CELEBRATING TEN YEARS OF THE MTC

the-mtc.org
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£100M REVENUE
100 INDUSTRIAL MEMBERS
TOP 100 APPRENTICE EMPLOYERS 2020
SUNDAY TIMES 100 BEST COMPANIES TO WORK FOR 2020
An introduction from

Clive Hickman

CHIEF EXECUTIVE

The business plan set out that by 2020, the MTC would be a £10m business with 150 employees and 10 industrial members.

Today we have over 800 employees, 100 industrial members and a turnover of around £100m.

It was the foresight of Hamid Mughal and our university partners that has made this possible, along with the funding support from Advantage West Midlands, EMDA and Innovate UK.

I believe the secret to our success has been:
• Having a clear strategy, that we’ve communicated concisely and rigorously implemented;
• Consistent engagement with stakeholders to develop the capability, skills and experience that customers value;
• Delivering the promised outcome, on time and within budget.

It has been a privilege for me to be the MTC’s Chief Executive during this period of unprecedented growth, which reflects the impact that the MTC has begun to have. I have always said to the team here that the intent is not to be bigger per se, but the bigger we become, the more impact we can have in society.

We realised that to enable UK manufacturing to prosper, we also needed to deliver high value manufacturing skills to industry by upskilling and training the next generation. Our Advanced Manufacturing Training Centres are becoming integral to narrowing that skills gap, particularly in the West Midlands and Oxfordshire.

Looking back, it is pleasing to see the positive support we have received from the Government, not least through the establishment of the High Value Manufacturing Catapult where, along with our partners in the Catapult and Innovate UK, we have been able to deliver innovation to a wide range of industrial partners ranging from large global manufacturers to small SMEs.

Over the next 10 years we will be committed to responding to the critical challenges that the UK, our academic colleagues, and our industrial partners face, not least:
• Supporting the generation of zero carbon economic growth and the UK’s green manufacturing revolution;
• Strengthening UK manufacturing by accelerating reshoring;
• Inspiring the Total Value UK concept, an initiative to source locally to support our UK ecosystem;
• Helping government to level up parts of the UK through skills and R&D;
• Providing support to SMEs to enable them to work ‘on’ the business and not ‘in’ the business;
• Driving the creation of new sector clusters.

It makes me smile to see how far the MTC has come in the last 10 years, and it is our ability to remain agile and adapt to change, whatever that may be, that will allow us to capitalise on the opportunities resulting from change and to make an even greater impact on our society.

Many people have been influential in the success of MTC and I would like to make a special mention to:
• Our Research Partners:
  • Sir David Eastwood, Nigel Weatherill, Richard Williams, Tim Jones, Andy Schofield and Paul Bowen at University of Birmingham
  • Bob Allison, Steve Rothberg and Mike Jackson at Loughborough University
  • Shearer West, Sir David Greenaway, Andy Long and Svetan Ratchev at the University of Nottingham
  • Sir Terry Morgan and Alex Stephenson, our past Chairmen of MTC
  • Dr Hamid Mughal, who was instrumental in creating MTC
  • Mick Laverty (Advantage West Midlands) and Brian Jackson (EMDA) who provided the initial funding for MTC
  • Iain Gray, Dr Will Barton and Simon Edmunds at Innovate UK for their support through the Catapult programme
  • Lloyds Bank, particularly David Richardson and David Atkinson for their sponsorship of AMTC and continued banking support to MTC
  • Andy Street, Mayor of the West Midlands and Sir John Peace, Chair of the Midlands Engine

And all the local MPs, past and present, who have given their support to MTC, not least Mark Pawsey, Chris White and Bob Ainsworth.
Manufacturing is a vital part of the West Midlands’ economy, providing jobs, investment and growth. The Manufacturing Technology Centre is very much at the heart of the sector, bridging the gap between academia and industry. Over the last 10 years, MTC has grown impressively from Portakabin beginnings to the multi-million business it is today.

MTC now houses some of the most advanced manufacturing machinery in the world, working with cutting edge 5G technology thanks to the region being the UK’s first large-scale 5G testbed. Offering impressive development opportunities and apprenticeship programmes, and engaging with a wide range of partners, the MTC is a success story that benefits the whole of the West Midlands.

ANDREW STREET
MAYOR OF THE WEST MIDLANDS
It is a rare privilege to be Chairman of a company with such a strong success story behind it, such a vibrant present, and such a promising future ahead of it. It is only special companies of which that can truly be said.

On MTC’s Day One, ten years ago, it was special because it was unique in the UK landscape. It still is unique in the UK landscape, but now it is special for more profoundly important reasons than that. It is special because it has used its 3,650-day journey to prove, time and again, that so much of the technological magic it weaves as it works with its member companies and its research partners has the potential to transform all our futures.

MTC has proved, too, that the more of that magic we weave, the more there is of it that we could and should weave, and that when we do there need be no limit to the scale of transformational benefits we could deliver.

We will of course rise to that challenge. Why am I so confident? Because what has enabled us to rise to that challenge in each of the last 10 years – what has always made the most difference to all those who depend on us, does now, and will continue to do so into the future – is our people. We should be in no doubt about that. It is the knowledge, talents and unwavering commitment of MTC people that together constitute the most special of all MTC’s attributes, and is foremost of all the reasons that I think myself privileged to have joined the MTC team.
Manufacturing is tough but exciting.

Manufacturing companies exist in one of the most mature and globally competitive sectors where every aspect of our business must be continually examined, questioned and improved. Management structures and methods, teamwork, communications, environmental and space efficiency, plant and capital utilisation, lead times, productivity, and quality systems: the list goes on and on.

And with each new product or capital investment comes the question of where to locate. Which global region or nation has the best economic policy, geography, employees, suppliers, and routes to market to maximise the return on investment? And which can provide the support to improve existing business performance and, at the same time, bridge to the new opportunities presented by climate and social change?

