propel the venture which raised a Series A round in March 2025 of £9M led by BGF.

The rapid rise of deep and hard tech in Sheffield

According to data platform Dealroom, more than half of VC funding raised in Sheffield and the wider region since 2020 has gone to deep tech companies and around half of VC-backed companies are developing physical tech – hardware-software combinations used in manufacturing, logistics and agriculture. Deep tech has attracted £121 million in funding since 2022, making it the top-funded sector, with transportation, climate tech, energy, and fintech each exceeding £70 million.

The Region on the rise: South Yorkshire's pathway to scale report, published by TECH SY and Dealroom, notes that "physical tech and deep tech make up a greater share of South Yorkshire's funding compared with the UK overall, reflecting the region's strengths in advanced materials, engineering, and manufacturing-led innovation". It suggests Sheffield is "tracking at a similar enterprise value to where Helsinki and Pittsburgh were a decade ago", and that the region's tech strengths are "emerging."

Pittsburgh's sister act

A prize worth pursuing

A comparison with Pittsburgh is revealing as Sheffield and Pittsburgh have been 'sister cities' since 1980. Pittsburgh's stellar performance in advanced manufacturing and deep tech points the way to what the steel city could achieve. The roots are not to be found in access to capital, or talent, but in how a small, committed leadership team welded the region's diverse and often conflicting actors into embracing a steel-hard, collective commitment to changing their economic future built on core industrial strengths in engineering and science.

Pittsburgh today is a global powerhouse for robotics and autonomous systems. More than 250 advanced technology companies offering 7,300 high-impact jobs dwarfs Sheffield's hard tech footprint.

The familial resemblance between the two is striking. Both suffered the uncoupling of industrial staples. Steel and coal. Less obvious, but more worthy of scrutiny, is how Pittsburgh as a city united five metropolitan counties behind a collective vision and mission for the region. It wasn't easy. A study was commissioned which highlighted the lack of a shared vision of what the future should be. Consensus was missing.

Working together

There followed a wide consultation with numerous key players which resulted in the publication of The Greater Pittsburgh Region: Working Together to Compete Globally in 1994. Carnegie Mellon threw its considerable weight behind it. This identified five "clusters" or strengths which they would promote, including metals and biomedical technologies. A key message was to retain and expand existing businesses and attract new ones to the region

What followed was an immediate 100-day plan with clear deliverables. This created a sense of purpose from the start, underpinned by a long-term and continuing commitment to actionable growth interventions. We reference this in the context of what South Yorkshire is also setting out to do in its recently published Growth Plan.

Investment boom

Pittsburgh has come a long way since it published its 100-day plan. As of 2024, tech jobs comprised 5.2% of Pittsburgh's workforce, totalling nearly 60,000 positions, with the sector contributing an estimated $11.9 billion to the economy. Last year was the fourth straight year that Pittsburgh's tech ecosystem achieved a 10-figure funding total, demonstrating that the city's tech economy remains resilient through waves of macroeconomic challenges. The region brought in approximately $1.89 billion in funding in 2024, primarily driven by a high volume of corporate and venture capital deal flow at both early and later stages.

The striking takeaway is that Pittsburgh — a post-industrial city rebuilt on deep tech from an engineering base — has produced seven current unicorns, four in the last year alone, and has 20–30 companies valued above $100 million in the pipeline.

Regional comparison

South Yorkshire has a population of around 1.4 million, while the Pittsburgh metropolitan area is about 2.43 million. Both are large enough to sustain serious research, talent and company / spin-out generation and neither so large that scale alone explains success. Both regions share an industrial inheritance that can be built upon having a history of advanced manufacturing, engineering know-how, practical technical capability along with

a culture of solving hard real-world problems. But one thing does separate Pittsburgh: it has one of the top Ivy League universities, Carnegie Mellon University (CMU). This does distort comparisons, but also lays down a challenge to ask, what does good look like.

On the supply side of innovation, South Yorkshire is already much stronger than many, unfamiliar with the region, would guess.

TECH SY reports a South Yorkshire startup ecosystem valued at £3.1 billion, with 100+ VC-backed startups, and describes 2025 as a record year for early-stage and Series A investment in the region.

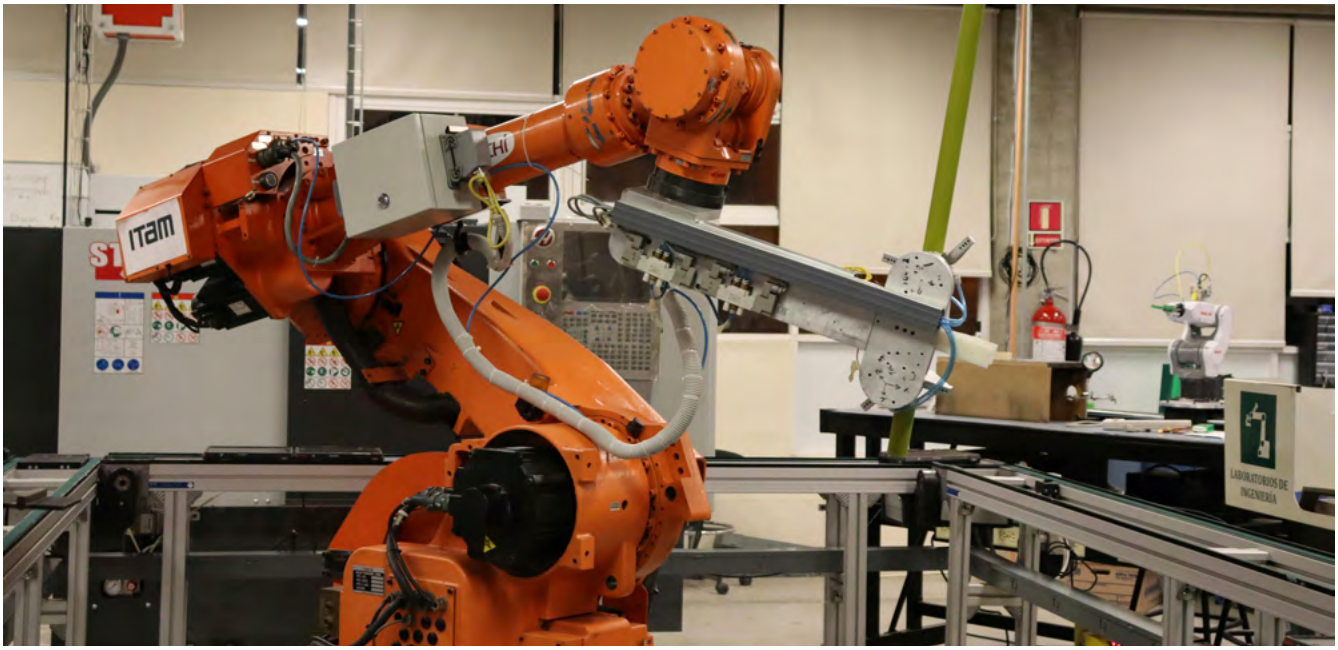
Pittsburgh's 2024 investment review saw 182 companies being funded and $999 million of VC investment in that year alone. These are not completely comparable as it is not clear how far CMU spinouts are included, but it is clear that Sheffield and South Yorkshire are no longer short of investor relevant companies. Sheffield already has a cluster of deep and hard tech startups and established companies, some of which are documented in this report, making the comparison with Pittsburgh credible rather than simply aspirational.

The university comparison points in a similar direction. The University of Sheffield reported 11 new spinouts in 2025. The University of Pittsburgh reported 15 new startup companies based on Pitt-developed IP in fiscal year 2025; while over the last decade, CMU has helped launch more than 400 startups which raised more than $7 billion in follow-up funding."

The investment capital difference

Where the divergence becomes clearest is in capital. South Yorkshire startups have raised more than £200 million since 2020, while Pittsburgh raised $999 million in 2024 alone (equivalent to £782 million using the ONS 2024 annual average exchange rate of £1 = $1.278).

The funding gap is large enough to show substantial headroom, but it's also close enough to show that Sheffield and South Yorkshire are already on the journey rather than starting from scratch. It only needs to accelerate the eco system that already exists and to scale and mature faster. This means enough repeat, large-scale capital to help them scale locally and consistently. This is a national issue for the UK but we see it here through a Sheffield lens.



The Sheffield start-up ecosystem

If Sheffield can move in the direction of building a self-sustaining ecosystem in which capital from successful investments and exits is recycled back into the region, as it does in Cambridge, local founder-investor networks will deepen and additional outside capital pulled in.

The impact of successful founders in an eco system cannot be overstated, and in particular if they stay and recycle their success as a serial entrepreneur or investor. This has underpinned Cambridge's success, driven by founders turned investors like Hermann Hauser, one of the UK's most successful serial entrepreneurs and co-founder of Amadeus Capital Partners.

