



Manufacturing Confidence

Midlands Manufacturing
Resilience Commission

Dr. Clive Hickman FREng



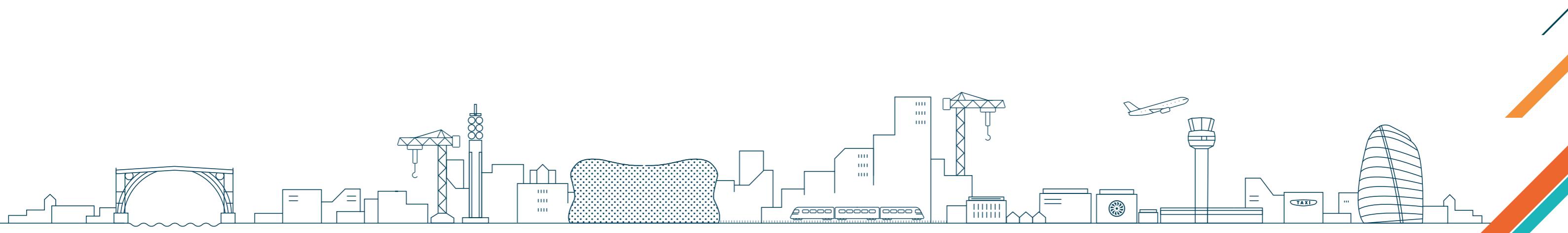
With thanks to Lloyds Banking Group for providing sponsorship for this independent Report.

With special thanks to

Andy Street, Mayor of the West Midlands
Sir John Peace, Chair of the Midlands Engine

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Foreword to the Commission

The Midlands has a history of resilience. We are innovative and creative by nature, with a relationship to manufacturing like no other region in the country, or for that matter, the world. A relationship of which, I for one, am very proud.

In my role I have more opportunity than most to visit our towns, our factories, our universities and even our Catapult Centres. This allows me to meet the very people who drive our economy. The engineers, the scientists, the designers and the technicians who, over many generations, have built our reputation as the 'workshop of the world'.

Yet, in recent decades, we have fallen behind our competitors in terms of productivity, skills and well-paid, sustainable jobs.

That is why I asked Dr Clive Hickman, with his knowledge, experience, and networks, to create a Commission to take a fresh look at our competencies. I asked him to provide recommendations that would better equip us to face the challenges of global competition, the transition to net zero, and a changing technological landscape with a renewed confidence and greater, lasting resilience.

The concept of the innovation region has strong resonance with our ambition for the Midlands. This is exemplified by programmes such as the Speed to Scale initiative which, linked with our proposals for a gigafactory, will support our drive for manufacturing resilience.

So I applaud the work of the Commission, and I am grateful for everyone, particularly Clive, who has played a role in completing this urgent task.

I commend this Report to our politicians, our academics, our businesses, and most crucially, the residents of the Midlands, on whom the recovery depends!

Andy Street
Mayor of the West Midlands



Preface

The Midlands spans a large geography of rural and urban areas; places with strong manufacturing bases and others more reliant on the service and visitor economy sectors. Our population and places are diverse. It is this great diversity that is a strength of the Midlands.

The Midlands Engine Partnership brings voice and vision to the Midlands, ensuring that our collective needs are heard. Through the work of the Midlands Engine, partners come together to collaborate and champion both their own and our shared work - bringing collective strength to the Midlands.

The Midlands' first Independent Economic Review (IER) published earlier this year by our Observatory highlighted the importance of the manufacturing sector to our regional economy.

This Commission is therefore an important route through which to influence beneficial change for our region, by helping the Midlands overcome barriers to growth in the manufacturing sector.

I would like to congratulate all involved in the important work of the Commission, in particular Dr Clive Hickman, who in his role as Chair was able to bring his expertise on our regional economy to bear, and has delivered a strong set of recommendations to improve the resilience of our manufacturing sector.

This report highlights the need for ongoing support and a co-ordinated, partnership vision to secure the future of the sector. It references many of the key barriers to growth that the Midlands Engine is currently working on – business leadership skills, productivity, and embracing digital and new technologies.

But the report also highlights the opportunity for the sector in our region – the opportunity to rebrand the Midlands as the Innovation Region, and to become truly world-leading in net zero, digital manufacturing and medical devices.

The Midlands Engine will champion this vision and support the well considered and measured interventions proposed in the report.



Sir John Peace
Chairman, Midlands Engine



Dr Clive Hickman
Chair, Midlands Manufacturing
Resilience Commission

Executive Summary

Manufacturing as a sector has been tested by the pandemic - whether the vulnerability of our supply chains or the need to transform our production lines in timescales never before imagined or required.

Andy Street, Mayor of the West Midlands, and I, agreed we needed to build 'resilience' into the system. Not least to prepare us against future shocks, but to start to rebuild our global reputation as a centre for manufacturing excellence. This Commission seeks to build this resilience.

The Midlands Manufacturing Resilience Commission, or M2R as it has become known, gathered evidence from a series of roundtables, surveys and other contributions from senior representatives from industry, academia and other regional bodies, including the West Midlands Combined Authority, the Midlands Engine, the CBI, and financial institutions, such as Lloyds Bank. This Report is a consolidation of those discussions, with a series of independently authored chapters focusing on the main themes, from productivity to emerging technologies.

Our findings identified that:

- Productivity in the Midlands is amongst the lowest in the UK, whilst at the same time the UK lags behind the world's leaders in productivity.
- Though we have the ability to adapt to change and respond to the challenges we are facing, we lack the confidence, belief and organisational leadership to respond.
- There is fragmented support for manufacturing across the region, with too many disparate intervention mechanisms that are either too obscure, or too complex, to be accessed by many of our small and medium sized enterprises.
- With a few notable exceptions, we have failed to embrace sufficiently the advanced and emerging technologies which have the potential to increase productivity and growth, creating sustainable, high quality, well paid jobs.
- Our business leaders, particularly in the SME community, are too busy working 'in the business' to work 'on the business'; we have not provided the leadership development opportunities or created the bandwidth to address this concern.
- We have not developed or retained the skills which allow us to become world class. In particular, there is insufficient emphasis on upskilling and reskilling to enable advanced technologies to be adopted.

These findings inspired the Commission to develop a shared vision of the future of manufacturing in the Midlands with the following elements:

- World class academic research with dynamic RTOs (Research and Technology Organisations) and to translate that research into innovative products and processes
- An effective and growing medium-sized tier of manufacturing businesses
- Confident and agile SMEs, with a strong and supportive ecosystem
- Greater access to finance and support to enable SMEs to grow
- An attractive environment for strong OEMs and Primes
- Co-ordinated and not ad-hoc interventions
- Resilience across the sectors where we have a strong tradition: aerospace, automotive, ceramics, construction, food production and processing, and textiles
- A focus on areas where we can become world class including net zero, digital manufacturing and medical devices
- Collaborative, commercially driven, integrated supply chains that are reshored and externally focused
- Strong business leadership in the supply chain: leaders working 'on the business' not 'in the business'
- An excellent skills base and pipeline
- Sustainable, high quality and well paid jobs

And to build on our **heritage of innovation** so that people can again have pride, passion and confidence in the ability of our region to succeed.

But to achieve all of this, to rebuild our manufacturing sector, and rebrand the Midlands as **the innovation region**, we must act now and at pace to implement the recommendations which have emerged from this Commission:

- The Government must match private sector investment in the Midlands at the same levels as it does for the rest of the UK, supporting initiatives such as the Speed to Scale programme
- Address the fragmented support for manufacturing across the Midlands:
 - Have a unifying agenda and consistent, coordinated intervention
 - Have a balanced and enhanced package of support including capital allowances, R&D credits, access to growth capital and patient capital
- Provide financial protection for SMEs to take on bigger challenges and to move from start-up to scale-up through an improved growth capital programme: a Midlands Equity Fund through the Midlands Engine, linked with a German style Sparkassen Savings Group environment established by the banking sector
- Establish a gigafactory in the Midlands, drawing from our local supply chain as part of the levelling up agenda
- Create SME clusters in the region, adopting the principle of the South Korean KICOX model to create supply chains for emerging markets and help SMEs pivot away from markets in decline
- Create an internship programme placing graduates into SMEs to provide:
 - Bandwidth for SME leadership to be strategic as well as operational
 - Vital industrial experience for graduates at a time when employment opportunities are scarce
 - Supplement this with an industrial mentorship programme to support both the SME leader and the graduate

- Create a productivity growth fund to support SMEs to adopt and deploy advanced manufacturing technologies based on the 'Made Smarter' initiative
- Modify the Apprenticeship Levy so that it can be used to upskill and reskill workers who have been displaced by advanced manufacturing technologies
- Repurpose the National Retraining Scheme and direct funding to support the redeployment of workers who have been made redundant during the pandemic
- Support Midlands' universities to create leadership development programmes on a modular basis that SME leaders can 'dip into and out of' to suit their needs and capacity
- Introduce the concept of 'Total Value UK' to recognise the value of localisation rather than the traditional focus solely on cost
- Task the High Value Manufacturing Catapult, in collaboration with our university sector, to develop a portal for key supply chain information and map the Midlands supply chain

This Report is an important milestone in the Midlands manufacturing 'journey'. For nearly three centuries, the region has been at the forefront of skills, technology and innovation. It has responded well to shocks in the past, whether in terms of global conflict or competition. With the correct structures in place, and a willingness to collaborate and adapt, the Midlands can once again lead the way.

The Commission is intended to be dynamic, with actions and responsibilities that will respond to the recommendations. Our researchers are now working on the implementation plans which will be launched over the next few months and the Commission will report its progress in summer 2021.

I look forward to hearing your thoughts, and more importantly, how you can contribute with your knowledge, experience or ideas, so that together, we can build our economic recovery on the back of a re-energised Midlands based manufacturing resilience.

Dr Clive Hickman
Chair, Midlands Manufacturing Resilience Commission

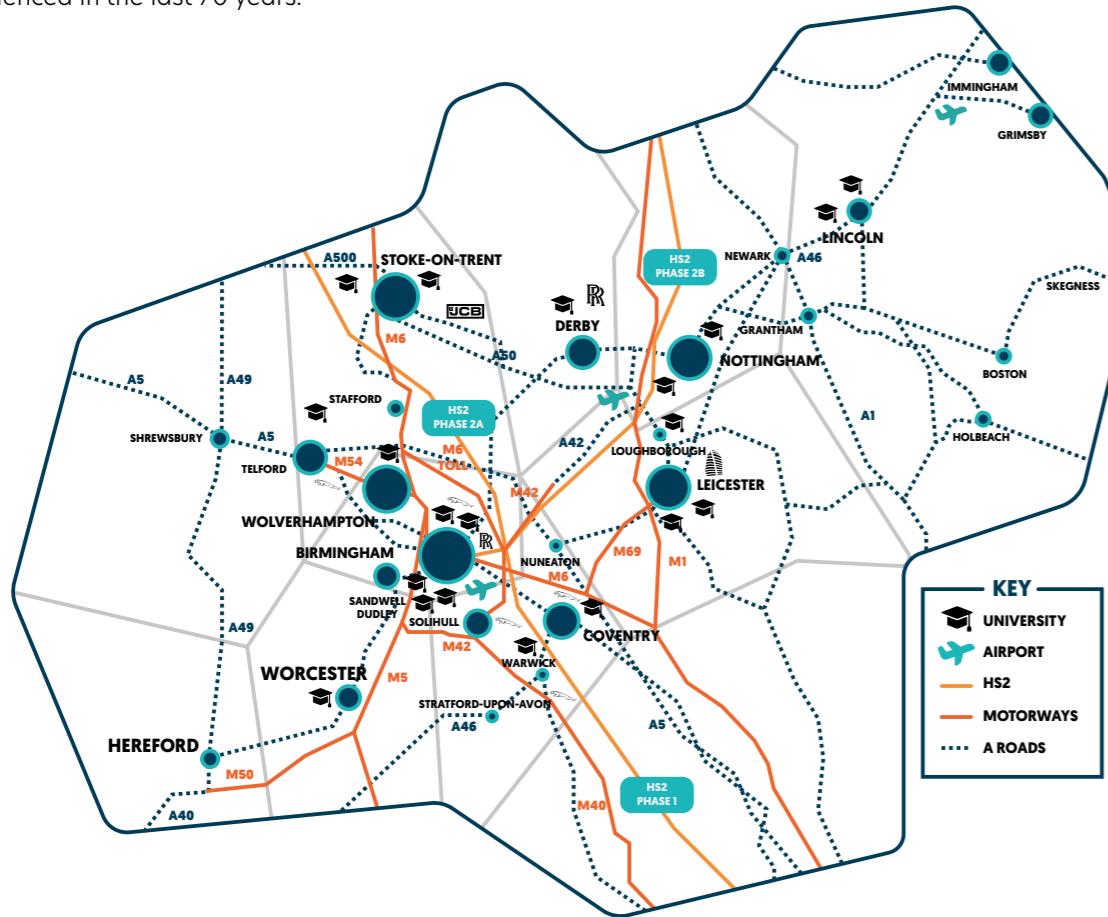
Chapter 1 - Introduction and the Midlands' Identity

Manufacturing as a sector has been growing rapidly across the world to support an ever-increasing consumer demand. However, at the same time, manufacturing output in the Midlands has shrunk, so I cannot help but wonder how this could possibly have happened. The Midlands was at the heart of the industrial revolution, manufacturing is in our DNA, and our heritage stems from iron smelting and the steam engine. Over the years, I have watched the decline of our historic and great industries, the loss of our steelworks in the 1970s, and the disappearance, over several decades, of our once massive car plants.

During the Covid-19 crisis, the Midlands' manufacturing family rose to the challenge, providing masks, face shields, ventilators, and a host of other equipment that was essential for our NHS to function. In these activities, we felt a sense of pride in what we as a sector had delivered, particularly in the face of arguably the greatest crisis this country has experienced in the last 70 years.

We have demonstrated our ability to respond to the call, and we must use this newfound confidence to harness the emerging technologies of automation, digital manufacturing, laser processing and Artificial Intelligence (AI). Our vision must be to enable the Midlands to become a resilient manufacturing force once again, prepared for whatever shocks that may be in store, whether those be political, environmental or technological.

The Midlands has geography on its side. Our location provides us with a natural advantage, whether developing our relationship with London and the South, or revisiting and refreshing our relationships with the North, but one we have not exploited to its full potential. From our supply chains, research institutions and infrastructure, we could and should be the hub to which our various national manufacturing 'spokes' attach themselves.



Midlands Engine, 2020

The Midlands has a clear sense of identity in terms of how it can differentiate itself from other regions of the UK. It will be on the foundations of this identity that it will create a sustainable vision of the future. The overriding theme raised time and time again in our roundtable discussions was innovation, on which our manufacturing heritage is based: from the smelting of iron in Darley Dale and Newcomen's first steam engine in Dudley, to Coventry born Frank Whittle's jet engine. These innovations have changed the world.

But it isn't just these outstanding manufacturing examples - everywhere we looked we saw the same iconic innovation:

- Cadbury's Dairy Milk is still the nation's favourite.¹
 - Stilton cheese has European 'protected' status alongside the ubiquitous Melton Mowbray Pork Pie.²
 - Whether you like it or not, where else could a by-product of brewing beer have become Marmite?
 - The world's first 4x4 saloon car was created by Harry Ferguson in Royal Leamington Spa in 1964.³
 - Northampton is synonymous with innovation in shoe manufacturing.⁴
 - The Midlands' motorsport corridor is home to almost 3500 related companies and employs around 40,000 people.⁵
 - The development of 'Bone' china is attributed to Josiah Spode, making the production easier and less susceptible to chipping.⁶
 - The Midlands' textiles industry historically made Leicester's women the highest earning in the world and Leicester the second richest city in Europe.⁷
 - It isn't by chance that Leicester is home to the National Space Centre, 60 years of innovation in the city has achieved that.⁸

- There are close to 1,000 med-tech businesses operating in the Midlands - the largest cluster of such companies in the UK.⁹

But innovation spans much wider than manufacturing in the Midlands; it was in Rugby that Webb Ellis picked up the ball and ran with it; Loughborough has more Olympic medal winners than most countries can boast; JRR Tolkien was inspired by our Midlands landscape to write the Lord of the Rings; Shakespeare found the essence of many of his plays and Lloyds Bank was created here in the Midlands. Not to mention the region is also home to such pillars of our culture as HP Sauce and the Salvation Army.

It should be no surprise therefore, that three of our national Catapult Centres are based here in the Midlands, and the High Value Manufacturing Catapult national activity is directed from its HQ in Solihull.

Our proud heritage points the beacon to our future as the 'innovation region', but to achieve that objective, we need to understand:

- a. Why the Midlands has fallen behind in manufacturing output whilst there has been such massive manufacturing growth around the world.
 - b. What actions we must take to achieve our aspiration for the Midlands to be at the very heart of the future of manufacturing in this country through innovation, skills and technology.

I am extremely grateful to Andy Street, the Mayor of the West Midlands, for sponsoring this Commission, and for his belief that we, as a team, will be able to deliver a positive impact for Midlands' manufacturing and its role as a foundation for our economic recovery.

To understand better the need for resilience in Midlands manufacturing, I chaired some 20 'virtual' roundtables with around 200 different participants from industry, academia and government - all knowledgeable in their field, but perhaps more

1 www.voucherCodes.co.uk

² [www.gov.uk/government/publications/protected.food.names/stilton.blue.cheese.PDF](http://www.gov.uk/government/publications/protected-food-names/stilton-blue-cheese.PDF)

3 Harry Ferguson Inventor and Pioneer, Colin Fraser ISBN 9780719 526602 1972

4 <https://northhamptonshoes.com/pages/shoemaking-heritage>

5 www.bbc.co.uk/sports/formula1/2304864

6 Britannica.com

7 <https://www.bbc.co.uk/news/business-48226187>

⁸ <https://spacecentre.co.uk/blog-post/leicester-in-space/>

9 <https://www.midlandsengine.org/medtech-worth-1-6.bn>

importantly, people who shared my passion for the Midlands, and for manufacturing. We discussed the predominant issues: skills, productivity, supply chains, innovation, leadership, confidence and finance, and what we wanted our region's identity and reputation to become.

My objective is to deliver a Commission which is relevant, with a set of actions that will propel the manufacturing sector in the Midlands forward, building on the strengths we are developing in med-tech and digital technologies, enhancing our capabilities in the food and drink sector, and restoring our automotive and aerospace heritage by responding to the ever-increasing demands of the next decade and beyond: global competition, rapid technological progress and a shared ambition to embrace the challenge posed by net zero.

This report also recognises the impact that the 'future of work' in manufacturing will have on society and our communities. On balance, and in my experience, automation and digitalisation will increase, rather than decrease employment, but this issue must be handled sensitively and should form part of a wider national debate.

Many people have generously given up their time to contribute to the Commission and to discuss the challenges that the sector needs to face. They have examined the evidence to determine the art of the possible, and what 'good' might look like. Our recommendations are based on these sound foundations, which I have summarised at the end of this Report.

I would like to thank Andy Street, the Mayor of the West Midlands, for writing the foreword and to Sir John Peace, Chair of the Midlands Engine and Mike Kapur, Chair of the National Space Centre, for their invaluable contributions and endorsements, demonstrating the regional significance of this report and our willingness to collaborate across the whole of the Midlands on something so vitally important to our economy.

Finally, I am delighted to launch the publication of the Commission's report to a wide range of stakeholders across the whole of the UK. I know that a great number of our recommendations will be delivered by Midlands' manufacturers and our region's stakeholders, whether they be in local government, our research organisations, our universities or our Catapult Centres, our financial institutions or by the local representatives of trade bodies such as the CBI or Make UK. But we would also welcome your support to make our recommendations a reality.

2020 was not the first time that manufacturing came to this nation's rescue, and I imagine it will not be the last. The sector has served this country well as part of our Great British brand, so let us work together to make it the resilient part of our recovery that it has the potential to be. After all, you cannot have a moon-shot like net zero without the support of manufacturing!

Dr Clive Hickman

As a representative of many East Midlands based organisations, I am delighted to be able to endorse this Report, not only because I know how important manufacturing is to our heritage, but because I believe it is central to our region's future.

The manufacturing industry in the East Midlands has a proud history and continues to make a significant contribution to the local economy. A total of 160 companies (32%) featured in the East Midlands Top 500 Companies Index are from the manufacturing sector, making it the largest group in the list, including household names such as Rolls-Royce, Toyota, Speedo, Games Workshop and Samworth Brothers.¹

I know from my background in finance and entrepreneurship how diverse our traditional industries can be. In my role as Chairman of the National Space Centre, I understand how important it is to embrace new technologies and the challenges and opportunities they will bring, as well as inspiring the career choices of future generations.

I am privileged to regularly meet with leaders of industry and academia, and I am always struck by the renewed sense of collaboration within and across the sectors, particularly as we begin to understand how to build resilience into our system. This Report puts the challenges we face into sharp focus, with recommendations which, if adopted, will help us to generate a manufacturing based recovery.

I would like to congratulate the Chair, Dr Hickman, and the contributors to this Commission - your passion and confidence in manufacturing and in the Midlands shines through.

Mike Kapur
Chairman, National Space Centre

Chapter 2 - Productivity

Productivity matters. It is one of the most important factors in determining prosperity and improving living standards. Higher productivity growth, enabling businesses to produce goods or services more efficiently and sustainably, leads to increased employee output, reduced waste and ultimately more and better paid jobs.

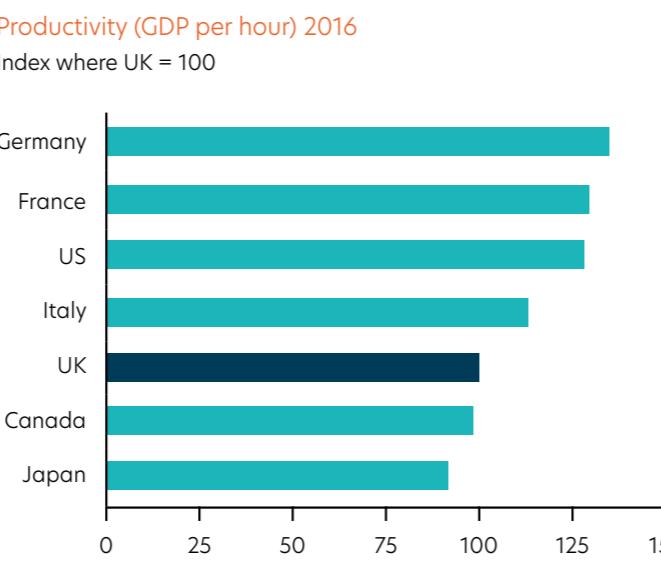
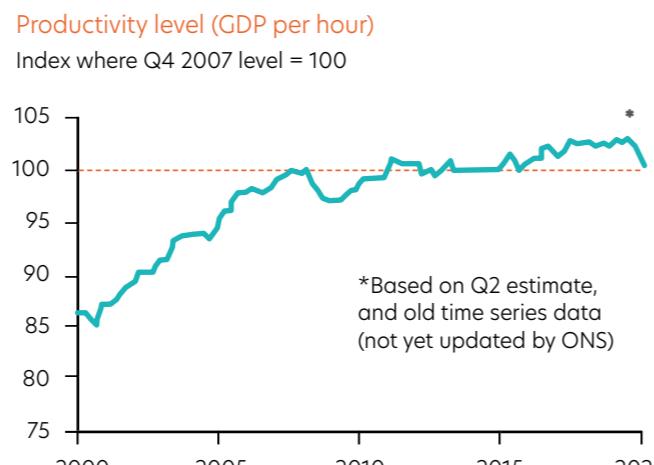
Until the recession of 2008/9, UK labour productivity (GDP per hour) had grown by around 2% per year (2000-2005). However, in the following decade, it largely stagnated averaging 0.2% (2010-2015). The economic shock of the pandemic in 2020 has had a sharp effect. Data from the Office for National Statistics shows that GDP per hour for the whole UK economy fell by 2.0% in Q2 2020 compared with the previous quarter, and that compared with the previous year, it was down by 1.8%.

Without sufficient productivity growth, people are less well-off and government is less able to raise revenue for the public services people need. By international comparison, the UK has suffered a sustained underperformance in productivity¹.

For example, France and the UK are similar in terms of population, and the size and shape of the two economies are broadly the same. France has achieved higher productivity growth since the 1960s, overtaking the UK, such that there is now a 20% gap in GDP per hour worked. Meanwhile in Germany it takes a worker 29.2 hours to produce what a UK worker produces in 40 hours².

Productivity output (GDP per hour)		
	% Change on qtr	% Change on yr
2018	..	0.5*
2019	..	0.0*
2019 Q3	0.3	0.2
Q4	0.4	0.2
2020 Q1	-0.5	0.2
Q2	-2.0	-1.8

SOURCE: ONS Q2 2020 release; *HCL calcs



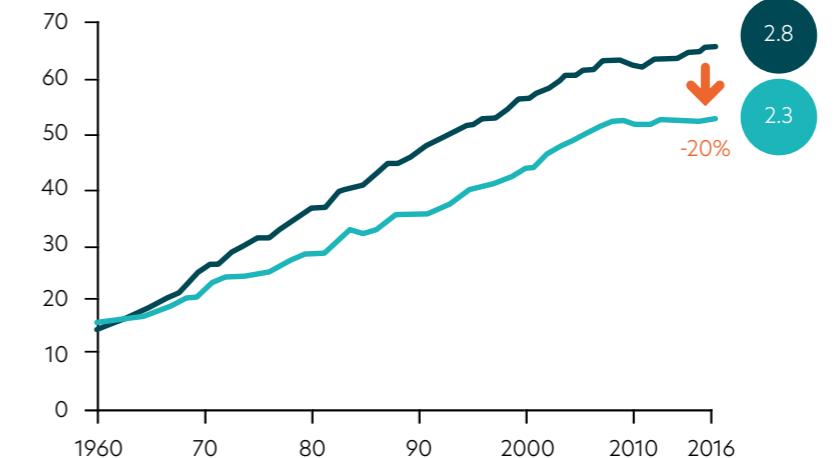
The United Kingdom's labour productivity diverged from France's in the early 1960s and is now 20% lower, while GDP per capita has grown in-line.

PPP, constant 2016 - \$

France United Kingdom Compound annual growth rate 1960-2016 (%)

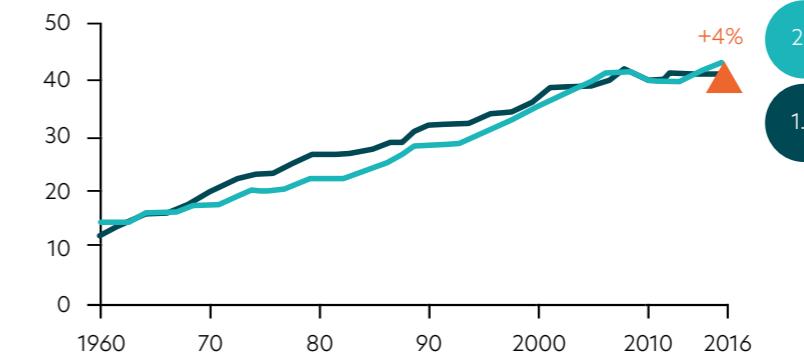
Labour productivity (GDP per hour worked)

\$ per hour



GDP per capita

\$ thousand per person



SOURCE: The conference Board data (March 2018 release); McKinsey Global Institute analysis

If weak productivity performance is a problem for the UK as an economy as a whole, it is a particular problem for the Midlands and its manufacturing sector. Analysis by the McKinsey Global Institute¹ (MGI) identified that the UK manufacturing sector had shown the biggest reduction of any sector in productivity growth (-0.5%) comparing 2010-2015 with 2000-2005.

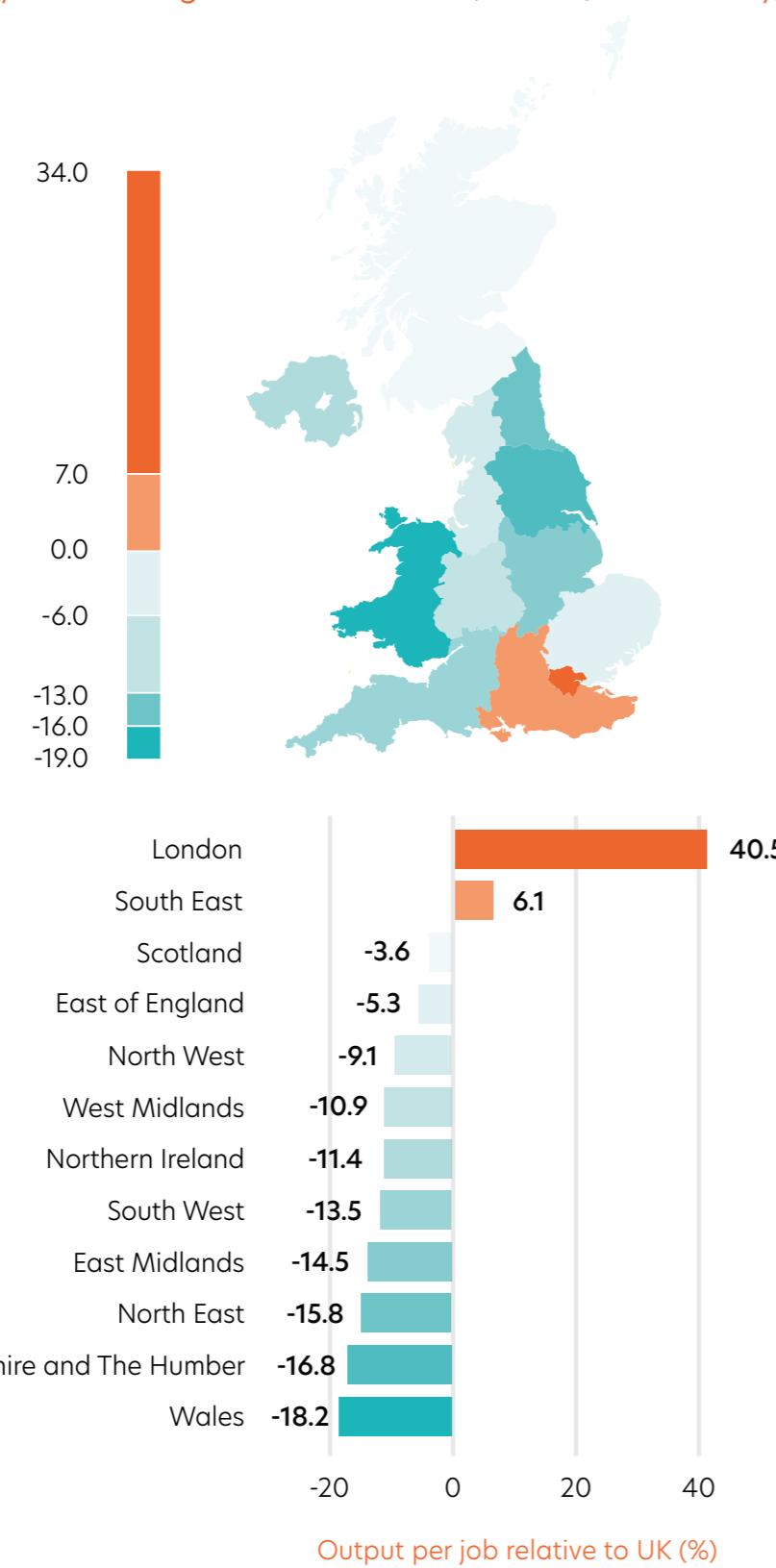
In the Midlands, the lack of productivity is striking when compared to the rest of the UK, and this is even more concerning considering that the UK does not compare favourably with international productivity levels.

1 House of Common Library Economic Indicators - Research briefing 26 October (Report 14 August 2020)

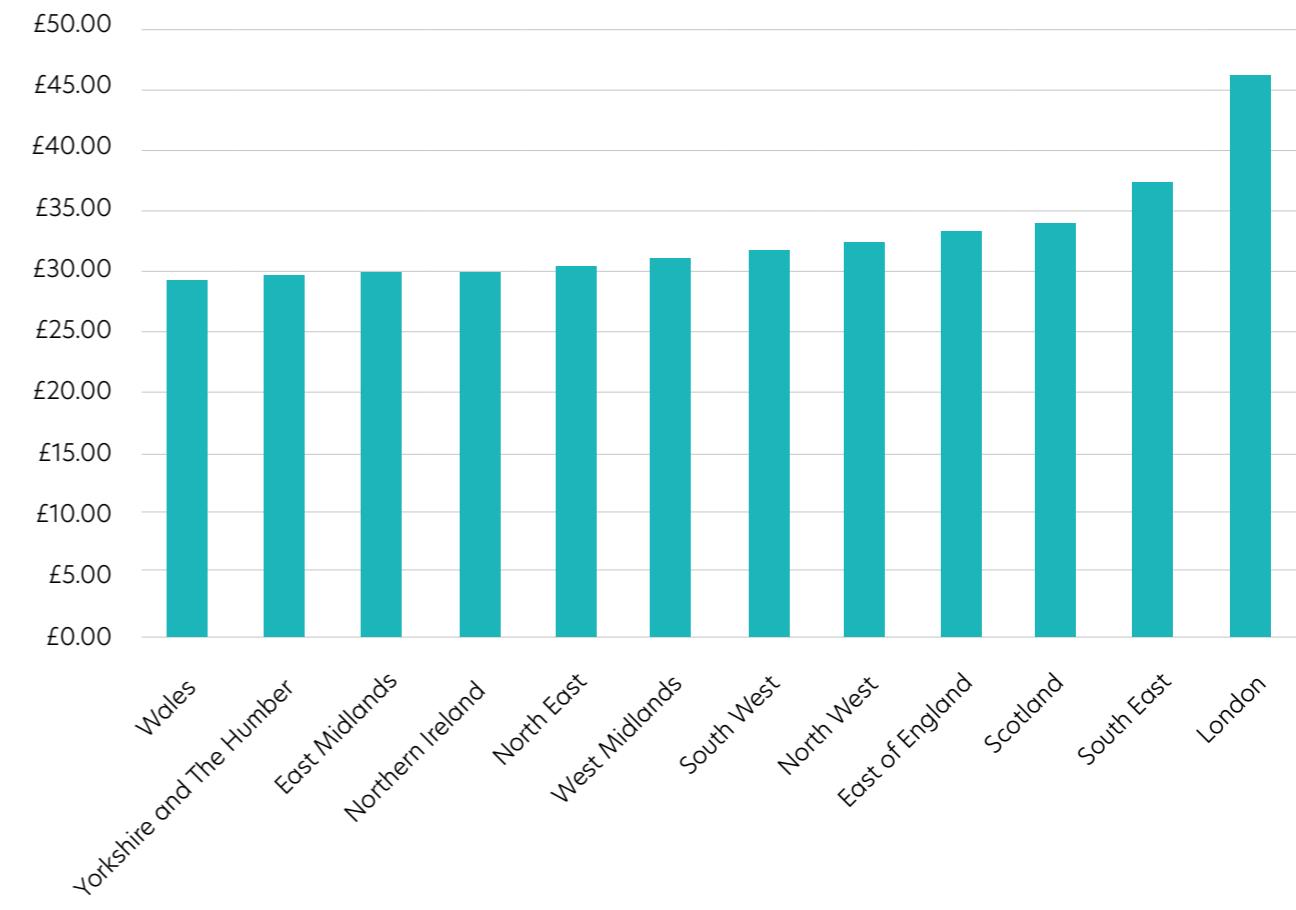
2 <https://www.independent.co.uk/news/business/news/uk-workers-less-productive-germany-business-france-american-sir-charlie-mayfield-john-lewis-be-business-a7834921.html>

1 Solving the United Kingdom's Productivity Puzzle in a Digital Age (September 2018)

Output per job by NUTS 1 region relative to UK, 2018 (Productivity)¹



GVA per Hour worked by Region¹, 2018



In 2018, the West Midlands was the 6th highest UK region for GVA per hour worked, while the East Midlands was 10th highest.

The above analysis shows that the East and West Midlands were among the very lowest performing areas of the UK in GVA per capita, such that in some areas of the West Midlands the aspiration is merely to be average. It is not however all gloom, and before the pandemic, the West Midlands had been the fastest growing region in UK for goods exports (27% WM 2015-17)², and the East Midlands had the fastest growing economy of any region in the UK in 2019, according to the findings of the EY Regional Economic Forecast³, which found that the region recorded economic growth in 2019 of 1.6% GVA.

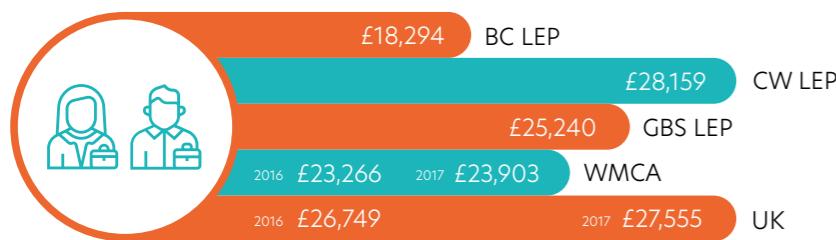
¹ Office for National Statistics

¹ Black Country Consortium

² <https://www.blackcountrylep.co.uk/about-us/west-midlands-combined-authority/local-industrial-strategy-evidence-base/>

³ <https://www.business-live.co.uk/economic-development/east-midlands-uks-fastest-growing-17803552>

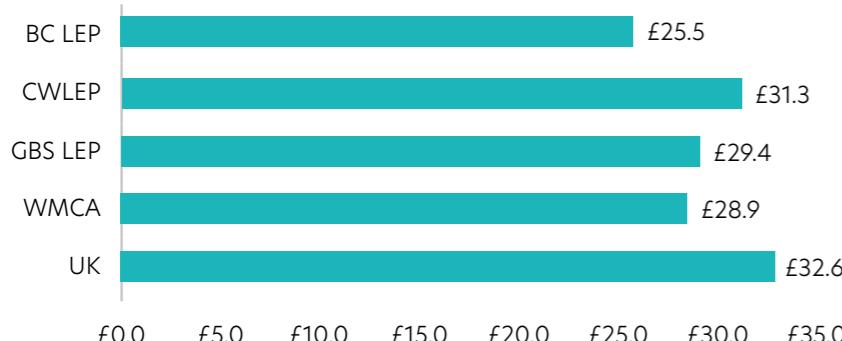
Current GVA per Head



The West Midlands Combined Authority (WMCA) total Gross Value Added in 2017 was £99bn, contributing 5% to the total UK GVA.

GVA per head in WMCA is currently £23,903 compared to UK average of £27,555.

GVA per Hour Worked



¹ ONS Regional GVA

KEY

- BC LEP - Black Country Local Enterprise Partnership
- CWLEP - Coventry & Warwickshire Local Enterprise Partnership
- GBS LEP - Greater Birmingham and Solihull Local Enterprise Partnership
- WMCA - West Midlands Combined Authority

The relatively poor level of productivity in the Midlands will impact the speed and sustainability of economic recovery at a time when it is most needed. Achieving unprecedented increases of productivity will be essential to our competitive future.

Throughout the Commission's evidence gathering sessions we sought to understand the nature of the problem, to identify causes and devise actions to address them. Many of the issues discussed - skills, appetite for R&D and innovation, investment preparedness, culture, technology diffusion and access to finance - are explored in detail in the chapters ahead.

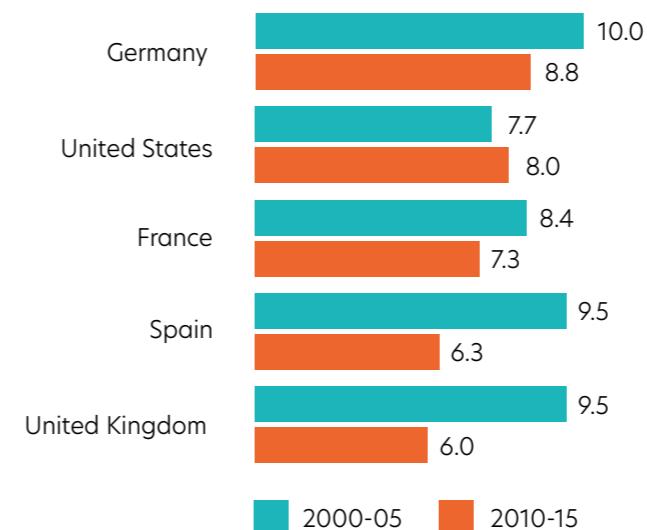
Prior to the pandemic in 2020 and in the decade following the 2008/9 economic crisis, the UK showed sustained employment growth across regions and sectors well ahead of its European peers. Employment grew nearly as fast as output grew, creating what analysts have called the "employment puzzle", with companies by and large prioritising additional labour over capital investment to meet demand.

McKinsey Global Institute suggests several factors have influenced employers' approach in this regard. These include a flexible and affordable labour supply, and economic and regulatory uncertainty, prompting low levels of capital investment. High levels of employment have been maintained with relatively low wage growth and a ready labour supply, as more young and elderly people enter the labour market prompted by a mix of policy adjustments including apprenticeships, university fees and pension changes, as an outcome of the 2016 EU referendum. Academics have noted that in periods of uncertainty, investment in capital goods is less attractive than adding workers, because it is harder to reverse the investment¹.

Employment growth does not necessarily preclude capital investment, but notwithstanding this, the UK and the manufacturing sector has tended to be slow in adopting leading edge technologies. UK manufacturing has one of the lowest levels of robotic equipment in the world, lagging significantly behind countries such as France and Germany.

Equipment investment in manufacturing¹

Average equipment gross fixed capital formation over manufacturing value added %²



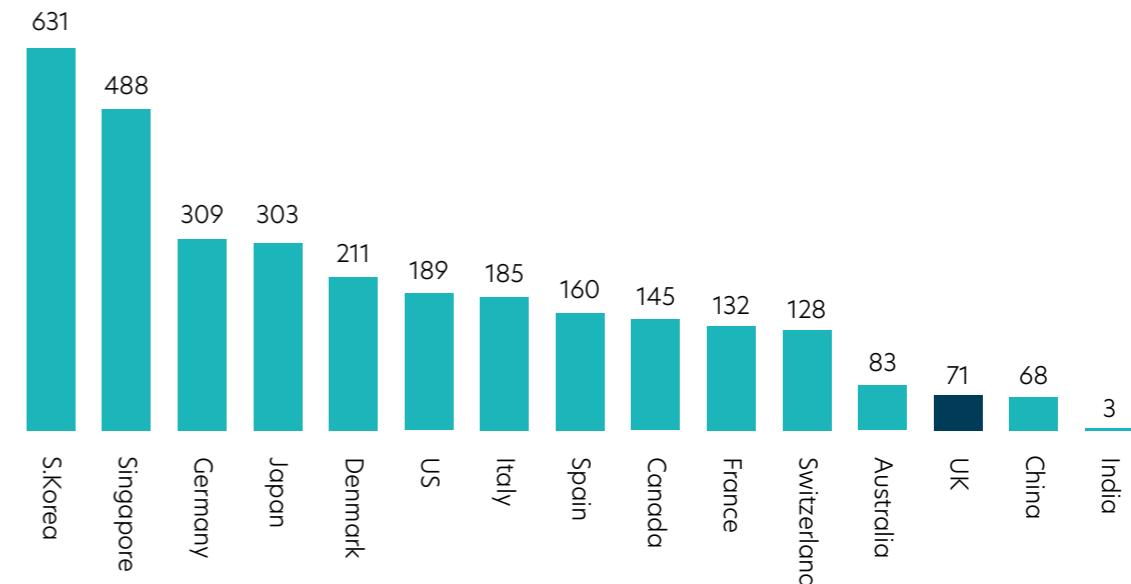
1. Sorted by equipment investment over value-added in 2010-15

2. Nominal values

¹ The decline in chemical products and chemicals includes a slowdown in productivity growth for the pharmaceuticals sector, where a "patent cliff" (the sharp decline in UK pharmaceutical revenues upon patent expiry) from 2011 onwards resulted in a shock to value-added growth.

² The 4th Industrial Revolution: A primer for manufacturers, EEF and Oracle, 2016.

Installed industrial robots per 10,000 employees in the manufacturing industry, 2016



SOURCE: EU KLEMS (2017 release); International Federation of Robots; Statista; McKinsey Global Institute Analysis

In some areas, the UK has high levels of digital adoption, advancing well in terms of Internet access, basic digital skills, and the adoption of cloud computing. However the UK performs poorly in areas such as the integration of information systems across the value chain, deep business process transformation and the adoption of robotics³.

The major challenge for SMEs is how they will embrace technology to increase productivity. If we consider, for example, automation, the number of robots per head employed in the UK is extremely low, relative to international comparators, as shown above.

¹ Nicholas Bloom "The impact of uncertainty shocks" Econometrica Volume 77, 2009.