For many years, the UK has seen a reduction in manufacturing’s contribution to our GDP. But it still accounts for two thirds of our R&D and 45% of exports, and we are the ninth largest manufacturing nation. Manufacturing is still critically important and demands the best of its people.

The need for an integrated system to mesh government, research bodies and manufacturers was always clear, but the means was not evident until a report published in 1998 reviewed the Fraunhofer research institutions in Germany and the pioneering work at WMG. Here was a way to de-risk advanced technology, a way to bridge pure research into products and processes in our factories.

These ideas were grasped by the government and the newly formed Regional Development Agencies (RDAs) and in 2010, with enthusiastic support of several leading universities, became the model for amongst others, the MTC. And, later the HVM Catapult was created to organise collaboration between the seven centres to advise government on national strategy and public funding.

It’s astonishing to realise how far the MTC has travelled in 10 years, beating almost 10-fold the predictions of turnover, jobs created and impact on manufacturing performance. A credit to everyone who has supported or contributed. And thanks to the member companies, the founder universities and TWI, central government, politicians, employees and management. This is truly an example of great UK teamwork.

Three early decisions undoubtedly contributed to this growth. Firstly, to extend the manufacturing technology offer into other sectors in the UK economy, secondly to develop a customised support for SMEs and of course, the opening of the Advanced Manufacturing Training Centre (AMTC).

The opportunities for a vibrant UK manufacturing sector have never been greater, so the role of the MTC and HVM Catapult has never been more important.

I think our passion for manufacturing has been captured by these organisations, and I look forward to even greater achievement over the next 10 years.

Congratulations to the MTC on its 10th year anniversary. I have always been very proud of my early role at MTC and for me it has passed all the expectations I had for it.
2010

- Key senior staff were appointed – Sir Terry Morgan (Chairman), Dr Clive Hickman (Chief Executive) & Prof. Ken Young (Technology Director)
- Building work on the Ansty Park facility began
- The MTC was established and four core themes identified: Automation, High Integrity Fabrication, Additive Manufacturing and Tooling & Fixturing
- Rolls-Royce, Aero Engine Controls & Airbus became the MTC’s first industrial partners

2011

- 16 industrial partners & 44 employees
- The MTC facility opened in Ansty Park, Coventry (August)
- The MTC was named a high value manufacturing technology centre (now HVM Catapult)
- MTC Apprenticeships enrolled its first four apprentices

2012

- 45 industrial partners & 150 employees
- Discussions to launch an elite manufacturing training academy began
- £20m turnover
**2013**
- **50**
  - BAE Systems became the MTC’s 50th industrial partner

**2014**
- **36 apprentices working at the MTC**
- Construction of the Advanced Manufacturing Training Centre (AMTC) and the National Centre for Net Shape and Additive Manufacturing began
- The MTC welcomed visits from the Chancellor George Osborne, and Prime Minister David Cameron

**2015**
- **90 industrial partners**
- **90**
  - Opening of the Lloyds Bank Advanced Manufacturing Training Centre (AMTC) and The Business Launch Centre (BLC)
  - First cohort of apprentices completed their courses and all went on to study engineering degrees

**2016**
- **465 employees & 45 apprentices**
- Smart Manufacturing Accelerator & Factory in a Box project announced
2017
- DRAMA (Digital Reconfigurable Additive Manufacturing facilities for Aerospace) project announced
- Record intake of female apprentices
- MTC becomes a founding partner of The ASTM International Additive Manufacturing Centre of Excellence
- Product Manufacturing Incubator (PMI) opened by Chancellor of the Exchequer Philip Hammond
- Oxfordshire Advanced Skills (OAS) announced
- Lloyds Bank provides extra £5m funding for AMTC
- Construction Innovation Hub launched

2018
- DRAMA project launched
- Oxfordshire Advanced Skills (OAS) opens as new training centre

2019
- MTC Liverpool office opened
- MTC apprentice named in the Top 50 Women in Engineering
- Factory in a Box launched
- MTC becomes a founding partner of The ASTM International Additive Manufacturing Centre of Excellence
- Oxfordshire Advanced Skills (OAS) announced
- Lloyds Bank provides extra £5m funding for AMTC
- Construction Innovation Hub launched

2020
- 100 industrial partners
- Digital Manufacturing Accelerator launched
- MTC SME Support Service launched in partnership with Lloyds
- MTC named in Top 100 Apprenticeship Employers and Sunday Times 100 Best Companies To Work For
- £90m turnover*
- 9 Technology Themes to include Metrology, Robotics & Autonomous Systems and Digital Manufacturing
- 800+ staff

*March 2021 target
MTC Training was established in 2015, with the remit to work in close partnership with the MTC and employers to design and deliver cutting edge training programmes focusing on industrial innovation. MTC Training aims to close the STEM skills gap by empowering learners with the future skills that will help to accelerate the adoption of game-changing emerging technology within the manufacturing and engineering industry.

Its flagship training facility, the Advanced Manufacturing Training Centre (AMTC), was purpose-built in 2015 and trains the next generation of engineers. The state-of-the-art centre is sponsored by Lloyds Bank and is located right next to the pioneering MTC. Oxfordshire Advanced Skills (OAS), the second training centre, opened in September 2019 after a 43-week build and with £8m investment from the Department of Business, Energy & Industrial Strategy (BEIS).

Located at Culham Science Centre near Abingdon, OAS is a partnership between the UK Atomic Energy Authority (UKAEA) and the Science and Technology Facilities Council (STFC), with MTC experts designing and delivering the specialist training programmes. The next phase of OAS is already being planned, extending both the facilities and range of subjects on offer to include Robotics, Power Engineering, Nuclear Design and Space sectors.

The MTC first took on its own four apprentices in 2011. Since then, the intake has increased every year and apprenticeship programmes are now offered at Levels 3 and 4, as well as HNCs. Currently (Jan 2021), there are over 360 learners on programme, working for over 85 employer partners. The MTC’s apprentices learn from proven industry experts in an environment at the forefront of technological advancements. The programmes include exposure to disruptive technologies and new ways of working, empowering learners to help accelerate innovation when they return to their employers. An ambitious enrichment programme also supports development of the ‘soft skills’ they'll need for professional and personal success.