The role of the University and its Technology Transfer Office (TTO) and how it works with the local VC and eco system is an important factor. In Cambridge this has occurred through the very tight relationship between the serial entrepreneurs who form Cambridge Angels and Cambridge Enterprise which nurtures and incubates startups and spinouts. Sheffield's TTO is doing well here, having published its Commercialisation Journey framework in 2022, which abandoned the practice of starting equity negotiations with aspiring spinouts as high as 50% to 60%. It now takes as little as 5% or 6% putting it much closer to Pittsburgh, and ahead of many UK universities.

Sheffield's backbone: the innovation spine

Another important part of an ecosystem is incubator and accelerator space. Here Cambridge is amply supplied, having opened the UK's first science park as long ago as 1973. Sheffield Technology Parks (a set of buildings in central Sheffield) was established 30 years ago. This shows an element of catching up, but it hasn't spawned anything close to a unicorn. Its founder, Tom Wolfenden, is now working with local government and the universities to develop the idea of an 'innovation spine' that creates lab, incubator and accelerator space in unused and under-used city centre buildings. It is slow work, but it is in the right direction.

"Sheffield is keen to encourage innovation-led businesses to locate in the city, to thrive and to scale. We've got two years' worth of funding, and a series of key deliverables to start thinking about what longer-term interventions look like. Over the next two years, we'll understand more about what the next five years hold."

Tom Wolfenden,
CEO, Sheffield Technology Parks

It is also significant that Aegiq, which was a recent tenant of Technology Parks, moved into larger space nearby, as this is how physical clustering occurs. Aegiq is the only UK quantum company operating outside the Golden Triangle, and one of Sheffield's potential stars. By remaining near to Sheffield Technology Parks, it helps the area become better known as a technology innovation hub. Similarly, one of Sheffield's most exciting tech companies, Razor, operates from repurposed industrial buildings nearby.

Pennine Five: Sheffield's largest and leading city centre innovation campus

As part of the Innovation Spine, the Mayoralty is keen to create a startup hub in the former 1970s headquarters of HSBC, now repurposed as Pennine Five. Already several of the companies featured in this report are tenants, including Exciting Instruments, Phlux Technology and FourJaw. Martin McKervey, a director of AESSEAL, states that the aim is to become Sheffield's largest and leading city centre innovation campus: "a £50+ million private investment reshaping an outdated, unwelcoming site into a vibrant hub for research, enterprise, skills and place making."

Coordination & Promotion

The promotion of the Innovation Spine will be helped by bringing together key elements of the incubator eco system and the startup community. There are now several entrepreneur networks operating in Sheffield, so access to these potential users of incubation space is not lacking. Indeed, Sheffield can congratulate itself on how well networked it is, starting with the 400-year old livery company, the Cutlers, which has been the pre-eminent convenor of the manufacturing industry in Sheffield over numerous generations.



Learning from Cambridge

Knowledge sharing

Cambridge is the front-runner in the UK for all forms of technology networking going well back to the 1990s. Cambridge Wireless and Cambridge Cleantech are both pre-eminent in their fields and their membership now extends well beyond Cambridge, such is their influence. Smaller business networks have come and gone over the years as well. Library House in its day was a far-sighted attempt by local serial entrepreneurs and angels to corral all of the information about exciting startups and spinouts in the region in order to match opportunities for investment. It served some of the functions of a club, with an actual library, information terminals, coffee, and a nearby railway station, with King's Cross, London a little over an hour away. One of the advantages Cambridge enjoys relative to Sheffield.

Manchester X Cambridge partnership

It is not impossible, however, to build stronger linkages with Cambridge. Last year a mayoral visit by Andy Burnham of the Greater Manchester Combined Authority, resulted in the formation of the Manchester X Cambridge Partnership. Burnham enthused, not just about the level of new buildings on the science parks (a favourite in Manchester) but also the can-do spirit. Arguably this fits Manchester's culture better, but Sheffield should take note.

Sheffield University's success in spinning out high quality companies has attracted Cambridge investors associated with the Cambridge Angel network. The companies they have backed, like Phlux Technology, Exciting Instruments and Pixel-Flo, have world leading technology, but they miss the benefits of having the support of an eco-system like Cambridge. These investors help bridge the gap.

Northern Gritstone

Interaction with the Golden Triangle has also improved since the formation of the Northern Gritstone Fund in 2022, designed to invest in spinouts from Manchester, Leeds and Sheffield universities. In particular, the two leading spinout funds in Cambridge and Oxford - Cambridge Innovation Capital and Oxford Science Enterprises - are both anchor investors in the fund.

A knock on from this is that Cambridge-based DeepTech Labs formed a partnership with Northern Gritsone, called NG Studios to provide a joint mentoring programme for Gritsone's portfolio companies. The first demo day in 2024 featured Sheffield companies, BOW Robotics (now OLO Robotics), Evolutor, and Exciting Instruments.

The Cambridge consultancies

What is not commonly understood about Cambridge is the important role played by the Cambridge consultancies. There are a dozen or so significant ones. The largest, like Cambridge Consultants, Sagentia and TTP, employ well over 2000 engineers and scientists between them. They have also spun-out at least 50 companies in the last 20 years which have fed into and benefited from the Cambridge eco system.

In Sheffield, there is the rare example of such a Cambridge-style consultancy that is making a name for itself, Amodo. We have highlighted this in the innovators section [page 51] because it could become a force for change in the same way as the Cambridge consultancies.

The University as a talent enabler

The challenge for any cluster to succeed is to build depth – companies, talent, knowhow and a level of excitement. Amodo helps to raise that bar. The University also plays an important role in nurturing the next generation of talent.

An important starting point is the encouragement given to academics to gain credit for other activities besides publishing papers, such as launching a spinout. A good example is Professor Chee Hing Tan, the Scientific co-founder of Phlux Technology.

Before the University simplified the spinout process, he had tried at least twice to spin out companies but had given up due to bureaucracy and costs. He is now highly enthused. Another example is Professor James Marshall in the Computer Science Department, who co-founded Opteran Technologies in 2020, and is the Director of the newly established Centre for Machine Intelligence. Opteran has raised over £10M of seed funding from investors including IQ Capital in Cambridge.

The link with Arm Sheffield

The encouragement of this entrepreneurial mindset helped attract John Goodenough to leave Arm and return to the University as Professor of Microelectronic Systems. He had earned his PhD at Sheffield, stayed on as a lecturer and then set up his own consultancy, which he sold to Arm in 2000. Goodenough remained at Arm for over 20 years, rising to a senior VP position, during which period Arm's Sheffield offices have grown from around 12 people to 250.

Goodenough therefore is in the rare position for a university professor of having spent most of his career at the UK's leading technology company based both in Cambridge and Silicon Valley. With Arm next door as a major employer, there are opportunities for graduates of his courses to remain in the region.

To take advantage of these assets Goodenough is planning to create a centre of excellence in microelectronics that will propel Sheffield into the top echelon of microelectronic design and development in the UK and beyond. He also plans to mobilise a future manufacturing capability for advanced packaging of electronic systems which can serve niche markets like defence. His plans are helped by the fact that Sheffield hosts the UK's National Epitaxy Centre for III-V Semiconductor research accessible to both academic and industry researchers. Spin-outs related to this include:

- **Infinite Design**
  (chip designs; now part of ARM)
- **Phasefocus**
  (imaging instruments; now part of Bruker)
- **Phlux Technology**
  (infrared avalanche photodiode)
- **AegiQ** (single photon light source)
- **PyrOptik**
  (quantitative temperature measurement)
- **Pixel~Flo** (microLED manufacturing).

Referring back to the factors which were important for Cambridge's success, we see in the above the elements of timing such as returning to the University when the environment for spinouts has improved so much; the key contribution an individual can make to change the culture and raise the bar; and the impact that this is already having in terms of spinouts. When combined with other positive signals we have noted it gives hope that the momentum will only accelerate from here.

Capital is the key

There is now more locally-available capital for Sheffield startups and scale ups. Mercia has a local office; Par Equity, headquartered in Edinburgh, opened its first office outside Scotland in Sheffield in 2023 before merging last year with northwest fund manager, Praetura, to become PXN; and the most recent arrival is Foresight, which manages the South Yorkshire Growth Equity Fund. Sheffield also boasts its own locally-grown private equity firm, Yorkshire AI plc, which plans to capitalize on opportunities in AI by taking advantage of its regional knowledge.

From coal mining to data mining

One company however that has built itself up without venture capital is 53North, an engineering consultancy established in 2013 and led by Tom Clayton. It harnessed its deep engineering domain knowledge to fast evolving AI-driven, data-led predictive maintenance analysis to expand into numerous high value markets.

Keen to exploit this opportunity Clayton looked for a fast and secure route to finance the new business. This led to the decision to list on the Aquis Exchange in 2025 as IntelliAM AI plc.

Tom argues that smart companies like IntelliAM, with a delivery track record, proof of value and a prestigious customer base are much better positioned than university spinouts with no product and no customers, to attract investment and be the agents of regional economic growth. A path others in the region could profitably follow.