³ UK Digital Strategy 2017 DCMS.

International comparison of robot adoption 2017¹

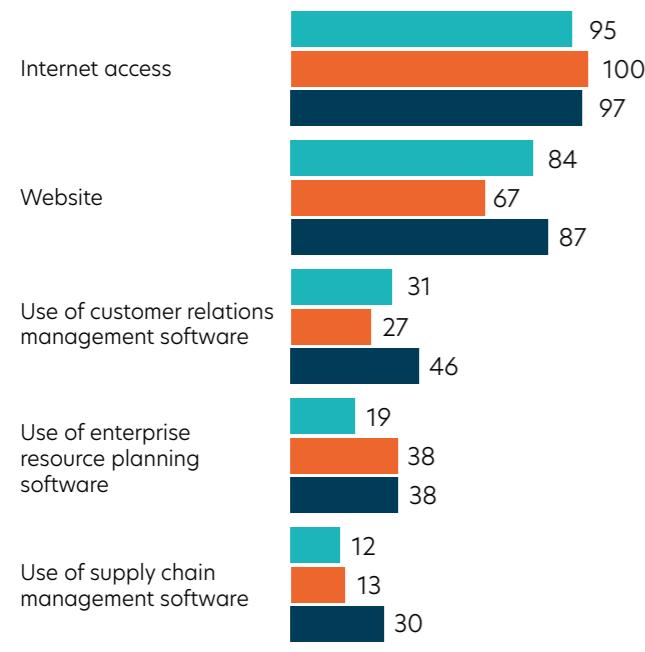
Robots per 10,000 manufacturing workers, 2017



Research has shown that without investment over a prolonged period, the efficiency gains that can be achieved by end-to-end digital integration will not be delivered. UK businesses lag in the adoption

Adoption of digital technologies

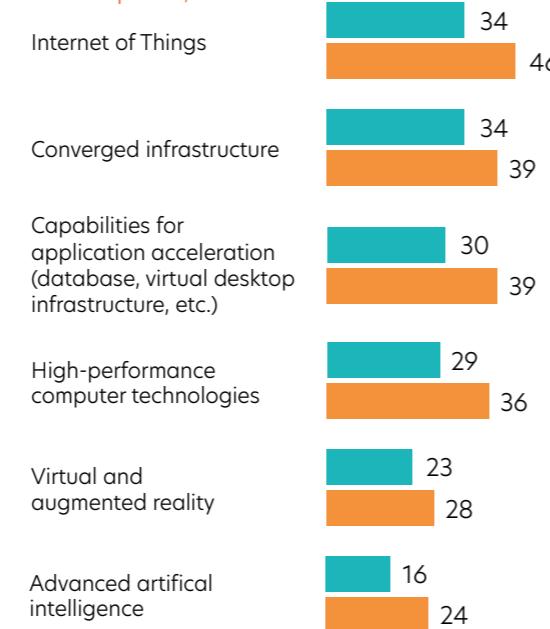
% enterprises, 2017



of customer relationship management, enterprise resource planning, and supply chain management, making it harder to achieve the transformation that can be delivered through Industry 4.0.

Investment in next-generation technologies

% enterprises, 2017



United Kingdom

France

SOURCE: UK Digital Strategy 2017, Department for Digital, Culture, Media and Sports, March 2017; Eurostat; Realizing 2030: A divided vision of the future, Dell, 2018; "UK lags behind Europe in technology investment", Digitalisation World, March 2018; McKinsey Global Institute analysis

1 Information, Technology and Innovation Foundation

2 Includes: Australia, Brazil, China, France, Germany, India, Italy, Japan, Mexico, Netherlands, New Zealand, Saudi Arabia, Singapore, South Africa, United Arab Emirates, UK and United States

Barriers to adoption, in addition to a reluctance to invest in a time of uncertainty, include a lack of business leadership and/or technical capability to execute investment strategies. Furthermore, the costs associated with preparing for Brexit, including temporary plant closures, stockpiling, and uncertainty over future tariffs, quotas and general bureaucracy, have disincentivised investment. The financial position of many businesses has been further weakened by the reduction in demand and economic activity prompted by the pandemic.

Real productivity gains require changes in business processes as well as improved leadership and technical innovation¹. Technology therefore, is not a "silver bullet", and changes on multiple fronts are needed. Other barriers include the fear of technological obsolescence and cannibalisation of existing products and services. MGI reports UK businesses as quoting "risk aversion" as the main factor for not committing to attractive investment opportunities.

The Commission has identified a number of other factors that also influence the adoption of new technology:

- Perception that technology will displace employment
- Cost of implementation
- Access to finance for implementation
- Risk that customers will offshore their supply to low cost countries
- Resistance to change
- Confidence and belief
- Industrial leadership and vision
- Availability of skills to enable the transition

Technology displaces employment

The perception that technology displaces employment is probably the most widely held misconception in the manufacturing sector. All the evidence points to the opposite outcome. Not only does technology adoption generate productivity gains through improved quality, reliability, delivery schedules and reduced waste, it increases net employment with higher skilled, higher paid jobs. However, this will only be achieved if upskilling is included as part of the programme.

The German Union IG² quoted large employment gains through the application of robots in the Volkswagen body shop and Rolls-Royce have also created incremental employment opportunities, improving quality and performance, by automating wax pattern production³.

The benefits can be astounding: Jason Aldridge, of Coventry-based SME Arrowsmith Engineering Ltd, said: "We have started to introduce automation into the firm and it has transformed us. I can similarly see that there are huge improvements that the UK as a whole can achieve. As an SME, we have doubled our size in the last three years as a direct result of automation and our collaboration with organisations who have helped us make this transition, such as the Manufacturing Technology Centre (MTC)."

Based on this evidence, a key question must be: why is there such a low level of technology adoption in our SME community, and what actions are needed to address this deficiency?

1 "How IT enables productivity growth" MGI November 2002.

2 <https://www.igmetall.de/ueber-uns/ig-metall--a-strong-community>

3 https://www.eu-robotics.net/robotics_forum/press/european-robotics-forum-2015-robots-will-create-jobs-conclude-high-level-speakers.html?changelang=3

Economist David Autor argues that 'When automation or computerization makes some steps in a work process more reliable, cheaper or faster, this increases the value of the remaining human links in the production chain¹'. An example that illustrates this is the introduction of ATMs in the 1990s. This move towards automation did not lead to a reduction in the number of bank tellers that these machines theoretically replaced. Although individual bank branches did reduce the number of tellers per branch, they also opened more branches to remain competitive, and tellers' jobs focused on more high-value tasks in customer interaction².

Not only does technology not displace employment, it actually increases it. Consultants Deloitte estimate that 'While technology has potentially contributed to the loss of over 800,000 lower-skilled jobs (in the UK), there is equally strong evidence to suggest that it has helped to create nearly 3.5 million new higher-skilled ones in their place'³. And countries with the highest robot density – South Korea, Japan and Germany – also have among the lowest unemployment rates.

British Automation and Robot Association (BARA) response to BEIS committee enquiry on Automation and the Future of Work 2018

1 Autor, David. 2015. Why Are There Still So Many Jobs? The History and Future of Workplace Automation. *Journal of Economic Perspectives* Volume 29, Number 3

2 Bessen, James. 2015. Toil and Technology. Article, Finance and Development, March 2015

3 Deloitte LLP. 2015. From Brawn to Brains: The Impact of Technology on Jobs in the UK. Deloitte LLP

Access to finance and the cost of implementation

Increased productivity is a function of innovation, but also important is an organisation's preparedness to invest in the relevant machinery. Furthermore, manufacturers need to invest in skills to facilitate the introduction of automation into production lines, and this investment needs to be de-risked as much as possible.

The 2018 Productivity and Skills Commission¹ identified that tax incentives would promote investment, and that there also needed to be far greater consideration of the increasing pace of technological change. Facilities which might once have had a 10-15 year life, may now only have an optimal life of 5 years.

The technologies that are now emerging will inevitably lead to the development of new products, and this can already be seen in the automotive sector, where the internal combustion engine is being displaced by electric propulsion.

There has been a great deal of discussion over the years on the 'enablers', and how we can use initiatives and programmes such as digitalisation and 'Industry 4.0' to help drive up productivity and other operational improvements. The challenge for the manufacturing sector is how the benefits of technology can be disseminated appropriately - automation is not the solution for every product and every manufacturer. And even if it were, there may be other tools and techniques that should be considered first.

The Mayor of the West Midlands, Andy Street, has submitted a £100m bid into government for a 'Productivity Booster' for the region and a further £500m to be invested in productivity and innovation across the region. The Productivity Booster initiative is designed to look at an SME as an individual entity in its own right, but can also be adapted to support a cluster of SMEs, particularly where leadership bandwidth within an SME is constrained.

What Japan and South Korea have done, and very successfully, is to build 'clusters' with similar needs and capabilities – machining, fabrication or digital for example, and link them together as an informal 'club' where they share the work and compete internationally, rather than locally.

In practice, these clusters consist of 30 to 40 SMEs, each offering a specific solution which becomes very cost effective, balancing capacity with demand and creating a scale that facilitates cross-sector collaboration and market penetration with the associated productivity gains. The Korean Clusters are created in communities called KICOX (Korean Industrial Complex) appointed by the Ministry of Trade, Industry and Energy and have, in part, contributed to 10% annual growth of GDP¹.

1 <https://www.clustercolloboration.eu/international-co-operation/south-korea>

Case study: reshoring

Technology investments can result in radical improvements in cost efficiency, allowing work to move back to the UK from low-wage economies, and strengthening UK supply chains. As an example, increased productivity is enabling firms, such as Whirlpool, Caterpillar and Ford Motors in the US and Adidas in Germany, to restructure their supply chains, bringing back parts of the manufacturing process to the country of origin.

The Reshoring Initiative in the US estimates that 250,000 jobs have been brought back to the country by reshoring and inward-bound foreign direct investment (FDI), since 2010¹. Not only does automation enable reshoring, companies that deploy robots are less likely to relocate or offshore in the first place, according to a report prepared by the Fraunhofer Institute for Systems and Innovation Research². Reshoring also brings other advantages such as the potential for demand spill over into other sectors, and the accumulation of specialist manufacturing know-how for attracting and expanding talent, and for national competitiveness.

BARA

1 http://reshorenaw.org/content/pdf/2015_Data_Summary.pdf

2 European Commission. 2015. Analysis of the impact of robotic systems on employment in the European Union. Luxembourg: Publications Office of the European Union

Opportunities to reshore

Many businesses in the Midlands have seen work offshore to low cost countries and the impact of this has been devastating for those businesses. This in part explains the reluctance to invest in technology: "What if we make a major investment in technology and the work is then offshore?"

However, for the offshore activities to be reshored, the application of advanced manufacturing technologies, with consequent productivity improvements, is necessary.

To achieve this, we need a renewed confidence and belief from the workforce, and an effective and insightful leadership, to address this perception.

The need to reshore cannot be better exemplified than by considering our reaction to the pandemic. Relying on imports for critical NHS supplies highlighted the lack of agility and flexibility that can only be achieved through localised manufacturing.

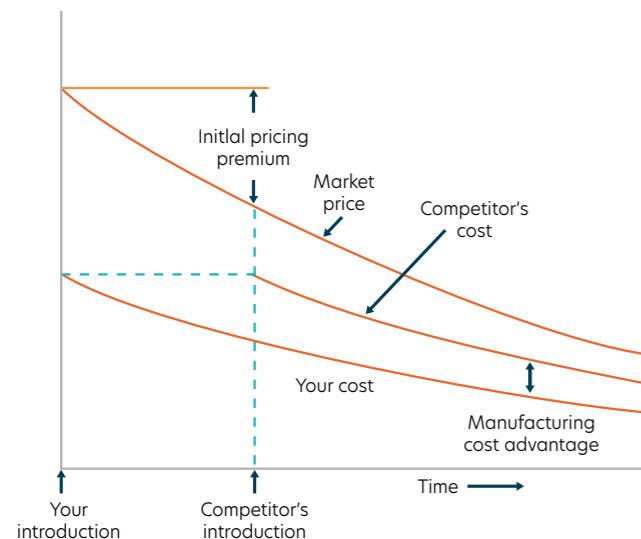
Resistance to change

'Adapting to change' is a further chapter in this report, but it is important to recognise the reasons for a general resistance to change. This attitude is particularly prevalent in the SME sector and is described in further detail in Chapter 8 - Support for SMEs, and Chapter 9 - The Supply Chain. Much of this resistance is related to confidence and belief.

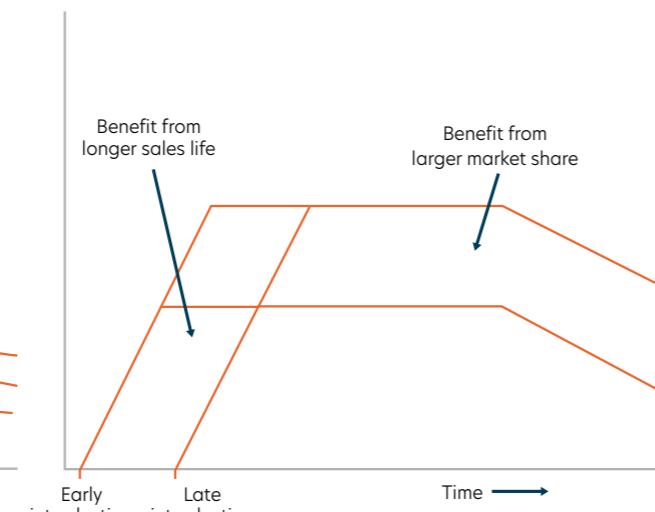
However, if businesses are too slow to embrace change, or worse still, are resistant to change, the greatest impact will be on the workforce, particularly as a recovery starts to gain momentum.

Evidence can be seen from new product introduction studies that the first to market with a new product gains market share, a premium price, higher sales over the life of the product, and a manufacturing cost advantage. As a consequence competitors lose market share and productivity falls, leading inevitably to unemployment. This is clearly evidenced by the gradual contraction of our indigenous automotive sector.

Unit cost/price



Sales volume



SOURCE: Developing Innovative Vehicles: The Challenges and Demands, James Clayton Memorial Lecture, Institution of Mechanical Engineers 18 October 2010

Industrial leadership confidence, insight, belief and culture

One of the biggest challenges that the manufacturing sector faces in the region, is the quality of its leadership and perceived culture. Skills gaps are often discussed, but identifying and developing a skilled workforce is often only part of the challenge. It is also important to develop leadership skills, including technology awareness and an understanding of the benefits of technology adoption. The solution is not just about forcing technology onto a company, the leadership of the company needs to be helped to understand the supply chain requirements and how the technology will help meet demand. The leadership needs to know why it is in their interest, and what is the business benefit of taking that journey? This requires leadership insight and a corresponding change in culture. The tools that many manufacturers need are already around them, they just need to be supported in learning how to use them effectively.

Flexible manufacturing systems

Flexible manufacturing systems allow supply chains to pivot from one product to another and from one sector to another. The 'art' of improving productivity is not just about identifying improvements to the engineering and manufacturing of the product, it is about bringing the engineering, manufacturing, and supply chain together.

The whole landscape of manufacturing is changing, not least in terms of emerging business models such as TES (Through-Life Engineering Services) and servitisation. With these, there are opportunities for revenue through the 'life' of a product, and businesses making these transitions, such as Rolls-Royce transforming from a manufacturer of gas turbines to becoming an energy business, providing the total care package, (i.e. the 'power by the hour' concept) and the repair base, with all the associated benefits that brings to Rolls-Royce and its customers.

However, in the case of Rolls-Royce, this has exposed it to their customers' plight during the pandemic and highlights the need to continually refresh business models to adapt to change.

Manufacturers can do more than just sell a product, they can develop a wider proposition, not least through the principles of clean growth and the circular economy.

Skills

The availability of the right skills is essential for the adoption of the advanced manufacturing technologies that will enable rapid and sustainable improvements in productivity. The skills chapter later in the report takes an in-depth look across the region, and identifies a number of opportunities to address the challenges to positively impact manufacturing productivity.

In the following chapters the Commission makes known its findings on the measures that business and government need to take together. This requires sustained, consistent, and clear support from government rather than a 'stop-go' approach to industrial strategy, the avoidance of procrastination over the rollout of initiatives such as 'Made Smarter', launched in 2017, and the delivery of the UK Shared Prosperity Fund, as a successor to European Structural Funds, also announced in 2017 but with no substantive details published yet.

The prize for the Midlands and the manufacturing sector in addressing these challenges is substantial, and the need to transform in the face of increasing international competition is essential.

Dr A Palmer CMG

Chapter 3 - Adapting to Change

The Commission's findings have identified that, whilst the Midlands has the capability to adapt to change and to respond to challenges, it often lacks the confidence, belief and industrial leadership to do so. However, when that is put in the context of a global pandemic, not only was it able to adapt, it actively embraced that change. Organisations of all types and sizes moved their focus, redirecting their assets and capabilities to support the global response and fill gaps. Distilleries and breweries repurposed equipment and worked with their supply chains to produce hand sanitiser. Automotive plants manufactured ventilators and respirators. Hotels provided rooms to the homeless. It was nothing short of one of the fastest, most widespread displays of global innovation. The Midlands can take pride in the part it played in this initiative.

The challenge now is to maintain this level of agility, flexibility, and responsiveness, by identifying and removing the barriers which inhibit the ability to adapt to change.

The global economy is facing one of its most severe crises. The aerospace sector is experiencing the biggest downturn in its history. The automotive sector is having to react to significant disruption in production, global supply chain and customer demand; industrial-products and chemical-products companies are facing deferred demand, supply disruptions and potential plant closures, dramatically impacting retail and purchasing prices. On the other hand, the crisis has created a major opportunity for businesses in other sectors, including medical devices, food and drink, e-commerce and consumer products, where demand has often exceeded supply. Couple this with the need to slow climate change as a global imperative, and the opportunity for the most agile is compelling.

Evolving customer behaviours, purchasing channels, regulations and national and international strategic priorities, including the green economy, are all factors which necessitate a high level of business agility and, in some cases, could trigger the need for pivoting between market sectors. In fact, many businesses need to reskill and adjust their business models to adapt to change within their own market sectors.

Despite the general perception of Midlands' manufacturing being heavily dominated by the automotive and aerospace sectors, the region also has the biggest medical technology sector in the UK, with over 1000 firms in the region who specialise in the spectrum of medical devices, spanning single use products to internationally leading expertise in the development of chemical imaging.¹

The opportunity for expansion in this sector is significant, and the Midlands is well placed to take advantage of this opportunity.

The region is already seeing multiple ways in which organisations can adapt their operations to create lasting competitive advantage, and meet environmental and social responsibility goals. Informed by customer insights, some companies will reinvent themselves entirely in the coming years, focusing on specific technologies or niche markets, or repositioning themselves within their industries, or within other industries. Businesses can also become more creative with the assets they have available, whether by repurposing equipment or people, they can address emerging requirements in other market sectors which have not been affected by the crisis.

According to a recent study², as many as 20% of businesses pivot to a different product or sector at some point in their lifecycle. This suggests that making a pivot transformation is a normal exercise that can be successfully achieved, no matter when it happens.

However, it is important to recognise that breaking into a new market requires much more than having flexible production lines. It often takes time and effort to build relationships in new markets, to understand the market needs and to comprehend the competitive environment. Furthermore, the way different sectors are regulated plays a major role in shaping opportunities and challenges. For example, switching from a high-volume low margin sector into a low-volume high margin sector (for instance, producing safety critical components) requires significant investment in training and education in both the manufacturing technologies and operating practices for that sector.

Pivoting between sectors

There are a number of challenges for SMEs when trying to move into a new sector:

- Acceptance by the OEM/Tier 1 supply chains and getting onto approved supplier lists
- The need to fully demonstrate relevant capabilities and expertise
- Achieving necessary regulatory approvals
- Differences in contracting terms and intellectual property
- Confidence and leadership

Many of these issues could be addressed by the provision of industry sector support services to help with the transition.

The Fit for Nuclear Programme³ is one such example, but, whilst this addresses the technical requirements, it does fall short in addressing all the issues outlined above.

Industrial leadership and culture

It is widely accepted that the key to enabling cross-sectorial work or shifting between sectors starts with leadership - having quality leaders who are prepared to risk moving outside their comfort zone and giving their teams permission to do things differently. Therefore the ability of an organisation to orchestrate a pivot, seamlessly and successfully, depends on the values on which its culture is based.

The common denominator among businesses that have pivoted is pace, both in decision making and execution. Whereas the typical consumer goods protocol for a new product involves developing and testing a prototype over several months, the pivot experience proves that the future belongs to the swift. In other words, it's not about planning our way to the future anymore. It's about acting and anticipating our way to the future.

Case study: market pivots

Unipart Manufacturing is a market leader in the manufacture of certain automotive components - fuel tanks, fuel systems and high pressure fuel rails - but when faced with the challenge of electrification, they needed to work out how they could get involved. The team set about describing what they did differently. They concluded they assembled complex, safety-critical systems, using a digitally-enabled manufacturing process that integrated total traceability. To this they added their core technical skills - forming and welding - and more generic skills of problem solving and collaboration. These were the same skills but seen through different eyes, which allowed them to determine how they were transferrable into new areas. The business went on to apply these skills to EV battery manufacturing. Of course they still needed leaders and entrepreneurs who could identify the right market opportunity and the appropriate business model, collaboration partners (in this case Williams Advanced Engineering) to fill in the specific product knowledge gaps, and owners/investors willing to support diversification, but looking at its capabilities differently enabled the team to create Hyperbat Ltd, its EV battery manufacturing business.

John M. Neill
Chairman, Unipart

1 <https://www.midlandsengine.org/medtech-worth-1-6-bn-to-midlands-economy/>

2 <https://www.bethebusiness.com/productivity-insights/coronavirus-pivoting-your-business/>

3 <https://namrc.co.uk/services/f4n/>

Skills

In terms of skills, there is a large focus on attracting new entrants into engineering through apprenticeships or academic training, but it is equally important to consider the development of the existing workforce. Data suggests only half of the existing workforce will remain in one job for 20 years, hence developing and maintaining appropriate upskilling and reskilling programmes is of great importance.⁴

"There is absolutely no reason why we should have skill bottlenecks in this region, we've got the right kind of population, we have got a young population, and if we do have skill bottlenecks it's because we're doing something wrong."

Professor Sir David Eastwood

University of Birmingham

Conclusions

- During this time of unprecedented demand, we will quickly rethink and redesign our ways of working – from business models to supply chains; from safeguarding employment to approval processes and product lines. In addition to meeting immediate needs, businesses and employees in many sectors are struggling merely to survive in the face of devastating losses. Many business owners are innovating to continue services, and the resulting models emerging from this time have the power to change communities and society for the better.
- Breaking into a new sector requires a differentiator or a unique selling proposition and a support system for new entrants.
- Pivots that prove strategically beneficial are often the result of leaders who are both informed and intuitive and have a very good understanding of the "megatrends".

Professor Iain Gray

- It is necessary to have an economy that is able to make the required skilling, upskilling or reskilling interventions at the right time. Therefore when talking about skill enhancement or development of people already in the workforce, the time to do so is not when they are about to lose their jobs or when the existing technology is about to become obsolete, it is before that situation occurs.
- In the UK there is a view that skills are only real if there are accredited. However, whilst accreditation is important to both individuals and institutions, it is not the only part of skills development. Skills should be developed in the places they are most appropriate and not according to accreditation.
- The introduction of emerging and advanced technologies, such as automation and digitisation, is somehow reducing the differences and increasing the commonalities between the various manufacturing sectors.
- When considering switching between market sectors, businesses need to carefully evaluate whether they are pivoting in response to unplanned events, or they are doing so as a result of a strategic decision (e.g. changing market dynamics) and understand the risks and opportunities associated with each case.

Chapter 4 - Research and Development

As global and national markets have evolved, the Midlands has seen a decline in the number of OEMs it supports, and has less local ownership of R&D. Manufacturing has transitioned to become part of supply chains that are led and driven from abroad. The consequences are acute and detrimental, putting capability, jobs, and the economy at the mercy of external influences, creating a "race to the bottom" culture of cost reduction where innovation is less valued, making it difficult to introduce R&D into SMEs and for them to absorb new technologies.

Innovation is a key mechanism to create thriving regions and societies, yet the current circumstances in the Midlands are not conducive to innovative supply chains, despite the significant capabilities and strengths available.

In addition, the Midlands has suffered from long-term public sector underinvestment in R&D, despite striving to maintain and grow its private sector investment. This results in weak inward investment as companies gravitate to areas where they can leverage greater public sector incentives. As the graph on page 29 demonstrates (R&D Expenditure per Capita by NUTS region - 2017), far from achieving a 2:1 ratio of public to private investment in R&D, the ratio is closer to 4:1 in the West Midlands and 3:1 in the East Midlands, compared to approximately 1:1 for Scotland, London, Wales, the North East and Yorkshire. This should be a key action for the levelling up agenda.

If government investment in R&D is rebalanced across the UK, and as the world goes through a significant transformation to tackle global challenges, the Midlands has an opportunity once again to leverage its inherent innovative core, by driving the creation of new R&D-intensive clusters. These will slot in place into the next generation of supply chains, such as those involved in electrification, hydrogen and mobility.

The Midlands has the highest density of manufacturing companies in the country¹ and arguably the most robust R&D capability, as evidenced in the graphic on page 30 (Public & Private Sector Spend (£) per person in R&D across the UK).

However, R&D is not flowing through the innovation chain as it should, owing to significant weaknesses and gaps. The most serious challenge being the lack of control of industrial R&D in the Midlands, making supply chains fragile, leading to the creation of fewer high-tech businesses locally, and impeding the scaling up and general commercialisation of emerging innovation.

4 <https://www.recruitment-international.co.uk/blog/2017/12/employees-staying-average-of-4-dot-5-years-in-a-job-finds-bps-world>

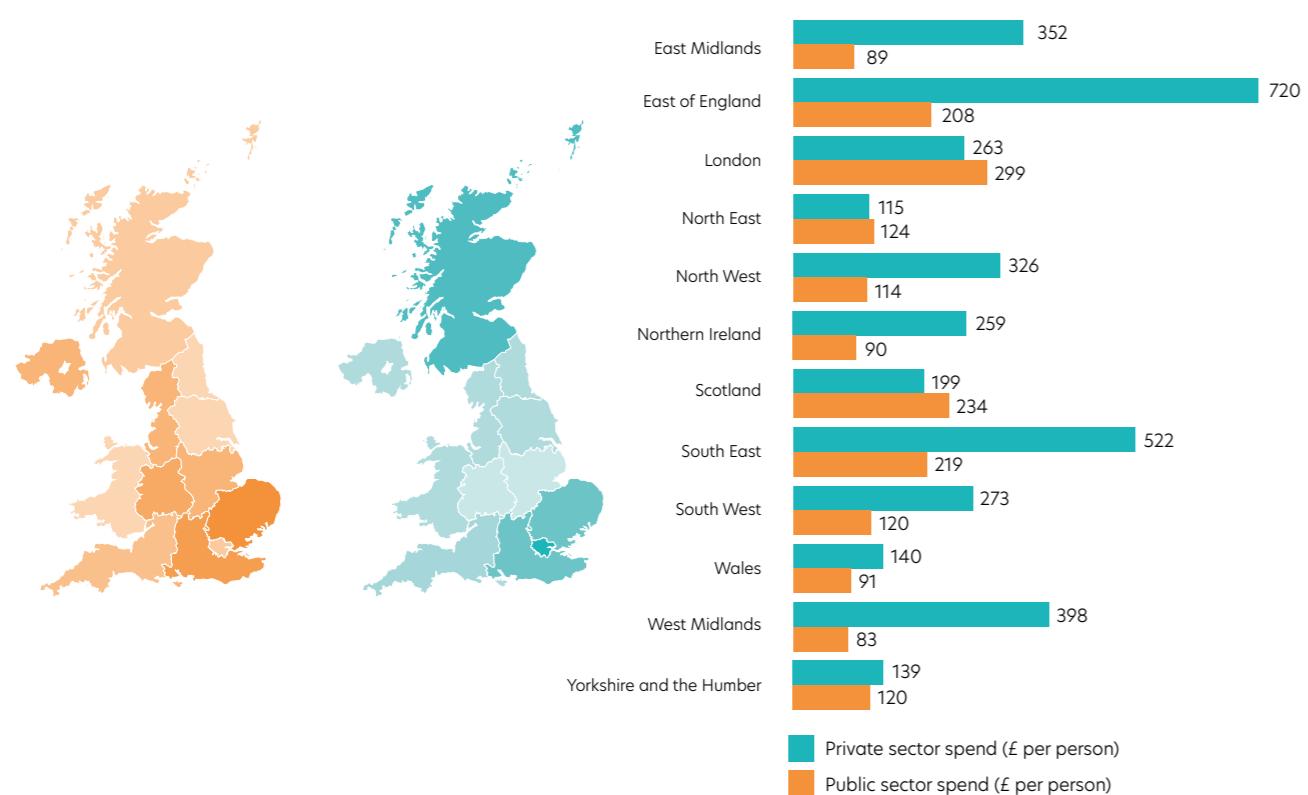
1 https://www.bdo.co.uk/BDO_UK/media/bdo/Microsites/Business%20in%20the%20UK/Regional-sector-map-Dec-2019.pdf

R&D Expenditure per Capita by NUTS region (2017)¹



SOURCE: Maximising Local Impacts of R&D Investment in the UK, The Power of Place: A Report by the Campaign for Science and Engineering May 2020

Public & Private Sector Spend (£) per person in R&D across the UK²



1 The Campaign for Science and Engineering

2 NESTA, Design the Future

With some of the largest manufacturers in the Midlands being foreign owned (including Jaguar Land Rover, Cadbury, GKN, Toyota and IMI), we are subject to remote investment decisions that could be devastating for the region, including in terms of R&D, talent and supply chain infrastructure. Under these conditions, even when innovation thrives, industrialisation, scale-up and exploitation of new ideas perform poorly, therefore resulting in commercial benefits accruing outside the UK. In addition, as industry simplifies its procurement processes by reducing supplier lists and using costs as a driver, supply chains are becoming less diverse and more inflexible, ultimately undermining local capability and exacerbating the threat of offshoring.

Despite a landscape that may seem unattractive from an R&D perspective, there is no need to look far to see opportunities for innovation in the Midlands which, if supported by appropriate interventions, could be game changing, not only for our region but the whole of the UK.

Current activities on Hydrogen and the recent success of the VentilatorChallengeUK [Appendix 3] are examples that illustrate what 'good' could look like for the region and how this ambition may be delivered.

The E2E Hydro-GEN initiative [Appendix 2] has already led to the identification of a gap in commercialisation and supply chain building, for which the organisation has sought support from the Government¹. A related initiative, Hy4Heat, led by ARUP, has also started to identify supply chain capability. However, efforts are required in the UK and in the Midlands to make sure that these supply chains and the associated innovation chains leverage local capability, and that we anchor that capability at this critical time in the journey.

The Speed to Scale Region, as proposed by the Mayor of the West Midlands, is just one example. This scheme identifies a number of hubs with a co-ordinated product innovation programme addressing the following themes:

- Low carbon heating
- New medical technologies
- Low emission urban mobility

- Secure connectivity

It also encompasses a 'Productivity Booster', leveraging double matched industry participation with a corresponding £460m of government investment, focusing on three key strands of government priority:

- Net zero
- Levelling up
- Supporting the NHS

This programme has the potential to generate an incredible economic stimulus, creating and preserving 2200 jobs locally and providing an additional £2.4bn GVA.

Similarly, the proposed space programme² has similar potential to be an economic catalyst and accelerate recovery in the East Midlands.

The 3.5:1 private to public investment in R&D across the Midlands facilitates a wide range of innovation opportunities through these programmes, not least those of net zero, mobility, hydrogen systems, electronics, digital manufacturing and artificial intelligence, which have applications across the whole range of sectors supported by the Midlands.

Conclusions

To make manufacturing resilient in the Midlands and reinvigorate and connect the world class R&D capability in the region, it is critical to build supply chains aligned with future trends, where the UK has influence and control. These supply chains should be built around R&D bases that deliver on key future trends, aligned with the capability in the Midlands. The orchestration, transformation and resilience of those supply chains should be the focus, including the development and attraction of talent. This will need independent leadership that can build consensus and create the connections, driving the pace towards achieving a common vision and purpose.

It is important to identify organisations which are well positioned to lead and convene the communities around the key priorities in the Midlands, to provide leadership, drive consensus, and help deliver the innovation strategy, including the Catapult network and the Regional Growth Hubs.

1 <https://www.baxi.co.uk/about-us/news/baxi-calls-on-government-to-mandate-hydrogen-ready-boilers-by-2025>

2 <https://www.eastmidlandsbusinesslink.co.uk/mag/property/next-era-of-multi-million-pound-development-programme-at-national-space-centre-begins/>

There is a need to ensure each R&D priority area has a connected R&D roadmap based on a detailed understanding of the requirements, the capability available and the gaps to be overcome. These roadmaps should identify the organisations and the innovation chain required to deliver critical innovation capability and provide mechanisms to connect and progress R&D between them.

We have the potential to align national and local government activities to attract foreign investment, based on a coherent offering, including connected R&D capability and the appropriate environment for investment. These efforts should start with a clear and imminent opportunity, attracting a gigafactory to the Midlands, supported by the R&D and industrial ecosystem available.

We must also recognise previous success, and build on existing lessons, to relaunch a supply chain programme. The main initiatives to learn from are:

- **AMSCI**³: based on partial public funding for capital investment, R&D expenditure and training, including the reshoring of manufacturing.
- **Fit4Nuclear**⁴: helping manufacturing companies prepare to become part of strategic supply chains, already adopted by other sectors such as those of renewable energy and electrification.
- **SME Reach**⁵: providing transformation services to embed technological innovation in SMEs to support supply chain development.

Dick Ely CBE

A Gigafactory

With the automotive sector shifting towards electrification there is great opportunity. For a long time the Midlands has been the centre of the UK automotive industry and is an integral part of Midlands' heritage. The battery of an electric vehicle is a major component and can make up as much as 40% of the total cost¹.

There is also a very strong customer base in the Midlands area, with, according to 2018 DIT (Department for International Trade) report, seven volume car manufacturers, seven commercial vehicle manufacturers, and 16 of the world's top 20 automotive suppliers located in the region². A vehicle's battery is also its heaviest component; this makes transportation expensive, difficult and environmentally damaging. Battery production taking place in close proximity to the vehicle manufacturers reduces these issues. As a result, a gigafactory provides a fantastic opportunity for supply chain reshoring, as it adds a further incentive for vehicle manufacturers to assemble in the UK.

Battery development is a continuously evolving area and a gigafactory offers a great opportunity for innovation. To aid this, there is already a strong automotive cluster in the Midlands with a large number of research centres such as the Advance Propulsion Centre UK (APCUK), a £108 million state-of-the-art Battery Industrialisation Centre in Coventry, and the recent creation of the Centre for Connected and Autonomous Vehicles, along with several world class universities.

1 <https://www.coventrytelegraph.net/news/coventry-news/jaguar-land-rover-electric-vehicles-16595142>

2 <https://www.midlandsengine.org/wp-content/uploads/Midlands-Engine-automotive.pdf>

Chapter 5 - Emerging Technologies

Emerging technologies have the power to transform the products we make, as well as the way we make them. They are extremely important to our economy as they influence productivity by enabling new high value products, but they also facilitate more efficient ways to produce those products competitively, responsively, and with substantially greater resilience.

Emerging technologies have always existed, and their influence has continually challenged industry to adapt and change both their products and processes. However, the current pace of technological acceleration, combined with the wide array of new technologies, poses a significant and growing threat. Deciding which technologies to adopt and how much capital to invest, gaining the knowledge and skills necessary, and understanding the best way to implement, has never been harder.

The challenge of adopting emerging technologies was highlighted by a recent study conducted by the World Economic Forum between March and April 2020¹. As part of the study, structured interviews were conducted with more than 30 senior executives and over 400 senior supply chain executives from across Asia, Europe and the US. The findings identified five key strategies to increase the resilience of manufacturing systems and supply chains. Unsurprisingly, one of the five strategies was to increase investment in advanced manufacturing technologies, such as digitisation, additive manufacturing, and artificial intelligence. However, the study also reported that about half of the surveyed executives only described their organisation as 'low to moderate' in leveraging advanced technologies as an effective way to quickly adapt to new challenges.

The problem with emerging technology is not deciding whether it should be adopted, but rather choosing the most appropriate technology and finding the correct implementation path.

Factors influencing technology selection

There are many factors which indicate the need for, and future potential offered by, such technologies. While predicting the future is always a gamble, it is clear there are some key trends that have the potential to influence and stimulate the Midlands' manufacturing landscape more than others, for example:

- The Midlands is strategically important for commercial distribution centres. This brings demand for emerging technologies and products to support increasingly sophisticated and automated warehouses and logistics systems.
- The 'Green' recovery and the associated transition of our future economy to net zero carbon brings growth opportunities related to the manufacture of new low carbon products.

3 <https://www.financebirmingham.com/amsci/>

4 <https://namrc.co.uk/services/f4n/>

5 <http://www.the-mtc.org/what-we-do/sme-support%20>

1 <https://www.weforum.org/whitepapers>

- The global ageing population brings associated manufacturing opportunities related to the supply of new high value personal healthcare products and technologies.
- As the region's food and agri-tech sector embraces new technologies such as robotics, automation and autonomous vehicles, this will drive local demand for new, high-value products.
- With the region's links to aerospace manufacturing and space-related research, the Midlands is well placed to support the increasing global demand for satellites and associated space vehicle technology. This has the potential to open opportunities to support the manufacture of these complex and high-value products.
- As companies look to gain more control of supply chains and become more resilient, the reshoring of manufacturing operations is set to increase, and has the potential to bring new growth opportunities to the manufacturing sector.
- The region has a growing medical devices cluster and is well placed to adopt emerging technologies to enhance opportunities for increasingly complex high value products.

The Smart Factory

In addition to these and other new markets and product opportunities, the state-of-the-art factory infrastructure (the so called "smart factory") is also rapidly changing as new technologies are adopted. There is increasing demand for high levels of data transfer, communications, and interconnectivity. This has been fuelled by improvements in wireless network technology, and advanced high-performance computing power that can now be embedded within factory cells and machines. The emergence of industrial 5G networks is also set to provide even greater potential in this area.

Complementary to new computing hardware and communications' capability, the processing of data using advanced algorithms and artificial intelligence is also becoming more accessible. The combination of these technologies offers the potential to collect, analyse and act on data at speeds that are fast enough to enhance the performance of manufacturing operations, from factory and supply-

chain level, down to the individual process level.

As well as making better use of data, new process technology is also transforming our factories. Additive manufacturing technology is widely deployed in manufacturing, and this capability continues to evolve as new machines, processes, materials, and design tools are commercialised.

The smart factory concept has been trialled successfully in the High Value Manufacturing Catapult (HVMC) network, using data to optimise process through a "digital twin" and to create factories to suit the process, rather than trying to fit a process to the factory. High volume food processing is probably the most appropriate sector for early adoption of these factories, but the principles are applicable across all sectors, and could have a profound effect on productivity and increased employment across our region.

More streamlined digital workflows eases the transition from CAD design, to prototype, to volume manufacturing. This includes, for example, increased access to more automated processes; the ability to integrate robotics more easily within the factory; or access to tools such as virtual reality for product design and factory planning.

Adopting and exploiting new technology

While understanding the benefits of emerging technologies is not hard, adopting and exploiting those technologies requires significant effort. However, from the perspective of embracing and optimising emerging technology, the Midlands is well placed.

Midlands' manufacturing companies have good access to these emerging technologies provided by our multiple research-intensive universities and through the High Value Manufacturing Catapult network, which has the capability to support implementation.

This has already enabled many organisations in the Midlands to adapt a range of these emerging technologies and they have developed adoption strategies, which include skills development, finance and resource planning.

However, compared to other manufacturing improvement initiatives, such as the adoption of 'Lean' or 'Six Sigma', there are very few readily available exemplars of best practice. Therefore, selecting the best approach to both justify and implement emerging technologies is a daunting task, and is especially challenging for smaller businesses.

While there are many support options available for businesses looking to utilise, adopt, or invest in emerging or advanced technologies, plotting the right path to access the most appropriate support offerings is not easy. While some are well connected to the support network available, many have little experience, and as a result have poor knowledge of how to access help and get the most out of the experience. It is often the case that academic and RTO collaboration with business tends to involve the same large businesses working with a small number of the same SMEs and the same university or RTO partners; limiting access to knowledge, equipment and infrastructure for businesses outside these established collaborations.

Hence there is a key role for the Regional Growth Hubs to provide the appropriate signposting to support the whole of our manufacturing communication, and for our banking sector to be co-ordinated with this initiative².

The complexity of the problem was well-illustrated by Andrew Peters of Siemens, when describing the scale of the challenge related to deploying AI and digital technologies:

"It's about bringing in network connectivity people from IT, the algorithm designers and the people in production, who have to make this all work, so it's an ecosystem of different skills that you're bringing together in an area you are not familiar with. So the deployment topic for us is not a straight forward one, it needs a lot of support and a lot of skills and it shouldn't be trivialised."

Andrew Peters
Siemens

The task of adopting new technology is very complex, which has been part of the challenge for programmes like Made Smarter. Companies are faced with potential barriers when securing capital investment and acquiring the necessary skills, which is one reason why some companies might choose to resist the adoption of emerging technology.

Another factor that impedes this adoption of emerging technology from a business strategy perspective is finding suitable use cases where both technical merit as well as financial payback can be predicted and assessed. For AI or 5G for instance, there is an array of skills and capability requirements in terms of understanding the cyber security implications, creating the right physical infrastructure and providing network connectivity. For such projects, creating a reliable cost benefit analysis is extremely challenging. Understanding the implementation costs alone is not trivial. However, the major challenge is in accurately calculating or predicting the resulting benefits and payback. Coupled with the rapidly changing technology landscape, where new technology is quickly superseded by newer and better offerings, long term investment in emerging technologies can be risky.

When technologies are very new, and evidence of their impact is only just emerging, it is very difficult to define what 'good' could look like. However, a universal feature of companies that repeatedly embrace new technology is that there must be a culture of change and continued learning that reaches all levels of the company. This culture must be driven by the business leadership. Workplaces are set to be transformed by emerging technology, and bringing automation closer to people, not just on the factory floor but within all parts of the business, from operations management to product design, are where processes are becoming more automated. As a result, there will be a significant change in the distribution of skills needed within all parts of the business.

However, while there is a desire to adopt new technology, it is often a challenge for companies to select the most appropriate path to follow on their journey to understand and apply a new technology. Putting together the right plan to learn about and implement new technology is not easy; the diversity of technologies, companies, budgets, and scales of

application mean that there is no one-size-fits-all solution. To address this, exemplar projects that focus on implementation methods, as much as the end results, are of significant value. The DRAMA project³ that was undertaken by the MTC and the Midlands Aerospace Alliance is one such project, and was identified by SME contributors to our Commission as a strong example of a project that gives companies an understanding of how to adopt and apply a new technology, in this case additive and digital manufacturing.

Conclusions

Not all emerging technologies are universally beneficial, and while some technologies are newly emerging, others have already reached a level of maturity. The way technology is integrated within an organisation and ultimately applied will therefore vary significantly. However, what all new technologies have in common is that they require time and effort, financial investment, new skills and a significant change to working practices; therefore, they represent both an opportunity and also a major challenge for manufacturers.

To enable companies to invest in emerging technologies, projects that demonstrate, de-risk and provide the confidence and knowledge to understand how to adopt and exploit the technology, are required. Acquiring the necessary skillset to support new technologies is also critical, and a strong focus on supporting companies to gain knowledge and skills is required, especially given the diverse range of emerging technologies and the broad skillset needed to support them:

- Supporting the generation of new skills and knowledge within the existing workforce and company leadership.
- Attracting and supporting those with skills from necessary disciplines, such as data science or AI, into the manufacturing sector.
- Providing a strong pipeline of new talent from all levels of education and promoting the new manufacturing careers that will be created because of emerging technology.

Achieving the above requires a joined-up approach that aligns the relevant stakeholders so they can coalesce around a specific and coherent message. Key to enabling this would be a central agency or hub with a remit to bring together clusters of industry, as well as providing a gateway or directory service to facilitate access to the appropriate advice and support on implementing and exploiting emerging technology.

Dr. Peter Kinnell

Chapter 6 - Digital Manufacturing

If there is one single imperative which can transform manufacturing resilience in the Midlands, it is undoubtedly digital manufacturing¹. Throughout our study, we have seen examples of the benefits this can bring, from improved productivity, reduced costs, and enhanced quality, to more inward investment, reshoring and greater employment prospects. These outcomes cannot be overstated, yet resistance to change and fear of the unknown is holding back widespread adoption across the region.