MTC Training also offers a comprehensive range of tailored courses to keep existing manufacturing engineers and technicians at the cutting edge of technological innovation. Its programmes bridge the skills gap by identifying current and future needs, arming learners with the latest technical skills helping to ensure both they and their company stay competitive. Today, MTC Training offers over 35 courses through a combination of face-to-face training, remote programmes, online and self-guided learning across subjects from Additive Manufacturing to Robotics to Leadership and Management.

"If we didn’t train people in the technologies that we were developing then the skills gap would only grow. The AMTC has played a central role in our achievements since its launch in 2015, and it will continue to do so for many more years to come."

DR CLIVE HICKMAN
Chief Executive, MTC
As one of the MTC’s founding members, Hexagon Manufacturing Intelligence has been a part of the MTC’s journey from the very start. “I remember meeting Clive [Hickman] and Ken [Young] in Coventry when the facility was still a building site,” recalls David Brown, General Manager. “They described their vision for the MTC to me and I was immediately sold; I wanted to be a part of it and go on that journey with them, and I often think back to that day when I visit the MTC now and reflect on how much it’s grown.”

With its history in developing sensor and software solutions, Hexagon has a vision for an autonomous future. And early on, the business recognised the role that its partnership with the MTC could have in growing its expertise, network, and services to help deliver autonomous solutions: “We could see that Hexagon had a great trajectory but that we’d benefit from wider support, and the MTC encourages us to ‘think big’ and our association with them is a powerful marketing tool,” says David.

MTC membership has also opened up new opportunities for Hexagon through funded projects, as Tim Gears, Business Development Manager, explains: “This was a space we weren’t active in previously, and the MTC has helped us to understand how to access different funding streams, and in doing so we’ve been able to accelerate existing technologies and take technology from one sector to another by collaborating with other organisations.”

“We can also tap into the MTC’s people and their skill sets – headcount is a challenge for many businesses, but with the MTC we can utilise its expertise and experience to support projects without the need to in-source,” says Tim.

As for the role that the MTC plays in developing future generations of engineers, this is something that Hexagon is proud to support. “We want to help young engineers embrace technology and together with the MTC, we committed to creating an industry-leading centre for metrology,” says David.

“It’s vital that the industry understands where emerging themes like metrology fit, and the MTC continues to do a fantastic job here.”

And with the effects of the pandemic still being felt in the workplace, the past year has highlighted other benefits to the partnership: “COVID-19 has reaffirmed the areas that we should treasure, and for us with the MTC, a major part of this is the informal networking and conversations that are had onsite at the MTC that our current way of working doesn’t afford in the same way,” says David.

“With any partnership you get back what you put in, and the more we collaborate the more we’ve got back,” Tim adds. “I’ve worked closely with the MTC for the past five years and it has been instrumental in us delivering some major results. Would these projects have happened without the MTC? I don’t think they would – it’s a launchpad, a mixing pot for ideas and innovations, and a platform to engage with other businesses which has led onto great opportunities for us.”
Being a member of the MTC was about setting the foundations for how we were going to do manufacturing research and development for the next 30-40 years.

It was a big commitment and shift in how we operated; making the switch from internalising a major part of what we do, to doing it all in Catapult Centres and accessing a network of engineers and experts in their respective fields to help us operate at scale and pace, and ultimately get to the end point much quicker.

At Rolls-Royce we’ve always shared the same passion for innovation as the MTC, failing at R&D isn’t failure, providing you apply the learnings next time round. In the past when all R&D was conducted internally, we’d have to manage the trade-off between this and our day-to-day operations. Working with the MTC in this capacity now de-risks a lot of what we do, and it encourages a culture to try, be innovative and think creatively, without the fear of things going wrong.

Over the past few years, we’ve also evolved how we work with the MTC; incorporating shorter three-month sprint projects alongside the longer projects we’ve traditionally focused on. This has been a real step-change for Rolls-Royce, and we’ve been surprised at how much we can do in a relatively short space of time. Collectively setting ourselves a challenge on a tight timeframe encourages focus and requires agility and has seen us deliver some great results in a short period.

As a business we operate in a number of sectors, and our network of partners and stakeholders continues to evolve. In explaining the MTC and its role within Rolls-Royce to engineers that are new to the business – particularly those from overseas – I’m met with the same reaction: an amazement that we have access to this capability, these facilities, and these people. It’s like the world’s best toy shop for an engineer, and I’ll never tire of seeing people’s faces on their first trip to the MTC.

Our involvement in the Core Research Programme continues to be a major part of our work with the MTC, and the value that we get from this has been felt across the business. I do believe that you get back what you put in and so the partnership is very much two-way, but the benefits are significant and if we were to quantify these over the past 10 years, we’d be looking at multi-million pounds in cost savings and revenue.

And on the impact of the MTC on Great British manufacturing as a whole – personally, I believe this is immeasurable. 15-20 years ago, UK manufacturing’s position on the global stage was fading, other industries were taking over and the sector was really suffering.

The MTC and other Catapult Centres have helped regenerate the industry and put the focus back on manufacturing, so that we’re once again able to make a significant contribution to the UK’s economy and exports. We’re incredibly proud to be a part of this.”
Siemens Digital Industries has played a key role in the evolution of the MTC over the past 10 years. As a Tier 1 Member, Siemens has been involved in many landmark projects, realising the benefits of the collaboration across the business.

“If we look back 10-15 years ago, as a nation we were failing to commercialise opportunities that academia and research and development were uncovering, and that had to change,” says Andrew Peters, Managing Director of Siemens Congleton.

“We were committed to making UK manufacturing great again, and so supporting the MTC was a no-brainer – we wanted to be involved from the start.”

As both a technology provider and a manufacturer, Siemens operates across a diverse range of sectors, and this has been reflected in its work with the MTC over the past decade.