Exploit a strong track record

"We all know the public markets are cautious, risk averse creatures, but if you have a strong track record, an expanding customer base and make a compelling business case with a clear return on investment, London will listen and even back you. Just as London has invested in steel and coal in the past."

He encourages others saying, "If you've got the characteristics I talked about, use the public markets. The reality is, you've got all the domain expertise, you've got the product, you've got the customers, you've got the track history, you're the one doing the pitches, the investors are the ones putting the money in, the nominated advisor (Nomad) is taking it to market and the legal team does the legals. All you need is the Nomad – picked from a short list of three – and a lawyer. Job done."

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Tom Clayton,
IntelliAM's Chief Executive

CHAPTER THREE:

Meet the innovators

"Sheffield inspires.
Always has.
Always will."

Sheffield City Council,
New mission statement

AESSEAL

A manufacturer that thinks like a service business. And wins like one.

In 1979, a 25-year-old County Down economist named Chris Rea arrived in Rotherham and purchased a struggling distributor called Aurora Engineers Supplies — ten staff, £400,000 turnover. Today AESSEAL employs over 2,000 people across108 locations in over 100 countries, and generates revenue of over £280 million in revenue , with more than 80% coming from outside the UK. It is the world's fourth-largest mechanical seal manufacturer and the last remaining one in Britain.

A Service Business That Happens to Manufacture

Mechanical seals are the precision-engineered components that keep pumps and rotating equipment from leaking or failing. They are critical in oil refineries, chemical plants, pharmaceuticals, water treatment and North Sea platforms. When one fails, the consequences range from costly downtime to environmental catastrophe.

It is here that Rea's service philosophy is most vivid. When a North Sea operator calls with a seal emergency, AESSEAL delivers a replacement within 24 hours — by helicopter if necessary. The operator pays a significant premium, but the arithmetic is simple: closing a platform for even one-hour costs far more.

Three hundred and fifty technically qualified sales engineers, deployed globally, are not order-takers. They are problem-solvers embedded in their customers' operations.

Seals are certified into industrial processes through painstaking validation cycles. Once qualified they stay, and trust — once earned — compounds over decades. AESSEAL has spent 45 years earning it, one solved problem at a time.

The Over-Investor

Rea's peers have repeatedly told him he has 'vastly over-invested' in AESSEAL. He considers it a compliment.

That philosophy has built extraordinary resilience — near-continuous growth across four decades, through three recessions, a pandemic and post-Brexit turbulence. In 2023 it took physical form in the Factory of the Future, already shortlisted for the RIBA Yorkshire Awards 2025: net zero in operation, advanced robotics, and a one-kilometre Tree Walk around the perimeter where a wetlands area supports local wildlife and classrooms welcome school visits. This is manufacturing conceived as a civic act, not merely a commercial one.

"My apprenticeship was a steppingstone. It gave me my first real opportunity in the world of work, and the foot in the door I needed to build a career."

Ava Jones,
Head of Marketing, AESSEAL

Apprenticeships and the Next Generation

AESSEAL's apprenticeship programme is widely regarded as the gold standard in British manufacturing — ranked the number one manufacturing apprentice employer in both the Sunday Times and Department for Education tables. As of January 2026, 10% of the entire workforce are current apprentices; 323 have been recruited since 2017, around 20 each year.

What distinguishes the programme is its philosophy. Selection does not begin with a CV. Learning and Development Manager Darren Jones explains: "Our selection events include group work, individual tasks and a short interview. This is about measuring the values of the young person against the values of the business." Places are decided by departmental managers as part of succession planning — because they will be responsible for those apprentices. Ava Jones started aged 17 as a Business Administration apprentice. Eight years later she is Head of Marketing:

"My apprenticeship was a steppingstone. It gave me my first real opportunity in the world of work, and the foot in the door I needed to build a career." — Ava Jones, Head of Marketing, AESSEAL

That same commitment to nurturing talent reaches into the wider South Yorkshire business community. AESSEAL is working with and supporting Innovation in Action, a programme connecting regional SME manufacturers with technology experts, industry guides, mentors and hands-on trials [See Page 54] . Non-Executive Director Martin McKervey, who is part of the team delivering the programme, embodies the same instinct in the company's work with schools:

"Five- to fifteen-year-olds visit our Tree Walk — a one-kilometre walk around the Factory for the Future. We have classrooms and outdoor meeting areas — supporting young people and the health and wellbeing of our employees."

Forty-Five Years of Honours

Sixteen Queen's and King's Awards across the group — the most recent a King's Award for Sustainable Development — testify to both manufacturing excellence and genuine environmental commitment. Chris Rea has been appointed CBE, made an Honorary Fellow of the Institution of Mechanical Engineers (one of only around 200 since 1866), and named Net Zero Champion at the Engineering and Manufacturing Awards. AVT Reliability, the group's IoT condition-monitoring subsidiary, has passed £20 million in annual turnover — proof that the future of sealing lies not only in the seal itself but in the digital intelligence wrapped around it.

"Five- to fifteen-year-olds visit our Tree Walk — a one-kilometre walk around the Factory for the Future. We have classrooms and outdoor meeting areas — supporting young people and the health and wellbeing of our employees."

Martin McKervey,
Non-Executive Director, AESSEAL

AESSEAL at a glance:

- £280M Annual Group Turnover
- 2,000+ employees worldwide
- 108 locations in over 100 countries
- World's 4th largest mechanical seal manufacturer Global market position
- 90% made in UK manufacturing share
- Went beyond Net Zero for the fourth year running
- 16 Queen's / King's Awards
- 323 Apprentices recruited since 2017
- 10% Workforce that are apprentices (Jan 2026)
- #1 in manufacturing UK apprentice employer ranking (Sunday Times 2025) and Department for Education's Annual Top 100 Rankings
- 13th consecutive gold accolade in the Royal Society for the Prevention of Accidents' 70th Anniversary Awards 2025



AMODO DESIGN

Cambridge consultancy ethos comes to Sheffield

When not topping up his 'ambition' with colleagues at DeepMind in London, Amodo Design co-founder, Tom Milton, is on a mission to replicate the success of Cambridge Consultants in the North.

It's early days, but there's little doubt that the full suite Sheffield engineering team is having a big impact.

Along with DeepMind, Amodo is one of just nine tech firms ARIA has appointed as "Activation Partners'. The first cohort of Activation Partners feature five US organisations — including two world-class deep-tech investors and the non-profit incubator, Convergent Research, based in Cambridge, Massachusetts. In support of Milton's ambitions, a clutch of Cambridge, UK, outfits with a focus on neuroscience are also on the ARIA moonshot launch pad.

So, what makes Milton moonshot material? ARIA knew that one of the main bottlenecks to exploring higher-variance ideas in deeply technical fields would be hardware constraints. Its latest report explains the challenges and heaps praise on Amodo's solutions.

"Often, the most ambitious scientific hypotheses require bespoke equipment that doesn't exist. We selected Amodo Design as a founding Activation Partner to test if providing world-class engineering expertise could remove these blockers, allowing researchers to explore a greater volume and more wide-ranging ideas than traditional lab setups allow.

"Amodo's work with ARIA's research teams has exceeded our expectations: they're currently supporting 32 ARIA-funded teams across a huge breadth of domains from robotics, high-throughput data pipelines, extreme environmental sensors, manufacturing assistance and clinical test equipment. This is proving that engineering is not just an 'add-on,' but a primary driver of scientific quality and speed."

In ARIA's Robot Dexterity programme, Amodo developed specialised hardware that accelerated research timelines by 6-12 months. With Danish materials scientist Guggi Kofod, Amodo designed and built a new control PCB and prototyped six alternative measurement carriages.

The resulting device allowed Guggi to go

"Amodo's work with ARIA's research teams has exceeded our expectations: they're proving that engineering is not just an 'add-on,' but a primary driver of scientific quality and speed."

ARIA Annual Report

from hypothesis to tangible data in just 15 minutes — and they started useful experiments several months earlier than would otherwise have been possible.

In three short years Amodo has propelled itself onto a global stage where the principal actors are the emerging tech stars from American universities and institutions who dominate the world rankings. It is no surprise that the firm is hiring talent: and doubtless paying top prices to get the top brains (there is no Sheffield discount here, if you want to be Cambridge you pay Cambridge prices).

The key for Amodo now is to create a commercial flywheel: attracting talented engineers through the diversity of the work and the culture (which includes the bouldering and climbing scene in the nearby Peak District); diverse client projects that generate IP and technology insights across domains; and crystallising the best of these into spinout opportunities.

Successful spinouts attract more talent and investment back to the cluster; and the cluster's density makes it easier to hire, collaborate, and raise money.

The Cambridge consultancies have had decades to build their spinout track record and IP portfolios. Amodo has not yet developed the spinout flywheel.

Its partnership with ARIA, however, provides Amodo with an accelerated pathway to advanced research opportunities.

The Cambridge model was also built on client fees from large corporations; Amodo's current public-facing work is heavily skewed toward government-funded R&D (ARIA) and mission-driven projects in biosecurity and AI hardware, which is a different commercial base. But that could change very quickly.