Digital manufacturing will create a transformational change and industry will become unrecognisable compared to what we understand to be the norm today. This transformational change will be seen at all levels; acceleration and enhancement of DMAIC (Define – Measure – Analyse – Improve – Control) cycles, integration of intelligent machines, advanced analytics and highly skilled people's capabilities, to create highly productive and adaptable knowledge-based Manufacturing Systems, autonomous and connected processes to deliver unprecedented improvements in quality and predictability. Furthermore, with embedded intelligence and real time decision-making capability, to enable greater flexibility and responsiveness throughout the value chain and the emergence of completely new, more diverse, varied and distributed supply chains connected directly to customers, constantly adapting to changing demands and environmental constraints, the significance of digital manufacturing cannot be understated.

Digital manufacturing is pioneering this industrial revolution and there is already overwhelming evidence that it can provide a step change in enhanced design-make capability and the connectivity and global reach to establish new business partnerships for regional growth and prosperity. There are numerous examples of companies where even relatively basic digital applications have resulted in improvements in productivity, customer relationship management, process control, product verification and traceability, HS&E and Product Safety Systems. The race to be at the leading edge of this revolution has therefore already begun and, given the density of manufacturing in the Midlands, the region is uniquely positioned to take this lead and help put the UK at the forefront of this revolution.

The 'Made Smarter Review' found that the positive impact of faster innovation and adoption of Industrial Digital Technologies could be as much as £455 billion to UK manufacturing over the next decade, increasing manufacturing sector growth by up to 3% per year, creating an estimated 175,000 new jobs².

Yet while the Midlands was home to the first industrial revolution, we are falling behind in the fourth. A manufacturing sector focused on disparate applications that might have been relevant decades ago, appear to be struggling to create new products and new, innovative value chains, due to cost, capability and timescale challenges. It is no coincidence

³ <http://ncam.the-mtc.org/drama/overview>

¹ <https://www.plm.automation.siemens.com/global/en/our-story/glossary/digital-manufacturing/13157>

² <https://www.gov.uk/government/publications/made-smarter-review>

that the current level of digital maturity is relatively low; the vast majority of factories are still operating legacy processes and equipment, with little or no connectivity, and paper-based shop floor planning and control systems. The general capability in UK manufacturing is therefore still some way off the Smart Factory and Smart Value Chain concepts being actively promoted in advanced industrial regions across the world. The UK is not alone, as some of this behaviour is driven by the immaturity of enabling technologies and the standard of installed shop-floor IT systems across the industrial legacy estate.

There are nevertheless, a few examples of Smart Factories, where equipment and operations are connected to a network in a way that enables integration of data acquisition with real-time analytics and AI solutions. These solutions, which deploy real-time data analytics, have a significant bearing on collaboration models across the global value chains. A critical mass of these new models will make the existing monolithic supply chain norms a ripe target for disruption. Similarly, new factories in a few of the more competitive UK companies have started to share their advanced Manufacturing Systems 'templates' that incorporate data integration and connectivity from enterprise processes, down to unique shop-floor assets. These templates are designed to international standards, but their configuration is typically proprietary to the companies and their enterprise systems.

A distinct lack of a coherent regional industrial strategy that duly acknowledges current weaknesses and promotes the evolving future opportunities for growth and prosperity is impacting the upscaling and broader deployment of digitalisation. A structured and connected suite of initiatives and actions are crucial to addressing the pressure points which impact the local industrial ecosystem. Our response to the crisis, however, does provide a glimmer of hope that manufacturing across the UK in general, and the Midlands in particular, can rise to this challenge. A collective sense of ownership and teamwork, rapid adoption of new digital technologies and fast-tracking critical NHS supplies generated very impressive results in the ventilator and personal protective equipment (PPE) programmes.

We will need to build upon the spirit and resolve we showed during the earlier phase of the crisis; leveraging available talent, fast tracking digital capabilities and grasping the opportunity to excel in the fast-evolving digital landscape. There is no reason why the manufacturing sector in the Midlands cannot be at the forefront of the Industry 4.0 renaissance. Companies like Harris RCS, a manufacturing SME, and Unipart, a multinational logistics, supply chain, manufacturing and technology company, are setting good examples of how to shape and deploy their digital strategy.

"Harris RCS wants to remain a key player in the aerospace sector. Global manufacturing is increasingly competitive and exploring (and exploiting) the digital enablers for productivity, cost, capability and opportunity gains is key to our long-term strategy for growth."

Harris RCS's digital manufacturing journey has included machine connectivity, automation & robotics, additive manufacture and the upskilling of our staff. We have now managed to integrate robust automated systems that allow us to make split second decisions backed by trusted data.

By gathering data from our machines and integrating it into our ERP system, we have been able to deliver the service that our customers want.

Like all businesses, we have challenges, and we use our own expertise and collaborations to overcome them. With our embracing of digital technologies, we now have an opportunity to diversify into new markets, whilst maintaining high quality and increasing sales, user adoption, productivity and growing staff digital skillsets."

Matthew Fielder
Operation Manager, Harris RCS

"We see our digital technologies as providing critical competitive advantage to our customers, reskilling our employees and growing our global business."

Four years ago, the Unipart Group set out a clear strategic intent to be leaders of the Fourth Industrial Revolution technologies in its sector.

Since then, the organisation has developed a comprehensive suite of digital products and all the key capabilities required to do so. These range from the design, development and production of highly sophisticated chips which are inserted into the pistons of Formula One engines to deliver millions of data points per second, through to digital twins for our battery manufacturing processes, and warehouse management systems which can be deployed in days, and changed in hours to accommodate customer needs.

The key challenge now is raising the digital quotient of thousands of our employees."

John Neill
CEO, Unipart Group

These are encouraging signs indeed, but we will need many more front runners to put the Midlands in a strong position in terms of digital manufacturing.

Seeding new enterprises in innovative digital technology, aligning them to our strengths, and establishing strategic international collaborations, will help us to create strong foundations for industrial digitalisation and therefore, a compelling and sustainable source of economic and social capital for the region. There are several small system integrators that could support a variety of focused initiatives to advance digital adoption. This is predicated on industrial leadership's willingness to overcome the challenges posed by cost and benefit and risk analysis at individual company level. Some of this

could be addressed by creating a systems integration cluster in the Midlands with an overarching umbrella to mitigate financial risks associated with the larger digital manufacturing integration projects.

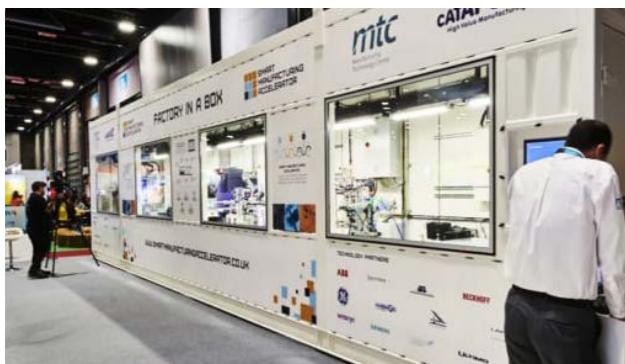
A programme of this type would help drive SMEs from start-up to scale-up as outlined in Chapter 8 - Support for SMEs.



The Midlands has a number of lighthouse assets that play an important role in elevating the route to digital adoption. Programmes such as ATI's DRAMA (Digital Reconfigurable Additive Manufacturing facilities for Aerospace), have outlined a strategic framework for digital manufacturing for the region. This three-year £14.3m collaborative research project started in November 2017.

The project aims to help build a stronger Additive Manufacturing (AM) supply chain for UK aerospace by developing a digital learning factory. The entire AM process chain is digitally twinned and offers application tools to de-risk the cost of process development by conducting it in a virtual environment.

The £10m Thermal-Energy Research Accelerator (T-ERA) project, a key component of the part of the broader £250m Energy Research Accelerator programme funded by Innovate UK, is another lighthouse exemplar. This work, concluded in 2019, was a collaborative initiative across the region's universities and RTOs to showcase how integrated digital technologies could both enable and de-risk existing manufacturing systems and also establish new manufacturing business models, such as the



Factory in a Box (FIAB), to unlock inflexible or capacity constrained supply chains.

These industrial scale regional assets will play a critical role in enabling companies and their extended supply chains to envision how the adoption of digital technologies and disruptive new processes could transform their operational performance, rapidly develop new products, collaborate more efficiently, pivot towards different business models, and drive real competitive advantage.

The tech ecosystem in the Midlands is also growing, involving an increasing number of companies and hubs for innovation such as the Silicon Canal in Birmingham¹. With almost 50,000 tech and digital jobs in Birmingham alone and as 20% of the total employment in the city, tech is becoming a significant part of the economy and one that will become crucial in the future². However, despite this promising start, these hubs will need significant ongoing support to ensure that this transformation is carried out at the right pace and scale, and with a sustainable structure that helps to lift and develop the future USPs for the region³. This includes ensuring that the creation of new businesses and new technology solutions are aligned with strategic priorities of the region. Digital manufacturing should be one such priority.

Advanced and ubiquitous digital infrastructure is also an essential prerequisite for the adoption of digital manufacturing across the industrial footprint. Digital infrastructure is not only indispensable for modern working practices (including remote working), but also a crucial driver for optimising the most

exciting opportunities of industrial digitalisation, such as autonomous and configurable factories, distributed supply networks and circular economies. 5G, providing a step change in speed, bandwidth and security, is one such technology with the potential to be the foundational pillar of not only the smart value chains, but also smart cities, future mobility and Smart Energy Systems.

The West Midlands has one of the highest available coverages of gigabit capable broadband⁴ in the UK. Significant work is also underway to accelerate digital infrastructure such as 5PRING⁵, focusing on acceleration of 5G commercial applications, and WM5G (West Midlands 5G)⁶, set up to accelerate the benefits of 5G throughout the region. However, despite these developments, UK is still lagging US and Asia in rolling out fibre and 5G. We are facing significant competitive pressure from US and China, which have established leading companies in this area. A recent study pointed out that just over 10% of the new unicorns are European based and between 35% to 47% came from China and the US respectively. In addition, with an average peak connection speed of well over 180 mbps, Singapore is leading globally, followed by Korea, Japan, the US and Canada.

The usage and adoption of digital technology is vital to the growth and prosperity of the Midlands. We will however need to significantly increase the scale and pace of investment in the digital infrastructure and public-private partnership programmes to drive its adoption across the full spectrum of industry; from the larger OEMs to thousands of smaller SMEs in the region.

Conclusions

Despite some notable exceptions, we are facing significant barriers to achieving the full digital potential in the Midlands. Regulatory barriers that stifle R&D and innovative use of data, insufficient targeted investment in fixed and mobile connectivity, lack of indigenous globally competitive data platform businesses, limited cross-sector collaboration and alignment between companies of different sizes, shortage of digital skills, a clouded perception of digital technology due to cyber security,

confidentiality and data protection anxieties and weak leadership, fear of the unknown, and job losses, are all playing their part in slowing down our response to this strategic opportunity.

However, a public-private partnership that embraces the anxieties related to this technology:

- Creates a compelling proposition of how digital technology enhances economic growth and improves social prosperity
- Establishes regulatory incentives for network operators to increase their investments
- Promotes the deployment of data analytics, artificial intelligence and automation to quality of work and industrial productivity
- Establishes a strong ICT ecosystem of entrepreneurs, start-ups and small enterprises
- Develops clear evidence based 'digital reshoring' roadmaps to regenerate the higher value-added activity and high-skilled jobs in the Midlands, which will provide the necessary stimulus, coordination and structure to address our current weaknesses, and boost confidence in the capacity of digital technologies to transform the social and business capital in the Midlands.

More specifically, this partnership will enable:

- Rapid design and development of strategic products enabled by digital technologies:
 - Using digital technologies (such as simulation and AI) to create R&D assets and rapid product and process development, aligned with the strategic priorities of the region such as light-weighting and net zero. It will also enable the Midlands to accelerate industrial growth, particularly if supported by targeted grant funding.
- The development of strategically connected, distributed supply networks:
 - A supply chain digitalisation programme aimed at identifying and digitally connecting strategic supply chains, including raising their digital readiness and operational flexibility. This should include basic data foundations to

the adoption of leading-edge technologies and the implementation of industrial cyber security standards.

- This programme will need to be linked with an awareness campaign to educate businesses and other stakeholders on the benefit of industrial digitalisation, addressing technical, economic, social and environmental concerns.
- Greater focus on industrial deployment of digital solutions at scale:
 - This will require the creation of a collaborative platform with a critical mass of regional and national players. As most of the potential participants in the Midlands are likely to be SMEs, a cluster of digital system integrators would address the concerns identified in Chapter 8 - Support for SMEs.
 - Coupled with a large-scale demonstrator (providing lighthouse implementations), the programme will provide intensive knowledge diffusion campaigns to propel industrial deployment at scale.
- Acceleration of the enabling digital infrastructure, regulation and standards:

- A thorough review of regulations and standards by identifying and addressing regulatory bottlenecks and out-of-date policies that constrain the free flow of data. This would include topics such as AI ethics, cyber security and connectivity, and a greater focus on adoption, and cost and complexity reduction.
- Data protection and privacy rules that ensure a higher level of trust, whilst facilitating new and innovative business models and ensuring that the businesses in the Midlands remain competitive in this growing data-driven economy.

Dr Hamid Mughal OBE

¹ <https://www.greaterbirminghamchambers.com/latest-news/news/2019/2/27/number-of-tech-companies-in-the-west-midlands-rises/>

² <https://technation.io/insights/report-2018/birmingham/>

³ <https://technation.io/news/tech-nation-talks-midlands-down-to-earth-with-a-bright-future-for-digital-tech-companies/>

⁴ <http://www.broadbanduk.org/2020/08/27/dcems-mhclg-updated-valuation-guidance-aug-2020/>

⁵ <https://www.digitacapult.org.uk/for-large-businesses/commercial-solutions/5pring>

⁶ <https://www.wm5g.org.uk/>

Chapter 7 - Skills

Throughout the Commission's roundtable evidence hearings, skills was one of the most frequently flagged topics. This reflects the view that manufacturing is all about the ingenuity of people and their ability to change the world. Manufacturers make things because they change people's lives for the better in so many different ways – food and drink, healthcare, transport, entertainment and many, many more. But the way we live our lives is changing rapidly, too. We know we need to make big changes to our consumption patterns if we are to tackle climate change, and we need to respond to the challenges of operating in a post-Brexit world. Now we also have to do all of that in an environment where we have experienced a pandemic, and we have seen first-hand our personal and national vulnerabilities.

This means that we need more people with the right skills and those skills are not the same as the skills of the past, or those skills need to be applied to delivering different solutions. That is why tackling the skills gap – both of the overall shortage of people who want to work in manufacturing and of people with the right skills in the right place, has to be at the heart of any Midlands' manufacturing strategy.

Articulating what our industry needs remains a challenge in the Midlands

No one argues about the severity of the skills shortage we face, but industry has been poor at articulating its needs in ways that the market can respond to effectively. Our propensity for focusing on subsectors and recruiting into those only, such as automotive or aerospace, is unhelpful. This focus leads to a dilution of the scale of the problem, as well as a failure to see the extent to which the skills needs of all sectors of manufacturing are common and shared.

In many subsectors, the skills required to adapt and innovate to the challenges that lie ahead will be similar, and in some cases, even the same. As our industry looks to fill these skills gaps, manufacturers must articulate not just the job role they require, but the necessary technical and transferable skills needed to carry out that role successfully. In many cases, some of these roles can be filled by candidates that our industry has traditionally overlooked. It is therefore vitally important, for both manufacturers and our industry as a whole, that we clearly understand and articulate the skills we need to overcome the challenge we now face.

Greater collaboration through a common, shared language about the skills required is one way to achieve this. Our efforts to attract a new generation of talent needs to refer to the skills we demand from not just the talent coming into manufacturing, but also upskilling or reskilling our existing workforce. This will create an ecosystem where cross-sector transferability of skills is possible, and individuals are better supported through their careers, including in times of crisis.

Exemplar training centres like the MTC¹ and Make UK's facility at Aston² are the exception, not the norm. We need to learn from their good practice and innovative approach in order to replicate their success across the region.

Visionary leadership and innovative management skills are missing

It would be a mistake to assume that the skills challenge we face is purely about technical skills. In fact, there is strong agreement across the industry that there is a pressing need to increase the level of capability and leadership across management roles. Whatever the size of the company, they all need inspirational and confident leaders to embrace the pace of change and to inspire the current and future workforce.

As more manufacturers edge towards a digital reality, embracing the considerable change this will bring requires visionary and bold leadership. Unsurprisingly, the Made Smarter Commission found "...a lack of effective leadership of industrialisation in the UK" as the biggest barrier preventing the UK from fully embracing Industrial Digitalisation Technologies (IDTs). However, innovative management is not just about embracing change in relation to technology, it is also about inspiring the workforce. To overcome our skills challenge, we will need to attract the next generation of talent into manufacturing. This means a better understanding of the values, drivers and motivations of the next generation, to ensure manufacturing is reflective and cognisant of this.

The image of manufacturing is changing, albeit slowly

Manufacturing continues to have an outdated image especially with young people. Perceptions of noisy, dirty factories and monotonous work remain. There is a pressing need to change this perception. We need to inspire young people and their influencers (parents, teachers and others) with what 21st century manufacturing looks like: mass customisation, where design, development and manufacturing come together, in a highly automated, digital and

clean environment.

We also need to talk about the "why" of manufacturing. Not in sector specific terms, but in terms of our purpose in delivering a benefit to society, in the design, development and delivery of exciting products that can change people's lives for the better, and in the benefits we provide to society, our contribution to the economy and the contribution we can make to an improved environment. And we need to start early. Most of our efforts to attract people to manufacturing have historically been aimed at secondary school level, but we must begin in primary and continue throughout the education system. We must also look for greater diversity in the engineering sector in the UK. There are only 8% female professional engineers and 5% BAME professional engineers. Increasing diversity will bring an increasing breadth of thought to manufacturing, creating a positive dynamic which will help accelerate resilience.

Equipping teachers with a better appreciation and understanding of manufacturing is critical for our quest to change its image, and we have a unique opportunity to deliver this to a receptive audience as we emerge from the pandemic, where we have both inspiring stories to tell as well as an acute awareness among the public at large about the importance of supply chains, which were previously taken for granted³.

1 <http://www.the-mtc.org/>

2 <https://www.makeuk.org/insights/blogs/the-eef-technology-hub-uks-premiere-manufacturing-and-engineering-training-centre>

3 <https://www.raeng.org.uk/education/this-is-engineering>

Equality, diversity and inclusion in manufacturing

In a 2018 report, The Manufacturer commented: "UK manufacturing has a shamefully large gender and diversity disparity, and progress appears to be moving at a glacial pace." Addressing this disparity is not just the right thing to do for individuals, it is also in the best interest of business. In the same report, the benefits of greater diversity are laid out:

- Companies with a more equal gender balance are up to 20% more profitable
- Companies with greater ethnic and cultural diversity are up to 30% more profitable

There is clearly an appetite for change within the sector. The UK Manufacturing Review (2019/20) found manufacturers are taking a lead on diversity. A survey by the Manufacturing Technologies Association (MTA) and Close Brothers Asset Finance found manufacturing and engineering firms in the UK are ahead of the curve in embracing diversity in the workplace.

It points to enlightened attitudes in the sector, but highlights that recruitment remains the challenge. This is accentuated by what is known as the 'leaky pipeline.' UNESCO reports that worldwide only 35% of STEM2D (Science, Technology, Engineering, Manufacturing, Mathematics & Design) students are female. There are multiple reasons for this, including education policies and social context, a lack of mentorship and care responsibilities. The report includes a grim reminder that 'it would take 99.5 years for gender parity to be achieved on a global scale.'

There is no time to waste. The sector needs to position itself as offering attractive career choices for women and people from BAME communities. We need to see role models in manufacturing industries operating at a senior level. People from diverse backgrounds must see manufacturing not only as a great career option, but one in which they can make progress and a mark at executive level.

Professor Nishan Canagarajah

President & Vice-Chancellor of the University of Leicester

UK Science and Discovery Centres

The UK's science centres are visitor attractions with high educational content that have a powerful, sustained impact on our understanding of how the world works. They are all run as charities or not-for-profit organisations.

In the Midlands they are particularly diverse, from the National Space Centre to Twycross Zoo; Think Tank in Birmingham to Sir Isaac Newton's birthplace at Woolsthorpe Manor. They are all centres of excellence in their own right, exporting expertise across the globe. The National Space Centre is the world's biggest producer and distributor of planetarium shows and has contracts to teach in China, the UAE, South Africa and Brazil. Twycross Zoo majors in the conservation of endangered species and takes part in welfare programmes in the Democratic Republic of Congo and Vietnam. It is the only place in the UK to see the four great apes.

Across the UK, these science centres welcome 25 million visitors a year of whom over 50% are female. Core audiences are families with children up to the age of 13 and school groups with children aged 8-13. The latter are supported in their curriculum study via onsite, online and in-school workshops delivered by science interpreters and subject-specific experts. All centres have community engagement programmes to help reach those who may not otherwise have the means or confidence to engage.

Some science centres provide more intense learning experiences for GCSE, A Level and BTEC students and their teachers. The National Space Centre is a case in point, with space used as a teaching context for curriculum study. Its National Space Academy runs full-time post-16 courses in Space Engineering and Immersive Design & Development, in association with local colleges. These courses have a strong widening participation remit, tracking students' progress to university or higher apprenticeship courses.

Many jobs are entry level jobs suitable for school or university leavers entering the workforce for the first time. They may remain in the sector or leave to follow their chosen career path armed with teamwork, communication and management skills that set them up well for future challenges.

The UK Association for Science & Discovery Centres is a membership body that champions the public understanding of science, drives best practice, shares ideas and secures partner organisations to deliver public programmes nationwide¹.

1 <https://www.sciencecentres.org.uk/>

For any organisation looking to adopt new technology, bringing in the right skills and getting the necessary training will be essential. Providing talent to support the needs for a new range of skills ultimately needs education providers to also adapt their offering. This requires both modification of curricular, but also rethinking how the skills needs of industry and the new career opportunities associated with emerging technology are promoted at all levels of education. Automation, AI, and the fourth industrial revolution, all offer a great opportunity, however the skill level required, for example to design and operate automation equipment, is far greater than that of conventional approaches.

Science, Technology, Engineering and Mathematics (the STEM subjects) have received significant promotion over the last decade. However, the link between these subjects and the manufacturing industry needs more promotion. The exciting face of manufacturing in the Midlands is not sufficiently presented within schools and colleges. Getting this right is important for increasing the uptake of apprenticeship training opportunities and attracting new discipline experts from subjects such as computer science, mathematics, or robotics to work in manufacturing.

With many high-quality universities in the Midlands, there is a good supply of graduates. However these individuals are in strong demand and recruitment competition is high. This can be particularly problematic for SMEs as they are less able to compete with large established companies for this important new talent pool.

Dr Peter Kinnell
Loughborough University

This is Engineering - A case study to show how we can change the image of manufacturing

This is Engineering is a campaign to bring engineering to life for young people, and give more people the opportunity to pursue a career that is rewarding, future-shaping, varied, well-paid, and in-demand. Launched by the Royal Academy of Engineering, it aims to change the perception of engineering by sharing real stories from those that work in the industry.

The campaign has been a huge success, and in the first two years (2018-2019):

- Its videos were watched over 38 million times in total
- The campaign received over 1 million additional engagements on social media (including likes, retweets, and comments)
- 90% of video views were from 13-17 year-olds, and 95% from 13-24 year-olds
- 50% of the audience was female

Lessons can be learnt from the success of this work, and how it can be replicated for the benefit of UK manufacturing¹.

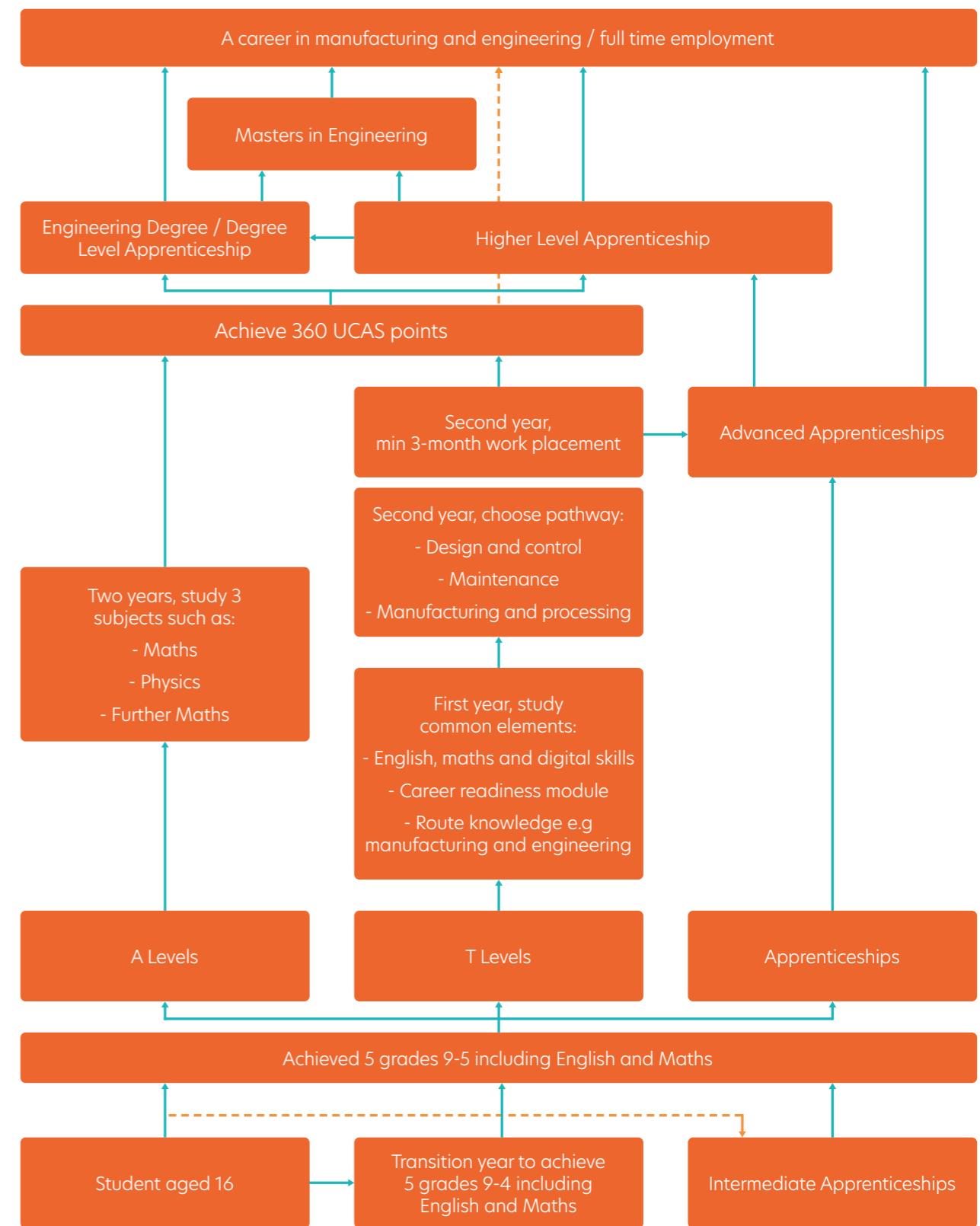
Professor Nishan Canagarajah
President & Vice-Chancellor of the University of Leicester

¹ <https://www.raeng.org.uk/education/this-is-engineering>

Clearly communicating the wealth of pathways and routes in our industry

If we are successful in presenting a more accurate and inspiring picture of engineering and manufacturing in schools, there is a wealth of talent to be developed for the future. The capacity is also there, but is not all being acquired. The variety of routes into industry need to be seen as having parity and as being interchangeable. Not all of the talent we need has to come from universities.

An interwoven learner journey¹:



Redeploying and capitalising on the skills available within the industry

It is important to recognise that the young people pipeline of talent is for the long term – and will not solve the immediate skills shortages and sector imbalances which already exist. Making this same modular but flexible approach available to those who are already of working age, but need to learn new skills, is an essential route to addressing shortages and improving productivity. Transferring from one sector of manufacturing to another may not simply be about learning new skills, but may also involve an element of learning about different cultures or regulatory environments – thought needs to be given to the extent that these are a “must acquire” at individual level, versus being made available as expert advice.

There is a significant opportunity to create a skills matching service in the Midlands, building upon the common skills and technical platforms that could be vital to retaining talent and boosting the regional manufacturing economy. This could enable those who were leaving one manufacturing company to find development and growth opportunities elsewhere in the region, and even in different sectors of manufacturing. At a time of considerable churn in employment such as we are likely to see in the next 1-2 years, this becomes increasingly important.

Providing this upskilling and reskilling is also necessary when roles are changed due to the intervention of technology, and it is essential that any project is accompanied with an upskilling/reskilling programme.

Meeting the growing demand for responsive and flexible provision

Education must be delivered in a more modular form and comprise chunks of learning which can be picked up as and when needed, or added to. Delivery of short courses and increasing amounts of online learning are an essential part of filling current and future skills gaps. Those in positions of influence need to recognise that whilst this was not the norm for us, it may be more appropriate, and desirable, for the next generation.

In developing a more flexible and modular approach to skills acquisition, it is essential that we develop a means of accreditation that allows those modules

to be built into higher level qualifications, and that they can be recognised and transferred through a common skills ‘language’ and a form of passport that details qualifications and competences.

The Apprenticeship Levy, which should have been such a positive stimulant for vocational training, has proved to have had a more limited impact than hoped, because of a lack of flexibility. It needs to be flexible enough to allow young people to start their training without having a formal apprenticeship offer from an employer (traineeships). It also needs to have the flexibility to allow reskilling and upskilling of mature learners seeking to enhance their employability through lifelong learning, either within the sector where they are employed, or by moving to other sectors.

Case study: The Open University (OU)

The OU has taken an innovative approach to providing online, flexible, distance learning. Using virtual reality, the OU has set up OpenSTEM labs, which allow those who study STEM subjects to use expensive research-grade scientific equipment – such as microscopes, robots and robotic rovers, telescopes, lab-bench experiments and analytical instruments – over the internet, and at a time to suit them. They can send real-time control commands, monitor real-time performance and download their data for subsequent analysis. Interactive learning is enabled through scripted tasks, much as in conventional practical work.

The creation of OpenSTEM labs has given students the flexibility of learning anywhere through access to high-quality content in a collaborative and interactive way, as well as the veracity of using real equipment in real time. One of the benefits of this has been that 43% of OU STEM students are women, 73% are working full-time or part-time while studying, and the average age of students is 28. This is just one way of making learning accessible to everyone¹.

¹ EEF, Reinventing Manufacturing Workforces, 2018

Harnessing collaboration over competition amongst education providers

It is widely acknowledged that not all university courses produce people who are ‘industry ready’. In part, this can be attributed to industry’s own poor articulation of need (both in respect of the present and the future) and there is widespread agreement that businesses and educational establishments (both further education and higher education) need to work more closely together to match supply and demand. It is also a reflection of some practices which need to be revisited – universities competing for talent rather than collaborating, silos of deep sector-specific material in course content rather than delivery of a common set of skills, and proficiencies for all manufacturing and engineering, with the specifics being seen as the ‘top up’ element.

The Midlands’ universities are a major source of strength and opportunity in addressing the skills gaps and are already demonstrating a high level of flexibility and willingness to work both with business and with further education. The existence of WMG and MTC are key strengths for the region in addressing these challenges and providing the new skills needed for the future.

The University Technical College network across the Midlands has the ability to connect students to both regional employers, who can shape their curriculum to ensure relevance, and also to universities.

Streamlining STEM initiatives, and communicating clear routes to success

In discussions as part of our Commission, there was a clear view that there is no need for new, centralised, initiatives, provided there is greater clarity about what is already available, greater flexibility around the ways in which schemes can be used, and much better collaboration between the organisations that exist. One clear example of this would be in how we tackle primary education’s appreciation of manufacturing. We know it needs to be done but this is best achieved through already successful approaches like the ‘Primary Engineer’, not by starting a separate or new initiative.

Born out of the Construction Sector Deal, the Construction Innovation Hub’s mission is to be a catalyst for change for the industry. The Hub partners, the Manufacturing Technology Centre, BRE and Centre for Digital Built Britain, recognised from the start that supporting, reskilling and upskilling in line with the outputs of the Hub, would be an essential part of the programme.

To address this skills gap, the Hub has developed a series of half day training courses which aim to support the delivery of new methods of construction through the adoption of advanced manufacturing processes. The training courses cover a series of topics that are core to the successful application of these processes and include such topics as Construction Quality Planning, Digital Tools and Quantitative Design for Manufacture. Transferring this capability and increasing capacity within the sector to deliver buildings in accordance with these principles will support recovery and onward sustainable growth of the construction sector in the UK.

With the need and demand for this type of structured training on the rise, the Hub will be supporting the development of an online programme which will broaden outreach and maximise impact across the breadth of the UK. It will be vital for existing industry training providers to also evolve their offerings to meet the demand in future skills training, and so the Hub’s engagement with them will be core to this next stage of development and delivery of this programme¹.

¹ Construction Innovation Hub, 2020

"A targeted Midlands' skills programme promoting specific topics, including apprenticeship schemes, reshaping university degrees, targeted graduate programmes, upskilling and leadership programmes, could provide a pilot for the future, particularly if industry and academia work together to define best practice and match candidate skills with strategic business requirements."

Dick Eisy CBE
High Value Manufacturing Catapult

Levelling up people through skills and place through infrastructure, with the manufacturing industry at its core

As the Government seeks to implement its ambition to 'level up', it is important to focus on the areas of strategic investment which will make the greatest difference. A strong industrial base is key to a successful economy, therefore we should also focus on levelling up through skills and infrastructure. As working behaviours and business models have evolved and changed significantly as a result of the Covid-19 pandemic, levelling up must look beyond the traditional focus of physical infrastructure projects.

Investment in both physical and digital infrastructure is central to any plan to level up our regions. Connecting towns, cities and places through transport and roads supports manufacturers accessing new customers, and new talent. But manufacturers also believe any investment in infrastructure must focus on the long term return on that investment. This means prioritising the infrastructure projects that will support sectors and regions that are considered strategically important, as well as the ones that will be creating high-quality jobs now and in the future, as we tackle global challenges.

The UK must invest to grow, and stay competitive in dynamic, global markets. The absence of the right skills, and a policy to ensure the economy retains those skills, will blunt the competitiveness and profitability of the UK and push investors elsewhere. Access to skills impacts manufacturers' investment decisions, whether this is investment in new machinery, expansion of a site or a decision to set up in, or bring production back to, the UK.

Creating and maintaining a visible talent pool within the Midlands is vital to attract investment - the availability of skills, access to innovation capability and infrastructure more generally, are all key parts of any business's decision on where to locate. Given the interconnection of supply chains, this talent pool must cover large and small businesses alike.

Conclusions

Greater flexibility of the Apprenticeship Levy and support for SMEs

With the number of apprenticeships falling, there is an urgent need to get apprenticeship starts back on track. Government must give employers greater flexibility on the use of the Apprenticeship Levy, including using these funds for wider training costs. For those SMEs which don't pay into the Levy, a direct, upfront payment should be made to mitigate cash flow concerns. Moreover, the time employers have to spend their Levy funds should be increased.

- National Retraining Scheme (NRS): repurpose the funding to support wider redeployment of workers
 - The NRS was originally set up to support those employees who need to find new jobs as automation takes over roles which are either dangerous, dirty or repetitive. However, with large scale redundancies emerging, the NRS should be repurposed and funding should be redirected to support the redeployment of workers within the region.
- A matching service should be established to retain manufacturing workers within the region but enable them to transfer between sectors
- This must be supported by a common skills language across the whole of manufacturing (including infrastructure)
- Leadership and management skills must also be addressed to drive the successful adoption of Industrial Digitalisation Technologies
- Further funding for sector-based work academies to support those in long-term unemployment (those not in education, employment or training) to train for a skillset on an intense fast track course. Such best practice can be learnt from HAAS, the machine tool maker, who have worked with West Suffolk College to produce highly valued CNC operators within about 6 weeks.

Greater collaboration and leadership on the skills agenda

• Make UK, Enginuity and the High Value Manufacturing Catapult have recently come together to form a Manufacturing Skills Alliance. Such collaborative models, where the strengths of different organisations are pulled together, are far more advantageous than organisations working in silos on the skills agenda. They have made clear their commitment to work with others so the model should be built upon and not competed.

Premiums/rewards/capital funding for University Technical Colleges (UTCs) whose students go onto apprenticeships

• UTCs in the Midlands have the potential to increase participation in much needed STEM apprenticeships. UTCs able to demonstrate that over 50% of their learners go onto STEM apprenticeships should be awarded capital funding to reinvest in STEM provision.

A UCAS type system for apprenticeships (including a 'clearing' process)

Learners applying to primes who are unsuccessful in securing placements need to be visible to smaller manufacturers and to see the opportunities that exist in the supply chain, in an approach similar to clearing. With many larger manufacturers in the Midlands, a lot of talent risks being turned away which could be utilised across the supply chain.

- Create a vision of the desired skills model for the Midlands, including management and digital skills built around a broad vision of the future of manufacturing in the Midlands - a Made Smarter in the Midlands
- Encouragement for international students to study at Higher Education Institutes (HEIs) and remain in the region with a more supportive migration policy

Rethink the qualification/accreditation system for secondary education

With qualifications no longer used as a primary recruitment tool by many manufacturing employers, the Government should consider a major reform to secondary education including GCSEs to prepare young adults who are work and life ready. This could

include a new system of portfolios of work from students and accreditation of competences rather than the measurement of retained knowledge. This would showcase their technical as well as academic skills, and offer experience of the world of work.

Increased access to STEM work experience

The Midlands is host to some of the best manufacturing, engineering and science companies and education providers in the country. However, young people need to experience this. Work experience within a STEM related company should be available to every young person prior to Key Stage 5. But this also relies on employers changing the quality of work experience to deliver that inspiration to consider a career in manufacturing – notwithstanding the system being made easier for businesses to navigate. Engineering T levels will include compulsory work experience, and this should be viewed as an opportunity to grow the number and quality of placements, and work towards making this an experience which is open to all.

Schools should be set technical education targets

The number of school leavers who choose the apprenticeship route remains low, and has barely moved in recent years. Schools should be set technical education targets, similar to academic targets, which are then reflected in league tables.

Dame Judith Hackitt DBE & Joe Greenwell CBE

Chapter 8 - Support for Small and Medium Sized Enterprises (SMEs)

The Midlands is a manufacturing stronghold for SMEs, with over 24,070 such businesses in the region¹. They are quick to respond to opportunities and challenges, and have an inherent agility and flexibility that is important to preserve.

The region has a first class logistics capability and takes advantage of its location to create the hub for all domestic logistics and distribution.

However, whilst we see continued growth of this subsector, the Commission has heard evidence of a number of constraints that have restricted growth of individual SMEs, some perceived, and some real:

- Access to finance
- Management/leadership bandwidth
- Confidence and belief of the SMEs and their workforce
- Attitude to risk
- The challenges of 'scale-up' compared to 'start-up'
- Disparate, uncoordinated support mechanisms
- Aversion to diluting equity
- Application of intellectual property
- Ability to balance the divergent challenges of finance, technology, and strategy
- Changing from survival mode to the adoption of innovation for growth
- Plugging the skills gap
- Perception that advanced manufacturing technologies will displace the workforce

SMEs are often family owned and managed and have a strong affinity for their employees, many of whom are second, or third generation.

The case study on JJ Churchill [Appendix 5] emphasises this point, and whilst a credible motivation, it often presents a barrier to adopting advanced manufacturing technologies, due to the perceived risks of displacing loyal employees. However, as detailed in Chapter 2 – Productivity, advanced technologies often increase, not reduce, overall employment.

The key to the adoption of advanced manufacturing technologies is to introduce a parallel upskilling/reskilling programme for displaced workers, providing those impacted with the opportunity for safer and higher paid roles in the company, further adding to improvements in productivity.

¹ Black Country Consortium, 2020

It is clear from the evidence the Commission heard, that those at the helm of many SMEs lack the bandwidth to work 'on' the business because they are too busy working 'in' the business, and often the leadership in the SMEs does not have the time to recognise the difference. There is a need for leadership training for SME business leaders and an urgent requirement to create management capacity. Our universities have a major role to play in both of these requirements; firstly, by working with industry to create leadership modules that SME leaders can dip into, and out of, as their bandwidth dictates; and secondly, as we come out of the pandemic, we will have graduates who are unable to secure their first graduate level post. By creating an SME internship programme, we could provide valuable experience for the graduate and extra bandwidth for the SME. To be truly successful this initiative would need to be complemented by an industrial mentorship programme for both the graduate and the SME leadership alike.

Many of the problems faced by SMEs have been recognised by local and national government, and a plethora of support mechanisms have been established, all with the best intentions. However, these support mechanisms are disparate, uncoordinated, and too complex to access for the beleaguered SME leader. Add to this another layer of private sector support, again established with the best of intentions, and it is understandable that the decision makers find the systems impossible to penetrate.

"There are many support and funding programmes available both locally and regionally, and the challenge is to ensure that they are less fragmented and provide a springboard for businesses to innovate and compete nationally and internationally."

Ewa Bloch
Innovate UK

There is clear need for a single coordinated regional programme that is designed to be the 'one-stop-shop' for business support in the Midlands. This should sit above the existing support networks, and

act as a guide, for example, signposting to sources of innovation support, academic collaboration, finance and skills development.

Potentially this programme could be managed through the Growth Hubs. However, these Hubs would need significant scale-up and be fully coordinated across the region, with access to all the support mechanisms and the ability to engage the appropriate service providers in order to be effective.

This programme should incorporate Made Smarter, but be tailored to the strengths of the Midlands, such as mobility and medical technology, textiles and agriculture, and offer support for the particular challenges identified by manufacturers in our region.

"Many Midlands' companies would not label themselves innovative, yet they look for new ways of manufacturing their products, pivoting their business models or supply chain collaboration opportunities. That is why we know that the appetite to grow through innovation is there, but they often need more tailored, local support to help them see the market opportunities and future benefits."

Ewa Bloch
Innovate UK

To help Midlands' manufacturers unlock the advantages offered by digital technologies, and the transition to net zero and sustainable manufacturing, we should facilitate and encourage industry collaboration with our world-leading universities and cutting-edge research centres.

"What helps is having Coventry University, WMG, the MTC, and others, providing a small company the ability to do research, take on an intern and find a high-quality apprentice. This has transformed us as a company"

Jason Aldridge
Arrowsmith Engineering Ltd.

A key challenge for manufacturing business is developing the organisational capacity to innovate. The bandwidth 'problem' already referred to with respect to leadership applies equally to finding time to consider how the market is developing, to introduce new work processes, or to identify new technologies that could potentially reduce costs or improve productivity.

The strong network of higher education and research organisations in the Midlands can and must add value to businesses locally by providing practical support.

"SMEs have a real problem in terms of the capacity and time available to evaluate what new technologies and what productivity improvements they can make, because they are so focused on the business, trying to get the orders in and concentrating on weekly figures."

Marcus Burton
Yamazaki Mazak UK Ltd.

There is a need for short, modular courses to introduce business leaders to key emerging technology 'tools' for the manufacturing sector, including automation and digitisation, AI, supply chain management and product development. Some of these programmes exist today, but they are run on an institution by institution basis, lack a clear identity, and are not easily accessible.

The opportunity to create a convening function for universities, RTOs and industry in the Midlands should be considered.

When firms become aware of the potential for innovation to grow their business, they face the challenge of finding the resources to deliver change. It is often challenging to bring together the technical knowledge of a new process or research innovation with the management experience of delivering that improvement on a production line.

Often there will be as few as one or two employees tasked with this type of work in a business, and they will be isolated from best practice and the support

"Often, the problem is that maybe you don't have five or 10 people in the company who all want to learn about AI, but perhaps only one or two working on that problem. If you could start to put them together with a cohort of people from other industries through an appropriate remotely taught module, and also provide the opportunity to come together occasionally, perhaps through some group project to share their experience, then you would achieve some powerful learning."

Dr Peter Kinnell
Loughborough University

networks, which makes the implementation of change difficult. To address this, manufacturers should be offered a consistent modular learning programme with the clear purpose of introducing business leaders to practical tools to improve productivity, potentially delivered in a workplace setting. To change this, the region could better utilise our strong research networks to support manufacturing businesses. By putting graduates and post-doctoral researchers into businesses to work on specific organisational challenges with leaders, they could both improve productivity and introduce researchers to real world business problems. We should consider a one-year research placement programme for Midlands' universities, open to all manufacturing businesses, with the researcher tasked to address a specific problem identified by the management of that business. Such a graduate internship programme, particularly for SMEs, would not only address the leadership 'bandwidth', but would also provide a positive employment impact at a time when graduates are struggling to find their first post-graduate placement.