“The size and scope of projects that the MTC has been involved in at Siemens is vast, and the impact is beyond what we could have predicted when we partnered with the organisation 10 years ago,” confirms Professor Alan Norbury, Chief Technologist, Siemens – Digital Industries.

“We’ve worked with customers and potential customers, as well other technology providers, to deliver industry-leading innovations in a low-risk environment – to innovate in-house and not affect production is a challenge, so by working with the MTC we’re able to utilise their skills and their facilities and not impact on our day-to-day output.”

The partnership has also had a significant impact on Siemens’ own manufacturing processes. In 2014 the business undertook a major project to explore the use of digitalisation: “Our Congleton manufacturing facility is our most advanced in the UK, and we wanted to better understand how we could improve our processes through the adoption and implementation of digitalisation,” explains Ross Caddens, Director - UK PreSales and Business Development at Siemens Digital Industries.

When the factory first started making variable drives in 1991, 400 workers produced 50,000 variable speed drives and controls every year. 30 years on, Siemens Congleton employs approx. 500 people and manufactures annually over 12 million electrical devices, which includes 500,000 drives (also known as inverters).

“In working with the MTC, we were able to create a digital twin and work with our staff to develop their skills and help them to understand how we could optimise a manufacturing cell in a virtual environment. This was a game-changer, and subsequently we were able to generate investment that provided us with the first steps to introducing automation and robotics into Congleton.”

Siemens has also been a strong supporter of the MTC as a hub for bringing the industry together, as Alan explains: “The MTC is in a great location, easily accessible and a fantastic venue for hosting meetings. The business put its name to the Sir William Siemens Theatre within the Advanced Manufacturing Training Centre, helping develop the facility and, since then, using the space to host conferences and events.”

Andrew adds: “Being an MTC Member is like an industry accreditation; there’s no doubt that it’s helped us win big business over the years, and some of the best conversations happen just by being around the facility.

“Our partnership generates significant value beyond what’s tangible, and we’re always uncovering new opportunities within the MTC’s network that we wouldn’t get if weren’t part of it too.”

“What the MTC provides is a great location, easily accessible and a fantastic venue for hosting meetings. The business put its name to the Sir William Siemens Theatre within the Advanced Manufacturing Training Centre, helping develop the facility and, since then, using the space to host conferences and events.”

“Reflecting on the broader impact of the MTC, Andrew concludes: “Prior to the MTC and Catapult network, there was disagreement as to the role that the manufacturing sector should have in the UK – now I don’t think that’s true. Collectively they’ve brought UK manufacturing back to the top of the agenda to deliver a long-term strategy to support the health of our economy – not just through innovation, but by application and continuing to scale.

“On top of that, it makes sense that there’s no alternative if we want to be a world class apprentice scheme is delivering the future leaders of our industry, and we’ll look back in another 10 years and see the impact that the MTC has had in growing that talent pool and bridging the gap between industry and academia. It’s been an incredibly exciting journey and one that’s still got a lot to give.”

With thanks to Andrew Peters
Managing Director,
Siemens Congleton

Professor Alan Norbury
Chief Technologist, Siemens – Digital Industries

Ross Caddens
Director - UK PreSales and Business Development, Siemens Digital Industries
The apprentices and skilled engineers who emerge from these world class training facilities play a central role in helping to drive up the productivity of the nation.

The Lloyd’s partnership with the MTC is a real jewel in our crown – we’re genuinely proud of it.

Since the launch of the MTC’s Lloyds Bank Advanced Manufacturing Training Centre (AMTC) in 2015, the partnership between the two organisations has gone from strength to strength.

In 2015, Lloyds Bank pledged £5m investment over five years to support the development of the AMTC, as part of its commitment to the UK manufacturing industry and to help the sector’s shortfall in skills. The state-of-the-art training centre was designed to create a new generation of engineers and technicians, equipped with the advanced manufacturing skills of the future.

Over the past five years, Lloyds Bank has been working with the MTC to promote the manufacturing sector and highlight the range of skills required. In addition, the bank actively supports clients in their drive to diversify their workforce to address the skills gap as part of its ‘Helping Britain Prosper Plan’.

In 2019, it was announced that Lloyds Bank would be investing a further £5m – doubling its original commitment – to support around 3,500 apprentices, graduates, and engineers by 2024. The funds will contribute to a 350% increase in the original target for training apprentices and supporting the AMTC’s commitment to addressing the skills shortage.

The MTC and Lloyds Bank have also recently partnered to launch the SME Support Service (Jan 2021), a £3m package of free support and resources to help UK manufacturing and engineering SMEs embrace innovation, develop their workforce and increase productivity.

For eligible employers, the service includes funding assistance for apprenticeships, free access to MTC training courses and advice and guidance on funding and resources to support SMEs.
At around the same time that the MTC was established, the Government announced a competition to establish a high value manufacturing technology and innovation centre. Innovate UK (the then Technology Strategy Board) managed the competition and was the funding agent for the initiative.

MTC, AFRC, AMRC, NAMRC, NCC, CPI and WMG came together to bid for the contract that was awarded in July 2011.

The seven centres created a company limited by guarantee and each centre has provided a guarantee of £10 in order to sustain the alliance.

Technology Strategy Board CEO Iain Gray and Director Will Barton were instrumental in the formation of the programme, which had been envisioned by Sir Hermann Hauser. Government consulted on the name for the new initiative which would throw innovation to the forefront and hence the ‘catapult brand’ was born.

Over the 10 years of operation, the embryonic HVMC has created a brand identity that is renowned worldwide and the ultimate accolade was when Norway copied the ‘Catapult’ brand name.

The 2019-20 annual review identified that the seven centres have a combined performance of:

- **£791m** assets
- **3130** employees
- **£518m** income

Looking to the future, Katherine Bennett joined HVMC as the new CEO in June 2021 at a time of great opportunity. The country is beginning its recovery from the pandemic and is looking towards net zero environmental impact, an area where the catapult will have a significant role to play, helping both multinationals and SMEs to redefine their business models and setting new standards for manufacturing productivity, collaboration and societal impact.