Amodo is one of ARIA's nine Activation Partners. The company's pitch is simple: scientific breakthroughs often require tools that don't yet exist. We develop these new tools - enabling scientific discovery by inventing new hardware.

GRIPPLE

Founded in Sheffield. Owned by its employees. Sold around the world.

Hugh Facey founded Gripple in 1989 with a mission to accomplish. Before launching the company, he had run Estate Wire, where conversations with farmers first sparked his idea for a device to join and tension wire quickly and reliably. When the commercial opportunity became clear he needed a standalone venture — but selling Estate Wire troubled him: the people who had built it would get nothing. That discomfort became the founding impulse of everything Gripple stands for.

From a disused Sheffield furniture factory, the wire-joining device was commercialised in 1988 and proved so distinctive that 'Gripple' — like Hoover or Velcro — became the generic term for a whole category. From that single invention has grown a £135 million business, exporting 85% of its output to countries all around the world and producing over 30 million devices a year across 30,000 products.

Since 2011, the company has been 100% employee-owned under a structure called GLIDE — Growth Led Innovation Driven Employee Company.

After twelve months, every employee must buy a minimum of £1,000 of shares. No gift, no option scheme: you put your own brass in, or you don't stay. The Custodian Charter bakes further obligations into the company's DNA: 20% of revenue into new product development, and 25% of turnover from products less than four years old. When a new M&E suspension product called UniGrip was needed, concept-to-launch took under a year — unthinkable in a shareholder-driven structure.

The effect is felt on the shop floor. Team leader Liz Lake: "I've found a new confidence in myself, because my voice is listened to." Gripple makes almost everything itself — die castings, injection mouldings, steel pressings — a vertical integration that keeps quality close and Sheffield firmly at the heart of all innovation. Alongside John Lewis Partnership, Arup and Mott MacDonald, it is a Principal Partner of the Employee Ownership Association's UK Growth Strategy.

GRIPPLE at a glance:



- Gripple at a Glance
- £135m Annual turnover
- 85% to 80 countries Export share
- 30,000+ Products in range
- 100% employee-owned since 2011 Ownership
- 20% of revenue (Custodian Charter) R&D

INNOVATION IN ACTION

A collaborative initiative, from the long tail to new frontiers.

Innovation in Action is a private sector led initiative, focused on making practical solutions accessible to small and medium sized manufacturers (SMEs) who often face barriers to innovation adoption. Time, cost and risk often stand in the way of trying something new, particularly for SMEs already operating under pressure. Convened with seed-corn funding and support from Sheffield City Council, South Yorkshire Mayoral Combined Authority (SYMCA) and the South Yorkshire Innovation Programme (SYIP), it has had a significant beneficial impact on its first cohort of SME manufacturers out of all proportion to the public investment.

Rather than leading with technology, Innovation in Action begins with the day-to-day challenges manufacturers actually face and then deploys focused practical solutions – a series of 3 to 4 month supported tech trials with expert guidance, combined with collaborative monthly workshops with other manufacturers to share best practice of what works.

What began as a pilot innovation challenge to reduce energy costs, has rapidly developed into a mission to drive productivity improvements on the shop floor, enhance business competitiveness, increase sales and unlock innovation-enabled growth. The latest Productivity Challenge brought together 15 South Yorkshire SME Manufacturers, 10 regional Tech experts and 13 leading business and industry mentors.

The programme is coordinated and delivered by public and private partners; Richard Bland, Innovation Growth Advisor, Business Sheffield, Gordon Macrae, innovation consultant, makingwayves.org, Andy Sorsby Business Growth Specialist, SYMCA and Martin McKervey from AESSEAL.

£83 billion boost to manufacturing GVA over the next decade

According to a recent MakeUK/Civitas report there are 250,000 active manufacturing businesses in the UK, with 99% of these micro and SME companies – many of these SMEs are often described as the so-called “long tail” of firms holding back the UK’s productivity performance. Almost two-thirds (64%) of these have unrealised potential and ambition to grow into large businesses, which could deliver £83 billion to manufacturing GVA over the next decade.

Innovation in Action goes some way to address the gap by sharpening Sheffield and South Yorkshire’s manufacturing capabilities, enabling them to cut a bigger slice of that £83 billion cake. Take EE Ingleton Engineering, a precision Sheffield manufacturer for over 50 years, keen to expand its business, they participated in both the pilot challenge looking at ways to reduce energy costs and the recent productivity challenge.

Following Innovation in Action support, EE Ingleton now plans to introduce robotics, deploy AI tools within sales and

marketing, and adopt a range of digital systems, while access to relevant funding is enabling older machinery to be replaced by more energy efficient alternatives, alongside mentoring that has strengthened relationships with fellow manufacturers, and is opening opportunities to diversify the business into new and growing markets.

The collective feedback from the first group revealed several common themes:

- Businesses like learning best from other businesses.
- Mentors accelerate decision-making and confidence.
- Local tech providers improve their own products by working on real issues with manufacturers.
- Innovation works best when it is practical and business led.
- Small trials are better than big projects.
- Data is critical to inform improvement.
- Growth must remain the end goal.

A great model with opportunities to scale

There is a strong case — and growing appetite among participants — for this programme to be expanded into one that retains the peer-to-peer, practitioner-led character of Innovation in Action but scales its reach, deepens its connection to the region's research and digital infrastructure, and links directly to the funding mechanisms of the Industrial Strategy.

Productivity gains from clustering do not flow automatically — they require the social infrastructure of knowledge sharing, trusted intermediaries and common platforms that allow innovation generated at the frontier to diffuse through the broader base. The model exists. What is needed is the institutional ambition — and resource — to take it to the next level. Innovation in Action provides that network. The gap it fills is real and well-evidenced. The prize is a bigger slice of that £83 billion boost to UK GVA. And a long tail that is wagging with delight (see recommendations).

"Here is a great model of something that works - we (South Yorkshire partners) are really keen to build on the momentum and look at how we can support the next wave, to elevate it and make it work at scale across the region. This programme shows what is possible when manufacturers, technology providers and mentors work together to drive innovation and productivity"

Chris Baker,
SYIP and Head of Knowledge Exchange at Sheffield Hallam University

Mentors

- Victoria Clarke-Brown, Kitlocker
- Andy Sorsby, SYMCA
- Gareth Barker, Sheffield Forgemasters
- Andy Richardson, Special Melted Products
- Richard Gould, Virtual Manufacturing
- Tom Helliwell, BAE Systems
- Rob Ward, Digital CNC
- Mike Maddock, MAMC Ltd
- Shirley Harrison, AMRC
- Paula Carter, Inicio Success Ltd
- Michael Carter, Vulcan Engineering
- Marie Cooper, CBE+
- Martin Baker, Gripple

Manufacturers:

- ASCENT Safety Fabrications
- Samual Staniforth
- HD Sports
- Hallam Castings
- Chesterfield Special Cylinders
- Goral Shoes
- Cobra Sport
- EE Ingleton Engineering
- Mayflower Engineering
- Colson X-Cel
- S4S Dental Laboratory
- Eroda Tools
- SNA Europe

Tech Solution Partners

- Promptable
- NexCAD
- A3L
- Manualy
- Track my Machines
- Razor DataQI
- Virtual Manufacturing
- Kristina Rutherford Consulting
- Digital CNC
- The Curve

INTELLIAM

From coal mining to data mining.

IntelliAM's South Yorkshire headquarters, on a modern South Yorkshire industrial estate, is built on the site of the Dinnington Main Colliery, a pit that closed in 1992 with the loss of a thousand jobs. The irony of its revival as a hot bed of industrial Artificial Intelligence is not lost on Tom Clayton, IntelliAM's chief executive: "We are actually sitting here basically at the pit top of Dinnington mine. Now we are still using manufacturing knowledge but rather than mining coal, we are mining data. Just as coal powered industry in the past, we are powering the industries of the future."

It is a line that captures something important about what IntelliAM actually is — not a tech company that happens to work in manufacturing, but a manufacturing company that has made a decisive move into artificial intelligence and machine learning, armed with decades of deep domain expertise that no Silicon Valley startup could replicate overnight.

The genesis of IntelliAM is one of the more novel corporate origin stories in UK technology. It was founded in 2023, tapping into the manufacturing expertise of 53 Degrees North (53North), an asset care company that was established more than a decade earlier and now acts as IntelliAM's engineering consultancy division.

Clayton had built 53North into a recognised name in maintenance engineering and asset management, serving some of the world's largest food and beverage manufacturers. But,over time, he and co-founder Keith Smith arrived at a conviction that the data flowing through production lines — almost all of it ignored — held far more value than the engineering services built around managing the machines that generated it.

Clayton explained the logic to The Yorkshire Post: "53North was primarily focused on the reliability of equipment. Myself and Keith shared a bit of a dream about using data to drive improvement. Inside every machine, every production line, there are millions of data points that are currently redundant and just get lost. We knew if we could harness this data, we could drive not just reliability but actually productivity which is what the nation really needs. We are not talking about one or two per cent, we are talking about quite a large increase in productivity."