Whilst this might seem to be a superficial response, it is important to recognise that the first steps in raising productivity and competitiveness for many SMEs is not about adopting leading edge technology, but by adopting existing best practice and making initial steps in better management of information flow in their business.

Case Study: Chafer Machinery

Improving work areas and introducing a visual management system led to a significant reduction in build hours.

"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 Challenge

Chafer Machinery builds strong, technologically advanced, and simple to operate spraying equipment. Struggling to meet delivery times, the challenge for Chafer was how to produce the machines using the current resources, whilst maintaining a high quality end product. The MTC was tasked with reducing build hours, increasing capacity and flexibility, to ensure on time delivery to the customer and maximising profit.

The Solution

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 Outcome

- Optimised factory layout
- Specification created for future investment in technology, including what to buy and when to invest
- Reduction in 'work in progress'
- Reduction in production costs
- Workforce engaged in the improvement programme
- Trials completed to prove improvement proposal and mitigate risk of investment

The Benefits

- 45% reduction in man hours per machine, from 370 to 205 hours
- Doubled turnover in two years without a significant increase in overhead costs
- Achieving delivery times, resulting in great customer feedback

"We've been able to adapt big changes into an environment that's already quite busy. Having the MTC behind us makes the changes seem easier and more achievable."

Ben Hand

Production Manager, Chafer Machinery

Conclusions

Access to business support would be easier with a one-stop Midlands support shop

The current business support mechanisms are complex, and act as a barrier to manufacturers, especially smaller firms, accessing the support available to them. The Midlands should establish a regional single point of contact for manufacturers to signpost to areas of support and finance. Specific focus should be given to support a shift to sustainability, innovation, skills and advanced technology for small and medium sized businesses.

Innovation support

Innovation should be seen as part of the Midlands' unique identity, which requires buy-in at boardroom level, to support the development of new products and processes. The Midlands should develop a package of support for business leaders to help them adopt innovation in their firms, delivered via the world-class academic institutions and RTOs in the region. This package should include sponsored graduate and post-graduate internship opportunities to give business leaders improved capacity to work 'on' the business, not 'in' the business. Modular leadership programmes should be developed for business leaders, including innovation, accessing finance, first steps to automation and managing flexible supply chains, all of which have been identified as key barriers.

Professor David Greenwood

Chapter 9 - The Supply Chain

Supply chains are often viewed differently to the other elements of manufacturing discussed in this report. Productivity, emerging technologies and skills are all very 'internal' to an organisation, where there is a high degree of control or influence. Supply chains are seen as 'external' to the organisation, where, particularly for the non-primes, there is less control and relationships are more at a 'reactive' level.

However, the last six months have demonstrated the importance of resilient supply chains - whether we are referring to VentilatorChallengeUK [Appendix 3], the acute shortage of PPE, or empty shelves in supermarkets. Our supply chains require an increased level of visibility, scrutiny and attention; not least as some traditional supply chains have broken down, desynchronised and unable to cope with the challenges presented by the pandemic.

The roundtables that took place over the course of our Commission looked at various elements of supply chains and some of the barriers that need to be overcome.

The environment at an organisational level such as the High Value Manufacturing Catapult network, where the supply chain can be both co-ordinated and highly skilled, is not always the case. Many companies are trying to reduce the number of providers, preferring fewer, larger suppliers, the result being that it becomes more difficult for new entrants to become part of an 'approved' supplier list. This has left a severely depleted supply chain that relies on traditional methods rather than investment in R&D.

In the UK, the supply chain has become a largely "make to print" activity with little intellectual property ownership. This approach is very market driven, with an emphasis on quarterly figures, rather than long term growth. This trend could be reversed, not least through the institutions that can be accessed in the Midlands. However, where there is a weakness, it is the commercialisation of that intellectual property.

We need to create and stimulate a market in the Midlands to respond to emerging technologies and embrace net zero so that it becomes a regional USP, to generate and drive domestic and international consumer demand. It follows that if there is a strong supply chain network, it will attract strong OEMs and other primes.

We need to encourage the view that being part of a manufacturing supply chain is a 'good place to be', and we need to articulate the attraction of moving from one sector to another, when there is a perception that this potentially increases the level of risk and distances the supplier from established good working relationships.

The complexity of managing diversified supply chains is increased, owing to the lack of visibility created by disruption, but this should be seen as a positive rather than negative challenge with the potential to create greater added value.

Recent analysis by Make UK found that the number of manufacturers monitoring their supply chain doubled from 7% to 13% between 2009 and 2020, whilst the number not proactively monitoring their supply chain has more than halved since 2009, moving from 13% to 6%. Whilst there has clearly been progress in gaining visibility, there still remains a proportion of manufacturers who do not have the visibility they need today to begin to mitigate the impact of shocks to their supply chains.

Taking the food supply chain as an example, we have experienced issues during the pandemic, not necessarily due to lack of food, but primarily due to supply chains having to respond quickly to a sudden reduction in demand from the catering and restaurant sector and an increase in retail food sales through supermarkets.

However, the industry was quick to react, creating thousands of jobs in the distribution network, necessitating the movement of resource from one sector to another and using disruption as a stimulus for change.

The task now will be to consolidate the gains and to look at methods to improve productivity and reduce costs. This will necessitate increased application of advanced manufacturing technologies and will create opportunities for businesses to pivot from long established sectors in the Midlands such as automotive and aerospace, creating new and disruptive opportunities in other sectors, particularly in food supply, energy and medical devices.

Case study: HS2

One of the benefits of being so heavily engaged in an infrastructure project of the scale of HS2 is seeing its potential impact on the region and beyond.

We can get better connected services within the Midlands on the existing lines through the capacity released by HS2, and we can also use this capacity to move freight away from the local road network.

There is a long way to go until we have delivered the first phase. However, there are a couple of things to bear in mind; one is that there is an economy developing around HS2 - there are around 10,000 people working either directly or indirectly on the project, and in the supply chain, and there are over 2000 companies working on HS2.

As the programme develops and its demand for resources increases, it will create a level of prosperity around the region. HS2 will be the most advanced railway ever built in this country, so together with a legacy for our transport sector, it will also have a significant impact on issues like skills and innovation, amongst other factors related to the manufacturing sector also discussed in this report.

In terms of the supply chain, our work will bring a more digital dimension in to play, particularly for our civil engineering partners. In addition, our work will have a wider societal ripple effect; the project will have a positive impact (rather than unduly disrupt) on the local community, whether socially, economically, and even environmentally. This means that our supply chain is also performing important 'outreach' activity in the communities along the line.

What we have learnt over the past few months is that we can change and adapt quicker than we thought.

Mark Thurston
CEO, HS2

Agile and flexible supply chains

There is a significant opportunity for the Midlands to create agile and flexible supply chains that can pivot between one sector and another, depending on the relative buoyancy of a particular sector.

A key challenge will be the acceptance of new entrants into the supply chain, rather than the acquisition of the skills necessary to move into that supply chain.

Hence, in order to address this challenge, we must:

- Utilise our universities and innovation centres to provide a support package such as the NAMRC 'Fit for Nuclear' Programme¹¹ to enable technical/manufacturing performance to be aligned with the sector
- Provide leadership development to enable supply chain leaders to rise to the challenge
- Provide a support mechanism to help join an approved supply list.

Local vs global

There has been a trend towards global rather than local supply chains over the past 30-40 years, primarily as a result of cheap transportation and low cost manufacturing in developing regions. The local supply chain has been unable to compete unless they have been able to demonstrate greater added value through quality or technological advantages.

"In the fashion market a third of clothing is sold at ticket price, a third is heavily discounted and a third is sent to waste. This is because the total volume for a season needs to be ordered en-masse to facilitate transportation time from the low cost supplier.

Even so, it is still more cost effective to procure this way than to source locally."

Katherine O'Driscoll
Director, KO Inc Ltd

However, this results in increased waste, a higher carbon footprint and reduced revenues for the public purse².

To address this problem we need to think about the concept of 'Total Value UK' where local supply provides a greater societal impact through local employment (with associated benefits to HMT), reduced logistics and hence smaller carbon footprint, greater flexibility and agility, and a significant opportunity to reduce waste through 'just in time' supply benefits. Looking at a total value proposition rather than a lowest cost proposition would be a significant step forward.

Make UK's latest research on supply chain resilience found that in spite of recent geopolitical events (including the pandemic), the proportion of manufacturers' suppliers' bases has not changed significantly in the past two years. Contrary to belief, there has not been a huge sway towards reshoring, with only 21% of manufacturers saying they have moderately increased suppliers based in the UK. Global suppliers, whether in Europe or further afield, remain important to UK manufacturing supply chains.

But as we look ahead to the next two years, our survey found over a third of manufacturers reported that they intend to moderately increase their use of UK-based suppliers in that time, with a further 12% indicating a significant increase. This is different to previous years, which showed manufacturers had not significantly increased the number of UK suppliers.

Whilst this is only showing the intention to reshore, it does indicate that manufacturers are beginning to address the international supply chain risks highlighted by Covid-19, by diversifying their supply chains as a way of spreading risk, and exploring the possibilities to use local suppliers is one option.

In 2019 David Nieper became a zero waste-to-landfill company, whereby all waste produced by the business and within the manufacturing process is either reused, recycled, composted or sent to energy recovery. This sustainable manufacturing strategy creates minimal waste, boosting both environmental and economic sustainability for the company.

David Nieper has engaged with the University of Nottingham's Energy Innovation & Collaboration team to undertake a study into the company's carbon footprint, illustrating that a garment produced in our sewing rooms creates 47% less emissions than a similar garment produced in China. The report will enable the business to continually benchmark progress within its environmental programme and improve carbon resource efficiency further.

Having a business with such competencies was vital during the Covid-19 pandemic, when production was switched to urgently supply 21 hospitals with reusable PPE. During the peak of the pandemic, the NHS was using an estimated 150,000 disposable gowns a day, equating to 54.75 million gowns being discarded each year. This figure could be cut dramatically by swapping disposable gowns for reusable gowns, which can be washed up to 100 times and safely reworn - reducing both waste generated, associated disposal costs and saving of 170,000 tonnes CO₂ emissions per year.

Christopher Nieper OBE
Chief Executive, David Nieper Limited.

increasing throughput and supply continuity.

When we looked at the data¹, what we found was that the speed of execution of some of these processes was incredible: the speed of information exchange improving supply chain resilience by an order of magnitude.

The post war phenomenon of the automotive sector in the Midlands has been far reaching, not only in terms of value and jobs created or the local economy, but also unlocking wider impacts such as significant growth in infrastructure and putting the UK at the forefront of the global stage, as it became the second largest car manufacturer and the world's largest car exporter.

The success created by the sector in the Midlands was on the back of mobility as a disruptive trend in the world at the time. We are in a position to do this again if we can identify the relevant disruptive trends of our time and invest in the creation of critical capability to drive local and sovereign supply chains. Considering the strengths of the Midlands in automotive and aerospace, and with a world moving towards net zero mobility and a more environmentally sustainable future, the direction of travel points to opportunities in electrification, hydrogen systems, electric motors, battery systems and battery management systems. Other emerging opportunities might be found in electronics manufacturing, in particular associated to 5G and related supply chains, such as software and AI in relation to digitalisation.

Dick Elsy CBE
CEO, High Value Manufacturing Catapult

Emerging technologies

OEMs are increasingly looking for greater technical capability in their supply chains, including increased application of emerging digital manufacturing, additive manufacturing and other technologies that improve product quality and traceability. In particular, digital manufacturing can help with mass customisation and manufacturing processing times,

This is a key opportunity for the Midlands supply chain to implement the enabling technologies that will set themselves apart from the competition, leading to greater resilience.

1 <https://www.namrc.co.uk/centre/fit-for-nuclear/>

2 <https://www.openaccessgovernment.org/carbon-emissions-supply-chains/93896/>

1 <https://www.globaltrademag.com/leveraging-digital-technology-to-create-a-more-resilient-supply-chain/>

Creating connected, responsible and resilient supply chains

ASOS is a fashion house with brands including River Island, Fred Perry and New Look, and is already investing in the Midlands, with grant support from the UK Government, to bring the latest Japanese digital technology to enable supply chain transparency, bringing most of the knitwear at ASOS to Leicester. Block-chain technology and integrated enterprise data systems provide complete visibility across the supply chain, giving customers, who are the decision makers, visibility of factors such as workers' salaries and conditions. This drives far more responsible decisions and has resulted in onshoring of capability to the UK, where not only can we influence legislation and have better labour conditions than at most of the traditional garment suppliers in the world, but also where we can provide shorter times to market and reduce our carbon footprint, which are critical to retailers. This is already leading to the creation of new jobs in the region and far more control over corporate responsibility.

However, significant levels of investment are needed to integrate the technology and implement it across the supply chain, which consists of a large number of SMEs who have little purchasing power.

Katherine O'Driscoll

Director of KO inc Limited, Consultant to ASOS

Supply chain resilience

A HVM Catapult working group¹ identified three key components to building supply chain resilience: visibility, adaptability and robustness.

Visibility of the supply chain is essential for policy formation and government decisions on specific interventions. Visibility is about having the information required to take action, be this preventative or reactive. It provides access to key information such as who supplies what to whom, what is onshore and what is offshore, where critical capability is located and how the carbon footprint is distributed across the supply chain. Currently, this information is extremely limited. However, it is critical to identify the vulnerabilities in the supply chain, to show how best to grow supply chain capability or where to locate capacity that is critical to addressing societal challenges such as net zero.

Supply chain visibility can be increased by:

- Mapping end-to-end supply chain capability in key industries
- Developing a portal where key supply chain information can be viewed (a knowledge base) to support policy makers, government and funding agencies
- Identifying policies that drive better visibility of our supply chains, whether through incentivisation or regulation
- Combining and applying leading practices such as war gaming and foresight, and to identify threats and supply chain vulnerabilities
- Building collaborations to develop UK digital infrastructure for supply chain connectivity, including e-commerce platforms and data exchange mechanisms.

Supply chain adaptability is about being able to repurpose or transform the supply chain to a new environment or new opportunities - it allows measures to be taken in anticipation of a disruption. A key challenge for UK supply chains is the reliance of global suppliers for material production. There are also few indigenous manufacturing equipment developers and IP is moving progressively on to the machines and away from companies.

However, there are several ways to increase supply chain adaptability: by creating programmes to stimulate a wave of development and commercialisation of manufacturing equipment in the UK; increasing resilience of supply critical materials with material production and recycling, including through a circular economy; technology insertion programmes focussed on exploiting existing technologies to improve resource efficiency in existing supply chains; capturing and applying lessons on supply chains pivoting from examples such as VentilatorChallengeUK; creating methodologies for supply chain management and transformation.

The robustness of a supply chain or enterprise is dependent on strong customer and supplier relationships, diversity of work, high levels of productivity, multiple suppliers and parallel supply chains. Currently, UK investment in new manufacturing equipment such as automation and digital manufacturing is low and, as a result, supply chain capability is vulnerable.

Supply chain robustness can be improved by identifying critical capability and implementing:

- Programmes to demonstrate excellence in resource efficiency of the end-to-end supply chain
- Improvements in supply chain resource efficiency through technology insertion programmes focussed on exploiting existing technologies to improve resource efficiency in existing supply chains, and visibility of resource efficiency across the supply chain via software e.g. Circulor
- Programmes to build relationships across sectors
- Supply chain management programmes to demonstrate alternative strategies for supply chain management
- Industrial support for productivity and servitisation through new technology adoption, operational efficiency and upskilling. Helping the whole manufacturing community, with targeted aid for the long tail of the supply chain.

Societal impact

Earlier in this chapter we discussed the concept of 'Total Value UK', quoting greater societal impact as one of the benefits. But societal impact is an area where the UK falls far short of international competitors.

If, for instance, you consider a major infrastructure or capital acquisition project in France or Germany, there will always be an element specifically to consider the value that derives to local society as part of the tendering package.

Whilst we would not advocate a closed market in the UK, we must at least consider a measured approach to procurement, taking into account total value rather than purely purchase price.

There is also a need to ensure the domestic manufacturing capability meets the strategic needs of the economy. Critical products/components must be identified, along with the capability and capacity to deliver these.

¹ HMVC supply chain resilience working group, 2020

Ensuring critical supplies

Even before the Covid-19 pandemic, medicine shortages were not an uncommon problem for the NHS. The long list of medicines in severe shortage include anaesthetics, muscle relaxants, antibiotics, morphine and neuroleptics. The need to drive down costs has resulted in many generic medicines been manufactured offshore. The recent export bans on medicines, from both countries such as India & China, has exposed the fragility of our supply chains. Many of the most critical generic medicines are treated as commodities, with orders switched between suppliers on a daily if not hourly basis.

The UK is in a unique position to reshore the manufacture of Essential Generic Medicines. Significant investment from government, academia and industry, has established the UK as a world leader in continuous manufacture and green chemistry. Two approaches could be taken to expand the UK's current generic medicine manufacturing capacity. Firstly, existing pharmaceutical facilities can be repurposed to manufacture generic medicines. As this approach uses existing technology, it will provide supply in the short term, but will not be sustainable on price when markets open up. Secondly, manufacturing facilities can be re-configured to use advanced manufacturing. These innovative advanced manufacturing technologies have the potential to transform the manufacture of Essential Generic Medicines, reducing the cost, reducing environmental impact and improving the quality of these vital medicines.

Professor Mike Hannay

Managing Director, Medical Technologies Innovation Facility

Case study: precision engineering

One example of Total Value is a local precision engineering company, Cube Precision Engineering Ltd, where the company now sources over 80% of its supply chain within 40 miles of the business's HQ. This is an important factor to the business because the local relationships with suppliers improves flexibility, reliability, visibility, accessibility and agility, despite often being more expensive.

This local strategy clearly has a number of benefits; operating within a local geography gives better understanding of the local market, and connects with local supply chains more easily. It improves visibility of the supply chain. The 'dynamic' cluster has the huge associated benefit of providing a greener supply chain, increased revenues and wider reaching local societal impact.

David Atkinson

Lloyds Banking Group

Charlotte Horobin

Chapter 10 - Finance

Manufacturing is facing a range of challenges across its various sectors, for example the automotive and aerospace industries have experienced a collapse in demand, while there are also supply chain issues for the food distribution sector where demand has at points exceeded supply.

The industry is facing major disruption, but at the same time there are significant opportunities for the most agile. While investment in the manufacturing sector to deal with both the challenges and demands will be important for the UK, it will be critical for the Midlands. This is, in part, due to the low productivity levels in the Midlands' manufacturing sector, which, if addressed, can boost the resilience and agility of companies, especially SMEs, given the unprecedented challenges the region now faces.

Food manufacturing provides a good example. The cash-flow issues that SMEs are currently experiencing means that they are reluctant to invest in the right levels of new technology or skills, and this is compounded by the lack of long-term contracts from the major supermarket chains. SMEs are generally risk averse and lack the confidence to invest.

There appears to be cultural barriers in the appetite of businesses to invest in change and modernisation. This can in part be credited to a misconception that automation removes jobs, something we regularly hear from SMEs. It would be beneficial for industry experts to help SME businesses to have the vision to see the possibility of the higher paid, higher skilled jobs and growth that investment can create.

Through the coronavirus pandemic the Government's emergency funding programmes have provided substantial rescue funding, but the challenge is how this funding is repaid and, while it is being repaid, how this may impact on long-term growth.

It would be helpful for government, finance providers and industry practitioners, to continue to work closely together to develop options to restructure emergency funding schemes into a longer-term solution to ensure businesses have the balance sheet capacity to secure financing that can drive long-term investment and growth.

SMEs tell us that access to growth capital is a genuine concern. They are often unsure of the value of equity/growth capital and how to source it, and their balance sheet is often too reliant on institutional loans.

As discussed in Chapter 9 - The Supply Chain, with many SMEs being owner-managed, they are proud of the direct ownership and sometimes family history of their businesses, and understandably find it a challenge to sacrifice equity, with many believing they will lose control of their business. BGF¹ seeks to address this through long term patient growth capital.

1 <https://www.bgf.co.uk/>

There is a need to better inform industry in regard to financing options. When we speak to manufacturers, they are often unaware of the multitude of options available to raise funds, either through debt or equity partners. There appears to be a distinct difference in attitude towards private equity in the UK versus private equity in the US for example, where there is greater appetite to invest in more speculative areas, where new products are more typically developed. This appears to be encouraged by tax breaks and is an option that the Government may wish to consider. Private equity in the UK tends to favour buying out established privately-owned businesses, often family owned, and then driving up efficiencies.

Additionally, OEMs can be reluctant to invest directly in SMEs, and SMEs often lack the necessary cash-flow to develop and deliver the solutions demanded by the OEMs. In particular automotive and aerospace, being key sectors for the region, may benefit from support in their financing model, otherwise we could risk the failure of local supply chains.

Cash-flow is a key factor for business survival and success, but in times of uncertainty, the ability to manage and forecast cash-flow becomes critical for businesses of all sizes and sectors. A survey by Lloyds Bank² shows 71% of all UK businesses believe their cash resources will last less than six months or, worse still, are uncertain how long their cash will last.

As the difficult economic conditions continue, many SMEs experiencing liquidity challenges will look to lenders for additional funding support. Along with taking all necessary steps to preserve cash and minimise outgoings (such as freezing recruitment and cutting discretionary spend), another important step in this environment is to carry out a full cash assessment to identify accurately how much support might be required, and when.

Overtrading is also a risk when leadership teams focus on revenue growth during a period of recovery, when historically more businesses have faced running out of cash than when entering an economic downturn.

SMEs tell us they find it difficult to identify and access the right support to meet their needs. The various government funding routes have differing Key Performance Indicators (KPIs), meaning it can be difficult for them to collaborate. Therefore the support model for SMEs could benefit from rationalisation and alignment.

Grant funding availability is important, but this funding needs the appropriate associated advice and support to be used effectively, including mentoring and networking schemes. While there are some committed and capable individuals in some Midlands Growth Hubs, sufficient capacity of capable resource appears to be lacking.

The Made Smarter Initiative³ piloted in the North West also aims to provide this type of support, and with appropriate funding to enable broader roll-out, could become a positive national programme.

In addition, within the region, the WMG and the MTC manufacturing support services teams are providing a high quality and capable resource for the SME community.

Finance providers and banks could contribute to these initiatives, but there appears to be a lack of trust within the SME community for this type of service, something that the financial services sector could seek to help raise awareness of with their clients.

There is also a need to help SMEs to understand the opportunities that different business models might offer beyond standard 'make-to-sell' product models; assisting the SMEs to better understand what the customer wants and how best to address those requirements. For example, servitisation needs to be more clearly defined and communicated for companies to understand the opportunity to pivot their business. The pilot stage funding for advanced servitisation⁴ made available by the Department for Business, Energy and Industrial Strategy, and led by Professor Tim Baines at Aston University, has proven successful and could be expanded to provide wide support for the region.

Conclusions

Cash generation and preservation must be seen as a priority for senior leadership teams. A company that understands its cash and liquidity position, including potential risks, and has a robust process in place to understand and manage these resources, will be better able to control its own destiny.

Businesses should adopt the following six key approaches to enhance their generation and control of cash:

- **Control who can spend cash:** continue to control discretionary spend, as well as changes to delegated authorities, in order to minimise cash outflow opportunities. Defer non-essential capital projects and consider how financing could be used to change the profile of payments.
- **Leadership to set the tone with an emphasis on cash:** a strong control environment, and timely and regular reporting on cash and working capital, will help companies to manage risk.
- **Forecast cash-flow regularly:** regular preparation of short-term cash-flow forecasts will be critical throughout the period. Whilst this may be a time consuming activity initially, it is fundamental to the control of cash.
- **Manage creditor backlog:** managing creditor stretch or backlog as a result of deferral periods and payment holidays is critical to ensuring that suppliers continue to trade with their customers. Paying arrears will help to rebuild trust, improve service levels, and support suppliers with their own working capital pressures, as they start to recommence trading. Careful management of liquidity may mean trading ambitions and raw material purchases have to be reduced initially, to enable payment of deferred liabilities.
- **Use expert guidance and local professional advisors:** to maximise lean practices to minimise inventory and stockholdings, to reduce cash tied up in holding unnecessary raw materials.
- **Maximise all available government incentives:** such as capital allowances and R&D tax relief to get eligible cash back into the business to support working capital and/or support investment.

It is important to address the move from start-up to scale-up of SMEs across the region.

Few UK SMEs demonstrate the key characteristics of the German Mittelstand business model, at the core of which is the ability to focus on global markets where value-added and not cost-cutting is a regular feature. German Mittelstand businesses adapt and evolve while maintaining their core purpose and emotional ties to their workforce, community, client base and supply chain. Replicating the environment and funding appetite for Mittelstand growth potential businesses to thrive will require more investment.

A key question becomes: how do we support SMEs to scale-up to become the equivalent of the German Mittelstand companies? This could be supported by focusing on areas such as:

- SMEs employing professional business managers to support the owner/entrepreneur
- The financial services sector exploring whether the creation of the equivalent of the German "Sparkassen Savings Group" environment could be created¹
- Adopting the Japanese/ Korean SME cluster model (see Chapter 2 - Productivity)
- Business angels and venture capitalists creating a scaling up fund to support SMEs across the valley of death from start-up to scale-up (see Chapter 8 - Support for SMEs)
- The potential for leadership training to attract finance and investment (as outlined in Chapter 7 - Skills) should be considered
- It is incumbent on the financial services sector to connect with business leaders, and to create a platform to help connect businesses to opportunities - Midlands Growth Hubs could potentially co-ordinate such interactions
- Whilst the Midlands Engine Investment Fund² provides funding for both infrastructure and finance (£250m), it may be beneficial to explore whether this is the most effective funding model to drive innovation. This debate could be facilitated by Innovate UK.

2 Internal survey by Lloyds Banking Group June 2020

3 <https://www.madesmarter.uk/>

4 https://www.researchgate.net/publication/277018660_A_Delphi_study_to_explore_the_adoption_of_servitization_in_UK_companies

1 <https://www.centreforpublicimpact.org/case-study/sparkassen-savings-banks-germany/>

2 <https://www.midlandsengine.org/meif-reaches-50million/>

The West Midlands Inward Investment Strategy, which focuses on the regions' key industrial strengths and talent base, aims to ensure that the region can compete on the world stage for investment. The leading sectors for attracting investment include advanced manufacturing, transport technologies, IT and professional services. Substantial amounts of Foreign Direct Investment (FDI) have been achieved for the region: DIT data for 2019-2020 indicates that the West Midlands has retained its position as the UK's leading region for FDI outside London and the South East, accounting for 8% of projects and 10% of jobs³.

The East Midlands had the fastest growing economy of any region in the UK in 2019, according to the findings of the EY Regional Economic Forecast⁴ which found that the region recorded economic growth in 2019 of 1.6% Gross Value Added (GVA).

The region has a strong record in international trade, often led by the key inward investors attracted to the Midlands. The West Midlands, for example, currently achieves the highest level of export volume in the country outside London and the South East and accounts for 40% of all UK exports in the automotive sector⁵.

The Midlands Engine Investment Fund (MEIF) could be the vehicle to support greater inward investment but to maximise potential, it might be necessary to have a more holistic approach supported by individual councils and local authorities e.g. West Midlands Combined Authority.

Reshoring has to be a key opportunity for the immediate future to minimise supply chain risks revealed during the coronavirus pandemic. There will be wider trade challenges to achieve this if the local supply chain is not supported during this critical period.

Tax incentives may benefit from being reviewed to assess how they create maximum impact, with particular attention being paid to capital allowances, R&D tax credits, and more attractive business rates to incentivise both local and inward investment.

Incremental investment allowances for implementing capital-intensive advanced manufacturing technologies would further strengthen UK manufacturing attractiveness. This would also create the stimulus for supply chain reshoring, particularly if linked to a 'Total Value UK' initiative proposed in Chapter 9 - The Supply Chain.

With thanks to Dave Atkinson and Lloyds Bank for their support in facilitating sessions with SMEs and professionals from across the sector, whose feedback has informed this chapter.

Recommendations and Conclusion

Throughout our roundtable discussions and evidence gathering, there have been a number of recurring themes: that our heritage is based on innovation, that we need to move at pace, and that diversity, including diversity of thought, will be key drivers in creating a resilient and sustainable manufacturing base in the Midlands.

That our heritage is based on innovation is undisputable, but there is clear evidence that in spite of significant private sector investment, the Midlands is suffering from under-investment in R&D by the public sector.

This needs to be addressed urgently as part of the levelling up agenda. We are not asking for preferential treatment but we are entitled to fair treatment.

RECOMMENDATION 1

The Government must match private sector investment in the Midlands at the same levels it does for the rest of the UK.

We found that support for manufacturing across the Midlands is fragmented, business support mechanisms lack coordination and are too complex for our beleaguered SME leaders to access, and are in need of urgent attention.

RECOMMENDATION 2

Address the fragmented support for manufacturing across the Midlands:

- Have a unifying agenda and consistent, coordinated intervention
- Have a balanced and enhanced package of support including capital allowances, R&D tax credits, access to growth capital and patient capital.

The need for SMEs to move from start-up to scale-up, replicating the German Mittelstand model, has often been articulated, but with a few notable exceptions, rarely achieved.

The evidence presented to our Commission indicates that risk, and fear of losing control, presents an insurmountable barrier for most. Whilst the growth capital programme goes some way to addressing this problem, it does not go far enough.

There is also a role for the banking sector to play. The German 'Sparkassen Savings Group' environment has been raised repeatedly as a key factor in the scale up of German SMEs.

3 [https://www.thebusinessdesk.com/westmidlands/news/2042304-west-midlands-retains-position-as-a-leading-region-for-foreign-investment#:~:text=The%20West%20Midlands%20has%20retained,\(DIT\)%20latest%20official%20figure](https://www.thebusinessdesk.com/westmidlands/news/2042304-west-midlands-retains-position-as-a-leading-region-for-foreign-investment#:~:text=The%20West%20Midlands%20has%20retained,(DIT)%20latest%20official%20figure)

4 <https://www.business-live.co.uk/economic-development/east-midlands-uks-fastest-growing-17803552>

5 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/802092/west-midlands-local-industrial-strategy-double-page.pdf

RECOMMENDATION 3

Provide financial protection for SMEs to take on bigger challenges to move from start-up to scale-up through an improved growth capital programme: a Midlands Equity Fund through the Midlands Engine linked with a German style 'Sparkassen Savings Group' environment established by the banking sector.

During our roundtable discussions there was significant debate surrounding a gigafactory for the Midlands which would draw on our local supply chains and would make a significant contribution to the levelling up agenda.

RECOMMENDATION 4

Establish a gigafactory in the Midlands, drawing from our local supply chain as part of the levelling up agenda.

The Korean KICOX cluster model offers the potential to address the perennial productivity deficiencies in the Midlands and the supply chain issues in the region that have been so starkly highlighted during the pandemic, creating a platform for the supply chain to pivot between sectors.

RECOMMENDATION 5

Create SME clusters in the region, adopting the principle of the Korean KICOX model to create supply chains for emerging markets and help SMEs pivot from markets that are in decline.

We have the capability and the ability to adapt to change and to the challenges that face our region, but we lack the confidence, belief and industrial leadership to respond. Often the leadership (particularly in SMEs) is too busy working 'in the business' to work 'on the business'. To address this, we recommend that an intern system is created with one-year placements for graduates into SMEs to create headroom for the business leaders, whilst giving career starts for graduates who have been adversely affected by the pandemic.

RECOMMENDATION 6

Create an internship programme for graduates into SMEs to provide:

- Bandwidth for SME leadership to be strategic as well as operational
- Vital industrial experience for graduates at a time when employment opportunities are scarce

And supplement this with an industrial mentorship programme to support both the SME leader and the graduate.

To improve productivity significantly, it is necessary to introduce advanced manufacturing technologies which, far from reducing employment, will create opportunities for highly skilled, higher paid workers, provided the productivity improvement programmes include an upskilling/reskilling element. The existing funding models for training, the Apprenticeship Levy and the National Retraining Scheme, could be adapted for this purpose without requiring an additional funding intervention.

RECOMMENDATION 7

Create a productivity growth fund to support SMEs to adopt and deploy advanced manufacturing technologies based on the Made Smarter initiative.

RECOMMENDATION 8

Modify the Apprenticeship Levy so that it can be used to upskill and reskill workers who have been displaced by advanced manufacturing technologies.

RECOMMENDATION 9

Repurpose the National Retraining Scheme and direct funding to support the redeployment of workers who have been made redundant during the pandemic.

Leadership skills are lacking, particularly within the SME community, and there is inadequate training, coaching or mentorship provision for hard pressed SME leaders. Working with our industrial leaders there is an opportunity for Midlands' universities to address this deficiency.

RECOMMENDATION 10

Support Midlands' universities to create leadership development programmes on a modular support basis that SME leaders can 'dip into and out of' to suit their needs and bandwidth.

During our virtual roundtables there was extensive debate surrounding local versus global supply. Whilst global supply from developing countries offers the lowest price option, it is far from clear that this is the best value option, with its intrinsic waste, high carbon footprint and inflexibility; factors all clearly demonstrated during the early stages of the pandemic.

RECOMMENDATION 11

Introduce 'Total Value UK' to recognise value of localisation rather than the traditional focus on cost.

The High Value Manufacturing Catapult has mapped end-to-end supply chain capability for the metals industry, and has developed a requirements capture document to develop a portal where key supply chain information can be viewed. This should be extended across the whole of the Midlands supply chain.

RECOMMENDATION 12

Task the High Value Manufacturing Catapult, in collaboration with our university sector, to develop a portal for key supply chain information and map the Midlands supply chain.

This Report is an important milestone in the Midlands manufacturing 'journey'. For nearly three centuries, the region has been at the forefront of skills, technology and innovation. It has responded well to shocks in the past, whether in terms of global conflict or competition. With the correct structures in place, and a willingness to collaborate and adapt, the Midlands can once again lead the way.

Our Commission is intended to be dynamic, creating actions and responsibilities to respond to the recommendations. Our researchers are now working on the implementation plans which will be launched over the next few months and the Commission will report progress against the recommendations in summer 2021.

We will continue to seek input to build our regional manufacturing resilience and bring forward further recommendations and implementation plans following a positive review of the recommendations presented here.



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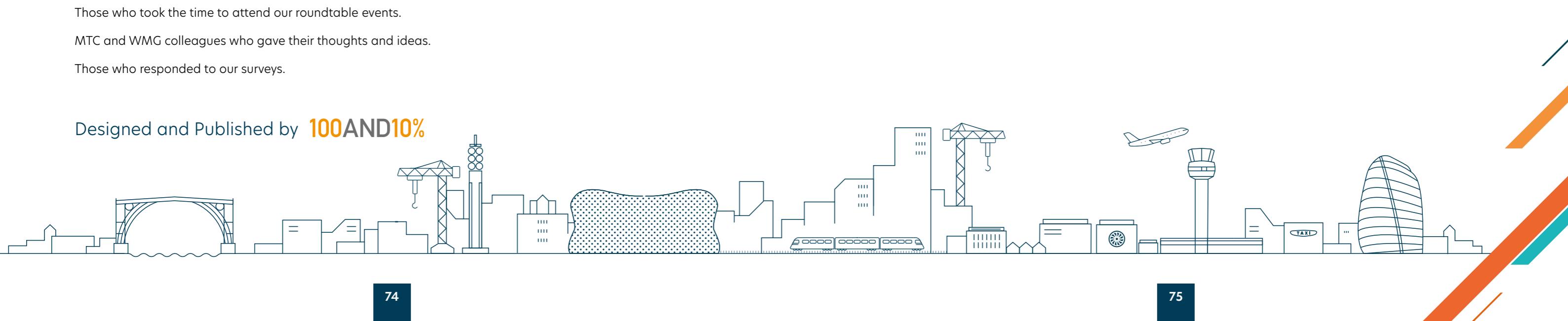
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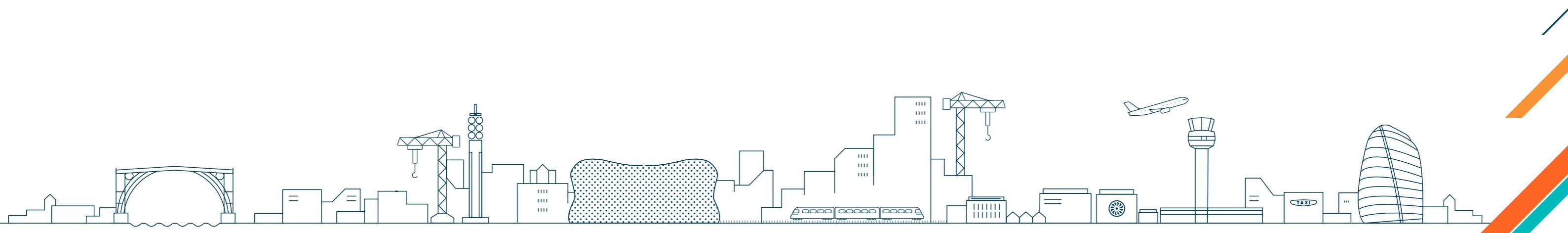


Manufacturing Confidence

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Appendix 1

Letter from Sir John Peace, Chairman, Midlands Engine

Clive Hickman
Chief Executive
Manufacturing Technology Centre
MTC Limited
Ansty Park
Coventry CV7 9JU

1 September 2020

Dear Clive,

Response to the Midlands' Manufacturing Resilience Commission

I am pleased to provide you with a summary of points relating to your ongoing work with the Midlands Manufacturing Resilience Commission.

I understand that both Rachael Greenwood (Midlands Engine Director) and Anthony Everitt (Observatory Lead) have input into your roundtable discussions and we have also provided you with a series of reports from our Observatory. I trust this input to date has been valuable.

I know your commission is engaging heavily with industry so I have purposely kept my observations to areas of particular interest to the Midlands Engine partnership, specifically those where we have evidence and insights.

I would be delighted to meet with you to discuss the Midlands Engine perspective and the early findings of the Commission and will ask my team to get in touch with your office.

The identity of the Midlands

The Midlands is by no means homogenous. It spans a large geography of rural and urban areas; places with strong manufacturing bases and others more reliant on service and visitor economy sectors. Our population and places are diverse. It is this great diversity that is a strength of the Midlands. Not being homogeneous does not mean the Midlands does not have an identity.

The Midlands Engine partnership brings voice to our region to ensure our collective needs are heard. The macro-economics and sheer scale of our geography is a powerful platform from which we engage with international investors and indeed, engage globally with countries and regions looking to build international links – such is our collective scale.

Communicating our needs has more impact in influencing a highly centralised government system when we speak with one voice. Over the past few years there has been a change in discourse nationally, 'levelling up' is now an established government policy objective. Whilst we do not

claim credit for this national shift, we, as Midlands partners speaking together, have certainly raised the profile of regional need.

Though the work of the Midlands Engine, partners come together voluntarily to collaborate and champion both their own and our shared work – bringing collective strength to the Midlands. Partnership working has already led to great successes, whether through the accelerated impact of groups of universities like Midlands Innovation or Midlands Enterprise Universities, sector specific projects like the Energy Research Accelerator or the pan-regional co-operation of local authorities in delivering a response to the Covid-19 crisis.

As we move forward, it is critical that whatever economic development interventions are undertaken, these are considered, designed and implemented at the appropriate geographical scale. Some will naturally rest with local areas through local government. Some will need delivery at LEP / sub-regional scale and others will remain the domain of central government. In between this sub-national and national scale there is a now well evidenced need for, and opportunity through pan-regional collaboration. We know that, in discussion with both partners and government, that the Midlands is an appropriate scale for such pan-regional working.

We have completed a great deal of research into what interventions are most appropriate on a pan-regional scale and clear areas have emerged. These are reflected in the Midlands Engine's Business Plan for 2020/21 and include:

- Providing research and evidence on our economy through the Midlands Engine Observatory
- Growing the global reach of the Midlands – promoting the voice of the region internationally, overcoming barriers to exporting, and increasing FDI into the region
- Strategic planning for infrastructure – including transport (Midlands Connect), energy and digital
- Understanding and mitigating barriers to growth for Midlands businesses, such as energy, supply chains and access to finance
- Supporting the green recovery through

region-wide opportunities for growth, such as Development Corporations and Freeports, as well as a Midlands Engine Environmental Strategy

The future goals of Midlands manufacturing

The Midlands economy is less productive than the UK average and the gap is substantially larger when comparators include London and the South East. Our goals are to ensure that in every part of the economy, productivity levels can be increased to in turn drive up wealth and living standards.

The Midlands' first Independent Economic Review (IER) published earlier this year by our Observatory highlights some manufacturing strengths in the Midlands, whilst also putting a spotlight on some of our challenges.

Our IER shows that whilst productivity in the automotive sector is above the national average, across most other sub-sectors of manufacturing in the Midlands we perform less well. This paints a clear picture that whilst manufacturing is a strength, it is not always the case that we are leading when it comes to productivity. Our collective challenge has to be to address this. We have to improve productivity across the whole economy – with additional focus on more challenging sectors.

The barriers

Understanding barriers to productivity growth is at the centre of our Observatory's research work. The IER highlights the following as particularly acute obstacles that need addressing:

Transport infrastructure – across the Midlands, investment is needed. The Midlands road and rail infrastructure has long faced significant levels of underinvestment compared to the rest of the UK. Whilst HS2 is critically important and the most substantial investment our region will have seen in decades, alone it will not address the range of problems associated with east-west movements. The work of Midlands Connect on how we take advantage of the additional capacity released by HS2 is crucial in improving connectivity within our region. Accessibility and logistics are of course of particular importance to manufacturing – as goods are exported from our manufacturing heartlands via our ports, airports and rail network to both domestic

and global customers. Four of the five main UK rail freight routes pass through the Midlands. HS2 and Midlands Connect's proposals for Midlands Engine Rail will allow manufacturing to take advantage of the increased capacity on these routes.

Energy - This is highlighted as an active barrier to growth. Businesses have told us that in some cases they have insufficient energy supplies to allow expansion in production, and developers highlight that they cannot get energy connections to sites earmarked as employment hubs. Taking this with the ongoing decommissioning of fossil fuel power stations in the Midlands, the drive towards renewable energy sources and the need for each producer to become more energy efficient, there is a clear priority for strategic coordination in energy across the Midlands - something which, as a partnership, we are now embarking on addressing together.

Digital connectivity - This is a well evidenced existing barrier in many areas and equally an enormous opportunity - especially when considering the potential of 5G. Digital connectivity, particularly 5G connectivity, is increasingly becoming a core utility; a basic standard required by firms - especially in manufacturing. If we are to remain globally competitive and drive growth, in advanced manufacturing in particular, it is critical that digital connectivity is accelerated for every part of the Midlands.

R&D investment - Investment in R&D is essential as we strive to remain competitive in the global marketplace. The Midlands has some exceptional R&D assets, from our catapult networks, our HEI's and internally within some of our global leading manufacturers. Recent data suggests that the Midlands firms invest above average in R&D but as a region, we are in the bottom quartile (and for the East Midlands, at the bottom) when it comes to securing public sector investment (comparisons per capita). The data also presents a clear picture of underinvestment by our SME base in R&D. I would welcome any intervention targeted at ensuring our smaller producers can more easily access publicly funded R&D or derive benefits from larger R&D programmes - which SMEs find onerous and burdensome to engage with and report poor levels of success. Tailored and targeted public investment

in R&D is overtly disproportionately concentrated in London and the South East. This needs addressing if we are to achieve the Government's 'levelling up' ambitions.

Skills, management and leadership - Addressing the challenges to meeting the skills needs of businesses is always a high priority in any research we have completed with industry. They report consistently that there is a misalignment between skills provision and business demand - a perennial and grave problem yet to be tackled effectively. The performance of our schools needs improvement in some areas of the Midlands - again this is cited by firms who are highly alert that their future skills pipeline has poor foundations in some areas. Graduate retention remains an ongoing challenge for the Midlands, an area in which our researchers are currently exploring possible mitigations.

Access to business finance - Our business base find it more difficult to access business finance, in particular equity finance, than elsewhere in the UK. The work the British Business Bank is doing through the Midlands Engine Investment Fund, in partnership with our region's Local Enterprise Partnerships, is beginning to address some of the market failures underpinning this. But there is much more that needs to be done. There is a critical scarcity of early stage business funding, for proof of concept and smaller start-up companies. Access to finance for infrastructure programmes at scale is absent and should be considered regionally to both accelerate and find new ways of delivery. There is also a cultural reluctance in part where firms do not seek to access equity funding to accelerate growth. Interventions in these areas are needed and we are jointly investigating with the British Business Bank what more could be done.