The High Value Manufacturing Catapult is at the heart of delivering a long term tangible industrial transformation that will grow the contribution manufacturing makes to the UK economy, and power the transformation of our industrial landscape to benefit the whole of our society while we drive down industrial greenhouse gas emissions.
A RANGE OF CASE STUDIES OVER THE PAST 10 YEARS TO SHOWCASE THE WORK OF THE MTC

2020
AEROSOL GENERATING PROCEDURE (AGP) SHIELD
P34-35

2020
ALBERT JAGGER: RE-SHORING FROM CHINA TO THE UK
P32-33

2019
CHAFAER MACHINERY: IMPROVING MACHINE PRODUCTION EFFICIENCIES
P36-37

2018-19
SMART MANUFACTURING ACCELERATOR & FACTORY IN A BOX
P40

2018
COLCO: IMPROVING QUALITY & VOLUME OF COCOA PRODUCTION
P38-39

2017
BUILDING CONFIDENCE IN ADDITIVE MANUFACTURING: AMAZE
P42-43

2016
ADDITIVE MANUFACTURING OF STRUCTURES FOR THE MISSION TO MARS
P44-45

2012
ADVANCING ELECTRIC VEHICLE BATTERY TECHNOLOGY: EV-LITE
P46-47

2017
USING GROUNDBREAKING TECHNOLOGIES TO IMPROVE SIT SKI DESIGN
P41
Having already re-shored production of almost a quarter of a million fastening components – and in some cases, reducing costs by up to 50% - Albert Jagger worked with the MTC’s Manufacturing Support Services (MSS) operation to revolutionise their factory.

The team produced a new factory layout, introduced new technology including CNC machines and automation, and re-trained staff using virtual and augmented reality.

As a result, the firm was able to produce fastening components which had previously been imported from China for between 20% and 50% of the cost. In addition, they have reduced stockholding costs by 50% and created space in the factory for future growth.

Albert Jagger, a Midlands-based supplier of commercial vehicle engineering and industrial hardware, approached the MTC for support with a project to re-shore component production from China.

OUR WORK WITH THE MTC HAS BEEN TRULY TRANSFORMATIONAL. WE’VE INVESTED IN OUR FACTORY AND IN NEW TECHNOLOGIES, WE HAVE TAKEN ON STAFF AND IMPROVED THE SKILLS OF OUR EXISTING EMPLOYEES. WE ARE ALREADY SEEING THE BENEFITS OF OUR STRATEGY TO RE-SHORE AND RECENTLY SECURED 200,000 UNITS OF PRODUCT ORIGINALLY OUTSOURCED TO CHINA.
SUPPORTING THE NATION’S FIGHT AGAINST COVID-19: DEVELOPMENT OF THE AEROSOL GENERATING PROCEDURE (AGP) SHIELD

In April 2020, the MTC, in collaboration with Rolls-Royce and Dr Ian Renfrew, Consultant Interventional Radiologist at BARTS alongside Dr Paolo Perella, Anaesthetic Registrar at Royal London Hospital, responded to a nationwide call to support frontline NHS workers in the fight against COVID-19.

Supported by Innovate UK and HVMC, in just seven days the team prototyped and developed a fast-make AGP Shield for ventilators. These were trialled in three hospitals, and feedback was used to implement design changes ahead of the MTC manufacturing the first 200 units.

Feedback from medical professionals suggested that these shields could not only be used during intubation and extubation procedures, but also several other medical procedures beyond COVID-19.

The next stage of the project was to improve build quality and manufacturability. This involved engagement with new and existing supply chain partners to update designs and produce tooling that would allow a smooth increase to high volume production, should the demand arise.

READ MORE
Chafer Machinery, manufacturers of spraying equipment, embarked on a project with the MTC to improve production output and delivery times, without increasing resource or compromising build quality.

The MTC was tasked with reducing build hours, increasing capacity and flexibility to ensure on-time delivery to the customer and maximising profit.

In order to do this, the factory layout was optimised and working areas were improved, creating individual colour coded bays, standardised tooling and flow racks for kitted parts.

Visual management was introduced in the workshop for the fitters and management, allowing greater visibility of the production plan.

The work with the MTC resulted in a 45% reduction in man hours per machine, meeting of delivery times and doubling of turnover in two years without significant increase in overhead costs.

**CASE STUDY - 2019**

**CHAFER MACHINERY: IMPROVING MACHINE PRODUCTION EFFICIENCIES**

We’ve gone from building our typical machines in 370 hours, down to 205 hours – that represents a 45% saving in man hours per machine. To bring this into context, we’ve managed to double our turnover in two years without significantly increasing our overhead costs.

**ROB STARKEY**

MANAGING DIRECTOR, CHAFER MACHINERY
The COLCO project is a two-year, million pound project concentrating on the improvement of farm productivity, consistency of product, quality and post-harvest processes through the integration of IOT.

Funded by the UK Newton Fund, the project aimed to improve the quality and volume of cocoa production in Colombia through increased monitoring, certification and localised processing along value and supply chains. The MTC team was looking specifically at bean fermentation (which accounts for 70% of the flavour profile) and drying processes, both which are vital to the bean quality.

Alessandra Matamoros
Technology Manager, The MTC

We want to ensure that the smallholder farmers get a better deal, which will improve the quality of life for them and their families, and will have a socio-economic effect on their region and the Colombian economy as a whole. We are not just interested in deploying technology - that would be easy. We want to make sure that our impact is positive and lasting.

CASE STUDY - 2018

READ MORE
The Smart Manufacturing Accelerator (SMA) was launched by the MTC, in partnership with the Energy Research Accelerator (ERA) programme funded by Innovate UK and run in partnership with the University of Birmingham, Loughborough University and the University of Nottingham, as a framework for delivering integrated manufacturing and supply chain solutions enabled by the application of digital technologies.