The IPO: A deliberate signal

Rather than simply pivoting 53North, Clayton structured a new entity around the AI platform giving IntelliAM the rare combination of software intelligence and boots-on-the-floor operational credibility.

IntelliAM floated on the Aquis Stock Exchange Growth Market in July 2024, raising more than £5 million at a market capitalisation of approximately £17.9 million. For Clayton, the IPO was as much a statement of intent as a capital-raising exercise. "We're building a world leader in AI and manufacturing productivity leveraging our rich engineering heritage in South Yorkshire. Our goal is to revolutionise global manufacturing, boosting output and returning prosperity to our industrial heartlands. By combining our deep manufacturing expertise with cutting-edge AI, we're creating high-value jobs and demonstrating that AI can be a force for job creation and regional economic rebalancing."

When challenged about the wisdom of building a technology company outside the established tech clusters, Clayton turned the question on its head. "My first question from the post-IPO was why would you start a technology company in South Yorkshire? The irony is it could have only started here because that is where the manufacturing heartland is."

The American footprint

IntelliAM's move into the United States has been carefully staged and is now accelerating. The hardware partnership with Connection Technology Center (CTC), headquartered in New York — which designs and manufactures industrial condition monitoring hardware - provides IntelliAM with dual-branded sensing capability that closes a critical data gap in the US market.

The Bigger Argument

Clayton is not shy about articulating the broader industrial and political significance of what IntelliAM is attempting. Writing in The Yorkshire Post, he argued that IntelliAM's technology "can eat into the $1.5 trillion annual cost of unplanned downtime" globally, and that "AI can be a tool for job creation, not job destruction, and applied to manufacturing can help rebalance the country in a way that political slogans cannot."

On what distinguishes IntelliAM from AI ventures with no manufacturing roots, he has been equally direct: "The UK is not going to compete with Silicon Valley and China on large language models. But if we use the domain expertise in our region, we can create models with a massive advantage and this type of machine learning can make a massive difference in terms of employment, driving productivity and providing services globally. That is our belief and that is why we listed and raised the money to drive out and do that."

IntelliAM at a glance:



- Founded in 2013
- 64 employees based in Dinnington, South Yorkshire
- £5 million via stock market listing. July 2024.
- Global exporter, selling to 200+ manufacturers, especially in the fast-moving consumer goods sector in Europe, Asia and America.
- 25% of the world's top FMCG companies are IntelliAM clients.

RAZOR

Where Digital Meets Manufacturing

There is a particular kind of energy that Jamie Hinton brings into a room — part engineer, part evangelist, part stand-up comedian. The CEO and co-founder of Razor has been on a one-man mission to convince Sheffield's manufacturers that digital technology is not a threat to what they do, but a supercharger for it.

He started building that case when he founded the company with Steve Trotter in Sheffield in 2009, and he has not let up since.

Razor grew from a back-bedroom consultancy into a 60-strong team of software engineers, data scientists, UX designers and AI specialists, with offices in Sheffield and Leeds and clients spanning from local SMEs to FTSE 100 companies including Rolls-Royce, Total Energies and Virgin Trains.

In January 2024 the company was acquired by Fulcrum IT Partners, a Canadian technology group with operations across the UK, Canada and the US. The acquisition was the turning point Hinton had been working towards: Razor was evolving from a bespoke consultancy into a product business, with its own proprietary platforms for manufacturing analytics and AI — tools that can be deployed at scale rather than built from scratch for each client.

The AMRC partnership: two horses pulling in the same direction

No relationship has shaped Razor's manufacturing credentials more than its decade-long partnership with the AMRC. What began as a chance introduction through an Innovate UK speed dating event became a formal collaboration spanning three distinct modes: Razor building products for the AMRC, Razor working alongside AMRC researchers on joint customer projects, and the two organisations co-commercialising intellectual property together. The common thread is a shared conviction that applied digital technology — not research sitting on a shelf — is what transforms manufacturing.

"Together we are an enabler in taking incredible research and making it real in industry. We can really accelerate

"Together we are an enabler in taking incredible research and making it real in industry. We can really accelerate that and make it stick. All the stars are aligning — Razor and the AMRC are in the same vector, pulling the same way. Two horses are far stronger together than pulling on their own,"

Jamie Hinton,
CEO and co-founder of Razor

that and make it stick. All the stars are aligning — Razor and the AMRC are in the same vector, pulling the same way. Two horses are far stronger together than pulling on their own," says Hinton.

That partnership extended to Sheffield Forgemasters, the 250-year-old steel giant now owned by the Ministry of Defence and undergoing a £1.4 billion recapitalisation to serve the UK's defence and nuclear programmes. Razor's data and visualisation expertise contributed to the digital transformation work that Forgemasters is embedding across its operations — helping one of Britain's most venerable manufacturers make the leap from paper-based production control to real-time, cloud-connected manufacturing intelligence.

From consultancy to products — and beyond

The Fulcrum acquisition accelerated a strategic shift that was already under way. Razor's new product suite includes 'Insights' — a live manufacturing analytics platform giving operators end-to-end process visibility — and 'DataQI Agent', a private AI Agent platform that lets industrial organisations interrogate their own data and automate processes securely, without information leaving their systems.

Hinton's ambition has always extended beyond Razor's own client base. He established Bulldozer Limited specifically as a vehicle to support university spinouts — a software and technology incubator that puts Razor's capabilities at the service of early-stage companies emerging from Sheffield's research ecosystem.

Exciting Instruments is the standout example: a University of Sheffield spinout that built a tabletop single-molecule detection platform capable of transforming drug discovery and diagnostics research. Bulldozer was instrumental in developing the cloud data analysis software that made the instrument commercially viable, helping it secure £4 million in seed investment from Northern Gritstone in 2024.

Exciting's co-founder and CEO, Tim Craggs is generous in recognising the collaborative partnerships that unlocked success: "Exciting Instruments is a true partnership of science and software. While we provide the expertise in single molecules, Bulldozer Ltd has been essential to the speed and the success of the spinout so far through their business acumen and support, particularly in the development of our cloud data analysis and visualisation platform."





ADVANCED FORMING RESEARCH CENTRE

Forged in ambition: the Don Valley super alloys chasing a billion-dollar future.

Andy Richardson is in a bullish mood. The CEO of Special Melted Products (SMP) is setting out his plan to become a billion-dollar super alloy business to a packed room of metals and materials leaders in the Don Valley. He is in a buoyant but not boastful mood. Richardson's business, now part of a global Taiwan industrial conglomerate, is integral to the cluster of forging, casting, and machining leaders who meet at Gripple's GLIDE House every six weeks to share successes, air concerns and rub shoulders with their peers. He is among friends.

Gliding down to the forum

The thriving Forging Forum is the brainchild of Alan Lyons. As convenor-in-chief for the Advanced Forming Research Centre Lyons knows this community well. Often, as today, the gathering will include seniors from nuclear fission and fusion R&D – the latter from the UKAEA's test bed facility on the Advanced Manufacturing Park — alongside defence, clean energy, aerospace and space specialists.

Nuclear fission and fusion

On fission, the much vaunted "SMR bonanza" is only a potential bonanza. This is an industrial group all too familiar with false dawns. Regular updates from Professor Keith Ridgway and former Trade Minister, Richard Caborn, who are working on SMR supply chain development proposals with Sir Patrick Vallance and his officials in Whitehall, are a much-valued feature of the Forum. As are their efforts to establish a grassroots defence and security industrial alliance with the region's Mayor of South Yorkshire Oliver Coppard.

Ridgway established the AFRC in 2009 in Glasgow, to provide R&D forging support for Rolls-Royce. With the epicentre of the UK's forging, casting and machining capability concentrated in the Don Valley Corridor, however, it was natural for the AFRC to open an 'outreach centre' in Attercliffe to serve the heavy engineering community in South Yorkshire and the Midlands. Which they did three years ago.



Discrete support for defence forging

Sheffield Forgemasters, now in Ministry of Defence ownership, immediately signed as Tier One member. The AFRC's discrete event simulation (DES) expertise has been critical to its £1.4 billion recapitalisation programme, with its tech specialists embedded in Forgemasters 'transformation team' to ensure its monumental Don Valley facilities will maximise productivity, quality and sustainability immediately they go live.

Proposal for a Forging and Forming Accelerator

The spate of investment in this part of the Don Valley is staggering, with big money coming from Taiwan, Europe and the United States to buy into a sector experiencing consistent growth. With growth comes challenges. Which is why Ben McIvor, President of nearby Forged Solutions Group (FSG), along with Andrew Hartley from The Sheffield College, Professor Martin Jackson from the Royce Institute and the AFRC team, put together a proposal for a Forging and Forming Accelerator on land to be gifted by FSG. It would accelerate skills' growth in a high wage sector drawing youngsters from communities hardest hit by the decline in mass steel production. It would also function as a 'living lab' for R&D alongside two of the world's leading forging companies, with incubator space for start-ups developing new technologies. All with the blessing of the Forum.