Trade and investment - The Midlands is known for its manufacturing strength, and our manufacturers disproportionately contribute to the UK's exports of goods - representing 22% of all England's exports. It is paradoxically this strength that puts us at greater risk of trade disruption from both the Covid-19 economic shock and Brexit. Our businesses are clearly relaying to us the dangers of exiting the transition period without frictionless and tariff-free access to the market, and the perils of uncertainty of not

knowing what future trading relationships will look like. It is manufacturing that will be the sector most impacted by these trading disruptions and efforts must urgently be focused in this area if adverse impacts from transition are to be mitigated.

Sustainability - All of the above comments focus around removing barriers to economic growth. However, across the Midlands Engine, we see growth objectives through the lens of the climate crisis. It is imperative that support is forthcoming to enable the Midlands manufacturing base to both actively seek to reduce its own environmental impact, but also through its ingenuity and inventiveness to play an even greater role in solving global problems. We are at the forefront of R&D in energy production for example and we should aim to lead the world in clean manufacturing - ensuring our business base contributes to our collective efforts to reduce our carbon footprint.

Championing excellence - As a region we have a reputation as a manufacturing base. However, perceptions of the Midlands often held relate to heavy, dirty industry and this is juxtaposed with the reality today. We excel in advanced manufacturing with ambitions to lead the world in advanced ceramics, we lead today in advanced health science such as in imaging and a range of medical technologies, our agri-tech solutions will help sustainably feed our growing global population - and we conceive of, design and manufacture the clean energy solutions of the future - for instance our ground breaking work in hydrogen fuel. It is very much a role for the Midlands Engine partnership, but also for all partners of the Midlands, to champion this excellence and highlight at each and every opportunity the importance of manufacturing - and how in the Midlands we are innovators, creators and makers (and distributors!) of so many of the solutions future generations will depend on.

I hope this above is helpful input for your review. If any of the above observations need expanding or for us to provide further evidence that support them, please do contact my Director, Rachael Greenwood.

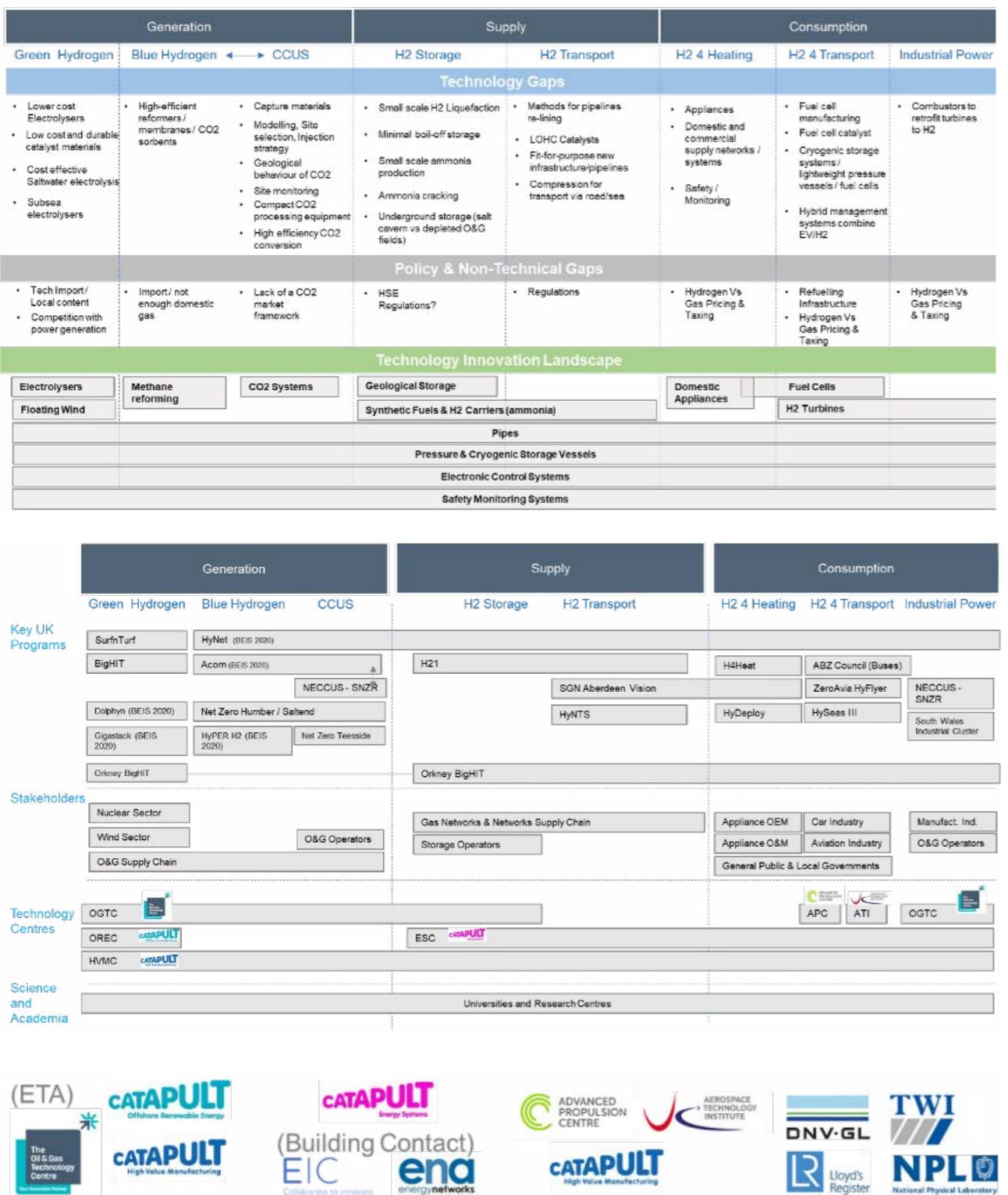
I am personally most keen for the Commission to successfully influence beneficial change and remain committed to our role in improving the competitiveness of our manufacturing sector.

Please do not hesitate to make contact should you require anything further.

Yours sincerely,
Sir John Peace
Chairman, Midlands Engine

Appendix 2

E2E Hydro-GEN: Connected Innovation Backbone



Appendix 3

VentilatorChallengeUK



A great exemplar of what is possible and what we could expect from local supply chains is the VentilatorChallengeUK (VCUK), which, although not based exclusively in the Midlands, demonstrated how rapidly UK supply chains can react, repurpose and pivot to serve sectors of critical needs. With Catapult playing a leadership and convening role, VCUK combined the knowledge and skills of 33 UK technology and engineering businesses across the aerospace, automotive and medical sectors, to produce more than 13,000 ventilator devices for the NHS.

Exactly one month after the Government's call for assistance, there was regulatory approval for the design to be used by the newly formed VCUK. Within weeks it reached peak production, exceeding 400 devices a day (when traditional manufacturing would have manufactured an average of only 10 a week)¹. The VCUK highlighted the ability to orchestrate new supply chains when critical requirements are present, and the underlying strength of UK supply chains, with their ability to respond and adapt, mitigating risk and sourcing local components, whilst operating in a highly regulated environment.

This feat could only be achieved by bringing innovative talent around the table for collaborative problem solving, challenging the status quo. The team ended up adopting completely new practices such as moving to adaptive machining tooling rather than relying on complex fixed tooling, training a workforce of 3,500 people in record time using modelling and mixed reality and using a digital twin to design the new production system remotely, without access to the physical product or plan². And while the perception may be that this flexibility and pace came at a price, VCUK generally managed to find solutions without increasing costs, delivering the project in 12 weeks, under budget and producing ventilators at price point less than market norms.

While the VCUK consortium has now officially come to an end, it has left profound lessons that can be used in the Midlands' journey towards resilience. The main lessons are around pace and an economic level of embedded flexibility in manufacturing. We can't rely on the next crisis to bring pace to the way we innovate in the Midlands and flexibility into manufacturing, when we know that both are achievable. We need to grasp the opportunity now, alongside leadership that can convene and connect a community, providing purpose, focus and confidence.

1 <https://www.pesmedia.com/ventilator-challenge-uk-siemens-22072020/>

2 <https://www.microsoft.com/en-gb/about/ventilator-challenge/>

Appendix 4

Executive Summary: The Speed to Scale Region (SSR)

HARNESSING THE INNOVATION AND INDUSTRIAL STRENGTH OF THE WEST MIDLANDS TO DEVELOP, MANUFACTURE AND DELIVER NEW PRODUCTS AT SCALE AND PACE

We are living in unprecedented times and the magnitude of the challenge facing the UK and the West Midlands (WM) is enormous. Long term regional inequalities and the changing industrial environment, combined with the impacts of the Covid-19 pandemic, have put the West Midlands in a precarious situation both economically and socially.

Our organisations are founded on social purpose and share a strong Midlands industrial heritage. As two of the UK's most respected universities and the two largest High Value Manufacturing Catapult centres, it is in our DNA to make a difference. At times of change the bold seek opportunities. It is time for the West Midlands to be bold. The Industrial Revolution built the Midlands on technology advancement and an insatiable desire for goods. Today we face the same type of opportunity. The West Midlands has the technology advantage and the manufacturing base on which to build, and the world has an urgent need and appetite for clean growth and medical products.

We've proven the science, it's time to sell products to the world.



- Four Hubs for industry and start up incubation. Designed to clear the industrial and commercial roadblocks to the rapid growth of promising technologies and business models, driving productivity in new sectors and creating thousands of skilled job and launching new products
- A pipeline of Pre-Hubs in future market pivot areas
- A Productivity Booster programme to support SMEs to increase productivity and resilience and facilitate pivots into Hub sectors and new opportunities
- Core Activities to curate ecosystems, influence procurement, value analysis and economic data analytics, ensure multiplier effects across related WM activities, and provide international marketing for Foreign Direct Investment (FDI)

The investment is primed to launch with Fast Start Actions across programme areas for immediate impact.

This partnership approach with the business community's support, drive and ambition, linked to the West Midlands Mayor's wider strategic vision and activities is unique in the UK. This programme will deliver **Immediate economic impact and recovery and longer term clean, inclusive, sustainable growth.**

- Our focus and deliverables over 4 years with an investment of £460M will be product development programmes in;
- low-carbon heating
 - new medical technologies
 - low-emission urban mobility
 - secure connectivity

EXECUTIVE SUMMARY JOBS AND GVA DELIVERED BY THE SPEED TO SCALE REGION PROGRAMME

National Hub for the Decarbonisation of Energy & Heat (NHDH)	The UK low carbon economy could grow 11% per year between 2015 and 2030 -x4 faster than the rest of the economy and deliver between £60bn and £170bn of export sales by 2030.	£140m JOBS 7,200 GVA £790m
National Medical Technologies Resilience (NMTR) Hub	Scaling our current regional industry base is predicted to: ■ Increase employment by over 6,000 new jobs ■ Increase turnover by ~£2.5bn UK annual market turnover is worth over £70bn and predicted to hit ~£500bn globally by 2024.	£75m JOBS 2,800 GVA £320m
Sustainable Multimodal Transport (SMT) Hub	UK delivers \$120bn of the global revenue, one third of this from the WM. Without reskilling, 30,000 jobs will be lost in decline of the Internal Combustion Engine; but there is potential for 80,000 jobs by 2040 in the electric mobility sector. For every Tier 1 role there are 5 additional roles in the supply chain.	£70m JOBS 3,000 GVA £340m
Connectivity, Security & Resilience (CSR) Hub	■ 5G technology market is \$667bn by 2026 ■ 5G services market is \$41bn in 2020, expanding 43% per annum to 2027 ■ Cybersecurity market size is \$281bn by 2027.	£70m JOBS 3,300 GVA £360m
Core: Innovation Pipeline	A curated pipeline of Pre-Hubs around future market pivot areas where the West Midlands has technological advantage and potential to capture or convert significant positions.	£45m JOBS 2,600 GVA £280m
Core: Productivity Booster	Supporting SMEs to become more productive and resilient. Readyng them to pivot into supply chains designed by the Hubs. A new Intelligent capacity database of thousands of West Midlands companies will unlock pivots to new products and sectors.	£35m JOBS 1,700 GVA £170m
Core: Activities	Delivering an integrated programme to maximise synergies between the Hubs, their markets, regional & national businesses, regional providers, national programmes and influence national procurements with the Business Futures programme. Market globally and secure International Investments.	£25m JOBS 1,200 GVA £120m

Appendix 5

Opinion Piece - The Mittelstand Business Model & J.J.Churchill

JJ Churchill Ltd (JJC) is a mid-sized, aerospace based, precision engineering business that has specialised in the manufacture of gas-turbine blades and vanes since the dawn of the jet-age. JJJC is an 82-year-old family-owned company that continues to succeed in a sector where small, independent suppliers are increasingly rare. At a time when manufacturing is being severely tested, it is probably timely to consider whether a British interpretation of Germany's Mittelstand model might demonstrate some valuable resilience.

I always find it curious that others are surprised with the way we have run our business. For me, it's the culture I grew up with and has always seemed common sense. Being a family run business is not just about the owning family, but much more about the family of employees and dependents that make the company a success. Often, the Mittelstand model is either crudely conflated with mid-caps in the British press, or disparagingly dismissed as only something that could work in the perceived more 'structured' culture of Germany. Whilst both assumptions are incorrect, it is also fair to recognise that a simple replica of the model is not a panacea for the woes of British manufacturing in a post-pandemic world. From my perspective, it is innate; I discovered the term long after living the values. The flipside is that, as a model, it's quite hard to emulate unless you already believe in the concept.

In the literature, the Mittelstand management model is often reduced to a shorthand of four themes:

- Strategy: Global niche dominance
- Governance: 'Enlightened' family capitalism
- Performance: World-class in focused areas
- Place: The German microeconomic business environment

The first three are nationality-agnostic and therefore equally applicable to the UK, only the fourth is unique to Germany where there is local business banking

(Sparkassen and Landesbanken), as well as local mandatory membership of Chambers of Industry & Commerce. The latter co-ordinates and oversees apprentice training and certification, as well as forge and perpetuate a sense of being anchored in the community. Although today we might include membership of the EU trading bloc as a part of the 'place' narrative, it would be unduly dismissive to assume that British manufacturers could not develop their own version of the model. Indeed, without much fanfare, a number does.

Looking at JJJC, we have been in long-term family ownership but are not a family 'piggybank'; I am an employee first, a custodian second, and a shareholder third. The family is deeply attached to the business, and as one would expect, over its 82 years there have been some very significant industrial and economic shocks to deal with. Professional management must therefore be at the core if we are to be credible in our very demanding sector. That means that we expect to employ the best and naturally these will usually come from outside of the family. Consequently, although we are the third generation of Churchill's, only one or none of us is in the business at any one time.

We are overtly for profit, but how we choose to spend that profit is rather different from both public and private equity (PE)-invested businesses. The independence this brings from the typical three-year PE payback expectations is critical and whilst our rather boring, and conservative, debt-gearing would be the cause for significant censure in other business models, in ours it is a reflection of our recognition that we have only ourselves to rely upon. In the short-term, whilst this might attenuate growth, it places us in a far more secure position to withstand the headwinds of unexpected economic shocks.

Long-term focus drives rolling strategic planning, and combined with a by-day cashflow plan for the twelve months ahead, gives us the stability and confidence to invest in innovation and capacity, often counter-cyclically. We like to earn it before we spend it; however, this does not preclude a modest overdraft facility to smooth cashflow, or asset finance.. In short, our shareholders value resilience over gearing.

Opportunities, including those that may arrive completely from the 'left-field', are welcome, but are assessed against strategy; if in-line, we move quickly to capitalize on these, or otherwise politely decline. We're not large, but our agility is a key differential advantage.

On arriving eighteen years ago, I introduced a 'Vison & Values' statement. This began to codify the culture we were already living, formally introducing the concept of the 'stakeholder'. We have five stakeholder groups which, in order of priority, are: our employees, our customers, our suppliers, our local community and finally, our shareholders. Profits earned are largely re-invested in capital equipment, technology, and our people. Through a profit-sharing scheme, all employees benefit from our endeavours as well as having access to a private healthcare cash-plan. However, this is not philanthropy, but something I prefer to think of as 'enlightened self-interest'. Our management structure is thin, we are not top-heavy, and I know and am known by all employees. In return for being a great place to work, we see an amazing willingness by employees to put themselves out for the Company.

Looking to the future, essential to our success and a part of our corporate DNA, is the belief that an apprenticeship is a key career development pathway, and one that helps us secure future management talent early. As a result of the impact on aviation and aerospace in the pandemic, we have recently been forced to re-size the business radically. Notably we took the decision to protect all of our apprentices, and today they represent nearly 10% of the workforce. We value innovation, and often find our youngest employees are the most creative. This cohort will become ever-more important as we robotise and digitise our manufacturing processes into the world of the Fourth Industrial Revolution. Reflecting upon the turmoil of recent months, there is no doubt in my mind that a very British interpretation of Mittelstand has not only strengthened our ability to survive the downturn, but will also put us in a much stronger position than many to capitalise on the inevitable opportunities that will follow. The combination of our cash position and our longer-term measures of success inherently leads to a certain degree of resilience. Of course, there is no 'right' model, no single path to success, but I suspect there are many other similarly-managed manufacturers in the Midlands who may not have realised their resilience in these difficult times, is at least in part due to their family-ownership structure, and the patient approach to capital that this can bring: re-investing profits for long-term success tomorrow, rather than dividends today.

**Andrew Churchill
JJ Churchill**

Appendix 6

Opinion Piece – SME's, by Mark Adams

2 September 2020

In 2013 the renowned German industrial designer, Dieter Rams (formerly head of design at Braun), was in London when Sir George Cox's review on overcoming short-termism in British business was published. Rams recalled that he had also been in London in 2006 when Cox had published his review on design. The reviews concluded that 1) Britain needs more recognition of the value of good design and 2) more long-term business thinking. Wide-eyed, Rams asked, "You need reviews to tell you that?"

Cox said, "The UK lacks either the US culture of investing in entrepreneurs or the German system where banks take a long-term holding in companies. One thing this has led to is an 'early-exit culture' in the UK: entrepreneurs and their backers both working on a clear, relatively short-term plan to get their money out." He concluded, "the short-term aspiration and the lack of a series of steps, by which companies can keep growing, undoubtedly leads to the UK's failure to produce world leaders capitalising on its inventive skills."

Cox's research echoed what Lord Heseltine encountered in carrying out his 2012 review, 'No Stone Unturned, In Pursuit of Growth': "In the private sector, British success stories are numerous. We have world-leading businesses, delivering innovative products and services to markets at home and overseas. But our overall attainment is judged by the performance of the average business. And the average business in the UK is simply not strong enough."

In turn, Heseltine referred to Lord Devlin's 1972 report and the fact that successive governments had failed to act on Devlin's recommendations to help the private sector create world-class support systems. Devlin focused on the role of chambers of commerce and trade associations. Heseltine concluded: "Much more of the inspiration for our economy should be based on the strength and ambition of our cities and their communities. It was this local leadership that built our country in the first place." Cox agreed: "Industrial strategy ... requires a regional dimension."

Having contributed to both Cox reviews, the British furniture manufacturer, Vitsœ, was involved in 2012 in 'Sharing Success, The Nuttall Review of Employee Ownership'. The establishment of the Employee Ownership Trust was a direct result of Graeme Nuttall's review. He explored "the long-term focus of employee-owned companies" and the fact that "employee-owned companies were particularly attracted to longer term 'patient debt capital.'" He highlighted bonds as one solution to the debt-raising problem – in distinct contrast to venture capitalists whose eye is almost always focused on the door marked 'Exit'.

In between Devlin and Heseltine/Cox/Nuttall was Sir John Harvey-Jones's 1986 Richard Dimbleby lecture, 'Does industry matter?' As chairman of ICI he started, "It is manufacturing industry whose praises I want to sing tonight. It is now becoming so undervalued in Britain that our decline could become irreversible." He was critical of the "move to services at the expense of manufacturing" and of "short-termism in the City". He pointed out that the "best natural leaders have not gone to work in industry" and that "our attitude has become negative towards industry". Importantly, for me, he said that "wealth creation is not a motivating force; job satisfaction is." His rousing conclusion was: "think science; think international; enthuse and excite our brightest and best to get into manufacturing."

As the managing director of a (now) medium-sized furniture-maker, I have spent more time exploring the merits or otherwise of British manufacturing at round tables, policy reviews, evidence sessions and webinars than I wish to recall. None has done better than to recall the words of the wise souls I attempt to summarise above. Perhaps the wheel does not need reinventing.

I was a child of the 1960s and 70s. The music was good: Pink Floyd, Bowie, Genesis, Motown and more. As was industrial design: Alec Issigonis with the Mini; Malcolm Sayer with the E-Type.

But industrial relations were bad: Michael Edwards at British Leyland versus Red Robbo, the trade unionist, Derek Robinson; and, in the early 1980s, Margaret Thatcher, the new prime minister, versus Arthur Scargill of the National Union of Mineworkers. Surely, I thought, there was a better way to run businesses than this.

My father discussed with me EF Schumacher's 'Small is Beautiful, Economics as if people mattered'. He wore an enamel Union Flag in his lapel and drove his Rover 2000 TC with pride. Meanwhile, the influence of my East Midlands school, David Attenborough and Richard Dawkins were driving my fascination with the natural world. Advised to study what I enjoyed rather than the career I wanted to follow, I emerged from university with a vital degree ... in zoology.

Shortly afterwards I was introduced to the furniture of that industrial designer, Dieter Rams – in particular,

his renowned 606 Universal Shelving System designed in 1960 – and, having hopped on a plane for my first visit to Germany to introduce myself to the company's ageing founder, Niels Vitsœ, I used the government's loan-guarantee scheme to borrow £10,000 to set up a company to launch Vitsœ in Britain.

Despite the great merits of Rams's design-thinking – shelves, chairs and tables designed as a long-living, self-effacing, kit-of-parts that would adapt to users' changing lives – it was quickly evident that Vitsœ's retailer-dependent business was beyond its heyday. From 1993 I spent two years commuting weekly to Germany as a young Geschäftsführer attempting to save a failing German business. In 1995 we closed it, relocated the corporate seat to London, licked our wounds, and started the process of finding suppliers to build a British manufacturing business.

One of the early discoveries was a sheet-metalworker in Cirencester. The relationship started in 1993 after I wrote a letter to the Financial Times complaining about the difficulty finding UK suppliers in the wake of the UK's exit from the Exchange Rate Mechanism. Since then Vitsœ has been the annoying itch, constantly urging that supplier – and about 30 others – to invest in the best, whether it be Germany's latest fibre laser-cutting or CNC-milling equipment, or Switzerland's bespoke powder-coating line (all have been added recently).

Vitsœ took the opportunity with new suppliers to improve the design and production process of every component. Gradually the product quality was improved, the price reduced, and the delivery period shortened. Visits to New York in the late 90s resulted in a partnership that started Vitsœ's export market. This spurred the considerable and risky investment in the development from scratch of a Java-based planning and pricing tool that was deployed to customers via the internet. Due to the innovative nature of this route to market (a successful claim for R&D relief was made) Vitsœ developed other bespoke software in-house that has allowed exports to grow to 70% of sales, achieved to 70+ countries.

By selling directly for decades – using intelligent staff who provide exemplary service – Vitsœ has built up a loyal customer following that respects its honest-pricing policy of charging everyone the same

fair and reasonable price (and taking payment up-front). At any one time, 50-60% of Vitsœ's orders are from returning customers. Nobody at Vitsœ earns commission, as the entire focus is to establish long-term customer relationships. Frequently customers have said, "Just let me know if there's anything I could do to support Vitsœ."

By adopting this model – and paying suppliers on-time – Vitsœ had been largely self-financing as it outgrew two London buildings in 20 years. But its London days were numbered – by virtue of cost-of-living and the frequent need for visits by 40' containers heading to the ports. The search for a welcoming community and an industrial cluster had started – as well as the financing challenge for a move to a location and building that would allow Vitsœ to add a zero to its size.

Many regional towns were visited but putting the word out led to an approach from the MP for Warwick and Leamington. Vitsœ was looking for a community amongst which it might become a symbiotic partner – giving and receiving in equal measure. In Leamington it found a handsome, creative, walkable town with a good train connection to Vitsœ's London shop. Critically Leamington was central to Vitsœ's supply chain, thereby offering a ready-made industrial cluster. (In a low-tech way Vitsœ is a simple automotive-style business bringing in components from its local suppliers, assembling them to order, and dispatching the finished product to the customer. Many Vitsœ suppliers primarily supply automotive companies).

All of which took the mind back to those offers of support from customers. Having observed the developing mini-bond market Vitsœ issued a bond invitation exclusively to customers in 2013. £9m was raised to buy the site of the former Ford foundry in Leamington and to design and construct an innovative timber kit-of-parts building that is almost energy self-sufficient.

Vitsœ has had a longstanding relationship with the Institute for Manufacturing at the University of Cambridge – and was invited in 2011 to be a founder member of the EPSRC Centre for Industrial Sustainability. Annual lectures and cohort visits result in each party learning from the other. Together with Imperial College and Cranfield University,

Cambridge contributed to the world-class team that was assembled to design Vitsœ's new building (including a gold-medal-winning structural engineer). Its naturally-lit and naturally-ventilated design was directly influenced by lessons of the 1918-19 Spanish flu pandemic where human's immune systems were found to be strengthened by exposure to natural light and fresh air. The building's kit-of-parts reconfigurable mindset came directly from the monastic makers of medieval cruck-frame barns via Joseph Paxton and his relocatable 1851 Crystal Palace – designed and built in nine months in Hyde Park for The Great Exhibition.

Not only did the academics help but Vitsœ found a committed partner in Warwick District Council (WDC) that went out of its way to facilitate what was, at times, a challenging relocation project. WDC did precisely what Heseltine and Cox had been calling for: making possible an important step for an ambitious business. WDC introduced the Coventry and Warwickshire Local Enterprise Partnership that kindly provided funding (dependent on completing the box marked 'Number of jobs to be created'; Vitsœ's emphasis is always on the quality of jobs rather than the quantity).

In moving to Leamington in 2017 Vitsœ also considered the availability of good schools, colleges and universities who would supply Vitsœ's future workforce.

Without knowing it, Vitsœ became part of the "levelling-up" agenda before the term had entered daily government parlance.

Having financed the higher-risk construction phase of the project via the Vitsœ bond, part was then refinanced over a longer period with Triodos Bank (high-street banks declined to support Vitsœ) whose managing director, Bevis Watts, said in his review of 2017, "a personal favourite this year has been our loan to support Vitsœ which is the first time we have supported a circular-economy business – one which makes long-lasting lifetime products, and which operates incredibly high environmental sourcing standards and practices." A relevant side-note is that Vitsœ had great difficulty securing a suitable RICS-approved valuation to allow bank finance due to the building's innovative design and construction; there were no "comparables".

It has been an observation during Vitsœ's development that there has been no long-term consistency of government support for SMEs. The Small Business Service, Business Link, Regional Development Agencies and the Manufacturing Advisory Service have all come and gone. In Germany industrial strategy is regarded as too important to be meddled with by politicians, hence it is generally blessed with far greater consistency.

Having spent 35 years travelling to and from Germany I have become well aware of the virtues of the country's Mittelstand – where many of the bosses are on speed-dial with each other. As The Economist said in 2010, "They are run by anonymous company men, not hip youngsters in T-shirts and flip-flops." A point noted by me was that 70% are based in the countryside. They focus on market niches, preferring not to "dance where the elephants play." Many generate the vast majority of their sales outside Germany. Importantly, they are conservatively financed for the long term, with their owners rarely looking to exit – unlike in the UK where entrepreneurs who build and sell businesses in rapid succession have become the model to which one should aspire.

The Mittelständler are known for their constant innovation – the improvement of an existing product, process or service – rather than the more fashionable need to constantly create new products or services. As the German American economist Theodore Levitt said, "sustained success is largely a matter of focusing regularly on the right things and making a lot of uncelebrated little improvements every day." That has been Vitsœ's staid mantra for more than 60 years – resisting the persistent pressure to create new for the sake of new.

As we absorbed the initial shock of lockdown in April 2020 I listened with interest to a webinar discussion – hosted by the stalwart Make UK that proved such a strength at that time – turning to resilient business models. Three points caught my attention: 1) restore local supply chains by reshoring from Asia, 2) sell directly to customers to avoid the closure of third parties who cut you off from the market, and 3) put your business in the cloud so that it can function from anywhere.

Vitsœ ticked all three boxes by having resisted to lure of cheap Asian production to keep all supply in the UK and northern Europe; having terminated by 2011 all dealer relationships, including 85 retailers in Germany (resulting in a smaller business but one that sells only to the end-user); and having moved to the cloud in 2005.

That business model allows Vitsœ to make at the highest quality in the UK and to sell worldwide at affordable prices using the internet as the middleman. But it is also a demanding model because it encourages customers to buy less furniture, to rearrange it, to repair it, to take it with them when they move, and to hand it on in their wills. The model only works because new customers are constantly being introduced by existing customers who value their relationship with Vitsœ.

Recently The Economist assessed the lessons of General Electric's performance since the departure of its CEO, Jack Welch, in 2001. It concluded: "... companies have few better options than to perfect what they are good at and embrace the simple life – even if it makes for less suspense."

I suspect that Devlin, Harvey-Jones, Cox, Heseltine, Nuttall and Rams may not disagree. Keep it simple. Do it better. Keep it consistent. Focus on the long term. Do we really need another review on our shelves – other than to help the makers of shelves?

Mark Adams
Vitsœ

The Devlin Commission on Industrial and Commercial Representation, November 1972
Sir John Harvey-Jones, Does Industry Matter, Richard Dimbleby lecture, April 1986
Sir George Cox, Review of Creativity in Business: building on the UK's strengths, November 2005
Graeme Nuttall, Sharing Success, the Nuttall review of employee ownership, July 2012
Lord Heseltine, No Stone Unturned, in pursuit of growth, October 2012
Sir George Cox, Overcoming Short-termism with British Business, The key to sustained economic growth, February 2013

Appendix 7

Opinion Piece - UK SME'S – The challenge & the opportunity, by Tony Hague

General elections, political uncertainty, Brexit negotiations and a global pandemic virus – it's hardly been the smoothest 12 months for UK manufacturers, in particular for the significantly important SME community that represents such a massive percentage of the UK manufacturing landscape.

However amongst the chaos and uncertainty of the last 12 months, perhaps recent events may just act as a catalyst of change, and as such we will see the significant opportunity that actually exists for long term investment and growth.

The clear and very real opportunity for growth is to create a sustainable, agile and competitive supply chain of sub contract manufacturing services that meets the needs of many of the larger prime manufacturers in such sectors as automotive, aerospace, agrimech, power generation, high technology sectors and many other industrial markets.

Just stop to consider the huge value of spend that is placed with overseas suppliers, whether on fabrication work, castings, pressings, plastics, electronics, forgings... what if this spend (or certainly a good percentage of it) could be diverted back into the UK supply chain? Imagine the affect on GDP growth, productivity and balance of trade – all of which we have been bemoaning about for a number of years.

So why does so much supply chain revenue leave these shores?

The answer is clearly a complex one and both industry and process specific. One could argue that on occasion UK manufacturers have taken a short term view and simply followed the path of the "lowest bidder," picking suppliers in LCGs, whether eastern Europe or Asia. In some instances, the supply chain for a given requirement or commodity does no longer exist in the UK – for example try and source certain types and sizes of castings in the UK, it is simply no longer possible – energy prices, health & safety and environmental requirements ensured they became uncompetitive many years ago and now you are likely to find a supermarket on what was once their site.

But let's work on the basis that the UK SME sub-contract manufacturing community can rise to the challenge and work with the primes to be able to meet future needs, what needs to change?

The clear and obvious one is investment in automation and robotics, let's please avoid the phrase Industry 4.0 as all it has caused is total confusion and additional and unnecessary jargon. Automation is vital in order to create agility – this should now be the focus. The days of huge factories focused solely on process flow and lean are over – now

it's about agility and creating processes that ensure a competitive batch price of one in a world where we have demand around mass customisation, and hence modularisation and late configuration models are needed – automation helps provide this.

One of the issues surrounding the very slow adoption of automation and robotics within the UK (and it is staggeringly low) is in my opinion one of relevance and understanding. As such, we need an independent advisory body and attractive financial incentives to support such investment. Too many companies that have "bitten the bullet" and made such investments have been mis-sold and as such have seen poor ROI, which in turn gives them a negative view on future investment opportunities. Let's be honest, an applications engineer from one of the key automation providers will always try and sell from their own portfolio of products – whether the solution is best fit or not.

Creating a collaborative approach between SME's, primes, independent advice and automation providers would create clear solutions and provide a business case for investment. The involvement of the prime may be key as their support in helping develop a sustainable UK centric supply chain should be seen as part of their long term strategy and provide a solution that helps support their growth and indeed manage risk.

Lets be clear, reshoring activities could create huge and sustainable wealth for the UK economy, it won't be easy but now is the time for full-throttle, unapologetic, uncompromised political support for aggressive investment in new products, in new industries and in new factories.

I'm not for one minute suggesting that global supply chains are not vital for our economy, nor am I suggesting that we take an insular "island mentality" approach to doing business in the future – what I am suggesting however, is that with the correct investment and collaboration, UK manufacturing can reach new heights, create sustainable wealth for the nation, and create incredible employment opportunities for generations to come.

Tony Hague
CEO, PP Control & Automation Ltd

Appendix 8

Opinion Piece - Digital manufacturing industrialisation, deployment and scale-up, by Neil Tatman

Digitalisation will transform manufacturing beyond recognition and achieve a step change in industrial productivity. However, it is still early days, and many of the challenges associated with the adoption and deployment of solutions for legacy factories, are still blocking the UK from grasping the opportunity and taking a leading position.

Rolls-Royce has taken its own journey to Smart Factories/Industry 4.0 over the last 10 – 20 years, where we have invested heavily in essential standardisation, e.g. the Turbine Blade Facility (TBF) in Derby, where automation levels were high but to a prescribed recipe. This has evolved hugely to the newest factories, e.g. Advanced Blade Casting Facility (ABC) in Rotherham, Fan Blade Singapore (FBSG) – where fully adaptive processes can now be seen integrated into everyday manufacturing operations.

In parallel, there has been a development of IT and systems in manufacturing at Rolls-Royce, referred to as Minimum Standards, which set out and describe the underpinning infrastructure for managing and controlling the products and processes while also collecting data from those parts and processes. It's this approach to our Minimum Standards, which has provided the essential foundation for our ongoing journey. A journey that is far from over.

The World Manufacturing Forum sees a different model for manufacturing in 20 to 30 years, and we at Rolls-Royce have a shared ambition and vision for our developing Digital Manufacturing Technologies to deliver this:

- Cognitive Manufacturing which is smart and optimised allowing manufacturing as a service in the cloud
- Hyper-personalised Manufacturing which will take customisation to the next level
- Global Risk Resilient Manufacturing which will adjust value chains as strategies and risks change
- Circular Manufacturing which will reuse materials and resources
- Inclusive Manufacturing which will empower all to ensure equity and well-being of every individual
- Rapidly Responsive Manufacturing which will respond to changing markets and needs

However, to realise just a small percentage of this future vision there must be some step-change in the way that government, industry and key technology vendors collaborate. Arguably, no one country, let alone a single company, can deliver the full portfolio of capabilities needed.

The commoditisation of this technology domain is essential for the landscape ultimately to become both predictable and 'economic'. This requires digitalisation at a scale that industry can deploy in their factories, if we are to achieve the productivity we need for the UK to remain a world power in manufacturing. Competitors are actively working with their governments in an effort to lead in the digitalisation race; we cannot continue to deliberate. The UK genuinely has an opportunity to take the lead globally here – if we so choose to do so.

Neil Tatman
Rolls-Royce

Appendix 9

Invest, Employ & Upskill A strategy for Midlands Engineering & Manufacturing

About Enginuity

Enginuity is a not-for-profit skills organisation innovating to develop the skills we all need to succeed today and tomorrow. Enginuity creates practical solutions for individuals, educators and engineering employers using unmatched industry expertise and data – so engineers can change their world and ours.

Given Enginuity's expertise we are well placed to support the Commission with their work. Our submission seeks to provide comment to support each of the objectives of the Commission.

Objective 1 - Review of the Midlands' manufacturing landscape post-Covid-19

The top three Midlands manufacturing sectors by employment levels are: Manufacture of Food Products 15.8%; Metal products 15.2%; and Automotive 11.7%¹.

The impact of Covid-19 has been seen in a steep decline in general job postings with a hotspot within apprenticeships. However, any review needs to look at the breadth of the manufacturing base where smaller numbers collectively contribute to the big employment picture.

Non-Apprenticeship Job Postings

% Decrease May	% Decrease June
National	
45 %	30%
Midlands	
57%	42%



Appendix 10

17 August 2020

Report to Midland Manufacturing Resilience Commission by Thistle Management Ltd

Dynamic Clusters of SMEs as an Engine for Growth

To the MMR commission chair Dr Clive Hickman

The issues around resilience are so wide ranging that Thistle Management has taken the view that it would be more constructive to concentrate on the important SME sector which we believe we can offer solutions that will yield measurable results:

The issues on which we will focus are:

- **Pivoting between market sectors** - how SME companies in the Midlands can adopt flexible manufacturing systems: changing products and processes between sectors for a more agile response to the market's demands;
- **Productivity** - how SME companies in the Midlands can solve the productivity puzzle (essentially stagnant growth since the financial crash) by developing digital capabilities linked to outcome-based services;
- **Finance** - how can finance be leveraged for effective manufacturing and services;
- **Supply Networks** - how to create supply networks of mutually supportive Midlands SME companies that are able to satisfy an increasingly dynamic market, both in the UK and beyond.

After the 2010 finance collapse the SME sector recovered more quickly than other manufacturing (SQE and LQE) sectors. We build on this by taking positive action to build Dynamic Clusters of "SME" companies having complementary capabilities to facilitate an accelerated recovery within the cluster.

When proven successful, scaling the cluster to other SME sectors will not be financially onerous and can be implemented on a timely basis. Marketing the cluster concept will not be difficult so should yield early success in other SME sectors.



We hope this approach of "Dynamic Clusters" is seen as being a constructive, practical and efficient approach to accelerate the recovery of the added value SME sector within the Midlands Region.

The objective of each cluster would be to maximise the opportunity which develops through collaboration. Collaboration enables participant companies to create value together by sharing risk and reward in pursuit of common goals. Collaboration will include best practice, technology, market, agility, networking, competitive intelligence, etc. which leads to an agile response to market opportunities.

Current negotiations with selected SME companies to complete the initial Dynamic Cluster are in progress. The "Dynamic Cluster" focus will be to identify the recovery and subsequent growth generated by the cluster and report cluster progress to the commission on a periodic basis.

Thistle Management Ltd will develop and deliver the ongoing active management of the cluster.

The cluster management process will:

- Develop the trust, confidence of the cluster companies
- Establish a collaboration agreement
- Enable best practice exchange
- Mentor and leverage the expertise within the cluster
- Capture key metrics such as added value and productivity

Appendix 11

Questionnaire feedback

Questions

Q1. Your name:

Q2. Your email address

Q3. Where are we now? Please consider the following in your response:-
How homogenous is the Midlands as a region? Does it have an identity?
- What is the identity of the Midlands, and is this the identity we want in 5 years' time? Is the Midlands maximising its collective potential?
- Where do we want to be, what is our ambition for manufacturing and what opportunities do you see? - How relevant/important do you think manufacturing is to the Midlands, a) now and b) in five years' time?
- What impact has COVID-19 had on your organisation? How have you mitigated this impact and how will this change your organisation going forward?
- Academia. How do you work with/collaborate with business?
What is your most active department? Which businesses are the most proactive and which sectors? How long would be an average research activity take? Are you more or less reliant on this type of funding?
- Supply Chains. How efficient are your supply chains? Do you have any "buy local" procurement policies? How do you support your supply chains in terms of training? How would you describe your relationship with your suppliers? How do you think this could be improved?
- How well are you supported by local infrastructure a) physical and b) digital.

Q4. Where do we want to be? Please consider the following in your response:- How do we become world-class?- How important do you think R&D is to Midlands Manufacturing?- What industries do you associate the Midlands with a) now b) do you think will be the case in five years' time? How do we prepare for these 'new' industries? - What opportunities are there for our manufacturers to move to a mixed "servitised" model?- What does 'Flexible Manufacturing' mean to you? How would you encourage such a strategy?- What infrastructure (physical, digital, connectivity) improvements do you think can be made?
Do you believe a 5 or even 10-year strategic plan to build Manufacturing Resilience in the Midlands is achievable?
- What region should the Midlands compare/contrast itself with a) in the UK b) internationally?- Emerging Technologies. How would your organisation approach technologies such as AI etc.? What impact do you think the so-called 'Fourth Industrial Revolution' have on your organisation? Do you think you are in front of, or behind your competitors? How do you think you can improve this situation?

Q5. What are the barriers? Please consider the following in your response:- What are the barriers to achieving our ambition and how can we remove those barriers?- How constrained are we by our culture and behaviours, financing, innovation, lack of agility or other factors and how

can we remove those constraints?- What do you think are the barriers to improving productivity? How do you think they will be overcome?- How do you think the Midlands can attract inward investment?- Business support. How easy/difficult is it to find relevant support/information on topical issues eg standards, export procedures. What would be your usual 'go to' organisation, [government body]/Chamber of Commerce etc? Do you think there is an appetite for anything similar to the former Manufacturing Advisory Service?- Are you familiar with a) the Made Smarter programme b) the LEP or c) the Growth Hub? How proactive have these organisations been to your organisation? Have you seen any particularly effective action that you would like to share- Access to Finance. How accessible are different types of finance? Where would your organisation usually go for finance, and what type?- Are you familiar with the German Mittelstand model? Do you think it would be possible to replicate something similar in the Midlands? - How do we create agile and flexible supply chains?- Do you think membership of a business membership organisation should be mandatory - ie you should be required to pay a levy?- How can we support our large SME base to become more resilient and agile?- How can we address productivity across the region?

Q6. Skills / People Questions Please consider the following in your response:- What are the skills issues that are holding us back and how can we address those issues?- How important are apprenticeships to the future of manufacturing? What more can be done to encourage more young people to apply?- What more can we do to ensure lifelong learning and help experienced workers re-train/update?- How do you think we can attract the widest range from society to the sector and improve diversity?- How do you encourage engineering graduates to a) have a career in engineering b) stay in the Midlands c) move to the Midlands?- What impact do you think automation will have on employment in the region? Do you see automation as an opportunity or a threat?

Q7. Next steps?- How do you think we could improve manufacturing resilience in the Midlands? What would be your top two suggestions?- What support does manufacturing need to navigate its way through the recovery? a) nationally b) in the Midlands?- What else do you think national/local government could be doing to support manufacturing in the Midlands eg a) investment in skills b) through the Treasury c) through BEIS d) other initiative- What legislative change do you think would assist the sector most? Can you give an example? - What would you like to see in the Budget, that would support manufacturing in the Midlands?

Q8. Other: Please let the Commission know any other thoughts/suggestions you may have in the box below.