Its first project, Factory in a Box 1, was delivered in collaboration with a number of funding and technology partners and resulted in the development of a rapidly deployable, remotely managed, modular manufacturing supply chain solution. FIAB 1 was launched in March 2019 at the MTC to more than 300 attendees.

Factory in a Box 2 - a mixed reality demonstrator for automated batch production of phase change material – was then developed. The process design, ICT and controls architecture for Factory in a Box 2 were commissioned in a fully virtual environment and in the absence of a physical factory, it simulates the production process and uses mixed reality to visualise real time production data.

The MTC, working with the HVM Catapult, used groundbreaking manufacturing technologies to improve the design of a Paralympic Sit Ski.

The outcome was the manufacture of a lightweight Sit Ski which saved 30 per cent of the weight over existing designs. Using the same technologies as Sit Ski, spin-off projects were developed with a number of UK manufacturing companies.

The MTC were also able to deliver a solution for Rolls-Royce to simplify their supply chain, mitigating the need for a large multi-million pound equipment investment.

This project has developed a great Sit Ski, whilst showcasing British manufacturing technology, with potential savings and improvements in products and processes all over the UK.
AMAZE - Additive Manufacturing Aiming towards Zero Waste & Efficient Production on High-Tech Metal Products - is a collaboration of 26 leading companies and institutions in European academia, research and industry - the largest and most ambitious group ever assembled on the topic of additive manufacturing (AM).

The primary goal of the project is to produce rapidly large defect-free metallic components up to two metres in size, ideally with zero waste, for use in high-tech sectors such as aerospace, automotive, space and energy.

READ MORE
ADDITIVE MANUFACTURING OF STRUCTURES FOR THE MISSION TO MARS

The MTC provided additive manufacturing (AM) expertise to help space R&D company Magna Parva develop a crushable thermal protection system for the Mars Return Capsule.

Magna Parva needed support in manufacturing an energy-absorbing structure for the Mars Sample Return mission, using an electron beam melting (EBM) additive manufacturing process.

The structure needed to be strong enough to withstand freefall impact on re-entry, crushable enough to reduce impact shock for its contents, and heat proof to keep the sample below a specified temperature.

Working in conjunction with Magna Parva, the MTC’s additive manufacturing team was able to manufacture lattice structures using EBM, taking into consideration the effects of build orientation. Inspection of the structures was conducted using non-destructive x-ray CT scanning to assess the quality.

The MTC team also provided Magna Parva with the parent properties of titanium alloy Ti6Al4V, which the team used to assess demonstrators against, to see if the material could withstand the stresses of re-entry.

The additive manufactured crushable structure enabled Magna Parva to assemble and mechanically test the structure for the European Space Agency’s Thermal Protection System Project. The innovative technology, manufacturing process steps and mechanical test results were captured and validated by theoretical analysis and FEA, allowing Magna Parva to further optimise the structure design while considering manufacturing post-processing techniques to improve accuracy and quality of the parts.

READ MORE
EV-LITE

ADVANCING ELECTRIC VEHICLE BATTERY TECHNOLOGY:

EV Lite was a two year Innovate UK funded project starting in August 2012 which aimed to reduce the weight and cost of battery packs; a major barrier to the uptake of electric vehicles.

The MTC led the project and worked with a consortium comprising of engineers and scientists from Loughborough University, Unipart, RDVS Components, the Bluebird Innovation Group and Cenex, the Government-backed centre of excellence for low carbon and battery technology.

The project’s objectives were to redesign a battery for an electric vehicle (EV) with the following attributes:

- Reduction in overall battery weight including structure, BMS, charging systems by 27% to 215kg, by reducing the weight of the non-cell elements of the battery by 50% from 144kg to 72kg;
- Reduce cost of battery structure, BMS, etc. by 50% from £9000 - £4500;
- TAKT time requires automated assembly with one cell every 40 seconds;
- Consideration of 2nd and 3rd life as well as recycling.

THE RESULTS

The prototype battery achieved a weight of 38kg per 4kW module, 35kg for a module with an IBIS, therefore a weight saving of 41% was realised on the non-cell components resulting in a 45kg weight saving at a 26.5 kWhr sized system level.

The cost of non-cell components was reduced from £9000 to an approximated £3396 (using volume supply chain) giving a cost saving of 63%.

A patent application was submitted to protect 5 key inventions in the design.

The MTC built a robotic assembly demonstration cell and completed fully automated battery builds using a dummy battery. The build was completed in 18 minutes, 6 minutes shorter than the target TAKT time.

READ MORE
Whilst not part of the MTC’s original business plan, the launch of the events arm did two things; it significantly grew the MTC’s outreach, and, following the opening of the Advanced Manufacturing Training Centre (AMTC) in 2015, it helped to fund the AMTC’s apprenticeship programme, with all profits reinvested back into the business to support with funding new equipment and machinery.

In-line with the wider business’s strategy, MTC Events is tailored towards high-value manufacturing. Feedback from customers and members in the early stages was that they wanted more networking opportunities; they were starting to view the MTC as a hub for the industry and they recognised the value in bringing together stakeholders to fuel collaboration, under the umbrella of the MTC.

Since the opening of the MTC in 2010, the facility has welcomed visitors in big numbers. However, in 2015 when MTC Events launched, footfall grew to unprecedented levels and the MTC soon became one of the region’s premium events and conferencing facilities.

The size, scale, and flexibility of the campus remains one of the key USPs for MTC Events. From the 252-seat theatre and exhibition space to configurable meeting rooms and breakout areas, the MTC has hosted conferences and product launches, through to gala dinners and private dining experiences.

Over the years the business has invested heavily in AV technology, and the COVID-19 pandemic has seen this grow further still.