Ghosting out the competition

Today, however, Richardson has the floor. With an FSG contingent, one of his biggest customers, taking front row seats he tells how SMP's collaboration with University of Sheffield spin-out M2i2, led by Lucia Scotti and Miguel Espadero, is harnessing "digital ghost" technologies to achieve the rapid validation of DQ nickel-based super alloys to increase customer confidence and optimise forging programmes before commissioning and during production, thus reducing energy consumption. An industrial fraternity forging the future.

"The Forum is very much what its members make it. Which is a vibrant meeting place that sparks lively discussions and shared perspectives among senior industry figures. It is relaxed, open and an essential date in their diaries."

Alan Lyons.
Convenor-in-chief for the Advanced Forming Research Centre (AFRC)

A3L — Advanced Automation and Assembly Ltd

Making automation work for the many, not the few.

Jim Heley spent a decade at the AMRC solving the hardest assembly and automation problems in aerospace — the kind that, left unsolved, cost manufacturers millions in rework, scrap and lost contracts. As Head of the AMRC's Integrated Manufacturing Group, he led the development of digital technologies now transforming how complex products are built: laser projection systems that guide assemblers with pinpoint accuracy, large-volume metrology tools, and robotics that take over the most dangerous, repetitive and exacting tasks on the shop floor.

In 2012, he turned that knowledge into a business. A3L — Advanced Automation and Assembly Ltd — a Sheffield-based robotics and automation specialist serving customers from SMEs to global blue-chip manufacturers in aerospace, defence, plastics and sports goods, across the UK and Europe. Its expertise spans industrial robots and cobots, optical projection and augmented reality for complex assembly, metrology, and digital work instructions that replace paper drawings with dynamic, error-proof guidance at the point of build. Customers report zero-defect assembly as a measurable operational reality, not an aspiration.

From aerospace labs to a traditional Sheffield hand tool factory

The story that best captures A3L's character begins not in an aerospace facility, but in a hot, sparks-flying, drop-hammer Sheffield factory: Footprint Tools. This is a company that has been making hand tools for the construction industry since the 1870s, owned by the same family across four generations. At its peak it employed over 300 people. By the time Tim and Richard Jewitt took over the business, it had been much reduced to a workforce of six, by the twin pressures of Far East competition and the collapse of Sheffield's coal and steel industries.

Their flagship product — the builder's line pin, produced at 200,000 units a year — required two highly skilled craftsmen performing a labour-intensive linishing and polishing process by hand, day in, day out. The quality was exceptional; the productivity was not. The Jewitts turned to the AMRC, and the AMRC pointed them towards A3L. What followed was a masterclass in practical automation. Heley's team, with support from the AMRC, spent time on the Footprint shop floor watching the two craftsmen at work, filming the subtleties of their hand movements in slow motion to understand what the robot would need to replicate. A3L then sourced

"We want to grow and become the UK's top automation specialist for finishing and polishing operations, and to compete internationally."

Jim Heley,
Founder and Managing

a second-hand robot — keeping costs within reach of an SME — programmed it to reproduce the precise motions, designed and 3D-printed a bespoke fixture to hold each pin at exactly the right angle, and integrated the whole cell into live production.

The results were transformative. Footprint's average days-to-despatch fell from 21 days to just seven. One person now does what three had done before. The two craftsmen replaced, freed from the grinding repetition of linishing, moved on to higher-value work that unlocked bottlenecks across the factory. The workforce has since doubled to twelve.

"We were concerned that this kind of project was too small to be of interest to the AMRC. We couldn't have been more wrong. They have been with us at every step of the way — even helping source a second-hand robot and introducing us to an AMRC spinout to integrate it on the production line." — Richard Jewitt, General Manager Footprint Tools

Bigger ambitions, same philosophy

The Footprint story illustrates the principle at the heart of everything A3L does: automation is not the enemy of skilled workers, it is their liberator. The same philosophy runs through A3L's Made Smarter Innovation collaboration with HAL Robotics, which produced a self-programming robotic finishing cell capable of adapting to the shape and requirements of each individual part — reducing robot programming time from up to a week to mere seconds. Heley's stated ambition is to become the UK's leading automation specialist for finishing and polishing operations, competing internationally. The Footprint cell was, as it turns out, the proof of concept for that entire journey.

A3L at a glance:



- Founded in 2012 (AMRC spinout)
- Jim Heley, PhD University of Sheffield Founder
- Robotics, cobots, optical projection, metrology, digital work instructions Core disciplines
- Aerospace, defence, plastics, sports goods, manufacturing Sectors
- Footprint Tools robot cell (3× productivitygain); HAL Robotics self-programming finishing cell Notable projects
- UK's leading automation specialist for finishing and polishing operations Ambition

CHAPTER FOUR:

Beyond the Orgreave model

"Advanced manufacturing is a very high value-added sector. It's a place where you can use science and technology to create competitive advantage, and that is why it is vitally important to encourage the growth of advanced manufacturing jobs in a region and why it has to be a key part of regional policy."

Lord David Sainsbury
Minister for Science and Innovation (July 1998 to November 2006)

The role of the AMRC

In a recent Yorkshire Post article, the former Bank of England Chief Economist Andy Haldane, and the Mayor of South Yorkshire, Oliver Coppard (on whose economic advisory board Haldane sits) identified what they called “the Orgreave Model” as a “trailblazer for a place-led industrial strategy” that could bring economic and social renewal to the region.

From industrial confrontation to industrial collaboration

At the core of the Orgreave Model, primarily located in Rotherham, sits the Advanced Manufacturing Research Centre (AMRC), built on the site of what was once an open cast coking coal plant and, more controversially, the site where the Battle of Orgreave took place during the Miners’ Strike of 1984.

The AMRC, alluded to many times in this report, began as ten researchers risking their early academic careers in a shed on the site of the disused Sheffield airport. A spreadsheet tracked how much money they needed to bring in each month to pay the bills. It was a lean, hungry experiment in ambition and talent.

That the Mayor and Andy Haldane reference it in the newspaper is no surprise. It is a regular destination for senior government ministers – the Queen and Prince Phillip paid a visit – as it is seen as an exemplar of how to breathe new life into areas abandoned following the collapse of mass-produced steel in the 1980s and the relentless rise of China as an industrial superpower.

As Beijing raced up the global manufacturing value chain, successive British governments seemed indifferent to the speed and scale of the nation’s industrial decline. The AMRC was a remarkable exception, as Coppard and Haldane testify. They cite figures showing Rotherham is now “one of the UK’s fastest growing sub-regions

Impact of the AMRC

1,700+

apprentices trained working with 400 manufacturing firms

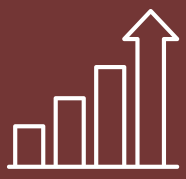
£260m+

of Inward Investment into South Yorkshire manufacturing cluster



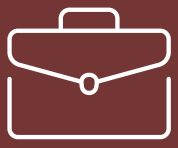
80%

of the apprentices are from South Yorkshire



1,100

buiness engagements per year



42%

with SMEs



£55.8m

GVA equivalent generated per annum

for productivity, registering almost a two-thirds rise between 2004 and 2023". It's a powerful story. But one that begins with a low base, and no real agreed roadmap charting a route to the commanding heights.

The dates cited by the mayor accord, almost entirely, with the opening of the industry-led AMRC's first purpose-built facility funded by David Sainsbury, Minister of Science and Innovation in the Blair government. His investment allowed for a significant upgrade from a shed on the old Sheffield Airport where AMRC co-founder Professor Ridgway and his PhD students had established an engineering skunkworks.

Love at first sight rather than arranged marriage

A neat shorthand has emerged that the AMRC was an institutional marriage between the University of Sheffield and Boeing that turned the University's 'world class academic research' into skills, jobs, innovation and exports. The R&D income and investment graph points in the other direction. It was the AMRC's spectacular ability to attract public and private R&D funding that propelled the University of Sheffield's Engineering Faculty to the top slot for research income and investment. Outpacing the likes of Cambridge and Imperial College London.

Rather than a partnership arranged between the university and Boeing, the AMRC was the brainchild of a visionary engineering entrepreneur, Adrian Allen, determined to sell his cutting tools to Seattle, and an equally brilliant Professor, Keith Ridgway, who was about to amaze the multi-billion dollar machining world with his ability to cut aluminium and titanium at record breaking speeds.

Entrepreneurial inspiration and passion

Allen, who was a director at specialist machine tool company, Technicut, had the dream of creating a South Yorkshire Centre of Excellence on the former site of the Battle of Orgreave. His confidence of achieving this unlikely goal was based on the talents of Ridgway and his small team of engineers at Sheffield University. A confidence rewarded when Boeing agreed to be a co-founder, on condition it was renamed, "Advanced Manufacturing Research Centre with Boeing".