1	Ben Sheridan
2	-
3	<p>The West Midlands has perhaps the greatest concentration of high value manufacturers in the UK. This concentration gives the possibility of enabling greater collaboration leading to much more innovative approaches.</p> <p>With the changes in manufacturing arising from Covid-19 it is clear that there are both opportunities and challenges facing manufacturers. Companies in aero and auto are facing global reduction in demand, but we have seen they are capable of pivoting into medical device manufacture and it is this kind of flexibility which is key to future resilience, particularly as global supply chains are likely to shorten.</p> <p>In order for Midlands manufacturers to innovate better, their management need to quickly adapt and change their traditional ways of working to meet these opportunities and challenges. There are a number of examples of internationally recognised good practices that we should quickly embed into the fabric of these companies at the highest levels. These include:</p> <ul style="list-style-type: none"> - ISO 56000 Innovation Management - BS 8001 Circular Economy - BS 65000 Organisational Resilience - ISO 44001 Collaborative Business Relationships - Various management systems standards AS 9100, IATF 16949, ISO 13485 <p>By working closely and directly with the businesses in the region we can rapidly upskill their management, and open their eyes to exploiting the kinds of opportunities that are likely to arise in the next few years.</p>
4	<p>The Midlands has a world class design capability - we need to rapidly reduce the design and assurance cycle time to be able to a) move quickly across different sectors and react to changing customer demands and b) to continue the innovation cycle throughout the use phase of the product.</p> <p>Digital adoption will be key to achieving better collaboration, resource efficiency, and enhanced design & assurance. However digitising a poor process does not make the resulting process any good. The company must work hard to achieve best in class collaboration, innovation, and management systems to be able to make sure digitalisation works as intended. The vast majority of digital transformation projects fail and this is one reason why - BSI would like to increase confidence in digital transformation to unlock investment in UK industry in these technologies.</p>
5	<p>Confidence and trust in digital technologies needs to be addressed. We need to put the relationship between manufacturer and vendor on an even footing to ensure that interests in a positive outcome are aligned. New risk-sharing business models based on a service ethos may go some way to achieving this (as described in PAS 280 through life engineering services).</p>
6	<p>We need to work on upskilling management in our manufacturing SMEs, to ensure they are capable of putting data at the heart of their operations and they know how to exploit it.</p>
7	<p>We need a programme that directly interacts with small and large manufacturers, and technology vendors, to:</p> <ul style="list-style-type: none"> a) upskill management and ensure their company processes are as good as they can be, b) encourage digital investment, and c) be able to give the companies that achieve excellence in this area some evidence that they are better than their competitors (e.g. certificate, independent body opinion or something else)
8	N/A
1	Simon Pearson
2	-

3	<p>1. Midlands. I think broadly it is homogeneous but divided between east and west and those of us on the extremities (Lincolnshire etc) often feel forgotten! I do think there is a defining economic geography around industry and manufacturing. It is also a central logistics pivot point for the UK which will be extended with HS2. The concentration of supply chains will always be critical and create the manufacturing centre of mass...as long the key automotive industry stays strong post Brexit. My own interests are in food, and these will always stay strong...the key thing for food going forward will be automation, supply chain access and logistic costs...ultra high volume / low margin....</p> <p>2. COVID. The university sector have been heavily impacted and key will be number of UK and international students who turn up for 2020 / 21. I expect significant cut backs but strong centres should and will remain OK. My own productivity has increased with COVID...less travel...more working at home, but more companies who need help and support. I worry we are eroding our social capital and though and we cannot sustain current SOP's for much longer.</p> <p>3. Academia. We have seen a step change in business collaboration, especially around automation and robotics which are our specialists. Companies need to de-risk from labour, keep operating and find new ways of working. I suspect though the response is highly polarised, some topics will be inundated (robotics) but others less so. We work with multiple SMEs and I am worried if these will start to run out of cash.</p> <p>4. Supply chains. Highly connected in Lincolnshire as it is a centre of both primary food production, manufacturing and logistics. Supply chains are also highly focussed on retail which saw increased food sales through COVID. The longer term threat is still Brexit both in terms of labour and also import of products...we only grow just over 50% of UK food. Customs processes post Brexit will be crucial. We are though starting to see business moving south towards Kent and the Dover ports...critical the Midlands has great connectivity to sea borne supply chains for food.</p> <p>5. Infrastructure. Digital has performed well in COVID for our supply chain. During COVID you hear more of what has gone wrong than what has worked well. Digital Food System performed well and in my view prevented a national meltdown of food security...key we keep this in mind going forward as we can't be complacent. Local infrastructure also coped well and sales of food maintained string...showed a high degree of resilience and this included responses from the infrastructure. Key thing going forward in a post Brexit world will be access to port....take trucks off the road, decarbonise the supply chain.</p>	5	<p>The main barrier in ME encourage more collaboration less internal competition plus investment in skills and sharing expertise across the community. I don't sense yet that finance is a key barrier. The challenges in the food system is that margins are thin and most producers are highly reliant on few big retail customers...I can't see this changing though at a significant rate and have to accept some of these challenges as part of the ecosystem. The food culture in ME is very strong, it has good supply chains, lots of expertise and is highly competitive in terms of inward investment opportunity.</p>
4	<p>We need to be world class in core areas including manufacturing...but not in everything. Certainly in the food system world class is crucial as UK customers are promiscuous and shop around on price...sadly the UK flag does not have that much value when it comes to food prices.</p> <p>Food per se is unlikely to be servitised but certainly the manufacturing equipment and robotic application. This overcomes a great issue in the food supply chain of finding the capital cost of new equipment..challenging as volumes are high and margin usually low.</p> <p>Digital infrastructure is crucial especially as we move up the data scale. The particular challenges though are logistics (ports as above) and telecoms. We really do need to move to 5G, understand the opportunities and start rolling it out. I assume this will happen around private networks to start and factories. 4G rural connectivity is still very poor.</p> <p>I certainly believe a 5 year plan for resilience is crucial and deliverable. We need to learn lessons from the first Midlands Engine process though that seemed to create competition internally rather than collaboration. For the food perspective little centrally came from the process other than we all had greater awareness of each other and the opportunity. Led to some excellent collaborations with MTC and demonstrated to me very clearly that to step change we need to bring in the midlands engineering excellence to food....we now have 3 cracking projects with MTC that would not have happened without the ME consultation. Next time round though I think it needs clearer leadership from HMG...needs some commitment. There are lots and lots of opportunities.</p> <p>We are absolutely committed on Industry 4.0 and very active interest in the food system where margins are thin and every ounce of competition gain is crucial. Key areas will be connected factories and supply chains. It does though need collaboration with the ICT community as food manufacturers only want to buy tech not develop it. We are also extremely active in robotics...replacing the lost EU migrants as a consequence of Brexit is a major challenge...but if we can crack it we can export the tech globally...very exciting space.</p>	6	<p>I see automation as a primary opportunity, not a threat, especially in an industry that may lose its EU labour source. It is existential that we automate in the food sector.</p> <p>We have a serious lack of trained engineers at both a high (research / innovation) and operational level. Food industry in particular is poor...tends to take the easy route which brings in more people...this is no longer sustainable and should not really be acceptable. Apprenticeships are essential as are STEM activities in schools. We should also celebrate success more...ventilator challenge was great as it highlighted how important engineering was to the community...</p> <p>We certainly need more focus on retraining across all levels. I am amazed at how quickly technology is developing...it is breath-taking and just shows that we need continuous and life-long learning. This needs business to give the time needed and also access to trained trainers.</p> <p>In terms of food employment the main impact has been increased productivity but usually with little impact on jobs....this makes the companies competitive and protects them from overseas competition. The skills base goes up and people have more enjoyable / rewarding jobs (note working in cold food factories can be quite unpleasant). We do need though to shout louder about how excellent these careers are, plus most high-level engineers are well rewarded.</p> <p>In terms of graduates the Midlands need to be a great place to work and a great place to live. This includes attractive universities to bring them in and lock them to the region. Also access to the environment, community, reasonable house prices etc etc. Sadly not sure many of the areas in the region have all that recipe but some do!</p>

7	<p>1. Commitment from government is crucial and should be coming with the "levelling up" strategy. This time though the approach needs more coherence and push from HMG. I was never convinced that ME got the buy in relative to the Northern Powerhouse but now is the time. Will take some connectivity of local leadership too and a refreshed priority and delivery plan...everthing has changed since Brexit and COVID</p> <p>2. A real focus on transferable skills and technology demonstration. We need highly trained people, skills investment is crucial, and real leadership to not just talk about the way forward but really demonstrate it.</p> <p>In terms of support for the food sector we need more engineers but the post Brexit supply chain will be critical, this needs ports investment to control logistics costs and lubricate supply chains and also digital / telecoms. We also need a greater focus on inward investment.</p> <p>The key legislation will be around trade, not just tariffs but also easing the flow of goods and access to supply chains. We also need access to the best people in the world...so immigration policy will be crucial...especially in the food system. I'd also like to mention the criticality of data, with leaving the EU we might be able to refresh this..but access to data and digital collaboration will be essential and this might require government intervention.</p> <p>Significant investment in innovation to drive forward digital manufacturing and robotics. COVID just emphasised that we need to derisk manufacturing and drive productivity. The whole world will be focussing on this and demanding solutions. Simpler and large capital allowances to allow investment in automation.</p>
8	I think this is a very exciting initiative and very supportive
1	Andrew Peters
2	-
3	<p>My own personal experience of the Midlands comes from being part of business activities in Siemens over the last 15 years to promote improving productivity and efficiency in OEMs and End Users.</p> <p>- I see through groups like made in the midlands, a tremendous potential for many smaller SMEs to transform their business, through investment and deployment on more industrial digital and automation technologies. There has clearly been significant underinvestment of many years. I believe the collective potential lies in creating groups of similar companies and sharing best practices but more importantly between engagement, through schemes like mentoring when companies can start to implement more structured long term plans. Many of the companies I have spoken to over the years, when asked about their own vision or strategy for the business don't have any clear view, and quite often it's not because there isn't the potential, but just because the leadership capabilities and support are lacking. To evidence this, I have found companies in the same sector that do have clear vision and implementation plans. So my clear view would be around investment in industrial technologies, but having a clear vision of where those companies want to go. To caveat and put in context, there is a group of family owned type businesses, that don't want to grow, it's more a lifestyle business, low risk and these businesses should not be forced to go on a journey in my view as it's more to support shorter term aims.</p> <p>In terms of potential areas, I agree based on the call, identifying which big potential exist for UK wide and then also Midlands would be key. My own view, is when I compare the UK and the Midlands with other countries and competitors, is we have key areas of high value manufacture, lower volume but higher complexity, where inherent design and manufacturing capability come together and this is where we excel and looking at other potential to exploit this, in automotive electric drive and battery assembly technology is a big opportunity. High speed rail and the electrification of our railways will require high value manufacturing expertise and also design knowledge. The links between the University of Birmingham and Siemens Rail in our new facility in 2022 could provide such opportunities. Military defence programmes are long term and with the successor submarine and tempest programmes opportunities exist to become more involved.</p> <p>Intralogistics (industry which has grown dramatically in recent years and Midlands geographically houses many distribution companies, opportunities exist the mechanical infrastructure being delivered by integrators to the likes of Ocado, Amazon - that mechanical knowledge could provide some SMEs an opportunity to diversify.</p> <p>Renewables as a market, - digital grid, so the concept of wind power being used in combination with home battery storage technologies to remove the problem of storing energy consideration to be given to a Midlands wide pilots with the aim just like the Electric taxis of building competence and capability to locate in the Midlands.</p> <p>One of the mega trends is people living longer and population density increasing, so identifying opportunities for high value manufacture in the pharmaceutical areas and like COVID 19 has shown us, make the Midlands an area where PPE, face masks, - the business case for this is strong and may get government support, the Midlands has much of the engineering knowledge to achieve this.</p> <p>Supply chains, - the problem I have seen here is many tier suppliers in the Midlands become component supplier for the larger tier companies, and often are excluded on price, so creating a supply chain capability which actually engages with the customer to help design different components much more cost effectively, this requires a change in some of the tier companies also to allow supply chain innovation. Some years ago the government launched the AMSCI programme Advanced manufacture supply chain initiative to give</p>

4	<p>If you look at the origins of many manufacturers and why they are where they are often the reason is it started with some form of R&D or innovation, which then led to manufacturing, I believe in my own experience bringing innovation, design and manufacturing closer together has tremendous differential advantage in terms of agility and adaptability. Therefore re introducing design into manufacturing with the principles of design for manufacture of automation (using principles of Boothroyd, Lucas, Dewhurst which has been around for many years gives the UK and specifically Midlands a unique opportunity again MTC universities Nottingham, Birmingham Loughborough can all play a decisive part, in achieving this. Creating an Eco system for SMEs to build this capability</p> <p>My views on strategic plans should be timeframe should be 5 to 10 years, but implementation plans need to be on a shorter time frame, otherwise the impact and impediment can be dissipated so combination of short medium and long terms activities, but short term really important to give visibility of improvements.</p> <p>Flexible manufacturing to me is not about automation its about giving the customer what they want when they want it, In my experience the UK and midlands suffers from a lack of end to end thinking in manufacturing starting at suppliers, and one of the key issues, is the lack of accurate and joined up data, 99% of companies I visit still have paper processes on the shopfloor , use of disparate systems all of which don't allow speed. So leaning the processes, first so we don't digitalise waste is key in my opinion . A real focus then on joined up data systems, from suppliers to customers would be my priority to speed up supply to the customer and make SMEs more flexible, more automation can come but getting the fundamentals of connected backbone of business systems is key and majority of the time is a significant business constraint. for example companies find it very difficult to offer variants to other customers, because they don't have digital systems in place to do this sustainability, often its a case of modifying a drawing without all the Bill of material and bill of processes changing. here the solution isn't software companies offering their own point solution its a void and again a new form of support helping with business engagement would be vital.</p> <p>Getting the digital systems in place, is key before a company looks at 5g or AI as its progressive based on existing maturity.</p> <p>I think a great comparison with Midlands would be German mittlestand.</p> <p>I think the 4th industrial revolution has already been here for many years, the problem is most companies are at very early stages of this, so implementing bar code scanning, RFID, simple digital design tools for manufacturing, is going to be the first step for most, as per my commentary technologies like AI and 5g which Siemens Congleton are working on, require a lot of support and understanding and identification of use cases, better in my view to catch up with rest of world quickly as described with digitalisation to make businesses more fit for these technologies later, currently I see quite limited opportunity for many companies in the Midlands to benefit because they don't have a sustainable way of implementing that will give benefit.</p> <p>We are way behind in other countries, we are in the top 5 for innovation and around 35 in the world for the deployment of these industrial technologies, but the answer isn't just deploy a whole lot of these technologies, its first businesses understand how these might make there business better ofcourse you can run pilots etc, but in general businesses must themselves understand the why, because without it it wont become sustainable . A good target would be to try to make paperless SMEs seems like a dumb target but behind that</p>	7	<p>Accelerate the business engagement activities as described through SME champions network and rapid extension of business mentoring.</p> <p>Create a capability to support the introduction of industrial technologies, capable of providing support for overall solution implementation, might be around anumber of vendors, who can work together.</p>
8	no other comments	8	
1	Hugh Clayton	1	Hugh Clayton
2	-	2	-
3		3	0
4		4	<p>For the Midlands to thrive and prosper, building on the manufacturing heritage to create high-value and differentiated products for the 21st Century is key. Covid-19 has proved the opportunity to reflect and shift course but the fundamentals of the global landscape haven't changed: increased competition, mitigating climate change, digital technologies.</p> <p>My view is that we should use this opportunity, where change is possible and cash will be limited, to focus efforts in areas that will win in both the near and medium term. Specific areas to focus on should include:</p> <ul style="list-style-type: none"> - electric vehicles - low-carbon flight - additive manufacturing - energy efficient products and processes - and the skills to design and make these products in a competitive market
5		5	<p>I haven't seen evidence of barriers in terms of product ideas, ambition or design and engineering skills.</p> <p>I do however believe that there are barriers in terms on access to capital and access to people with the right skills to operate a modern factory effectively.</p>
			<p>In terms of capital the issues appear to be around the time periods that both managers, owners and investors want returns. This is very different to both Switzerland and Germany, where I have lived and worked as an engineering leader. The role that local owners, managers and lenders play cannot be overstated and this appears to be lacking in the Midlands. My view is that the capital available from the LEPs is insufficient and that we should explore recreating something similar both to Regional Growth Funds and 3i.</p>
			<p>The second barrier is the lack of skills needed to operate a modern and competitive factory: there are shortages of skilled and experienced first-line leaders (team leaders), production and manufacturing engineers and planners. In many cases it involves a lack of skills in using modern data and IT systems in a traditional manufacturing environment: use of Statistical Process Control, detailed planning within the ERP (Enterprise Resource Planning) systems, connecting up machine and inspection systems to networks etc etc. There has been huge developments in this area in the last decade and many experienced staff are lacking training and aptitude in this area and (younger) staff who may understand the IT don't understand the realities of a production environment. I suggest that there is an opportunity to set a skills agenda to address this issue.</p>
6	See above.	6	
			<p>I also think that the focus has to move away from traditional university education (Bachelors or Masters) and move towards offering specific modules to address specific key manufacturing issues.</p>
7		7	0
8		8	0
1	Adrian Elwell	1	Adrian Elwell
2	-	2	-

3	<p>The Midlands as an economic region has always been known as a manufacturing hub based on metal industries and mining and has seen prosperity due to these industries, over the years the region has changed in its identity with the change in population and moving technologies, however, in my opinion, maintains as the centre of manufacturing in the UK.</p> <p>I cannot see a drastic change in the identity of the region, technologies will change, ownership of companies will go overseas and the way we "make things" will not rely on the past. Only when industries disappear do I see a change in a location's personality as has been the case in places like Glasgow with the loss of the shipbuilding industry and regions where mining was lost in the 80s'.</p> <p>Over the next few years, we know the demand for products and services will be driven by the changing economy and environmental demands, the Midlands region needs to be focused to adopt and capitalise on these changes.</p>	
4	<p>It's been documented in great detail the rapid changes in manufacturing technologies including AI, IoT and robotics, but a greater change will come from the product we produce in the midlands which may be radically different over the next 10 years.</p> <p>We have seen a previous trend for off-shoring fuelled by a reduction in productivity cost, advancement in new technology can increase productivity and attract companies to re-shore these facilities.</p> <p>The type of manufacturing in the midlands is changing now and has been for the last 20 years, within car production the use of robots, advanced and lightweight materials and sub-assembly development manufacturing has changed what was seen as a heavy industry to effectively what is a light assembly role.</p> <p>Green and environmental demands have benefitted the midlands with the growth of battery technology, advanced materials, and digital technologies being the replacements for some of the forges and heavy production.</p> <p>However, the rest of the UK is also aware of the need to change to alternative manufacturing methodologies and the Midlands region needs to be prepared to attract these industries with local funding such as a return to a subsidy system for land, building and planning considerations. The availability and more importantly the ease of gaining this funding is something I hear commonly.</p> <p>However, this cash needs to be readily available to fund emerging technologies at an incubation stage and for those investing in new technology. Although there is funding available at all levels in technology, especially given new announcements on innovation funds, many start-ups are still struggling to gain enough credibility to gain investment or find the process confusing and difficult.</p> <p>In times of crisis, research shows that those who invest in technology can accelerate growth and recovery from crises such as Covid 19, so this is an important part of the bounce back for our region.</p>	<p>When speaking to manufacturing companies across the East and West Midlands I hear two major barriers to the growth and survival of the midlands manufacturing region</p> <p>Skills Gap</p> <p>Both pre and post Covid times have seen a severe skills gap with a significantly limited supply of people who have the skills and technology understanding. With the growth in numbers of high technology, innovation and advanced manufacturing companies across the midlands region, attracting new STEM entrants is proving a challenge. Redeploying or retraining people from traditional to new technology is time-consuming and potentially costly although will have a positive return in the longer term. The resultant skills shortage forces inevitable competition and demand for those who have the skills now, leading to rising costs both to onboard and sustain employees. Leading-edge disciplines including AI, Robotics, Data and information analytics require people with skills from other sectors such as IT or online developers, leading manufacturing companies into a rivalry with industries with significantly higher margins and consequently finances to attract talent. It has been noted some manufacturers are slower in adopting new working cultures than other segments – adaptability and flexibility over work balance is new to the manufacturing sector, unlike other advanced industries. Although the Covid crisis has forced a change in working practices for many.</p> <p>Slow adoption of technology</p> <p>When speaking to manufacturers I hear a great deal of appetite for the new manufacturing technologies pioneered by the likes of the MTC and other catapults and innovation companies, however, the take up seems lower than the interest in certain areas. The willingness to innovate is certainly there, but a lack of short-term funds and the ability to adopt the technology is more difficult. Of the industrial SMEs I have worked with recently who are operating on lower margins (often automotive suppliers) many are risk-averse, or more practical terms, simply don't know how to manage time and/or production to change. These manufacturers know that underinvestment in technology will hinder growth and lead to potential failure based on local and global competition, but when they have the mindset of supply at all cost to stay liquid these changes are difficult to adopt.</p> <p>It seems from the conversations I have with manufacturers that there needs to be a better educational and support system for manufacturers and engineering firms, possibly private rather than governmental run who better understand the difficulty in companies</p>

6	<p>We have yet to see the impact of Covid on the skills issue, but during the recession of 2008 – 2009 we saw sustained job losses in most sectors but very little impact overall on the skills gap. The lack of qualified and/or experienced staff remains as a primary issue for continued growth in the innovation, research, manufacturing and engineering sectors of the Midlands as a region and across the UK.</p> <p>Graduates</p> <p>Overall, figures from UCAS, there has been a general rise in the number of students entering engineering-related courses across the UK, albeit with a small fall in the last two years admissions. The number of female students entering has also risen for the last few years by approx. seven percent, but again with a recent drop and still a slower rate than the industries would like. The mobility of students is good and we as a recruiter have little difficulty attracting students from across the UK to the Midlands.</p> <p>The traditional entry into manufacturing in the Midlands has been through an engineering related discipline but with technological and product innovations we have seen more manufacturers seeking students from disciplines such as computer sciences and business. We have seen the increase in demand for IT students into engineering and manufacturing firms rise exponentially for the last three years. New data and IT-driven technologies are changing the landscape for Graduates into engineering and the choice employees have and we report that this trend is set to continue.</p> <p>Although conversely, the non-manufacturing industries such as banking and finance have seen the attraction of engineering students for their logical skills and abilities, this may be more prevalent as we fight our current crisis as these industries are currently seen as "lifeboat" sectors.</p> <p>In the last twelve months, we have also seen a trend towards environmental concerns with more graduates keen to work in greener industries, although competition is high for these roles, the green credentials of a company will be more of a factor as this is addressed globally.</p> <p>The Brexit issue has been significant and the numbers of European graduates have diminished greatly over the last two years. The government's points-based system for immigration, as currently proposed, is also having an effect on the potential number of overseas students willing to attain an education in the UK, especially if there is little chance of entering to work after completion</p> <p>Overall, the market for Graduates (excluding Covid effect) remains stable although if manufacturers in the Midlands want to compete on a global scale, more companies need to consider hiring graduates into well developed and designed internal graduate schemes. Graduates tend to have more choice and they can move across industry platforms with greater ease.</p> <p>Apprenticeships</p>
7	<p>I feel that resilience goes hand in hand with flexibility, quality, agility, innovation, and responsiveness – these three principles will aid any company with its development and thus mitigating the risk of product or process becoming outmoded. Companies, both manufacturing and services suppliers, need to move to operate with fewer resources, physical or not, with a key focus on the reduction of waste. Having a resilient manufacturing or service strategy can and will result in faster more robust and better responsiveness.</p>
8	<p>Non beyond above.</p> <p>Thank you</p>
1	<p>John M Neill</p>
2	<p>-</p>
	<p>3 Situation</p> <p>the national debt will be massive the country will be in economic decline unemployment will be high and rising the tax take will be lower we need to increase our exports goods and services protect and enhance the nations quality-of-life</p> <p>Complicating Factors</p> <p>The country has to be able to produce products and services competitively for the domestic market and global markets because the track record of consumers is that they buy based on quality, cost and delivery, domestically and globally. Our big wealth creating industries have been severely damaged by Covid-19 and the predictable and unpredictable consequences of a no deal Brexit. Manufacturing is much better positioned to remain productive and competitive under a pandemic situation (provided there is sufficient demand) but the big wake up call is that the service economy has been brought to its knees</p> <p>Resolution</p> <p>The scale of the challenge truly Sisyphean and will need a combination of massive cash support, competency, and collaboration to create the globally competitive exporting industries as well as products to substitute imports. Government will need to learn and organise to act with flexibility, imagination, speed of decision-making and agility. The sums involved probably stretch to hundreds of billions support the world-class industries we already have (but are at huge risk) and help them regenerate compete in the global economy of the future. 20% of GDP would make a real strategic difference. As I explained on the call building world-class carriages don't go anywhere unless there is a train to pull them.</p> <p>The Midlands is famous for automotive design, development, manufacturing, technology et cetera Proven and in some cases maturing organisations like the MTC and Unipart's AME. It is critical that we build on what we have that is working and proven because creating large-scale alternatives will take too long.</p> <p>Of course we should be planting the acorns for the future but we are in an unprecedented crisis right now</p>
	<p>4 How do we become world-class?</p> <p>This is a huge problem for the UK because for three decades we have lagged our global competitors in productivity by between 10 and 40% and despite all the government's efforts in the last few years we have gone backwards even faster. At Unipart we know exactly what to do to solve the productivity puzzle but there is no silver bullet. It takes decades of training, development and hard work, in a properly architected organisational and learning structure such as the "Unipart University" and our Faculties on the Floor around the world</p> <p>We already have world-class automotive manufacturing and aerospace.</p> <p>We need to protect it and grow it because we cannot recreate it and replace it with anything of the same size scale and value in the medium-term</p> <p>the best thing we did was bring world-class companies like Honda Toyota and Nissan to the UK who taught the supply chain how to become world-class.</p> <p>- How important do you think R&D is to Midlands Manufacturing?</p> <p>R&D is critical particularly for the new technologies like batteries where we are in a global race the Americans, the Europeans, and the Asian who are investing hundreds of billions to win this race.</p> <p>- What industries do you associate the Midlands with a) now b) do think will be the case in five years' time? How do we prepare for these 'new' industries?</p> <p>Automotive and aerospace now, and serious deprivation if they're not there in the future, because they provide the engine to pull and develop the new technologies</p> <p>- What opportunities are there for our manufacturers to move to a mixed "servitised" model?</p> <p>This is probably an unstoppable trend but you have to have customers who want to be "servitised" and an economy that can buy the services</p> <p>- What does 'Flexible Manufacturing' mean to you? How would you encourage such a strategy?</p> <p>Pervasive deployment of industry 4.0 technology</p> <p>- What infrastructure (physical, digital, connectivity) improvements do you think can be made?</p> <p>Roll-out 5G fast everywhere</p> <p>- Do you believe a 5 or even 10-year strategic plan to build Manufacturing Resilience in the Midlands is achievable?</p> <p>Yes but it will take a lot of money and we will need to persuade world-class global companies to invest in the UK as we previously did with the Japanese who saw us as a gateway to Europe - we will need to puzzle out compelling logic in the future as we disengage from the world's biggest, richest, closest free trade market</p> <p>What region should the Midlands compare/contrast itself with a) in the UK b) internationally?</p> <p>DK</p> <p>- Emerging Technologies. How would your organisation approach technologies such as AI etc.? What impact do you think the so-called 'Fourth Industrial Revolution' have on your organisation? Do you think you are in front of, or behind your competitors? How do you think you can improve this situation?</p>

5	<p>What are the barriers?</p> <p>Please consider the following in your response:</p> <ul style="list-style-type: none"> - What are the barriers to achieving our ambition and how can we remove those barriers? <p>Demand in the short term... engineering and technology skills</p> <ul style="list-style-type: none"> - How constrained are we by our culture and behaviours, financing, innovation, lack of agility or other factors and how can we remove those constraints? <p>This can only be intelligently answered in a specific context or industry</p> <ul style="list-style-type: none"> - What do you think are the barriers to improving productivity? How do you think they will be overcome? we know exactly how to improve productivity. I genuinely believe that the answer to Britain's productivity puzzle in three words is "the Unipart way" - How do you think the Midlands can attract inward investment? This may sound simplistic but we have to be competitive with all of the attractive offers being made by our global competitors and increasingly in the steps that will be taken by Europe with a very comprehensive suite of support programmes which are benchmarked against the best in the world and demonstrably competitive - Business support. How easy/difficult is it to find relevant support/information on topical issues eg standards, export procedures. This is not a problem for us What would be your usual 'go to' organisation, [government body]/Chamber of Commerce etc? Do you think there is an appetite for anything similar to the former Manufacturing Advisory Service? CBI, SMMT, government Contacts - Are you familiar with a) the Made Smarter programme b) the LEP or c) the Growth Hub? How proactive have these organisations been to your organisation? Have you seen any particularly effective action that you would like to share - Access to Finance. How accessible are different types of finance? Where would your organisation usually go for finance, and what type? our normal source of finance are the banks - Are you familiar with the German Mittelstand model? Do you think it would be possible to replicate something similar in the Midlands? I think this would be desirable but difficult - How do we create agile and flexible supply chains? you start with a world class demanding customer - Do you think membership of a business membership organisation should be mandatory - ie you should be required to pay a levy? <u>no, the organisations need to be providing services which are sufficiently attractive and competitive to convince companies to want to</u> 	6	<p>Skills / People Questions</p> <p>Please consider the following in your response:</p> <ul style="list-style-type: none"> - What are the skills issues that are holding us back and how can we address those issues? STEM skills - How important are apprenticeships to the future of manufacturing? What more can be done to encourage more young people to apply? Apprenticeships are critical but the government's apprenticeship scheme is an elaborate, expensive and dysfunctional way of taxing companies. - What more can we do to ensure lifelong learning and help experienced workers re-train/update? This is best done in companies where people can learn by doing - How do you think we can attract the widest range from society to the sector and improve diversity? convince them we are a great place to work - How do you encourage engineering graduates to a) have a career in engineering b) stay in the Midlands c) move to the Midlands? convince them we are a great place to work and to find well paid interesting, creative, challenging jobs - What impact do you think automation will have on employment in the region? Do you see automation as an opportunity or a threat? automation is both an opportunity and a threat .people will need to learn 1/3 of new skills or they will be unemployable *
			<p>7</p> <p>Next steps?</p> <ul style="list-style-type: none"> - How do you think we could improve manufacturing resilience in the Midlands? What would be your top two suggestions? Ensure massive financial support is available to sustain and then transform the world-class industries we have in the Midlands already Stimulate Demand domestically and provide massive short term support for exporting - What support does manufacturing need to navigate its way through the recovery? a) nationally b) in the Midlands? see above - What else do you think national/local government could be doing to support manufacturing in the Midlands eg a) investment in skills b) through the Treasury c) through BEIS d) other initiative - What legislative change do you think would assist the sector most? Can you give an example? - What would you like to see in the Budget, that would support manufacturing in the Midlands? Yes definitely <p>8</p> <p>Firstly protect what we've got and build on it, before trying to invent something new that will take too long when we have no time</p> <p>1 jason aldrige</p> <p>2 -</p> <p>3 Midlands, especially Cov and Warwickshire has a world wide reputation for Manufacturing excellence - this should be nurtured and expanded further. Home to MTC, WMG catapult centres, Warwick, Coventry, Birmingham, Nottingham Universities, Rolls-Royce, Meggitt, Siemens, JLR and Aston Martin HQ's, Battery centre, Mira, Fanuc.....the list is huge of manufacturing excellence and support. The Battery centre, Electric research and world class research centres put the midlands in the centre of UK innovation in manufacturing International students purposely study at these universities because of the quality courses and job prospects locally. Supply chain is strong in Coventry and Warwickshire - developed over the last 100 years</p> <p>4 R&D is very significant to Midlands Manufacturing. Catapult centres and Universities make this possible for Primes and SMEs to undertake credible research. The midlands is well known for automotive with JLR and Aston Martin but Aerospace and Rail are also very important sectors. The midlands aerospace clusters is one of the worlds largest. The UK ventilator challenge showed how flexible UK manufacturing is. The midlands were critical to this project and showed how flexible the supply chain is. What isn't flexible is the entry into different sectors. Companies may have the skills and processes but not the approvals from customers. A central hub or integrator may be the answer. As an SME emerging technologies are accessed via the abundance of Catapult centres and Universities. The MTC/MAA DRAMA project is a good example of how Arrowmith has progressed in Additive Manufacturing</p> <p>5 Automation is critical for productivity improvement. Not job reduction but additional cobots/robots on production quantity work. We therefore need to keep the production work in the UK and locally rather than off shoring - more production work - more possibility of automation. Investment in Automation should be encouraged and made available, The culture and behaviour's of our engineers is improving with the emergence of the MTC/WMG/JLR etc - better candidates are choosing engineering at a young age due to these world class role models and facilities. Chamber of Commerce and BEIS/UKTI are very good for export advice. We go to the chamber first. The LEP and Growth Hub have truthfully not been as good as they should have been for SMEs. Business Memberships are hugely important - but sometimes feel understaffed and under funded. SMEs have a huge support network in Cov and Warwicks. The council are ok but the real benefits are the research centres, universities, skilled work force and world class customers.</p> <p>6 Cov and Warwicks are lucky - we have a huge skill base - 3rd and 4th generation. Proud engineering area. Apprenticeships have improved over last 5 years. MTC and WMG attract much brighter candidates than previously. this is a great asset. Degree apprenticeships from Coventry and Warwick Unis allow continued education for the students whilst at the SME. These academic offerings along with local major Manufacturing employees is a big initial draw for students. What isn't tapped as well is the huge supply chain that also require these apprentices and graduates - this should be promoted more to the students, The supply chain needs the bright young talent also, Automation will secure jobs and allow growth - it is 100% the way forward</p>

7	<p>keep progressing how it has over the last 5-10 years.</p> <p>The infrastructure is here - skills, Academia, Research centres, labour, reputation, large Manufacturers and a strong supply chain.</p> <p>The council needs to recognise the importance of the sector and fully support not just the big companies but the whole supply chain.</p> <p>R&D tax credits are essential but also assistance with R&D for smaller companies with grants etc.</p> <p>The money should not just go to the big companies and expect that it will trickle down - it will not.</p> <p>National Improvement projects such as NMCL or SC21 should be supported and recognised by the region</p> <p>I think a midlands integrator to head national projects like the ventilator challenge is a great idea. This does work and then we have a huge supply chain to work with from all different sectors.</p>
8	Coventry to be capital of the midlands:-)
1	Dr James Wilkie
2	-
3	<p>The Midlands is a collection of disparate fiercely proud individual areas. Most UK nationals probably don't really know much about the region apart from what they see as they pass through on trains or motorway network. The name is obvious to most UK nationals because it's in the 'middle' of the country. If pushed they would probably think of historical 'dark satanic mills' or the Peaky Blinders as setting the image of a decaying industrial environment. We could and should be working on the public image of the region - acknowledging local differences but creating an 'overall' impression. We know we should but we don't do this because it would cost a great deal of investment and effort. Any money we have tends to be prioritised for other more 'important' matters than reinventing our regional image.</p> <p>Playing to our real strengths:</p> <p>We are at the heart of the logistics/transport networks for the country. This has seen the rise of logistics distribution centres and we should emphasise our expertise and location. It would create jobs not just in logistics but in the data and automation technologies that underpin logistics operations. In this our current USP is geography which no-one can copy or take away from us.</p> <p>We do have mass manufacturing capability - mainly in the areas of small components and surface treatments etc. So we are a (potential) source of supply for many larger firms. Example sectors that we could apply these collective skills to are: Automotive (well established), Aerospace (established), medical devices (some activity) and renewable energy technologies (need to be established). There will be others.</p> <p>Historically because of the need to keep many parties happy regionally we tend to compromise and say we are good at a wide range of things. To get ahead we need to choose to understand our real strengths as a region and focus on a few key sectors where our manufacturing capabilities can actually make a difference in the global market we face. Then we need to ensure that our manufacturing companies have the knowledge, skills (at all levels from management to the shop floor) and capital investment to succeed in these sectors.</p>
4	We become world class by being as good in the sectors we choose to succeed in as our competitors all around the world are or will be. This needs focus, collective working (less intra-regional competition) and considerable public and industry investment into developing skilled staff (at all levels) and capital for the upgrading of manufacturing processes and capabilities.
5	<p>Lack of focus so most activities remain at too small a scale to compete internationally</p> <p>Intra regional competition</p> <p>The Mittelstand works because Government guarantees the Banks in a way that enables 50 - 200 employee sized family-run businesses to raise the capital and attract management of quality to succeed. Regional governments as well as National government in Germany also provide substantial access to capital and grants provided the company concerned is in a sector they have decided to focus upon.</p> <p>e.g. Chemical industry in the Ruhr valley. Other German OEM are also supported politically (import tariffs) and financially by Governments to source their supply chain from the Mittelstand companies where possible.</p>
6	<p>Lack of sufficient well paid jobs for the highly skilled people we do have. Means they often have to move elsewhere (London, abroad) to find rewarding work.</p> <p>But we lack sufficiently skilled people at all levels. This is not Midlands problem it's a UK problem and it begins at school. It is compounded by the UK's lack of a 'vocational' route to employment. In Germany, there is a twin track system in which more vocationally minded people go to Technical High Schools & Colleges whilst potential management attend University. In the UK, we have invested in Further Education colleges and have a monolithic university system that makes it difficult to understand where to obtain high quality vocational training.</p> <p>Therefore our regional universities need to significantly influence the schooling system in our region and also work closely with more vocational providers (such as FE Colleges) and business to ensure that we collectively deliver skilled individuals relevant to the business needs in the region.</p> <p>Apprenticeships are an excellent route to skilled employees, however they probably need to be renamed (especially the 'graduate apprentice' schemes) to appeal to graduate level students and their parents. I don't have a good name to hand but it needs to make the point that these are a "Fully paid off degree with a job at the end of it" offer.</p> <p>Attracting diverse people into engineering starts with modifying the public perception of what an engineer actually is. In Germany one can only be called an Engineer after appropriate qualification. In the UK the term can be used by an untrained washing machine repairman. The Engineering Societies should be pushing for this in the UK. At the same time ideally one would be asking existing role model engineers to be publicising what their career has been about and why they find it stimulating. School visits are a key way to shape future mindsets around engineering as a career.</p> <p>Automation is an opportunity for individuals exposed to it early in their careers or at school etc. Provided they are taught a wide range of life skills to be flexible, they should be able to move employers as needed. However individuals caught in a low skill/training need operation will be easily displaced and will need retraining if they are to return to the workforce. Linking our FE Colleges to universities would help here.</p>
7	Improve management and decision making skills across the board - attract people back into manufacturing from the financial sectors.
8	Focus on real regional USP and sectors. Then put both public and private capital into reinvigorating the relevant regional businesses so they can really compete with anyone in the same game anywhere in the world.
1	None
2	-

3	<p>- How homogenous is the Midlands as a region? Does it have an identity?</p> <p>There is an intention to portray the Midlands as an Automotive/Transport manufacturing region given the large companies based here as well as the supply chain (mainly SMEs) around. However, there is also Food & Drink, some Textiles and Materials and this is less visible. I dont think it is perceived as homogeneous in the region and outside.</p> <p>- What is the identity of the Midlands, and is this the identity we want in 5 years' time? Is the Midlands maximising its collective potential?</p> <p>It is not maximising it. There is a general lack of awareness of who else is in the region. Speaking to companies in the region, I observe there is no ""yellow pages"" to go to to find out. I know most of the collaborations and 'deals' are done on personal networks and of the vague chance of knowing the right person.</p> <p>As per q above, I dont see a well defined identity for the region.</p> <p>- Where do we want to be, what is our ambition for manufacturing and what opportunities do you see?</p> <p>I would like to see a region that is recognised for high value products and systems manufacturing, 'made in the Midlands' sub-brand to the 'Made in UK' one. A place that embraces both heavy manufacturing (eg machining, etc - traditional pic of manufacturing) as well as more advanced, small & bespoke, automated & intelligent manufacturing, overlapping with software and data driven decision making. For both large and SMEs and all sizes in between. We need to portray a region that offers careers in Manufacturing for the young and more senior people who wishes to have a career in it.</p> <p>- How relevant/important do you think manufacturing is to the Midlands, a) now and b) in five years' time?</p> <p>now - very, simply that we dont know enough about it. To know it is to love it, esp public in 5 years; - very, as above</p> <p>- What impact has COVID-19 had on your organisation? How have you mitigated this impact and how will this change your organisation going forward?</p> <p>We have managed to continue activity at a smaller pace due to the limited people presence in the lab, but are increasing monitoring and remote working for people and machines.</p>
4	<p>- How do we become world-class?</p> <p>More visibility of the activity ongoing; this will foster more collaboration. There should be an annual 'meeting point' when people come together to showcase and celebrate success. More research going into the Companies who do not historically invest on that, but however see the benefits to stay competitive.</p> <p>- How important do you think R&D is to Midlands Manufacturing?</p> <p>Very, and it should be presented to the companies as an opportunity, not as a drag. I know companies' past experience working w Univs has not been pleasant. We need to manage expectations better, on both sides.</p> <p>- What industries do you associate the Midlands with a) now b) do think will be the case in five years' time? How do we prepare for these 'new' industries?</p> <p>Now: auto/transport; Food&Drink; Textiles; Materials Future: the above are fine, but more of, and more resilient wrt global disruptions. Knowledge-based manufacturing companies, data and automation services supporting manufacturing. Bespoke manufacturing, high value products and services</p> <p>- What opportunities are there for our manufacturers to move to a mixed "servitised" model?</p> <p>There are opportunities but I observe industrialists dont have either the time/bandwidth or the understanding to come forward. And on the other side, we struggle to paint a picture appealing to them to bring us closer.</p> <p>- What does 'Flexible Manufacturing' mean to you? How would you encourage such a strategy?</p> <p>Scalable, small at times, big at times, bespoke, short-runs, rapid moving products, anytime, borrowed facilities elsewhere for a short-turn or very specific item, 'factory in a box', equipment and personnel (talent) on loan for a period of time, several companies working together to design, make ans ship a product from the Midlands.</p> <p>- What infrastructure (physical, digital, connectivity) improvements do you think can be made?</p> <p>More knowledge of what exists at the moment.</p> <p>- Do you believe a 5 or even 10-year strategic plan to build Manufacturing Resilience in the Midlands is achievable?</p>

5	<p>- How do you think the Midlands can attract inward investment?</p> <p>Showcasing what we do: private sponsorship, philanthropic sponsors and crowdfunding are options that could be considered to. But this requires that we show we are doing absolutely BRILLIANT work and we are proud of it. People like supporting winners.</p> <p>- Business support. How easy/difficult is it to find relevant support/information on topical issues eg standards, export procedures. What would be your usual 'go to' organisation, [government body]/Chamber of Commerce etc? Do you think there is an appetite for anything similar to the former Manufacturing Advisory Service?</p> <p>In my experience and the experience other companies have shared with me, we are very much lacking on all those. There is not a 'go to' clearly identified, it is quite of a piecemeal.</p> <p>- Are you familiar with a) the Made Smarter programme b) the LEP or c) the Growth Hub? How proactive have these organisations been to your organisation? Have you seen any particularly effective action that you would like to share</p> <p>a,b,c) Yes, at Uni we go out and approach them. It is not really suited to us as first hand users. Typically we facilitate our industrial collaborators to approach them.</p> <p>- Access to Finance. How accessible are different types of finance? Where would your organisation usually go for finance, and what type?</p> <p>Typical University funding routes.</p> <p>- Are you familiar with the German Mittelstand model? Do you think it would be possible to replicate something similar in the Midlands?</p> <p>I am not familiar w it</p> <p>- How do we create agile and flexible supply chains?</p> <p>I am less versed in Supply chains</p> <p>- Do you think membership of a business membership organisation should be mandatory - ie you should be required to pay a levy?</p> <p>They would accept it mandatory if what they receive in return is top class, not more piecemeal of the same. They need to be awed. We <u>really need something really impressive here to reenergise everybody</u>.</p>
6	<p>- What are the skills issues that are holding us back and how can we address those issues?</p> <p>An understanding of manufacturing science; not spanners and power tools; more data analysis, coding; more product design methods; more talent management.</p> <p>- How important are apprenticeships to the future of manufacturing? What more can be done to encourage more young people to apply?</p> <p>Very and more PR should be done about them. Young people come to Uni but are not really suited to it. They truly belong in an Apprenticeship programme and you see their eye light up when they are in such environment. We need to erase the message that those are "less" valuable than going to Uni. We need to start with the parents, actually.</p> <p>- What more can we do to ensure lifelong learning and help experienced workers re-train/update?</p> <p>Mentoring: w/i the organisation or cross-organisation. Up-mentoring: younger people guiding more senior ones; A place and time to celebrate - similar to a coaching programme across several organisations</p> <p>- How do you think we can attract the widest range from society to the sector and improve diversity?</p> <p>Mentoring again, role models, blow our own trumpet. We have them but hidden in the dark.</p> <p>- How do you encourage engineering graduates to a) have a career in engineering b) stay in the Midlands c) move to the Midlands?</p> <p>Opportunities to have a career that is inspiring, uses their creativity, makes an impact in society and internationally, team work and a strong sense of community.</p> <p>- What impact do you think automation will have on employment in the region? Do you see automation as an opportunity or a threat?</p> <p>An opportunity and this needs to be communicated appropriately so it doesn't put people off.</p>
7	<p>- How do you think we could improve manufacturing resilience in the Midlands? What would be your top two suggestions?</p> <p>Lets make is a region people want to come to More visibility of industrial and R&D activity going on in the region</p> <p>- What support does manufacturing need to navigate its way through the recovery? a) nationally b) in the Midlands?</p> <p>As above, more info on opportunities, and on what's going on regionally.</p> <p>- What else do you think national/local government could be doing to support manufacturing in the Midlands eg a) investment in skills b) through the Treasury c) through BEIS d) other initiative</p> <p>My main initiative is the platform where resources (people, talent, tangibles) can be accessed and shared at a pre-competitive stage, as mentioned above.</p> <p>- What legislative change do you think would assist the sector most? Can you give an example?</p> <p>i am not fully verse on current legislation and barriers companies are currently facing</p> <p>- What would you like to see in the Budget, that would support manufacturing in the Midlands?</p> <p>the sharing platform, as above</p>
8	i believe I have covered it all above. Thanks
1	Will Pollitt
2	-

3	<p>Manufacturing is good for the midland as it provides a range of jobs at different levels making products that can ultimately be exported. By having opportunities at different levels it gives good balanced employment.</p> <p>Previous employer, Collins Aerospace had as part of their Lean "rules" that all suppliers must be within 50 miles which is an excellent target.</p> <p>Could academia be encouraged to collaborate with industry by having it as part of their funding? For example if for ESPRC they had to present output to industry or catapult centres with an initial TRL assessment. Some involvement from business minded venture capital may also help commercialise some of it.</p>	<p>This initiative is long over due and has the potential to achieve a significant step change within training, innovation and the use of new technologies in all areas of manufacturing within the midlands region. Having a 'midlands wide' plan to have a better trained and more flexible workforce means manufacturing is better equipped to meet not only the challenges of today but also of tomorrow.</p>
1	Andrew Churchill	
2	-	
3	<p>East and West Midlands still appear to have different cultural and business identities. Intra-regional transportation infrastructure could do a lot to bind the two more closely. The multiple layers of overlapping local government further confuses the picture: District/Borough, County, City and Unitary authorities (+ LEPs). Manufacturing remains a key identifier for the area and it is something people continue to emote to; in 5 years' time I believe manufacturing will remain as important, but will have evolved.</p>	
4	<p>The midland has a great association with aerospace and automotive which are great but very transport focused. More emphasis of machine manufacture and automation especially the flexibility of that automation. How to target automation at a mixed model value stream so that it can be justified for more low volume and bespoke products. for example food machinery that can be reconfigured to process whatever is in season. If automation can be made multiuse then the cost benefit will increase.</p> <p>The midlands needs to be world class with the use of innovation and automation rather than trying to win on cost.</p> <p>Flexible manufacturing should be more applicable now than ever before. Any conventional lean production line that can be adjusted to cope with higher levels of hygiene and social distancing is in a strong position.</p>	
5	Many companies are not likely to change unless they are forced to by which time it is likely too late. Some government encouragement of this would be helpful.	
6	There are skills shortages in the practical hands on and also within the digital areas such as systems engineering. I think there are a lot of companies that lack the skill and knowledge to justify Industry 4.0 and to see the benefit.	
7	Automation is a great opportunity however the skill level required to operate automation equipment is greater than that of conventional. I think the basic economics often get forgotten, in order for people to have more they need to produce more or rather be more efficient.	
8	Training and skills shortage both in terms of practical skills and digital skills.	
1	Target certain supply chain gaps. For example within the composites industry there is no UK made carbon fibre (there is precursor manufacture) something which is becoming more essential to many industries.	
2	Could a digital platform like Mybuilder.com be appropriate for the manufacturing industry to connect supply chains?	
3	Dermott O'Connor	
4	-	
5	The midlands does have an identity as a hub of new technology and as one of the most important manufacturing region within the UK. However I don't believe that this identify is fully recognised outside of the midlands in other parts of the country for example in London and therefore by our government. This has resulted in a lack of investment for decades within our region and the inability of the midlands to reach its full potential. This new initiative is an opportunity for the midlands to demonstrate and fulfil that potential.	
6	I believe there needs to be a clear strategy/plan to describe what needs to happen in terms of investment within manufacturing over the next 10-20 years. This plan must include targets for R&D which is the life blood of manufacturing and would build in future proofing as any new technologies and initiatives emerged. This would help the midlands to provide a model for other regions of the UK to follow.	
7	The barrier to this initiative are ambition (or lack of it), clear leadership, governance and funding, all of which could be provided by a central organisation that is funded by a national levy. This body's function would be to coordinate the overall plan and allocation of central funds around the midlands region guided by information/advice from local representatives from the various industrial sectors, universities and other stake holders, on agreed and prioritised needs.	
8	Unless the midlands has a skilled 'workforce' including trained managers and leaders then the midlands will not reach its full manufacturing capability. Continuing staff training and development at all levels is key to driving any future plans for improvement in innovation within manufacturing, to ensure all sectors within the midlands reach their potential. Apprenticeships have always been relevant to manufacturing but these are increasingly become the preferred mode of study, from a learners and employers perspective and should be a key part of the training plan moving forward. As the plan develops and the training/innovation continues to bear fruit a whole range of people including graduates will look at the midlands as a place to start/build their career and possibly stay on a permanent basis.	
9	1/.Continued political backing is absolutely paramount to the success of this initiative 2/.Sustainable funding (e.g. a training levy/national) is vital to allow for the required level of certainty when planning 3/.Leadership and governance is required at all levels to ensure the initiative is relevant & sustainable 4/.Intimate contact and input is required from midlands manufacturers, universities and other major stake holders to ensure step 3/.	