As with all events businesses, MTC Events has been significantly impacted by the effects of COVID-19, and with the facility either closed or capacity significantly reduced for the majority of 2020, the business needed to look at new ways to engage its target audience and help its customers do the same.
The introduction of new technology has facilitated a number of major virtual events in the past year. Digitalising Manufacturing 2020 was the first of these, with over 70 industry professionals speaking across two days, to an audience of more than 400 delegates from 28 countries. More recently, the National Manufacturing Summit (March 2021) was a huge success, further showcasing the MTC’s agility and ability to respond in challenging times.

Within the AMTC, extensive measures have been taken to ensure that the events space can continue to be used in-line with COVID-19 guidelines and as lockdown eases, the campus is ready to welcome back visitors safely and securely.

Whilst there’s no escaping the difficulties caused by the pandemic, with challenge comes opportunity; MTC Events has evolved and adapted to ensure it can continue to deliver state-of-the-art events, and in doing so, has strengthened its offering to provide large-scale virtual and hybrid solutions.

And crucially, the business continues to support the development of the engineers of the future, by reinvesting all profits back into improving facilities and training opportunities. To know that your event can impact the future of the industry in that way is a truly unique selling point.
I had the honour of being the MTC’s second ever employee, joining as Technology Director – a position I still hold today – in January 2011.

At that time, the Ansty Park facility was starting to take shape, but it was still very much a building site. For the next six months, we operated the MTC out of Portakabins – not quite what you imagine when you see the site today.

If truth be told, it was a hard sell for us initially. I remember in the very early days it was amazing how quickly the word of the MTC had spread, and how much of industry wanted to come and see us and hear our story. But it was only once the building was open that people started to believe in our vision to inspire Great British manufacturing on a global stage.

I even remember Clive going to buy us both mobile phones and laptops for when we were on the road as we hadn’t even considered how we’d keep in touch - thankfully, our internal processes have come on a bit since then...

Quickly we knew we had to fill the building with research and projects, and of course the teams that would deliver these. We were bidding for projects with no idea if we’d win – and as we did, we had to build the teams around them. In truth, the process is similar even now, but on a much greater scale and with a lot more structure in place 10 years on.

At the start, recruiting good people wasn’t easy. We found roles for anyone that we saw potential and promise in, and one of the things I’m most proud of is how well many of these individuals have gone on to do in their respective fields and careers, both within and outside of the MTC.

It’s been incumbent on the MTC to bring everything together to deliver the industrial and societal impact that we strive for.

Over the past 10 years, the manufacturing landscape has changed considerably, and we’ve had to adapt and evolve our areas of research in-line with technology and industry demands. At the start, we identified four core themes: automation, high integrity fabrication, additive manufacturing and tooling & fixturing. In hindsight, these were too discreet and narrow areas of focus.

Very quickly we recognised that industry wanted a systems approach; we needed to be delivering manufacturing systems and not individual technologies. We also realised we needed a much greater digital engineering presence, and soon followed our manufacturing simulation and informatics themes, which today, make up more than a third of our business.

Historically, the UK has struggled with helping industry adopt technology; the past century is full of examples where UK research has been implemented overseas and we then end up buying it back. This had to change, and as the MTC, we knew we had to lead the way.

Over the last decade we’ve recognised where new technology should be added to our offering; but, critically, we know that having this technology isn’t enough. It’s been incumbent on the MTC to bring everything together to deliver the industrial and societal impact that we strive for.

As for the future of the MTC – undoubtedly, we’ll see a major shift towards sustainability and net zero – both areas that we’re already very active in – and then who knows what’s round the corner? Society, industry and technology are all interwoven, and each one plays its part in driving research.

Not every project we’ve commissioned has worked beautifully, but we need to make mistakes to learn from them – if everything is safe, where’s the ambition? We need to retain that attitude as we head into the next decade of the MTC and continue to build on the successes of the past 10 years that I’m incredibly proud to have been a part of.
An interview with Vicki Sanderson
HR DIRECTOR

I joined the MTC in January 2018, and from my first interview, I bought into the organisation's vision and drive for innovation and creativity – it was an exciting opportunity that I just couldn’t pass up!

Whilst my time here spans more recent years, what I continue to witness every day is the passion and energy that our employees share for the MTC. Their collective want to deliver for customers and stakeholders, and impact society in some way, is inspiring, and it’s this shared drive and ownership that’s been at the MTC’s core for the past 10 years and has underpinned the organisation’s vision to better Great British manufacturing.

It’s no surprise that the last 12 months have provided us with challenges from a HR perspective. Back in March last year when we moved to full remote working, we had no idea that we’d still be operating in this way almost a year later.

Many discussions with the exec team focused on how we kept the business operating effectively, whilst engaging staff and supporting them with the ‘new normal’, and the operational and personal challenges that can come with working from home. Not forgetting that what brings a lot of us together is time spent at the MTC or AMTC; a quick catch-up over lunch or a coffee, and those informal social interactions with colleagues that being onsite affords.

At the start of last year in response to feedback from our staff engagement surveys, we were set to trial a fully flexible working policy from 1st April 2020. Staff wanted more flexibility and a better work-life balance, and other organisations have demonstrated a significant increase in productivity from introducing condensed working. Who knew that this would coincide with the upheaval caused by COVID-19? But we stuck to our plan, and recent feedback shows that this has had a positive impact on staff working through the challenges triggered by the pandemic.

This has been supported by regular communications, drop-in sessions, workshops and training, and more informal social events, quiz nights and networking opportunities to ensure that even from home, our teams can stay well-connected.

My aim in all that we do is to make the MTC a truly great place – the best place – to work. We all have tough days and times when you need the support of those around you, and it’s in those moments that make me incredibly proud of the people we have at the MTC. Over the past 10 years, the organisation has created a culture of true collaboration; working with industry, government, and academia to deliver an output that wouldn’t have been possible without relationships and teamwork.

How we operate internally is no different; staff come to the MTC to be creative, to collaborate, and work across teams and departments to achieve fantastic results.

Our customers and stakeholders trust our staff, and in many cases see them as part of their own teams, and I truly believe that without this, the MTC wouldn’t have achieved the same level of success that is has done over the past decade.