As Ridgway notes: "Our unique strength back then was that we knew how to cut aluminium faster than anyone in the world because we knew how to tune machine tools. That was taking a factor of five out of machine times. This got us to the point where Boeing are making gears in Sheffield which used to take two-and-a-quarter hours to manufacture. We now do them in 3.5 minutes. With that level of improved productivity, you don't need to give the job to the Far East, because you can do it faster in the UK."

A model with no assembly instructions

Understanding these origins is critical to understanding the so-called Orgreave Model. It is not a kit that can be bought off the shelf and erected on the site of an old steel works or shipyard. A clue to the hidden details of what made the AMRC such a distinctively 'place based' response to reinvesting and reindustrialising the region was revealed by Bart Moenster who was Boeing's European research director at the time.

Writing in the AMRC Journal after 14 years as the organisation's industry chair, he recalled that back then Boeing did not have commercial engagements with universities and their 'sand pits'. But Allen and Ridgway, he felt, were different. Drawing on his experience of working with an industry consortium in the US, Moenster suggested they try a governance model he was perfecting.

A research consortium of equal partners with three legs

As Bart explained: "I gave Keith some papers as to how the other consortium worked – it had a tiered membership with Tier One members paying sufficient money to sit on the board, enabling them to direct the centre's work. This formed a consortium based on three legs – research, industry and government. By setting the membership price sufficiently high secures skin in the game: you know your members have an interest in making R&D work and getting results".

Within months of their first meeting with Bart, the newly minted AMRC had a compelling vision, and offer to industry, that secured a substantial grant from Lord Sainsbury. Within four months of opening, the huge new facility was full of state-of-the-art machine tools donated in return for membership of what was attracting leading companies from across the world whose growth depended on getting close to the likes of Boeing and Airbus.

One of the early projects was with UK company, Messier Dowty, who wanted to win work on Boeing's new multi-billion-dollar Dreamliner Aircraft. By reducing the machining time for titanium struts from 55 hours to 11 hours, the AMRC secured the company a place on the 787 supply chain. At the time, the fastest China could achieve was a reduction to 22 hours. No contest.

Such unheard-of productivity gains were to become the hallmark of the AMRC. And the news spread. Before long, Rolls-Royce and BAE Systems were knocking on the door.

Over the next two decades, the AMRC with Boeing became a magnet for the primes and their supply chains to put roots down in the Don Valley Corridor. The list of investors reads like a Who's Who of advanced manufacturing. Rolls-Royce's single crystal advanced blade casting facility (£110m plus £30m in March) led the charge. Others followed. McLaren Composite Research Centre on-shored from Austria (£50m) and Boeing built a £40 million production facility, its only such plant in Europe.



From a slag heap and an SME to jewel in the crown

Almost two decades after the AMRC with Boeing started, Lord Sainsbury commissioned the Centre for Cities to produce a report, *Parks and Innovation*, into the AMRC's journey from a 'slag heap to the jewel in the crown' of industrial R&D institutions.

At the launch of the report in London, Lord Sainsbury said: "It is very important to understand that value added per capital varies very significantly by sector and advanced manufacturing is usually a very high value added sector because it is a place where you can use science and technology to create competitive advantage, and that is why it is vitally important to encourage the growth of advanced manufacturing jobs in a region and why it has to be a key part of regional policy."

Lacking a critical mass

Despite this evidence, the then Director of Strategy at UKRI candidly declared that were Ridgway and Allen to be making their initial proposal for funding today their submission would be rejected. It would "not fit the criteria". It was too big a risk. It lacked 'critical mass.' Though he did add that UKRI does look for inspiring individuals who might not meet Treasury rules.

Today, the site of the old Orgreave coking coal plant, now the home of the Advanced Manufacturing Park with the AMRC as its anchor tenant, provides a brilliant example of what Harvard economist, Michael Porter, called the power of 'clustering.'

Porter argues that clusters sharpen competitiveness in three ways: first, by increasing the productivity of companies based in the area; second, by driving innovation, which underpins future productivity growth; and third, by stimulating the formation of new businesses, which expands and strengthens the cluster itself.

"A cluster allows each member to benefit as if it had greater scale or as if it had joined with others formally — without requiring it to sacrifice its flexibility," Porter says. The productivity figures cited by Haldane and the Mayor would appear to back this up. As would the Centre for Cities *Parks and Innovation* study. Almost a decade later, the cluster continues to grow.

The Mayfair of Manufacturing

Last year the Italian-based Danieli group – annual revenues of £3.6bn – who design and build low emission plants for the steel industry worldwide, established a facility next to McLaren. Vulcan Engineering, a world leader in the manufacture of high purity, composite encapsulated seals, is also stepping up a gear. Perhaps most fitting, Adrian Allen's former employers, Technicut, who have done so much to inspire this manufacturing renaissance, are about to become near neighbours of McLaren, Rolls-Royce and Boeing as they take up a smart new residence on the Sheffield Parkway. Or, as the area is known in certain circles: the Mayfair of Manufacturing.

CHAPTER FIVE:

Seizing the day

"This is Sheffield's moment… Your capability in advanced manufacturing and materials is distinctive globally, and your culture of collaboration across business, university and local government aligns well with the new network model of innovation growth."

Bruce Katz,
US based urban planner's visit to Sheffield in 2015

It is more than a decade since Bruce Katz, now an economic adviser to the mayor, came to Sheffield at the behest of senior local council officers and politicians, and concluded, "This is Sheffield's moment". His visit, along with a colleague, Kelly Kline, both from Fremont, California, inspired policy makers to believe that something special was happening on the border with Rotherham.

Katz and his colleague asked themselves a simple question: Can a city and metropolis apply the innovation district model to advanced manufacturing? The answer, they concluded, was a "resounding yes". Their post-visit paper, 'An advanced manufacturing innovation district grows in Sheffield, England' declared that "advanced manufacturing has mastered the innovation side of the innovation district phenomenon. Indeed, advanced manufacturing is one of the most innovative sectors in the U.S. and the U.K."

What was needed next, they argued, was a leadership team capable of transforming the emerging 'advanced manufacturing innovation district' from a high performing entrepreneurial cluster into a fully-fledged "district" with a distinct vision and mission. Up to now however, government cash to enable Sheffield City Council to establish a Development Corporation to drive AMID forward has not been used to that effect. Neighbouring Manchester, by contrast, has quickly established a DevCo in its equivalent, to accelerate the Atom Valley Innovation District spanning Rochdale, Oldham and Bury.

Andy Burnham said at the launch of The Atom Valley Northern Gateway Mayoral Development Corporation (MDC): "Growth is only good if it's felt in every part of our city region. By bringing land, infrastructure and investment together through a single development corporation, we can move faster, attract high-quality employers and create good jobs that local people can access. This is exactly the kind of intervention needed to deliver growth that works for everyone and leaves no one behind. MDCs are powerful tools to help us achieve our shared ambitions for the city region."

Oliver Coppard's launch of the Don Valley Corridor Development plan at the McLaren Composites Technology Centre (MCTC) in March of this year may not be following in Burnham's footsteps by establishing an MDC, but the influence of Katz on his growth team could provide an opening for an important reset.

The geography of the Don Valley Corridor tallies with Katz's perception of place during his 2015 visit. "Our tour of Sheffield revealed the existence of an innovation triangle connecting the Advanced Manufacturing Park, key companies in the broader Don Valley, and the city centre's downtown area—with its ample amenities, university campuses, and focus on creative design. To this end, the Advanced Manufacturing Park appears to be the fulcrum of a broader innovation district rather than the sum total."

Whatever happens next will signal the degree to which the South Yorkshire Mayoral Authority is willing to embrace the entrepreneurial manufacturing talent in the region. Or whether the same cluster of actors that missed the opportunity proposed 10 years ago allow Sheffield to continue falling behind the likes of Pittsburgh. As this report makes clear, leading players in the advanced manufacturing community want to play a serious role in shaping the next 10 years. It is not only their voices that need to be heard, but they need to be shaping the conversation too.

A fast closing window of opportunity

The window of opportunity is not indefinitely open. SMR supply chain decisions are being made now. The defence procurement pipeline is being allocated now. The deep tech companies that will define Sheffield's next chapter are making decisions about where to stay, where to scale and where to raise their next round. Now.

Pittsburgh took thirty years to build its ecosystem from the wreckage of its steel industry. Sheffield does not have thirty years. It has the manufacturing base, the research infrastructure, the entrepreneurial talent and the global partnerships that Pittsburgh spent two decades assembling from scratch. What it needs is the institutional courage — across the Mayoral Authority, the universities, the industrial community and the investor base — to back itself at the scale the opportunity demands.

The following recommendations call for a number of big changes. These will only succeed, however, if everyone owns, embraces and embodies them. Which is what Pittsburgh achieved in November 1994 with the publication of *The Greater Pittsburgh Region: Working Together to Compete Globally*.

"Our region faces an economic challenge. The time to act is now. In early 1994 a nine-month process began to develop strategies to revitalize our economy. Since then, thousands of citizens representing our region's many constituencies have worked together to produce a shared vision and move forward. Here is the report on this comprehensive process."