6	<p>Apprenticeship is a key element to manufacturing's future success. But much more than this, we need to break the binary paradigm of students choosing either an academic or vocational routes - a more blended approach would be useful. The degree apprenticeship will play an important part here, but also a re-creation of a more 'sandwich' approach to some degrees would better link the academic to the applied and improve the employability of some graduates. The Levy should be overhauled, both from the perspective of its flexibility and the fact that monies raised are not currently hypothecated to apprentice training. Looking earlier in the 'pipeline' of young people considering a manufacturing career, I'm concerned from a practical sense how T-Levels are to be rolled-out, especially how SMEs are going to be able to engage.</p> <p>Automation is most certainly an opportunity, but more than that - it's a critical enabler of future manufacturing success for the UK. If we ignore the technologies and challenges presented by 4IR, we risk becoming a manufacturing backwater with an interesting industrial history, but little more.</p>	
7	<p>COVID-19 recovery will take place for different industries, economic sectors and regions at different rates. The Government's surprisingly generous CJRS and loan instruments that were introduced with speed and agility at the start of the UK phase of the pandemic will become progressively less equitable and less fit-for-purpose as the recovery begins; a 'vanilla-flavoured' programme of support for recovery (rather than survival) is therefore not good enough. It will be fiendishly complicated, but a far more nuanced approach is needed if long-term damage from a mid-term suppression of demand is to be avoided. Without this, whole manufacturing sectors will be threatened.</p> <p>I would like to see the CJRS morph into a Skills Retention & Development Scheme, much more like the German Kurzarbeit model - less generous than the current furlough, but much more flexible and longer-term. In addition I'd benchmark our fiscal competitiveness with peer-group economies and use the levers of Annual Investment Allowances, Capital Allowances and R&D tax Credits to improve the UK's attractiveness. For manufacturers, these instruments are far more significant than simply Corporation Tax (which disproportionately benefits the less capital-intensive sectors such as finance and retail). In addition, the 'pump-priming' effect on innovation and productivity of stimulating capital investment in manufacturing is just what we need at a time of stagnant industrial investment.</p>	
8	0	
1	Tony Minhas	
2	-	
		<p>Manufacturing is at a cross roads. We are moving away from carbon intensive technologies to greener technologies but this will mean a lot of restructuring of our manufacturing facilities. The current physical and energy infrastructure requires a drastic upgrade with refitting, retooling and reskilling. Our identity should be as a regional base for high quality and high value added products. e.g. as we move away from the combustion engine/diesel to EV, there will be a reduction in vehicle components manufactured locally but the components that will be required will be more specialised, highly engineered and in the case of our industry may require specialist treatments & coatings. COVID has had a huge impact in as much that productivity and output will be much lower over the next 12 months but actually a change was inevitable and COVID may just now accelerate that change.</p> <p>Current HE provision regionally is very well funded with great industry partnerships and involvement. The concern is at the FE level where often the most disadvantaged in society can be found. We need to solve the Maths and English underachievement prior to FE alongside an earlier focus on valuing 'work' and 'career', especially in STEM subjects.</p> <p>Local and regional manufacturing supply chains have evolved quite well over the last 20 years and do have "price" efficiencies. COVID may be a driver to strengthen more local chains but this will require confidence from the OEMs in the region's skill's base and infrastructure. COVID has shown that the digital infrastructure is quite robust and the development of 5G networks will undoubtedly enhance this.</p> <p>Funding / Grant aid in any form has been too reactive and inflexible. Greater autonomy should be provided at a local level to LEPs, Authorities and other funders to use funding to target local excellence that is not necessarily driven by short term central politics. LEPs and the funders are far too dominated by political (be it local or national) leaders, who whilst do a great job, are not necessarily in tune with the needs of SME's who make up a large proportion of economic output.</p> <p>Through the last 42 years, our business has grown incrementally, we very rarely seek 3rd party finance and use retained profits and rely upon equity to develop. Whilst this is often a slower model of growth, it is less fragile, more economically stable, more socially aware and is able to ride the storm of a downturn - often emerging stronger because competitors with external stakeholders/funders are not able make decisions for themselves. There is too heavy a reliance upon short term financing models such as Invoice Discounting to generate cash flows; investments are often not incremental but quite large and risky and there is no strategy to consolidate post investment because the focus is continually on growth -often for the sake of growth. SME's are disenchanted by the skills available to them within the region and whilst apprenticeships have come a long way, they often do not have the capacity to develop apprentice skills. The efficacy of the apprentice levy and current provider model should be reviewed, good practice replicated and mediocre discarded.</p> <p>Because of the nature of our industry, our key procurement is from overseas large multinationals - PPG, MetoKote, Akzo Nobel, Henkel. These companies have invested huge amounts into R&D and are at the forefront of emerging coating technologies. However, British Made coating plants and indeed Midlands based manufacturers are still highly regarded. Our Estonian coating plant was manufactured in the Black Country and we still supply service from the UK.</p>
4		<p>To become world class we have to start with the issue of SKILLS - we have to make our youth proud to be part of local Engineering and Manufacturing. MTC and WMG and the HE sector have been instrumental in moving towards this thus far but it now has to translate into that pride continuing into the workplace. We then have to be able to retain these skills locally which in turn will attract the R&D that is needed. R&D works well in clusters but I am not confident that the Midlands can consider itself a Hive of R&D yet.</p> <p>Our plants and processes, driven by the need to reduce energy consumption and be more efficient, has inherent flexibilities. 25 years ago we would install plant that was purpose built around 1 product or a very similar range of products, we have used digital technologies and AI to develop plant that can cope with a greater variety of products.</p> <p>A big hindrance currently is the aging physical infrastructure in our region - especially production buildings and power supply. The road and transportation networks cope quite well but if we can not get more power to produce we are stuck. Current building projects regionally seems to lean towards warehousing and distribution - local government plans need to be more flexible.</p> <p>We are quite optimistic about our Digital infrastructure though our demands may be somewhat lower in comparison to other manufacturers. The 4th Industrial Revolution is already with us. Our coatings have evolved but the application process is fundamentally the same; these new technologies will be the cornerstone of future plant design.</p> <p>As a business, we are most likely ahead, marginally of our competition but this is really because of our underlying financial stability as opposed to any other innovation or USP. By being in control of our own finances, we can react or even be proactive when change is needed.</p> <p>-</p>

5	<p>Once again, our biggest barrier will be SKILLS and the lack of a competent, motivated work force. In 2006 we setup a production facility in Tallinn, Estonia. The country and region had a very good skilled workforce with good engineering supply chains. But the influx of foreign companies into the market place meant there was immense competition for a finite number of skilled and capable employee. Other than that Estonia was a very good environment for manufacturing with good central and local government support, a favourable tax environment for with no business rates or corporation tax per se, a good social welfare system and digital e-government system ahead of the rest of Europe. Estonia's small population hindered further growth.</p> <p>Attracting growth into our region means we must try to focus support on those businesses that are fundamentally stable, socially aware and commit to something akin to the Mittelstand Model. I do not believe in paying a levy or being a member of an organisation unless it can demonstrate its value to the individual business. I worked with business link as PBA in the late 90's and whilst some great interventions were achieved our underlying role was to generate fee income to support the organisation. We need organisation like the Chamber because they are great mouth pieces for local issues but they do not necessarily provide a benefit to all businesses. Also, you will find that locally, that such organisation are dominated by a small group of individuals with very good intentions - there needs to be a regular 'refresh' to allow these organisations to evolve and be more representative of the wider business community. The LEPs are a refreshing change from the RDAs - they are more economy focused and have a wider remit with the flexibility through Growth Hubs to offer focused support. They are not perfect and need more autonomy in terms of ability to spend and react to changing local needs.</p>	5	<p>Difficult questions - i have little to no knowledge of the aforementioned organisations.</p>
6	<p>Math and English must be the core of skills development and a requirement for a 2nd foreign language. We can not continue to expect the FE sector to take the brunt of failings in our schools system pre 16yrs. Greater investment is need in the 16-19 yr provision at FE level with a review of local employment needs being carried out more regularly.</p> <p>Apprenticeships are very important but we are faced with a competition between industry/HE and FE for the best trainers and assessors and industry/HE will win. We have to incentivise trainers and assessors into Apprentice/FE/HE provision. The quality of provision must be assessed and national standards elevated for employers to be confident that the qualifications achieved actually address their needs.</p> <p>The Midlands is a very diverse society and on the whole it is well integrated in the workplace.</p> <p>We need more people like the late Lord Bhattacharyya, MTC, WMG and our colleges and universities to promote engineering. The Midlands is a good place to live already but some areas have underlying social issues such as high unemployment, poor housing and crime - these need to be addressed if we want the next generation of engineers to stay and live or move to the Midlands but I feel that even the current situation is much improved. We can not promise good weather but we can certainly assure a warm welcome.</p>	6	<p>Apprenticeships are absolutely vital to the whole midlands strategy. without apprentices there is literally no future for the industries! diversity is already flourishing in our organisation, and will only get better with time naturally.</p> <p>we need to show the youth in schools, examples and success stories in our industries that they can aspire too. More emphasis on strategies that maintain and pass down skill sets to the next generations. we need to streamline and perfect the art of knowledge transfer!</p>
7	<p>1. Continue to improve the development of local SKILLS through FE/HE/INDUSTRY</p> <p>2. Improve access to energy/power</p> <p>Improve the business environment for the existing manufacturing base and inward investment through a review of Business rates.</p> <p>I would even advocate an increase in income tax if it were targeted at improving social welfare and communities thereby creating resilience within our communities so they are encouraged to live, work and spend locally.</p>	7	<p>Subsidising companies to encourage them to use locally manufactured products rather than foreign even if they are more expensive. (short term solution)</p> <p>Innovative strategies to find ways to lower manufacturing costs and remain competitive.</p> <p>Continual strategies that identify and pursue high value and lucrative manufacturing endeavours.</p>
8	THANK YOU!	8	<p>investment in internet and our own 5G capabilities are vital.</p>
1	David Badham	continual investment in roads and transport is vital	The future needs to be "work from home wherever possible" in order to alleviate pressures and stresses on the road networks. this would also help with emissions.
2	-	More electric car charge points nationally.	1 Johnnie Arkwright
3	-	2 -	3 To the world and the UK the Midlands has an identity and a unique industrial history .
4	<p>In previous generations Coventry and Birmingham were industrial power houses. Birmingham alone was known as "the city of a thousand trades". Cars, motorcycles, guns, jewelry, tires and much more were all manufactured there on very large scales. we need look no further than our own history in looking to aspire to a prosperous manufacturing future.</p> <p>I do believe that the midlands should look to have a healthy variety of manufacturing types but should prioritise the high value sector of manufacturing first of all.</p> <p>I believe that UK businesses should behave ethically with regard to supply chains and utilise local businesses wherever possible in order to support our local economies.</p>	3	<p>The cooperation between local authorities , the private sector and industrial promotion groups in the WMCA is getting better but the link with the East Midlands is not : The Midlands Engine is a good start but that it does not have the devolved powers that WM has will make full cohesion difficult . Nevertheless momentum seems to be gathering for a more coordinated and comprehensive approach .</p> <p>The reputation of the Midlands for long established industrial skills , manufacturing , accessibility etc is good . Its reputation as an innovative tech area is a long way from being established (despite the existence of some world class companies). But we need to be careful as the South and Oxford/ Cambridge etc will compete head-on for high tech .</p> <p>There is a strong case for more manufacturing in the UK - low £, Brexit effect(Buy British) , Covid deglobalisation effect etc - and the Midlands is better placed for growth in manufacturing than other locations - so long as it innovates , ensures that innovative SMEs have access to capital and invests in adapting the workforce's skills . There is a danger that too much money will be diverted into public sector infrastructure projects rather than the priority areas I mention above .</p> <p>Re Covid - I am in the hospitality sector so closed down for 3 months and now seeing a much lower level of demand . Have had to borrow a considerable amount under the CIBILS scheme to get through . Anticipate a 25% reduction in this sector (which probably needed cutting back anyway) - equivalent to 750k jobs , many of which have been filled by Europeans who might now return to their own countries ie damage may not be quite as big as feared .</p>
5	The midlands should aspire to being a cutting edge, manufacturing and research hub. a kind of uk "silicon valley" for engineering, manufacturing and research.	4 Every non digital business I speak to reckons that it will employ 20% less people post Covid . My own business will employ 30-40% less but will ultimately be more profitable .	I reckon that Midlands infrastructure is already good , especially as work patterns will mean a lot less moving around in the future .

4	<p>Many of my comments re Q2 are as relevant here .</p> <p>Becoming world class is a combination of confidence - believing that we can do it - , a properly coordinated and financed marketing campaign to attract new businesses and ensuring public and private investment goes in the right places . Of all these , Building that Confidence is the key one .</p> <p>I believe strongly that a plan to build Manufacturing Resilience is key . The unemployment issues could in the short term be as bad as the 80s - we need a complete Re-Set.</p> <p>I will get back to you re emerging technologies generally . In my hospitality sector AI will help to identify potential customers more easily but it won't have a major impact .</p>	3	<ul style="list-style-type: none"> •Vast variety of manufacturing business across multiple end-user sectors. •West Midlands most commonly associated with automotive; East Midlands with aerospace. •There is a sense of place/pride within the region, but little identity outside the UK. •We want to be recognised for 'High Value' or 'Advanced' manufacturing, but haven't achieved that anywhere near enough •Little cohesiveness in approach. Catapults/RTOs/Universities, etc. still compete, without shared vision or common purpose for the region •Manufacturing remains and will remain very important to the region, if we find a way to be more cohesive •Academia/business collaboration: few truly strategic relationships; some good examples built on multiple touchpoints - skills & education, research, commercialization (e.g. AME). Long-term planning & commitment required for success, •Supply chains remain vitally important to manufacturing security, but re-shoring/right-shoring as a counter to unfettered off-shoring has been slow. More effort focussed on this, and support to businesses to help this happen would accelerate progress.
5	<p>Sorry - run out of time for the remaining Qs but keen to assist where I can and believe passionately that the Midlands will succeed if we get our act together properly. I believe incidentally that the local LEP, CoC and CWGrowth Hub are all good .</p> <p>Will circulate the attendees with info re Queens Awards for Enterprise . I am the Warwickshire DL with specific responsibility for promoting these . They are great for the winning companies but , more importantly , help to build the region's reputation for quality innovative businesses .</p> <p>If I can also help in using the 250th anniversary of the First Factory) my antecedent) as one of the launch pads for the initiative , I am happy to do so .</p>	4	<ul style="list-style-type: none"> •Is world class the right aspiration? Should we be aiming for world leading? •R&D is essential if manufacturing is to be differentiated to the higher value adding activities •Auto and aero still dominate. Both, however, will see massive change due to direction changes in Mobility, e.g electrification, hydrogen economy. New approaches will spin out of the changes, supporting new companies, but maybe not entire industries. Facilitate cross-sector learning to accelerate progress (but respect IP & competitive elements). •Servitisation needs to be more clearly articulated and communicated for companies to understand the opportunity. It will work for some but not others. The reasons behind why RR went for 'Power by the Hour' need to be properly understood, not just copied. Circular economy plays a significant role in this. Look at alternative business models - not just make-sell products. What does the customer want? •Flexible Manufacturing as a headline in this context is almost meaningless. Flexible in volume, sector, customer, process, product, throughput velocity....? Most manufacturers are flexible to some degree; such a 'strategy' should only be encouraged if we can articulate what it is and why it is the best option available. •Building Resilience to some level in 5 years (or even 10) is achievable, but should be seen as a point on a trajectory, not a destination
6	Run out of time . See above		
7	Run out of time . See above .		
8	Run out of time . See above .		
1	Bob Allison		
2	-		
3	<p>There are multiple questions here so I shall focus on those that are HE related.</p> <p>We have multiple partners across the University, predominantly but not exclusively in engineering and sport. Many partners are on our Science and Enterprise Park and they range from a Rolls Royce UTC to SMEs in the Advanced Technology Innovation Centre.</p> <p>We have been massively impacted by COVID-19. Social distancing of 2m makes much of our operation impossible. at 1m academic live is 85% back to normal.</p> <p>I do not see any homogeneity across the Midlands other than lack of collective ambition - sounds harsh I know.</p>	5	<ul style="list-style-type: none"> •Skills, Finance, Media, Policy – the list is almost endless, and each one well known and discussed at length. The real issue to removal of barriers is cohesive strategy, well-communicated and constancy of purpose (+ funding). •Finance and innovation: see above •Productivity – the same issues as the barriers. Constancy of purpose and long term vision needs financial instruments to match to facilitate investment in the things that deliver productivity: skills, innovation and technology <p>Inward investment - is predicated on either:</p> <ul style="list-style-type: none"> oRoute to market oInnovative differentiation oCost of production Make a choice... <ul style="list-style-type: none"> •Business support: difficult to find anything of real value or scale since the demise of MAS. Some committed and capable individuals in some Growth Hubs, but no coordinated resource of sufficient size or capability. •Mittelstand: of all the structural and cultural characteristics of the Mittelstand, there are two which really underpin its very existence: focus and long-termism. These are systemic, as well as company cultural. So, yes it should be possible, within a system (or ecosystem) with similar characteristics and commitment •Supply Chains: Toyota said many years ago, that to become a world class supplier, you need a world class customer. Our supply chains can be many things, but one of their biggest influencers (or constraints) is the behaviour of their customers. •Membership: the German model of compulsory CoC membership has merits. Chambers of Commerce, and Trade Associations, in the UK have struggled for relevance, so must have something to offer if compulsory membership were introduced •SME support: re-introduce a properly resourced and coordinated MAS. •Regional productivity: see above. What is it? An amalgam of individual company productivity? Regional averaging has the danger of hiding the important information, i.e. the highs (exemplars/benchmarks) and the lows (those most in need) & differences across sectors.
4	The key is critical mass, as I said in the online meeting.	6	<ul style="list-style-type: none"> •Businesses and education providers need to work closer with one another - both in defining what the skills needs are (at all levels, e.g. apprenticeships and re-skilling), developing the programs and also in delivery of this training.
5	Also, we are not particularly good at getting key messages across about our strengths in a way that leaves other regions behind.		
6	Please see above.		
7	Skills and skill levels need to be joined up far more effectively.		
8	Encouraging graduates and others to stay in the region is far more than just about employment but it is a lifestyle choice and I don't think we have fully got to grips with this yet.		
1	There are others better placed to answer this set of questions than me. I will come back to the comment that I met in the meeting about being far more joined up across sectors and the proximity of partner organisations.		
2	Many thanks for inviting me to join the discussion. If there are other ways in which Loughborough University can help or support the initiative do please let me know.		
1	Carl Perrin		
2	-		

7	<ul style="list-style-type: none"> •Two Suggestions: <ol style="list-style-type: none"> 1.A commitment to a high-quality support service for a long period – constancy of purpose 2.Systemic change in the finance sector (patient capital) and large company procurement behaviour •Support: <ol style="list-style-type: none"> 1.MAS - type organisation •Gov't/BEIS/Treasury needs to ensure that HVM Catapult funding is deployed in the correct way, with a consistency across the UK to ensure that SMEs in particular have a clear picture about how they can receive support and help. Different models of SME support in different regions is not helpful (unless there is a regional-specific reason for this). HVMC would be the perfect high-end partner for a new MAS-type organisation. BEIS need to make a commitment to recognising and growing the manufacturing support ecosystem. Government generally needs to recognise that manufacturing adds value. 	
8	None	
1	Terence Keith Morgan	
2	-	
3	the region has an identity but based on historical considerations. I personally do not believe the Midlands Engine created by Government to match the Northern powerhouse has had any impact and not sure that West/East midlands can be seen as one economic entity. I do think Covid -19 has had an impact on my organisation but has meant we have had to think to rethink our forward strategy and whether this is the time to take some difficult decisions to reshape the business	<p>The Midlands has a proud history and a strong identity as the UK's manufacturing heartland and the birthplace of the industrial revolution. Over the last 50 years, Midlands manufacturing has faced had to navigate some stormy waters, with a number of economic recessions and the long-term decline of lower value added sub-sectors in the face of competition from emerging economies with a much lower cost base. At the time of writing, meanwhile, the sector is grappling with:</p> <ul style="list-style-type: none"> •The collapse in demand and supply chain issues caused by the Covid-19 pandemic •The potential for disruption and loss of market opportunities from a no deal Brexit <p>But, the sector has adapted, survived and continued to thrive in the face of these challenges – and remains crucial to the Midlands economy. Key drivers have included:</p> <ul style="list-style-type: none"> •The attraction of substantial amounts of FDI. For example recently published DIT data for 2019-2020 indicates that the West Midlands, the area in which we operate has retained its position as the UK's leading region for FDI attraction outside London and the South East, accounting for 8% of projects and 10% of jobs. The West Midlands inward investment strategy, which focuses on its key industry strengths and talent base, has ensured that the region can compete on the world stage for investment. The leading sectors for investment attraction were advanced manufacturing, transport technologies, IT and modern professional services. •A strong record in international trade. Often led by the key inward investors attracted to the Midlands. The West Midlands, for example, currently achieves the highest level of export volumes in the country outside London and the South East and accounts for 40% of all UK exports in the automotive sector. •A world class R&D infrastructure with centres of excellence within Midlands Universities at the forefront of advances in, for example, electrification and energy storage, connected and autonomous vehicles, advanced materials and industry 4.0 and the development of IoT and data analytics. •An extensive pool of labour with specialist skills and experience supplemented by a strong pipeline of engineering graduates from Midlands universities <p>Over the next 5 years there is potential to establish the Midlands as Europe's foremost transport technologies and advanced manufacturing cluster. However, to make this happen the Midlands needs to maximise its collective potential, with agencies across the area working collaboratively to support and develop its business base and to create a strong global brand. While both the East and West Midlands are working effectively, but essentially separately, to try and realise these ambitions, they need to come together to make them a reality.</p>
4	R & D is important the Midlands Manufacturing but unlike other innovative hubs we have not seen enough pace or indeed champions to translate R & D into commercial exploitation. We are reviewing our strategy to make us fitter for the Digital opportunities	
5	There are too many questions in this section. If you have a good balance sheet financing is not a constraint. Our normal go to are the industrial sector grouping in Automotive. In other sectors such as Energy, RAIL we rely on HMG policies. I am against Levies I personally not hung up on productivity concerns. The market should sort this out.	
6	I do not HMG understand the skills issues. In recent times that appeared to be making progress until a levy was introduced that undid the progress made	
7	I think Midlands has to decide whether it can talk with one voice. I have my doubts We need to better onshoring opportunities and what would make tier 1's change their global sourcing decisions	
8	Keep talking	
1	Neil Rami	
2	-	

<p>4</p> <p>The creation of a 5 or 10 year strategic plan to build manufacturing resilience in the Midlands is definitely achievable – and we would argue it is essential.</p> <p>There is potential for the Midlands to establish itself as Europe's foremost transport technologies and advanced manufacturing cluster. As already mentioned agencies working in the East and West Midlands need to collaborate to make this happen. We need to create a strong global brand – and to support this we need to build on the sector's undoubted strengths. In particular we need to work together to:</p> <ul style="list-style-type: none"> •Build on our strong record in FDI attraction. While Covid-19 and Brexit issues mean that many investment decisions are on hold and some investments may not go ahead, most internationally mobile companies still have the resources in place to make their move once the economic recovery gets under way. Here in the West Midlands our pipeline remains healthy in a range of specialist areas including: <ul style="list-style-type: none"> ◦Energy storage linked to the development of electric/autonomous vehicles ◦Industry 4.0, AI and the digitisation of manufacturing ◦The rail industry linked to the go ahead for HS2 ◦We also expect further growth in enquiries from investors in modern construction techniques and modular manufacturing <p>Maximising the opportunity to showcase the region's strengths as an investment location via the 2022 Birmingham Commonwealth Games. The £23 million Trade, Tourism and Investment Programme we are delivering in collaboration with DIT aims to attract new manufacturing inward investment to the Midlands, support and retain existing investors and to assist and advise Midlands manufacturing businesses looking to export to commonwealth countries.</p> <p>Work with Midlands' universities to maintain and grow the pipeline of engineering graduate and post graduate talent available to manufacturers.</p> <p>And, critically, to support and promote the centres of excellence in R&D at Midlands universities in areas such as electrification and energy storage, connected and autonomous vehicles, advanced materials and industry 4.0.</p> <p>This can help the Midlands remain at the forefront of developments and attract and grow these new, cutting-edge manufacturing industries.</p>	<p>6</p> <p>Work our Research Team has done with Midlands universities reveals that management and leadership skills are a key area where skills gaps and shortages are holding the manufacturing sector back. The Bank of England argues that poor management is the principal cause of the UK's stagnant productivity. A key issue is that people commonly advance into management positions before acquiring the skill set for effective leadership.</p> <p>We are fortunate that in the Midlands a host of universities have developed innovative offers to meet the leadership and management skills needs of manufacturing businesses looking to compete and grow and to individuals working within these businesses looking to develop and progress in their careers.</p> <p>For example Aston, Nottingham Trent, Lincoln and Northampton universities all offer specialist consultancy services to help firms to develop their business and their people and to access the pipeline of graduate talent – alongside a dedicated business support function. Wolverhampton, De Montfort, Lincoln and Staffordshire universities, meanwhile, have all developed innovative, business relevant CPD and executive education options together with on-line and other flexible delivery options.</p> <p>It will be important to ensure that all parts of the Midlands manufacturing sector, including the SMEs we are keen to make more resilient and agile, are aware of what our universities can offer them and how to access it.</p>
<p>5</p> <p>The low productivity of the Midlands manufacturing sector is a worrying development over recent years – and it will be vital to boost the resilience and agility of firms – especially SMEs – given the unprecedented challenges we face.</p> <p>Attracting more inward investment has to be a key component of our strategy to boost the productivity of the Midlands manufacturing sector – and to help make it more resilient and agile.</p> <p>While new inward investors tend to have above average productivity, innovative practices and efficient production, boosting the overall average for the area, they can also potentially have a wider impact due to spillover effects. For many FDIs have adopted cutting edge technological advances, innovation or management and leadership approaches which are often transferred to supply chain firms or copied by competitors.</p> <p>In the West Midlands we have developed an inward investment strategy which plays to our strengths and seeks to give us a competitive edge in the marketplace. Our research has revealed the sectors and markets with the strongest global growth prospects – and in turn the subset of these where the region's strengths and assets differentiate it from competitor locations (linked to the West Midlands Local Industrial Strategy). Within the manufacturing sector, these are transport technologies (notably automotive, aerospace and rail) and advanced manufacturing (to include advanced materials, energy storage, medtech, food and low carbon technologies).</p> <p>The strategy has borne fruit, with the West Midlands retaining its position as the UK's leading region for FDI attraction outside London and the South East for the last five years. Going forward there may perhaps be potential for us to collaborate with colleagues across the Midlands to develop a Midlands-wide FDI attraction strategy, based on the strengths and assets of its diverse range of investment locations.</p> <p>At the same time we need to work with investors already based in the Midlands to ensure they survive, grow and have a long term future in the Midlands. Our experience of working with these investors indicates that issues such as access to finance, the availability of land, labour and energy costs are particularly critical.</p>	<p>7</p> <p>We believe that an 'open for business' campaign, bringing together a number of existing initiatives at a UK and Midlands level, is needed to secure new inward investment opportunities and support the recovery of the manufacturing sector.</p> <p>We believe that additional incentives such as a Mobile Investment Fund are needed to allow the Midlands to compete effectively for investment in an increasingly challenging global marketplace.</p> <p>The provision of 'soft landing' support will also be important to attract start-ups and fast growth SMEs to the Midlands offering physical space, access to university R&D expertise and facilities and connections into the wider sector ecosystem. The Birmingham Energy Incubation Hub is an excellent example of this type of support which could be emulated elsewhere.</p> <p>While the Midlands manufacturing supply chain is one of the most extensive in the world and a key strength, it is dominated by SMEs who face particular challenges to their sustainability in a post-Covid world.</p> <p>As the major OEMs move away from global supply chains to a re-shored/near-shored or even local solution in the wake of the severe disruption Covid-19 has led to, coupled with concerns over potential Brexit-related disruption, significant new market opportunities may emerge for the Midlands manufacturing supply chain. But we need to ensure that SMEs are resilient and agile enough to take advantage of these. Support in areas such as access to finance, availability of land, labour and energy costs will be critical – alongside assistance to accelerate the uptake of Industry 4.0 technologies to increase efficiency and product quality.</p> <p>The reinvigoration of support for Enterprise Zones with business rate relief and the establishment of Freeports offering tax breaks for importers and exporters could help kick start the recovery of Midlands manufacturing – and attract vital strategic investment for the future such as the 'gigafactories' needed to grow our transport technologies/future mobility sectors.</p> <p>These initiatives could usefully be linked to the government's 'levelling up' agenda</p> <p>8 Everything is covered above</p> <p>1 Shan Dulanty</p> <p>2 -</p> <p>3 I believe the Midlands has a strong identity within itself, however having come to the Midlands from the south of England at the age of 20 and having worked and lived in the north of England for 9 months, the North and South of England have little recognition of the Midlands region, in the South it is seen as the North and vice versa, so much so that junction 21 on the M25 exit road to the M1 simply says "To the North", not "To the Midlands". The Midlands is England's best kept secret, well paid work and affordable housing, this is due to the extensive manufacturing in the region, however this has been depleted year on year and the wealth of the region is slowly being eroded. The mining industry has gone, the car industry has been severely diminished with the loss of Rover and we are building more and more logistics parks instead of industrial estates as we loose our manufacturing and import foreign goods for distribution.</p> <p>The COVID crisis has highlighted the need to automate to improve resilience, especially in the food industry, building and agriculture; and has highlighted the poor infrastructure for wireless communication. The Government has been vocal about upgrading wireless infrastructure, however team members living in Rugby, Coventry and Birmingham have all suffered Bandwidth issues with various meeting software's regularly failing during video conferences regardless of whether it is 2 people or 20 people on the call.</p>

6	<p>Work our Research Team has done with Midlands universities reveals that management and leadership skills are a key area where skills gaps and shortages are holding the manufacturing sector back. The Bank of England argues that poor management is the principal cause of the UK's stagnant productivity. A key issue is that people commonly advance into management positions before acquiring the skill set for effective leadership.</p> <p>We are fortunate that in the Midlands a host of universities have developed innovative offers to meet the leadership and management skills needs of manufacturing businesses looking to compete and grow and to individuals working within these businesses looking to develop and progress in their careers.</p> <p>For example Aston, Nottingham Trent, Lincoln and Northampton universities all offer specialist consultancy services to help firms to develop their business and their people and to access the pipeline of graduate talent – alongside a dedicated business support function. Wolverhampton, De Montfort, Lincoln and Staffordshire universities, meanwhile, have all developed innovative, business relevant CPD and executive education options together with on-line and other flexible delivery options.</p> <p>It will be important to ensure that all parts of the Midlands manufacturing sector, including the SMEs we are keen to make more resilient and agile, are aware of what our universities can offer them and how to access it.</p>	3	<p>Not homogeneous – in some ways quite fragmented</p> <p>Although the industrial revolution started in the black country and many industrial advances were achieved in the midlands it does not retain a strong identity.</p> <p>Going forward Midland identity will be forged from the strategy adopted</p> <p>Midland potential needs to be harnessed –</p> <p>Manufacturing – "Added Value" activity is the driving force of the Midlands</p> <p>With a positive Manufacturing – "Added Value" strategy the Midlands could be the driving force of the UK</p> <p>Covid-19 has had a negative impact on the company</p> <p>Supply chain are essential to a dynamic added value clusters/operations.</p> <p>Infrastructure is physically poor (especially road transport) and significantly over the design capacity.</p> <p>Infrastructure "digital" performance is variable</p>	
7	<p>We believe that an 'open for business' campaign, bringing together a number of existing initiatives at a UK and Midlands level, is needed to secure new inward investment opportunities and support the recovery of the manufacturing sector.</p> <p>We believe that additional incentives such as a Mobile Investment Fund are needed to allow the Midlands to compete effectively for investment in an increasingly challenging global marketplace.</p> <p>The provision of 'soft landing' support will also be important to attract start-ups and fast growth SMEs to the Midlands offering physical space, access to university R&D expertise and facilities and connections into the wider sector ecosystem. The Birmingham Energy Incubation Hub is an excellent example of this type of support which could be emulated elsewhere.</p> <p>While the Midlands manufacturing supply chain is one of the most extensive in the world and a key strength, it is dominated by SMEs who face particular challenges to their sustainability in a post-Covid world.</p> <p>As the major OEMs move away from global supply chains to a re-shored/near-shored or even local solution in the wake of the severe disruption Covid-19 has led to, coupled with concerns over potential Brexit-related disruption, significant new market opportunities may emerge for the Midlands manufacturing supply chain. But we need to ensure that SMEs are resilient and agile enough to take advantage of these. Support in areas such as access to finance, availability of land, labour and energy costs will be critical – alongside assistance to accelerate the uptake of Industry 4.0 technologies to increase efficiency and product quality.</p> <p>The reinvigoration of support for Enterprise Zones with business rate relief and the establishment of Freeports offering tax breaks for importers and exporters could help kick start the recovery of Midlands manufacturing – and attract vital strategic investment for the future such as the 'gigafactories' needed to grow our transport technologies/future mobility sectors.</p> <p>These initiatives could usefully be linked to the government's 'levelling up' agenda</p>	4	<p>Investment from both Government and Private sources</p> <p>Government must ensure high calibre investment in infrastructure, energy, communications, transport capability. Private investment will respond to commercial opportunity.</p> <p>R&D is imperative</p> <p>Manufacturing – a 1000 trades.</p> <p>Manufacturing – a 1000 trades but less polluting, automated fully integrated</p> <p>Training will be the cornerstone of a skilled workforce</p> <p>'Flexible Manufacturing' must further restructured to become DYNAMIC.</p> <p>Dynamic clusters of companies all collaborating service focused with investment capability integrated within the cluster.</p> <p>Investment is required in the Midland infrastructure – communications and transport capability</p> <p>Resilience within the Midlands can be achieved with the correct strategic approach- Dynamic clusters of companies all collaborating service focused</p> <p>Midlands must compare with German mittelstand model we have all the base characteristics</p> <p>AI is a very specialist development sector – built into capital equipment it becomes automation and easily operated within company production capability.</p>	
8	Everything is covered above	5	<p>Methods/culture will be required to change – we will be required to be more dynamic / responsive going forward.</p> <p>Propose that Midlands manufacturing companies now form clusters of supportive skills, capabilities and technologies to be ready to serve customers across the UK, Europe and the wider world.</p>	
1	Shan Dulanty		<p>A SERVITIZED focused "added value" cluster will be the major contributor to MANUFACTURING RESILIENCE and increase efficiency, productivity and employee loyalty.</p>	
2	-		<p>Collaborative working now will ensure that risk and reward are anticipated and shared across the cluster so that it can act quickly and flexibly to new opportunities for outcome-based services.</p>	
3	<p>I believe the Midlands has a strong identity within itself, however having come to the Midlands from the south of England at the age of 20 and having worked and lived in the north of England for 9 months, the North and South of England have little recognition of the Midlands region, in the South it is seen as the North and vice versa, so much so that junction 21 on the M25 exit road to the M1 simply says "To the North", not "To the Midlands". The Midlands is England's best kept secret, well paid work and affordable housing, this is due to the extensive manufacturing in the region, however this has been depleted year on year and the wealth of the region is slowly being eroded. The mining industry has gone, the car industry has been severely diminished with the loss of Rover and we are building more and more logistics parks instead of industrial estates as we loose our manufacturing and import foreign goods for distribution.</p> <p>The COVID crisis has highlighted the need to automate to improve resilience, especially in the food industry, building and agriculture; and has highlighted the poor infrastructure for wireless communication. The Government has been vocal about upgrading wireless infrastructure, however team members living in Rugby, Coventry and Birmingham have all suffered Bandwidth issues with various meeting software's regularly failing during video conferences regardless of whether it is 2 people or 20 people on the call.</p>			<p>Customer service focused added value activity will undoubtedly attract investment.</p> <p>High quality "Business" support is a prerequisite to efficient business activity.</p> <p>Gov bodies in the past have had an agenda where they were focused on building "membership" going forward it is important they are focused on building "business".</p> <p>"Finance" must be integral to a "Dynamic Cluster" this is additive to a service focused</p> <p>Skill sets across the Midlands are a concerning issue – more pronounced with Technical issues.</p> <p>Technical education can be reviewed to match the subject matter of in work issues.</p> <p>Increasing apprenticeships will be a key metric - very important for the Midlands.</p> <p>In work training – both practical and academic –</p> <p>Career prospects – job security</p> <p>Automation is already a challenge in all industries – it will only be invested if it adds value to the process/company.</p> <p>Successful companies will grow employment</p>