If the last year has taught us anything, it’s the importance of remaining agile and connected.

Our HR strategy is employee-centric; we want to give staff autonomy and ownership, and provide them with an environment that empowers them to work effectively and efficiently.

We’ll continue to listen and take the time to review, reflect and adapt – ready to respond to whatever challenges we may face in the future. With over 800 staff now in the business, we have people at every stage of their career cycle. But what they all have in common is a want to make a difference – and that makes the MTC an incredibly inspiring place to be a part of.
In 2010, the government announced the abolition of regional development agencies (RDAs). Our RDA, Advantage West Midlands, had already asked the question of key industry bodies as to what its legacy should be; on the list was a manufacturing research centre to support the aerospace industry.

There were lots of detailed discussions and many stakeholders involved in developing the concept, but that aerospace project became something for the whole manufacturing industry across the Midlands – fast forward to summer 2010, and it started to become a reality as the MTC was launched.

Whilst I joined the MTC as Strategic Development Director in April 2012, my involvement with the organisation started much earlier; as part of the team who developed the original Advantage West Midlands business case, and then as a founder industrial member with Goodrich.

At the MTC, my role was to help the business to deliver for both industry and government. One of the driving factors in my decision to join was my desire to help companies and communities beyond just delivering the commercials; I wanted to make a difference and could see the huge potential of the MTC in its ability to do this.

At the start I was confident that we'd make a difference in the region, but looking back, I can be honest and say that I wasn't ambitious enough. By structuring what we delivered correctly and focusing on the challenges that businesses were facing, by building that bridge from industry to academia, we soon discovered that the MTC's potential was much greater than we had originally envisaged.

We didn't set out to offer training, but we soon realised that, unless we trained people, the SMEs we wanted to support would not be able to use the technology we were developing – we needed the AMTC. We also didn't set out to run an events business, but the potential we saw to bring visitors in and inspire them with a glimpse of the future - combined with the strategic decision to reinvest profits back into our apprenticeship programme - led to MTC Events. There are many more examples of how the business has evolved over the years, but what sets the MTC apart is our ability to do this by combining technology and R&D with business understanding, and a solid understanding of what government and society value.

Central to everything that we do is the team that we've created – and I'm incredibly proud of this. We do things that nobody else seems to, and we're able to do it because we have great people who are passionate and think beyond the normal way of operating. We have so many talented people with the drive and ambition to change the world, and without this we wouldn't have experienced the growth and success that we have.

We're a co-creation from industry and government for a social purpose – we're not just selling services to industry; our reason for being is much greater than that. We're independent, and over the years we have built industry's and government's trust. That trust, combined with the wide range of industries that we work with, provides us with an enviable level of insight into what can be done to support communities effectively.

This only happens because we have the right people with a passion for making a difference.

We're also good at recognising where we need support from outside the MTC – we know we can't do everything, but we can build the network and mobilise it to positively impact society. And it's this, the collaboration between the RTOs, academia and businesses, working together to solve problems – the 'wicked' problems that we talk about – that exist in challenging technical, business and political areas.

It's hugely complex, but it's been central to our growth. We also wouldn't be where we are without the Catapult funding (which gives us the freedom to do the right things just because they are the right thing to do), and the support of key partners including HVM Catapult, Innovate UK and our founding universities; we're collectively so much stronger together.

What we mustn't lose is our passion and our enthusiasm to try; to try new things, to push boundaries and to challenge the norm. Society and communities may not always know what's needed – and we might not know from the start. But we work it out - together. We experiment, and we make a difference – together.

It's this approach that will make an even bigger impact over the next 10 years and beyond.
“As a founding university partner of the MTC, the University of Birmingham is proud to have underpinned the centre from its origins and to have supported the massive expansion of this key innovation hub, collaborating on projects such as Factory In A Box, while providing a pipeline of novel research in support of the MTC’s applied innovation.

By supporting a range of industry sectors, the impact of MTC and academic collaboration has benefited many businesses over the years. Looking to the next ten years, we will work closely together to drive business innovation in our region and beyond, using the combined strength of the assets and capabilities both of the MTC and of our institution, to make the UK manufacturing industry a leader in rapid, sustainable and quick-to-scale product innovation.”

Professor Paul Bowen
Deputy Pro-Vice-Chancellor, Industrial Partners

“As a founding partner of the MTC, the University is proud to drive collaborative projects that translate cutting-edge research into integrated manufacturing system solutions across a diverse range of sectors. Highlights of our decade of partnership include hosting the EPSRC Centre for Innovative Manufacturing in Intelligent Automation, which together with Cranfield University, Rolls-Royce, Airbus, Aero Engine Controls and MTC, delivered transformative research and innovation in industrial automation, robotics and digitalisation. The research continues through the University’s Intelligent Automation Centre and through participation in critical pilots for the MTC including the Fully Flexible Working Trial to boost productivity and wellbeing within the workforce. As hosts and key partners in the launch of the new Industrial Policy Research Centre, the University and MTC are working together to rebuild the Midlands’ national and international reputation for being at the leading edge of manufacturing innovation.”

Professor Steve Rothberg
Pro-Vice-Chancellor (Research)

“As a founding academic partner, The University of Nottingham has been committed to the MTC’s success and growth since its inception in 2010 and opening in 2011. Collaboration between our organisations has grown in both strength and diversity since then to provide our stakeholders with research and the necessary skilled individuals to make a real difference to UK manufacturing, both at the MTC and within their membership. Examples of these include joint supervision of PhD students and collaborative R&D projects working in areas such as additive manufacturing, metrology, automation, and machine learning in a variety of sectors, including aerospace, electrification, healthcare and food engineering.

The MTC is part of our commitment to Manufacturing Research at Nottingham, our continued success in research is allied to the MTC and we look forward to continuing this journey for the next 10 years and beyond.”

Professor Christopher Tuck
Faculty Associate Pro-Vice-Chancellor for Research and Knowledge Exchange, Faculty of Engineering