Recommendations

The following recommendations call for a number of big changes. These will only succeed, however, if everyone owns, embraces and embodies them in the same way as Pittsburgh achieved with the publication of The Greater Pittsburgh Region: Working Together to Compete Globally. The Japanese talk of Nemawashi - the building of consensus before a big change. That is what Pittsburgh did. And that is what South Yorkshire needs to do.

1. Establish a Mayoral Development Corporation for the Don Valley Corridor

Modelled on Manchester's Atom Valley MDC. This should be a statutory body with real land use, planning and investment powers — not another advisory board. It should be chaired by a manufacturer, governed by a board on which manufacturing employers hold at least half the seats, and given a clear ten-year mandate tied to measurable economic outcomes: jobs created, exports generated, companies scaled.

2.Create the equivalent of the Pennsylvania Manufacturing Advisory Council in South Yorkshire

The Mayor's existing advisory groups may provide high-level economic counsel, but they lack the expertise and experience needed to unlock and harness the growth potential of the advanced manufacturing clusters in the Don Valley Corridor. The region needs the equivalent of the Pennsylvania Manufacturing Advisory Council to provide a stronger, more unified city-region-level voice for manufacturers – to tell the story of what Sheffield manufacturing is and what it can be. Right now, that is missing. Its membership should not be in the gift of the mayor but come from manufacturing leaders themselves.

3. Put the TECH SY role out to market to test private sector capabilities and appetite

The very honest account of the confused and confusing tech ecosystem produced by TECH SY begs for outside intelligence and experience. Sheffield should be looking to wider national and global experience to support its next steps. Bessemer Society founders and CEOs have front line experience of $billion scale ups and would support SYMCA in developing the 'proposal' for a private sector intervention. Sheffield is not trying to conjure an ecosystem out of nothing; it is trying to accelerate one that already exists and to scale and mature faster.

4. Create a £200 million Regional Manufacturing Investment Fund

The Don Valley Corridor's mid-tier manufacturers — those between £5 million and £50 million in revenue, employing between 50 and 300 people — are the most strategically important and the most capital-starved segment of the cluster. They are too large for most startup funds and too small for private equity. A patient capital fund on 10-12 year horizons, co-investing with private capital, anchored by the £50 million South Yorkshire Defence Growth Deal allocation, and governed by a board that includes frontier manufacturers as co-investors would address the most critical gap in the region's capital architecture.

5. Scale the Innovation in Action programme tenfold

The Innovation in Action programme, mentored by companies like AESSEAL and Gripple, is a highly effective model for industrial technology diffusion in the region. It costs almost nothing compared to the grant programmes and delivers results on the shop floor. It should be funded to reach 150 manufacturers per year and made permanent rather than project funded.

6. Commission a legally independent AMRC within five years

The AMRC is the single most important industrial R&D institution in the Don Valley Corridor. It should be constituted as an independent not-for-profit applied R&D organisation — with its own IP function, a dedicated Innovate UK funding stream, and formal accountability to the Mayoral Combined Authority and an Industry Board for regional economic impact. University ownership was the right model for its founding phase. But not the next twenty-five years. The ARM Institute in Pittsburgh — independent, industry-governed, defence-mandated — is a model to study. This could be part of a wider review/repurposing of the HVM Catapult.

7. Deliver five-year defence procurement visibility for SME manufacturers

The delay announcing the Defence Investment Plan has been causing SMEs to exit the sector. A defined proportion of programme value should be ring-fenced for SME manufacturers in the Don Valley Corridor, mirroring the approach the US Department of Defense takes with its industrial base.

8. Integrate civil nuclear and defence demand signals into a manufacturing strategy

A task force bringing together DESNZ, the MoD, DBT and the National Nuclear Laboratory, should be established within three months with a specific mandate to identify which high-value SMR components — pressure vessels, steam generators, primary circuit components — can be manufactured domestically, what investment is required to qualify UK suppliers, and what contractual commitments Rolls-Royce SMR and GB Energy Nuclear must make to trigger that investment.

9. Secure national funding for the Forging and Forming Accelerator

The Forging and Forming Accelerator, initiated by Forged Solutions Group and the Sheffield College and backed by the Royce Institute and the AFRC Forum's industry members, should be developed with local and Mayoral support and submitted to the government for funding approval. The UK faces a severe and worsening skills shortage in forging, casting and forming — the very capabilities on which AUKUS, SMR pressure vessels and next-generation aeroengine structures depend. An accelerator focused on these disciplines, industry-led and employer-governed, would address the most acute skills gap in the most strategically critical supply chain.

10. Send a delegation to Pittsburgh — the right delegation

Sheffield's sister city relationship with Pittsburgh is 45 years old. It has generated goodwill and cultural exchange. It has not yet generated a serious, structured programme of institutional learning. The Mayor, accompanied by manufacturing CEOs, university spinout leads, venture capital managers and a FE college principal, should visit Pittsburgh with a specific agenda: to understand how Carnegie Mellon's technology transfer office operates, how the ARM Institute's governance model differs from the AMRC's, how Innovation Works recycles capital through the ecosystem, and how the Pittsburgh Robotics Network coordinates a sector rather than competing within it.

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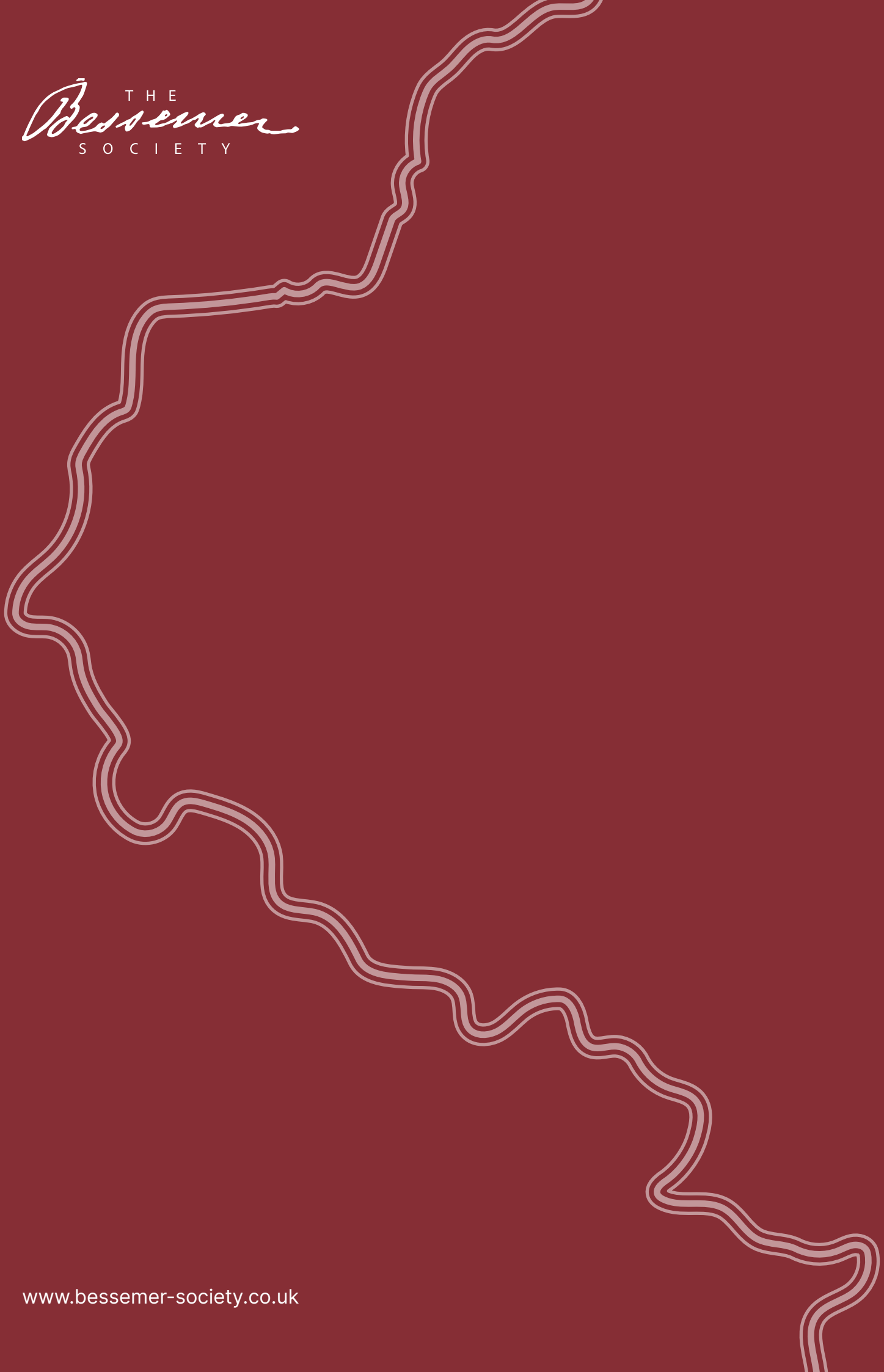

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