7	<p>Customer service focused added value activity.</p> <p>SME sector establish Dynamic "added value" Clusters - network of mutually supportive manufacturing companies to form clusters of skills, capabilities and technologies. This will facilitate:</p> <ul style="list-style-type: none"> •collaborative working •risk and reward are anticipated and shared across the cluster •the cluster can act quickly and flexibly to new opportunities for outcome-based services. <p>SERVITIZED focused training</p> <p>Employee skills training, technical and Commercial (Customer service focused)</p> <p>Ensure administrative capability in place to assist / advise clusters financially.</p> <p>Budgets for the region's development is imperative.</p>	3	<p>I do not think there is an identifiable set of characteristics that distinguishes the Midlands. On a map you will find the Counties, major cities, towns and topography offer greater distinctiveness. Would anyone regard the North or the South as homogenous? Local Government structures reinforces the notion of locale e.g. County Councils, District Councils, Town Councils. RDAs have been replaced by more numerous LEPs. Combined authorities provide a further overlay and joining up the dots/stakeholders around a major strategic thrust of potentially national consequence is not easy given all this structure. That said the Midlands Engine is an example of a relevant strategic initiative so there is potential for a body with a focused mission, resources, relevant stakeholders and effective governance harnessing diverse assets in the Midlands.</p>
8	<p>Important to establish a "Dynamic Cluster" to see if it works</p> <p>If successful can be replicated</p> <p>Will not be expensive - but will need some funding</p> <p>Will progress concept</p> <p>Drew Taggart</p>	4	<p>We have world class capability already at WMG/MTC and at the Midlands Universities as well as companies such as JLR, JCB, Geely, and Rolls Royce amongst others. I believe the Commission might set out the diverse nature of our industrial base in the Midlands, highlighting hot spots in our capability, the potential for emerging technologies, assess their strength and potential internationally and then make recommendations on priorities strategy and delivery. The NAIT Review of the Automotive Industry and subsequent creation of The Automotive Council offers a successful precedent: Agreed mission around Low Carbon technologies and Supply Chain reflation, support from the top from stakeholders allied with Government governance and secretariat. The review of emerging technologies should take a strong lead from the Catapult and Universities incl spin outs and assess the potential for development of AI, Digitisation, Advanced Materials and Processes (3D), Green Energy and Electrification, Creative Industries/Cyber Security, Computing and Space in the Midland region. Stakeholder engagement critical, 10 year scenario and closely defined mission, objectives, monitoring and control.</p>
1	Sir Peter Gregson	5	<p>There is quite a complex skein of local authority and NGO interfaces for companies and potential investors to navigate in attempting to set out an agreed coherent strategy, obtain business support, funding, training etc. Joining up the dots/relevant stakeholders around a core mission will be fundamental. Is the Midlands Engine the right body? If so we should support it as The Automotive Council equivalent or at least ensure the agenda, ambition and resources suggested by the Commission's output are measured against the ME's charter. The Mittelstand model works well in Germany as does the Fraunhofer model which the HVMC has successfully replicated. Our banking structure is more centralised however and banking support for SMEs in recent times has been patchy. SME experience has been variable as has their experience with the Apprenticeship Levy. The Commission will report out on the critical area of training in support its mission. Apprenticeships, Traineeships, Pathways to Further and Higher Education, Skills Development, CPD have to be prominent in the report's recommendations.</p>
2	-	6	<p>As above. The training needs and strategy to address should reflect the sectoral priorities and associated technologies, current and emerging. Broadly I see a continuing need for education and training outputs associated with electro/electronic and mechanical engineering foundation and above capability but with a significant boost in digital, IT and software development, advanced materials, electro chemistry, system and process engineering as well as AI, Cyber and Space related engineering and manufacture. Marquee product development from high profile companies will always attract engineers of all backgrounds. Cool brands and products are attractive to job seekers. CPD needs to actually happen. Automation is both opportunity and threat and unstoppable.</p>
3	<p>The Midlands is not a "homogeneous region" - there are different cultures, challenges and priorities between East and West but this makes it all the more important that the region should work together to gain critical scale, skills and impact in the post Covid19 world. The Midlands Engine is gaining traction within the region and can play an important role in the "levelling up" agenda.</p> <p>Cranfield University plays its full part within the Midlands Innovation grouping of research intensive universities in the region; we collaborate closely with businesses across the region.</p>	7	<p>I hope we can have a report with a good summary of existing assets throughout the Midlands, let's make sure we agree on where the geographical boundaries lie! The recommendations should also cover identification of key and potentially key sectors, centres of excellence, stakeholders and activities. It should set out the priorities, the key areas we shall focus on for the next 10 years in the same way that the NAIT did. Then we need a vehicle either the Midlands Engine or something new and allied with the right level of stakeholder representation, oversight of deliverables and Government sponsored governance/Secretariat. I am assuming the involvement of LEP leads, Trade Body heads, Companies, Banks/Funders, Universities and Local Authority leads. The other approach, avoiding the challenges associated with achieving effective co-operation with existing allied initiatives and bodies would be to insert the Commission's agenda and mission within an existing body but give it the priority, focus and distinctive profile that it deserves. I would like to see funding to support the Commission's recommendation and the necessary admin support to carry through a 10 year project as well as high level ministerial involvement and co-leadership.</p>
4	<p>At the heart of the "Green Economic Recovery" with the Midlands Innovation universities playing their full part in driving innovation</p>	8	All covered above.
5	<p>The Midlands is the one region of the UK where learning from the Mittelstand model might assist in strengthening the financial resilience of manufacturing businesses in the region, but regrettably the UK does not have the same cultural commitment to engineering and manufacturing as Germany!</p>	1	Robin Wilson
6	<p>I believe there is a good supply of graduates in the region; more should be done to integrate academic and experiential education through apprenticeships at all skill levels. The challenge is to attract / retain the talent in the region, and this is where a flagship regional project focussed on Manufacturing and Green Economic Recovery could help.</p>	2	-
7	<p>Developing a distinctive and integrated approach to growth of manufacturing SMEs.</p> <p>Rallying around a flagship project/theme discussed above</p>		
8	None		
1	Nick Hussey		
2	-		
3	<p>I think the region would benefit from consolidation and the end of the separation of East and West in surveys and references. It should be just The Midlands. Additionally, Midlands Engine is utterly horrible as a term and is something of a joke. We need to find a new better more dynamic, progressive term for the region. Manufacturing is the Midlands BUT it must be seen as the future for modern, advanced manufacturing not the place where old style metal bashers hang out en masse. I would down play the effect of academia, this is in danger of being over done.</p>		
4	<p>We need to be right at the forefront of the emerging technologies, materials, processes, but for me this needs to be at the commercialisation level not the purely academic end. I appreciate one leads to the other (or should do!) However we over emphasise the pure academic end and never get the commercialisation benefit. As regards IR4 stop trying to do everything from scratch and leverage from what already exists. eg: Digital manufacturing week, Smart Factory Expo etc</p>		
5	<p>Barriers: brand is currently poor and ill defined. Too many agencies and too complex landscape of support - too many programmes and too many names and brands and vested interests. Bang heads together - consolidate and simplify.</p>		
6	This is now another over done subject in my opinion		
7	We need a Manufacturing Tzar - a quasi minister - with budget and remit.		
8	This is a great initiative. Happy to expand and discuss. Apologies for being so blunt.		
1	Joe Greenwell		
2	-		

3	<p>Innovate UK investment in region to date: Over £760m in grant funding (£1,009m total project costs) in manufacturing and materials related innovation projects has been invested into organisations based in the Midlands since 2007 This is represented by 212 CR&D projects, involving 810 participants (organisations) of which 377 are unique 249 unique manufacturing and materials SMEs have received grant funding. We have also funded a large number of manufacturing and materials related KTPs (Knowledge Transfer Partnerships) in the region over the decades, with a typical investment rate of over £1m per year and a current portfolio of 40 live projects supported by £5m of Innovate UK KTP grants. We have list showing that 1295 businesses (all sectors) have worked with Midlands universities on 1570 R&D projects. Over £130m pa public funded core grant invested in High Value Manufacturing Catapult, with the MTC and WMG Centres located in the region. View from our Regional Manager: The Midlands is a very diverse region, with a high degree of disparity within the different sectors and geographies. With 16% of its output from manufacturing, and 10% of the regional workforce employed in the sector, its importance to both national and West Midlands regional economy is evident. But there are major differences in the productivity and innovation rates of the manufacturing sector in the three Local Enterprise Partnership areas (Black Country, Greater Birmingham and Solihull, and Coventry and Warwickshire). The identity of the region is broadly defined by its manufacturing heritage, which is still very prominent. There are many family owned businesses, with some adapted well to the ever evolving market conditions, while others are yet to embrace digital manufacturing and Industry 4.0. The four main manufacturing subsectors in the WM include transport and mobility related equipment and infrastructure (36.4%), metal products (15.4%), machinery and mechanical equipment (10.6%) and other (37.58%). The region has got an ambition to lead in advanced and digital manufacturing but has not managed to embrace and engage across the three LEP geographies to maximise on its existing capabilities, stimulate supply chain relationships. The main opportunities relate to embracing Industry 4.0, connected supply chains, supply chain and business model innovation and maximising economic opportunities linked to the national infrastructure investments (HS2, Commonwealth Games) for the regional businesses. Covid had a major impact on WM manufacturing – it exposed the vulnerability of the transport and mobility sectors and it's knock-on effect on the supply chains and businesses. The other main considerations is the lack of certainty about the future trade relationship with the EU – 44% of the WM manufacturing exports are to the EU block. Academic-business collaboration is patchy and tends to involve the same large businesses working with a small number of (the same) SMEs and (the same) RTOs/Catapult centres. This tends to restrict the access to knowledge, equipment and infrastructure for businesses which are new to such collaborations.</p>	4	<p>Investment in R&D is important to manufacturing in any region and especially in the Midlands where world class companies in automotive, aerospace and other sectors need continual innovation to remain competitive.</p> <p>The rich and varied mix of industries and expertise makes the region well placed to become leaders in the understanding, expertise and adoption of Net Zero technologies and business processes, to reduce GHG emissions caused by materials processing, manufacturing activities, supply and distribution chains across all the big-emitting sectors like transport, energy generation, construction etc. Manufacturing and materials processing causes 25% of the UK's current 500MT annual GHG emissions. The embedded energy in our imported goods and component supply chains accounts for most of the additional 300MT emissions incurred overseas in our supply chains. The Midlands has an obligation to clean up its industries, like any other region. But it also has a unique opportunity to harness its expertise in research and innovation to translate the National legislative requirement for Net Zero by 2050 into local and regional demonstrators and test beds across a wide range of industries and market sectors. This includes adapting skills and supply chains to re-shore key areas of material and component production back to the UK, where new and existing businesses revitalised through investing in clean-tech can 'build back better' to win and anchor a greater proportion of the estimated £40bn GVA growth potential in this region over the coming 10 years. The Net-zero agenda aligns well with the Recharge the West Midlands report. The region has leading providers of 'transport as a service' solutions and has a real potential to become nationally and world recognised in terms of its advanced manufacturing capability, but significant investment in R&D and a balanced distribution of such investment is needed in order to address the many challenges faced by WM businesses</p>
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4	<p>We absolutely need a long term strategic manufacturing plan, but more important a Vision - to be a World Class Innovation and Manufacturing hub for a number of industries - we have to pick heritage industries and possibly some emerging technologies if we believe we can build a sustainable future.</p> <p>Government has to back these chosen sectors. Which sectors.... I don't have the holistic view of the Midlands. Auto, engineering, materials,</p> <p>To kick off.... we need a multi sector and multi discipline (universities, govt, manufacturers, etc) brainstorm to create a Vision, Strategic Targets, pick sectors, partners.... and a plan that connects the overall plan And Vision and Strategy into deployment through to companies/organisations across. region.</p> <p>By being an active member contributing to this Vision what would be expected from the members and what do they get access to?</p> <p>Membership of MakeUK for example gives access to many things - wouldn't it be stronger if it was part of delivering the 10 year strategy?</p>	3	<ul style="list-style-type: none"> - How homogenous is the Midlands as a region? Does it have an identity? <p>From an industrial perspective, dominated by automotive and aerospace, both sectors badly damaged by the current situation. Also, both faced with the Greta challenge - I do not know what the outcome will be. I am not convinced by battery power - it is too expensive, too heavy and nowhere near enough range.</p> <p>The region is innovative but needs a new lease of life.</p> <ul style="list-style-type: none"> - What is the identity of the Midlands, and is this the identity we want in 5 years' time? Is the Midlands maximising its collective potential? <p>Good place to be, but industrially needs a transformation.</p> <p>Is government the solution? Not previously, the one activity that has been a real benefit has been the Grand Challenges - but because they were invented by another administration, the current powers want to eliminate them, not re-energise or improve them.</p>
5	What this needs is Leadership and pace. And targets. I am aware of a number of the orgs above and not aware of the German Mittelstand model, but the reputation of that region is unquestioned and they have created a pride that matters.		
6	<p>Engineering might be the easiest sector to promote if the UK culture recognised it like France and Germany and Asia does - make it cool. It is cool. Engineers make the world tick.</p> <p>To attract the best talent to the Midlands we have to make it an aspirational place to live. It is competing with the energy and bright lights of Manchester and Glasgow and London etc and the beauty of Yorkshire, the South Coast etc. A reality. In NA Charlotte has become a hub of innovation and start ups because it can easily attract the young brilliant talent to an aspirational. So inner cities and towns have to become world class and leisure and entertainment must be exceptional and promoted. This takes time. The airports need to be world class experiences and all travel.</p> <p>Apprentices are the future. And companies must have leadership and talent/skills development plans and any financial incentives and support from govt makes a difference if easy to access.</p> <p>Automation as with every development is only an opportunity - if an organisation becomes more efficient then it can compete better, win more and grow and create employment. Without it you will slowly die. We are behind Europe because we had access to cheap labour for too long and because companies, private and public want the return now - we are not long term thinkers.</p>	<ul style="list-style-type: none"> - Where do we want to be, what is our ambition for manufacturing and what opportunities do you see? <p>Efficiency, lightweighting, alternative power.</p> <p>Brexit damage on top of covid will get rid of most opportunities.</p> <ul style="list-style-type: none"> - How relevant/important do you think manufacturing is to the Midlands, a) now and b) in five years' time? <p>A) Critical B) hopefully still critical</p> <ul style="list-style-type: none"> - What impact has COVID-19 had on your organisation? How have you mitigated this impact and how will this change your organisation going forward? <p>50% turnover loss, so survival mode. 20% headcount reduction, stalling of projects, no spare resources to develop the business and take it forward. A global disaster, which is probably the only positive - every organisation globally is in the same mess.</p> <ul style="list-style-type: none"> - Academia. How do you work with/collaborate with business? What is your most active department? Which businesses are the most proactive and which sectors? How long would be an average research activity take? Are you more or less reliant on this type of funding? 	
7	<p>Top 2:</p> <ul style="list-style-type: none"> - incentivise companies/ people to buy British (Self help) - Create a Midlands Manufacturing Vision, Strategy, Targets and Plan and a task force that represents us in UK and Internationally - we need excitement. <p>Right now I need to implement talent development across my leadership and teams - to develop and retain the best people. I keep struggling to afford doing this - if a good incentive was made available then I would prioritise this to happen. We have arranged NMCL program which was put on hold due to COVID, but additional development would be great for leadership team.</p>	<p>Our R+D is heavily connected with various universities through project activity - some are very good, some are appalling, behaving high handedly and next to useless - I am concerned that a lot of University activity is not sustainable - Ponzi scheme comes to mind. I worry it</p>	
8	MakeUK are doing a great job and along with other leadership partners in the region (Eg WMG ...) can lead these initiative - government should empower the regions.		
1	George Wright		
2	-		

4	<p>How do we become world-class?</p> <p>Benchmarking, investment, long term partnerships to build investment cases</p> <ul style="list-style-type: none"> - How important do you think R&D is to Midlands Manufacturing? <p>Critical, but needs to be focussed and well managed. External support to meet R+D objectives critical</p> <ul style="list-style-type: none"> - What industries do you associate the Midlands with a) now b) do think will be the case in five years' time? How do we prepare for these 'new' industries? <p>5 years - alternative power, clean technology, reshoring</p> <ul style="list-style-type: none"> - What opportunities are there for our manufacturers to move to a mixed "servitised" model? - What does 'Flexible Manufacturing' mean to you? How would you encourage such a strategy? <p>Agile, design for manufacture, not hooking yourself to one process / market</p> <ul style="list-style-type: none"> - What infrastructure (physical, digital, connectivity) improvements do you think can be made? <p>Modern industrial space at an affordable cost, joined up thinking on training</p> <ul style="list-style-type: none"> - Do you believe a 5 or even 10-year strategic plan to build Manufacturing Resilience in the Midlands is achievable? <p>Not at the moment, because many sectors are in trouble and thinking is too short term. AND BREXIT</p> <ul style="list-style-type: none"> - What region should the Midlands compare/contrast itself with a) in the UK b) internationally? <p>The Midlands can be the high tech hub - Germany, Far East, China?</p> <ul style="list-style-type: none"> - Emerging Technologies. How would your organisation approach technologies such as AI etc.? What impact do you think the so-called 'Fourth Industrial Revolution' have on your organisation? Do you think you are in front of, or behind your competitors? How do you think you can improve this situation? <p><u>Our business struggles to automate. There are opportunities to improve the process and speed of design</u></p>
5	<p>What are the barriers to achieving our ambition and how can we remove those barriers?</p> <p>Habit of sourcing from the lowest cost location, despite IPR issues, shipping cost and emissions, vulnerability of supply chain.</p> <ul style="list-style-type: none"> - Reshoring, upskilling, process efficiency and investment, local partnerships. <p>- How constrained are we by our culture and behaviours, financing, innovation, lack of agility or other factors and how can we remove those constraints?</p> <p>Longer term planning, local ownership, reversing globalisation, more agility</p> <ul style="list-style-type: none"> - What do you think are the barriers to improving productivity? How do you think they will be overcome? <p>skills development, process development, public sector reform</p> <ul style="list-style-type: none"> - How do you think the Midlands can attract inward investment? <p>The govt lost that one when it allowed BREXIT.....</p> <ul style="list-style-type: none"> - Business support. How easy/difficult is it to find relevant support/information on topical issues eg standards, export procedures. What would be your usual 'go to' organisation, [government body]/Chamber of Commerce etc? Do you think there is an appetite for anything similar to the former Manufacturing Advisory Service? <p>Online info, trade associations, chambers.</p> <p>MAS would be good if it was accountable and not its own job preservation scheme.</p> <ul style="list-style-type: none"> - Are you familiar with a) the Made Smarter programme b) the LEP or c) the Growth Hub? How proactive have these organisations been to your organisation? Have you seen any particularly effective action that you would like to share <p>Not proactive and locally not looking at hitech manufacturing</p> <ul style="list-style-type: none"> - Access to Finance. How accessible are different types of finance? Where would your organisation usually go for finance, and what type? <p>The bank, Innovation funding, <u>Currently innovation funding is tight</u></p> <p>6</p> <p>What are the skills issues that are holding us back and how can we address those issues?</p> <p>Too many graduates, ordinary school leavers not encouraged to look at manufacturing</p> <ul style="list-style-type: none"> - How important are apprenticeships to the future of manufacturing? What more can be done to encourage more young people to apply? <p>In the current environment, if companies are in survival mode, apprenticeships are dead</p> <ul style="list-style-type: none"> - What more can we do to ensure lifelong learning and help experienced workers re-train/update? - How do you think we can attract the widest range from society to the sector and improve diversity? - How do you encourage engineering graduates to a) have a career in engineering b) stay in the Midlands c) move to the Midlands? <p>Decent prospects, stability, good management, interesting companies and products</p> <ul style="list-style-type: none"> - What impact do you think automation will have on employment in the region? Do you see automation as an opportunity or a threat? <p>Automation has to happen, but it needs good people to make it work</p> <p>*</p>

7	<p>How do you think we could improve manufacturing resilience in the Midlands? What would be your top two suggestions?</p> <p>BREXIT... Govt encouragement to think long term and sustainable.</p> <p>- What support does manufacturing need to navigate its way through the recovery? a) nationally b) in the Midlands? see above all points</p> <p>- What else do you think national/local government could be doing to support manufacturing in the Midlands eg a) investment in skills b) through the Treasury c) through BEIS d) other initiative</p> <p>Limit the effect of globalisation / internet on good business - The whole prospect of having an idea and commercialising it here at the moment with items made in the UK is almost impossible. New business must be global facing, but with supporting structures to nurture its future success.</p> <p>- What legislative change do you think would assist the sector most? Can you give an example?</p> <p>BREXIT DEAL</p> <p>- What would you like to see in the Budget, that would support manufacturing in the Midlands?</p> <p>BREXIT DEAL</p>
8	A supportive political environment that helps business success and new idea formation and commercialisation.
1	Fiona Norfolk
2	-
3	The Midlands is a region in its own right but it needs to strengthen its identity and have an image of more than just car manufacturing. Covid-19 has had a massive impact and we need to respond to this, as far as possible, as a collective. Manufacturing will continue to be very important to the Midlands and we need to adapt to the changing opportunities.
4	How do we become world-class? Training, education, resilience, automation. It starts at school. We need young people (including girls) to want to work in manufacturing. We want them to work as engineers and technicians, but we also want them to work as sales managers, programmers, planners and so on. It is the complete picture. We need people to see that manufacturing is an exciting place to work.
5	Manufacturing requires significant investment, it is not like services where you can have a virtual office, you need infrastructure and people on site. For decades our government has not seen further than London, which is dominated by the service industry.
6	Training programmes are still not where they need to be, but they have improved. Manufacturers are not all the same and training providers tend to offer a course. I would prefer to see more modular qualifications so we can pick and choose the relevant topics that make the qualification.
7	Schools - improve the image of manufacturing Make government see further than service industry in London.
8	0
1	Rex Baynton
2	-
3	I regard The Midlands as a discrete unit of the UK. Many people call it the Birmingham area, unfortunately. My perception is that there is a common view that our region is of declining importance and perhaps secondary to "The Northern Powerhouse." For these and similar reasons HS2 is of massive importance to the growth of wealth in our area. Regrettably I guess that this project is unaffordable following the huge drain on Government resources caused by our reaction to Coronavirus. This scourge has, counter-intuitively, led to a substantial boost to our turnover. I would like manufacturing throughout the UK to expand and look to re-shore production from the Far East. We do not do any research or have relationships with academia. We have developed our suppliers over years of trading and, by and large, we work well together. We only buy offshore when we can't buy a product in the UK. In the main, we regard the UK as "local." We have no infrastructure problems.
4	We are a small family group of businesses with turnover of about £7m. We have no influence over technological advances, trends and policy making. We have moved towards robotic control of production, where possible.

5	<p>Much of this is way beyond me.. We rely on others to consider these issues. We produce a quality product at the right price. If we weren't we would not be in business. We believe that much of our recent success is related to our responsiveness to customer need and our flexibility to be able to achieve this end.</p>
6	Good engineers are in short supply and any schemes, apprenticeship or otherwise, to create more would be very desirable
7	I think that manufacturers should be prepared to fight for their place in the world and not look for external help. If there were a way of levelling the playing field to stop unfair competition that would be good. Unfortunately the wealth creators, i.e. manufacturing, farming, fishing, mining and construction are parasitised by parts of the service sector, which is essential but increasingly expensive and can seemingly charge what they want
8	Corporation tax is obscene and should be abolished. especially for the wealth creators!
1	Sarah Middleton
2	-
3	<p>Manufacturers work wherever their customers and suppliers are, and what's best. However, due to constraints and complexities around logistics, fuel costs, travel times, geography of human networks and relationships, they do tend to cluster around regions/road networks. "The Midlands" as far as companies I speak to seems to exist in a broad radius around Birmingham, with edges around the M4 and the M62, Wales and Peterborough. This coincides with a cluster of manufacturing activity focused on auto, rail and aero. If there is an identify, it is around making things (and the services it supports) connected with those industries.</p> <p>Our ambition is for:</p> <ul style="list-style-type: none"> • Existing manufacturing businesses to greatly increase productivity through greater use of technology and better management and grow their customer base and sales (through diversification, exports, as well as growth within existing sectors) • For increases in efficiency to free up premises for more new manufacturing businesses, either indigenous or from inward investment • For those productive businesses to lead the way for excellence in working environments and conditions to attract and retain skilled labour • For that expanded sector to support a wider service economy in the local region
4	<p>Many businesses in the Black Country appear(ed) happy to be suppliers and producers of other people's IP. As a result, appetite and capacity to carry out R&D is limited. Capability may exist, especially around engineering know-how, but management skills (project management, change management, bid-writing, financial management) are often misaligned to the expectations of funders/project partners. Awareness of new technology is often low, but obscured by self-resilience of the sector created by robustness/inertia of supply chains, especially in aero and rail.</p> <p>There are plenty of examples of good practice, research centres and expertise that could support the sector. SMEs often claim to be aware of these so the issue is more around maximising the potential of interactions, rather than encouraging interactions in the first place. This is often down to mistrust and a reluctance to invest time and cash without guarantees of ROI.</p> <p>Servitization offers huge potential for mature manufacturing companies and as a way of alleviating the mismatch in expectations of skilled labour supply that may not be comfortable working in a factory environment. This shouldn't be at the expense of manufacturing, however.</p>
5	<p>Business growth is often hindered by a ceiling over owners' appetite for risk and complexity. Often, family-owned or owner/managed firms have a level of turnover at which they are comfortable, which matches their ability to control and manage, supports a comfortable lifestyle, provides employment for family etc. The drive to increase productivity is often limited to "keeping pace" with increases in gate fees, energy prices, customer demand etc. improvements are usually funded through reserves rather than external finance – fear and suspicion of debt is long-standing (some links to the Rover crisis and the 2009/10 financial crisis but it is most probably a cultural norm that will never shift). However, some indicators of younger owner/managers being more open to debt and equity as necessary to achieving their plans to keep abreast of competition and ride out technological changes.</p> <p>Often the above ceilings lead to their own proliferation of constraints: the absence of economies of scale, and a profusion of inefficiencies – lots of small, competing firms offering similar services rather than conglomerating to remove duplication and waste.</p>

6	<p>Lack of management expertise and qualifications. Mistrust around many owner/managed or family-owned firms of "management" as a discipline, and definitely of "management qualifications" leading to an isolationist self-reliance which is nowhere near as productive as it thinks it is.</p> <p>Poor performance within the leadership of these firms is often blamed on "young people" or "schools" or "apprenticeships". The sector has been complaining of a skills shortage for the last 20 years but still seems reluctant to take on staff and train them: business investment including training has been stagnant for a very long time.</p> <p>Greater partnership and collaboration between industry and schools to see education and training as an ongoing endeavour, rather than employers expecting school-leavers to finish education at 16 or 18 ready-formed and immediately able to start work, never needing to be trained ever again. Similarly, employers need to take responsibility for their working environments rather than expecting skilled labour to aspire to working in poor quality premises in hard to reach locations.</p> <p>Public sector has a role in creating partnerships of landowners, utilities, public transport providers and local authority and other stakeholders in improving environments, energy efficiency, access and other infrastructure needs that meet customer demands now and in the future.</p> <p>Automation is both a threat and an opportunity.</p> <p>On the one hand automation can drive productivity gains, which could maximise efficient use of land to accommodate more firms in the same amount of space, to improve environments, to improve working conditions and the attractiveness to skilled labour. However, there needs to be an alternative source of employment or a radical system of supporting attractive lifestyles – whether through UBI or communal resource such as subsidised housing, energy that reduces the need for wages in an area of sparse employment opportunities. These radical measures are difficult to raise in a conversation purely around manufacturing, and as a result are often ignored as "too difficult", and yet discussing alternative employment to automation and improvements in manufacturing productivity are essential to completing the jigsaw.</p>
7	<p>Drive from OEMs to reduce costs and improve quality down the supply chain (as a result of bail out deals?) – SMEs tend to listen to the OEMs.</p> <p>Infrastructure to remove carbon – business park improvements, local renewable energy projects, circular economy/industrial symbiosis projects to link waste with demand.</p> <p>Regional drive/campaign around supporting regional manufacturing aligning local procurement pledges of OEMs and public sector buyers (HS2, NHS, MOD etc) with demand-side measures (scrapage schemes, EV charging points, low interest loans).</p>
8	No further comment. Thank you
1	Chris Young
2	-
3	<p>As a business, the Midlands region is important in as far as it encourages manufacturing businesses by providing appropriate infrastructure and therefore makes operation cost-effective and provides potential suppliers and customers. However, we are part of a group with locations in UK and Europe so do not consider ourselves purely a "Midlands" business and do not see the identity or homogeneity as being particularly important.</p>
4	<p>Automotive sector is important for us - we would benefit from the development of a strong local EV supply chain. As a 2nd/3rd tier supplier, we have to be flexible but ultimately will only be successful if we are competitive against global benchmarks. We can invest in automation and other technology to mitigate against high labour costs, but for many products supply chain logistics are a major cost factor therefore encouraging OEM and Tier 1 manufacturers to invest in UK is important.</p> <p>South-West Germany is an obvious comparator.</p>
5	<p>Brexit is a potentially massive barrier; if it makes trade with EU too difficult we won't have the time to develop the local market to replace it and manufacturing businesses will fail.</p> <p>As a small business within a medium-sized group we fall outside almost all the business support schemes - there doesn't appear to be anything targeted at the £50-£100m groups which are still relatively small in global terms, but vital to employing people and investing in technology at a local level.</p> <p>There seem to be too many organisations competing in the same marketplace for trade associations / business support and so it's sometimes difficult to know where to go to.</p>
6	<p>For us, skills in mechatronics / automation are the biggest challenge. Lifelong learning is only relevant if the basic education grounding is good enough. High calibre graduates tend to be drawn to the "sexy" parts of engineering (e.g. F1, Space) or the big OEM's with large budgets, but the bulk of graduates are not interested in hands-on engineering. We need to be able to encourage more med-high calibre school leavers to join apprenticeship schemes rather than going to University, but I don't know how that can be achieved when all the pathways still seem to be geared to getting everyone with A-levels into University. The other problem is the standard of college-based engineering apprentice training is inconsistent and often inadequate, but SME's do not have the resource to do their own training.</p>

7	<p>1 and 2. A free trade agreement with the EU!</p> <p>I don't think this is a regional thing - it has to be national objectives. The recovery will be dependant on a recovery in demand, both local and global, rather than local support. The Gov't could stimulate some demand (e.g. car scrappage scheme).</p> <p>Continued high level of Annual Investment Allowances - potentially tiered to encourage investment by medium and large businesses.</p>
8	
1	Eugene Harkins
2	-
3	<p>NB; I am coming at this questionnaire "cold" not having participated in any session that may have spawned it.</p> <p>I approach this question with a number of questions. How much of the UK nation's wallet do UK Government want captured by UK manufactured goods and products? Where is there a disparity in respects of a UK demand for goods and products with them being satisfied by non-UK content? Where is the imbalance in GDP, i.e. dependence on imports of manufactured goods or products?</p> <p>Country of Origin is going to become more important as the UK looks to export post EU membership. Answers to the questions above alongside others are required to underpin a national manufacturing strategy, which needs to be supported by Government.</p>
4	<p>I want to see the UK manufacture goods and products that are sufficiently advanced to satisfy domestic demand and compete internationally. The UK has car manufacturing, but what is the UK content in the cars that it assembles in the UK and overall, how much of the UK's expenditure on vehicles satisfied by UK manufacture? I want to see this demand fulfilled with greater UK content, with a Government Industrial Strategy set out to see this achieved.</p>
5	<p>I believe numerous. Governments look for flagship initiatives and overlook the fundamentals that need to be in place and available for manufacturing businesses to be sustainable and successful. Parity of cost base for utilities, labour, taxes, etc. compared to competitor nations. Requires a wider conversation and difficult to capture in a cohesive response here.</p>
6	<p>People dedicate their effort where they feel recognised and rewarded, which are not necessarily just financial. It why I put so much emphasis on Government; what do they do to encourage and support sustainable and long-term manufacturing? Is it enough? Is there greater job security in manufacturing compared to other sectors and disciplines?</p>
7	I have insufficient time to complete at this time.
8	I have insufficient time available to complete at this time.
1	Kevin Oakes
2	-
3	<p>I don't consider the Midlands to be homogenous - I attended the launch of Midlands Engine and made the point at that meeting that the majority of attendees referred to Birmingham as The Midlands. In my opinion little has changed.</p> <p>One thing the Midlands does have in common is the history, heritage and current excellence of manufacturing and it is this that unifies. I believe that we need to re-brand Midlands Engine - Northern Powerhouse is less specific and has a stronger identity. In short we are not maximising our potential.</p> <p>Manufacturing is incredibly important for both the region and the nation but it needs the support of coherent and consistent Government policy at all levels.</p> <p>The variety and capability of manufacturing is incredible but it needs to be embraced and fully supported.</p> <p>COVID-19 has had a devastating affect upon demand particularly from the largest and fastest growing part of our business, the hospitality industry. As a result the company is being forced to significantly reduce the workforce.</p> <p>The supply chain is fragile essentially because of the significant decline in the industry. If we can increase manufacturing the supply base will follow.</p>
4	<p>Investment in every respect of world class - people, education & training, research & development, Universities, Institutions but as investment is going to be clearly limited it requires a well researched and coherent strategy in order to focus upon key priorities. This strategy needs consistency and not the knee jerk reactions witnessed in previous years.</p> <p>Emerging technologies need to be at the forefront in that the UK leads and doesn't follow but the adaptation of technology in small and often struggling companies, such as mine would be welcome. We are fighting to protect yet another historic brand, factory and skills base from disappearing but its certainly not easy. In France our equivalent is subsidised by the French Government which wants to preserve its history - not so the UK. The British Government has shown little interest and appears to content to support overseas production. In order for the Midlands to refer to its history, heritage and longevity we need to maintain it and not simply in the form of Museums.</p>

5	<p>The lack of long term finance is a major issue as discussed during the roundtable. We need a long term strategy and success stories in support of it. Germany and the Mittelstand provide an excellent example of what we should be striving for. All of the key stakeholders, including Government, appear to be working together. "The German SME Strategy" provides a comprehensive approach that should be considered.</p> <p>I sat on a LEP board for six years - it would be a sweeping generalisation to say that this model isn't working, not least given the relative performances of LEP's but I have yet to meet anyone in the private sector who is convinced that this is the ideal format to deliver local economic transformation and growth. We need a root and branch review.</p> <p>It's incredibly difficult for an SME to navigate the opportunities for support not least given demands within the business.</p>	5	<p>More joining up with Academia and smaller businesses that offer a commercial product at the end of the R&D project, Yes familiar with MADE SMARTER</p> <p>Mittelstand model: fully in support of this being an SME that turns over £13m and employs 120. Family owned.</p> <p>Paying a levy should be based on actual ROI from being a member at the end of every 12 months with maximum and minimum contribution outlined in advance.</p> <p>SME bases can be more agile if navigation is clearer with both academia, access to funding is worth the time investing in the paperwork and bureaucracy.</p> <p>I think it depends how exactly we choose to define "productivity" in this sense,</p>
6	As discussed in the roundtable.	6	<p>Employers have had long enough to consider and implement plans to grow their own workforce, especially with the RoTAP scheme made possible in the recent 24 months.</p> <p>Manufacturing for diverse groups is, I believe, now becoming more of an attractive and accessible option for a career. If we focus more on the additive side of the sector and digital this would in turn perhaps attract a workforce that is earlier in career. With the post covid workforce remodelling that has happened/happening currently, I believe that the Midlands, or certain pockets of it, will become a more attractive option for people who no longer have a fascination with living in the South (I am an ex Southerner..!) As ridiculous as it may seem, and as much as I do not agree with the principle of my proposed suggestion, attracting younger people very often involves some sort of "celebrity" endorsement, I cannot help but think perhaps there is an avenue to recognise some of the champions of the midlands - not so much the heritage Bournville Brothers etc but more of a modern feel:</p> <p>https://www.birminghammail.co.uk/news/midlands-news/birmingham-famous-people-midlands-celebrities-6771600</p> <p>Automation question, already answered above.</p>
7	<p>1. A comprehensive, coherent and long term strategy from Government providing the framework for manufacturing to flourish.</p> <p>2. Change the perception of all stakeholders - "Made in the Midlands" - needs re-branding to reflect quality, innovation, reliability, service generating Desire, Pride, Understanding of what it means to make, own a product made here in the heart of our country and economy.</p> <p>I would like to see far greater support and incentives for investment - create an environment where larger organisations (including Catapults, Universities etc.) can assist smaller firms and take rewards over the longer term.</p> <p>Traditional manufacturing needs long term investment therefore provide the necessary incentives to facilitate this.</p>	7	<p>I have recently been part of the DRAMA project with the MTC which was a catalyst for our business to invest £100k+ during Covid in a new 3D additive machine within our factory. The DRAMA project has so far been exceptionally helpful.</p> <p>There needs however to be more localised R&D centres for automation linked to business and academia, not just academia. If businesses were more involved then manufacturing potentials of new ideas, designs would be recognised and implemented more quickly. Especially in the Midlands as we have the transport links.</p> <p>Large regional R&D hubs that are partnered with huge Primes and leading academia are fine: but they are cumbersome often to navigate, although brilliant in terms of support longer term. Working mainly with academia for R&D does not always deliver. The potential for funding, in addition to the TOWNSHIP funding would really help an area such as Mansfield get on the map for Additive and Digital.</p>
8	<p>Engage with trade bodies in order to gain a broader perspective</p> <p>Retro fit firms with low cost but potentially transformative technology</p> <p>Enable learning via digital communication</p> <p>Awards and recognition - Made in Britain / Midlands - lets celebrate great products made here in the UK and not those imported and sold as British. It's a national disgrace!</p> <p>UK is a leading Green Economy (& therefore more expensive to manufacture here) and carbon emissions are a global problem - highlight, reward and celebrate products produced in the UK as opposed to importing lower cost goods.</p> <p>As above - Minimum wage and Modern Slavery.</p>	8	<p>Apologies time poor to complete this.</p> <p>Thank you for the opportunity to complete the survey.</p>
1	Samantha Handley		
2	-		
3	<p>How homogenous is the Midlands as a region? Does it have an identity?</p> <p>YES. Split almost 50/50 between opportunistic commercially thriving and areas that are featured heavily in Levelling up/ Cities outlook reports for negative rankings.</p> <p>- What is the identity of the Midlands, and is this the identity we want in 5 years' time? Is the Midlands maximising its collective potential?</p> <p>It would appear to be split East and West, with the Heart of the Midlands being perceived to be in the West perhaps from a manufacturing perspective. This may be a perception based on Automotive but also perhaps the lack of any smaller / more localised R&D manufacturing centres/ hubs such as the AMRC (but smaller) in East Midlands.</p> <p>- Where do we want to be, what is our ambition for manufacturing and what opportunities do you see? Additive needs to be led by the Midlands - the number of jobs that will be lost to automation in the midlands is eventually enormous therefore education, research and workforce planning to optimise the humanistic benefits of automation and additive are crucial here.</p> <p>- How relevant/important do you think manufacturing is to the Midlands, a) now and b) in five years' time? 10/10 for both.</p> <p>- What impact has COVID-19 had on your organisation? How have you mitigated this impact and how will this change your organisation going forward? More agile.</p> <p>- Academia. How do you work with/collaborate with business? What is your most active department? Which businesses are the most proactive and which sectors? How long would be an average research activity take? Are you more or less reliant on this type of funding? KTP projects and RoTAP. We have also been part of the DRAMA project with the MAA and Midlands Technology Centre to help us prepare for additive.</p> <p>- Supply Chains. How efficient are your supply chains? Do you have any "buy local" procurement policies? How do you support your supply chains in terms of training? How would you describe your relationship with your suppliers? How do you think this could be improved? Less interference from our Primes would give us more autonomy in this area. We are heavy MTO in defence, oil and gas, aero therefore many special processes and materials are already predetermined for direct supply and the chains associated.</p> <p>- How well are you supported by local infrastructure a) physical and b) digital.</p> <p>I am currently working on working groups locally to improve this, including the Mansfield and Ashfield Automation and Robotics collaboration with business and Academia.</p>		
4	Please see above, I am hopeful these questions have been partly answered.		

Appendix 12

Colleague Responses to M2R Commission

MTC

Alec Maxfield

Hi all,

I still feel strongly about the positioning of quality within organisations. Typically, the quality culture of manufacturing organisations is more developed than in service delivery organisations. However, very few have set quality objectives in the proper sense - certainly not beyond scrap, rework and warranty costs.

My view is that this is because of misconceptions about quality and having a narrow view of what quality means. Quality is not about inspection and clipboard carrying. Quality is the realisation of a business' planned outcomes at the strategic level. It's nothing less than that. And for as long as misconceptions about what quality is exist then it will only ever be a reactive tool for midlands manufacturing. Quality is a top-tier force for success when it is positioned in the boardroom. Quality is about the triple bottom line - people, profits and planet. I have seen many times that organisations are very internally focussed, obsessive about their own internal requirements without ever appreciating that every person in the business is truly customer facing. If Midlands manufacturing wants to be more resilient it must include the strategic view of quality into its organisations at the top level. Very often quality of outcome is assumed in financial forecasting and quality professionals need to be positioned to plan for these.

Matt Rayment

Response to M2R - AgriFood and Distribution Response

The Midlands is a key hub for food import and distribution to the UK, primary (growing) as well as secondary production (value-added - sandwiches, salads etc.) with a significant level of exports to Ireland as well as to the EU. The midlands is ideally placed to lead the design and development of technology-driven solutions for food production and distribution centres that have an established presence as well as brand-new facilities seeking to adopt new approaches in the region (HelloFresh in Nuneaton, TSL Development Centre). We should consider a focus on technology to assist production, systems that both enable post Covid-19 sustainability as well as social distancing needed. Systems that can handle the migrant labour cap as well as impacts of Brexit. We should consider the supply chain, connectivity and large distribution facilities in the region who are also reliant on high levels of staffing and low-cost labour. We should also consider the impacts of vertical farming for salads and protein, as well as the upcoming impact of hydrogen. We have a strong network of collaborative and supporting Universities, commercial businesses of all sizes (SME to Blue-Chip) as well as technology providers who would be keen to support a programme addressing this challenge.

N.B. It is my recommendation we steer away from the science side of the sector since this is both a contentious and congested space - I can offer further clarification on this matter.

I hope you are able to consider my input,

Matt

Nick Brierley

Dear M2R Commission,

In response to your request for input, here are some suggestions.

I would posit that resilience, and the ability to take risks to innovate, is strongly based on the supporting framework provided by state and society. In that sense the pandemic furlough scheme is a missed opportunity - with the long-term German Kurzarbeit scheme offering a better blueprint for what is needed, providing a much improved ability to "bounce back." In the longer term such schemes however should simply be embedded in the social security system through a universal basic income, minimising administration costs and eliminating any "benefits trap" whilst facilitating immense resilience and flexibility, simultaneously giving innovators the confidence to pursue start-up ideas. Of course, such schemes need to be funded (above and beyond savings made through scrapping other benefits): a land value tax that is impossible to dodge and simultaneously encourages efficient land usage whilst tackling stifling inequality would seem to be the best solution. A robust system of regulations, rigorously enforced, would also appear to be key for ensuring that small, new companies are not squashed by the anti-competitive behaviours of marketplace giants and hostile practices of financial institutions (there has been no shortage of scandals). An active industrial policy that supports home-grown successes in face of predation would be desirable (current example: ARM). Transparent tender processes, with independent oversight, at all levels of government would surely also help to give companies of all sizes a chance (and avoid recent fiascos that only undermine trust in meritocracy). Similarly, but more technically, a move towards open standards for system control and data exchange would reduce barriers to swapping in new hardware / software and breakdown technical monopolies, so should be encouraged and supported.

Whilst there are numerous other suggestions I could offer, I suspect that is enough for now and hope it provides some useful food for thought.

Charlie Foster

Dear Commission

Here are my quick thoughts on some issues and potential solutions that may help support the many Innovation Start ups and SMEs we have in the region.

This is based on my +20 years of experience in manufacturing supply chain.

Issue 1

Start ups are often disadvantaged by lack of track record to gain a foot hold in their market place, to gain their first orders.

Their needs to be more, 'low barrier' innovation/R&D procurement award mechanisms for these types of business.

Potential Solution - Low bar public procurement mechanisms to projects/product spend up to say £200k would allow innovative start ups their all important first order as a showcase to further orders and allow them to establish a financial track record. Perhaps a % target spend for each public procurement area might help?

Issue 2

In the public procurement process stop the practise of 'fishing'. This is when the public body engages with a start up/SME and 'plays them along' with potential large scale future orders. They then gather the information they need and let their own in-house resources/established lower risk supply chain implement and win the order. Comments that pubic procurement such as a local Authorities and WMCA are a 'nightmare to deal with' and 'unethical' that they 'change the goal posts' and then 'refuse to sanction payment' have been voiced to me by numerous organisations in private. Although hearsay, it is disappointing that the public sector has this reputation a sit should be supporting where possible these types of businesses.

Potential Solution - For micro/SME business establish a public procurement process, that allows for rapidly paid, small scale consultancy payments, when involve in collaborative discussions, would greatly help the

cash flow of these start ups. How exactly this is interacted needs some detailed thought, perhaps MTC and WMG could facilitate this fund.

Issue 3

Start ups lack rounded experienced management resources to grow.

Potential Solution - A secondment scheme for larger firms to assist SMEs in middle/senior management roles. This could be perhaps 6-12 months in duration and paid for through the apprentice levee. This would help the start up, help the secondee develop further in a fast moving environment and help the secondees firm get back a manager with a greater wealth of leadership and business experience. In HM Forces mid ranking careers officer used to be seconded out to large OEMs for development perhaps this scheme could be extended to the SME manufacturing sector?

Issue 4

Training and skills is a major issue in growing successful start ups. The traditional FE and HE sector struggle to provide candidates that can hit the ground running and make an immediate impact with these firms.

Potential Solution- Innovative proven Training schemes such as Digisheds (<https://www.tinmartsocial.com/>) could be expanded into the manufacturing sector to upskill and reskill local people for these specific roles financed potentially by the apprenticeship levee.

Issue 5

Inability to attract young people to manufacturing careers. 'You have to see it to be it.'

It appears after touring local sixth forms in Coventry for my daughter that the only options suggested appeared to be A-Levels and then Universities. When I tentatively asked about MTC and apprenticeships they were not visible at all as options and certainly had not made an impact with my 14 year old and 16 year old children. As an ex-Imagineering Ambassador, the importance of getting exposure to different career choices and paths and being able to touch and feel through work experience appeared to be lacking. This maybe an area that the commission could look at improving locally. It appears that the schools may

potentially have a conflict of interest, as they want to keep their best students to enhance their A-Level stream.

Potential Solution - Reinvest in the youth career service for manufacturing and establish strong meaningful work placements with Midlands local manufacturers.

Tim Greenway

Hi Clive,

Reference the M2R document sent out earlier today.

It has the potential to be a valuable initiative at a time of some distress for many businesses. I'd like to get involved where I can.

There are a lot of diverse questions in your document, I counted eight main topics:

- How to improve resilience?
- How to be more innovative?
- How to be more productive?
- How to adopt emerging technologies?
- How to support SME's?
- Market analysis for SME's?
- Vision for the MTC (& WMG)?
- Barriers for the MTC (& WMG)?

How to tackle these will require a differentiated approach, since the needs are diverse and some contradict.

My humble response to these. I've underlined the salient points, and included a few hyperlinks:-

Resilience

A resilient ecosystem is a diverse one, and not a mono-culture dominated by a single plant, to use a biological metaphor. If anything happens to that plant you've got a wasteland which importantly, is hard to recover. The same applies here I believe.

I would like to see a diverse Midlands, avoiding reliance on a single sector (eg. Automotive). The Midlands used to be the 'workshop of the world', but has become a very focussed supply chain for a very narrow range of major companies such as JLR. Very efficient I'm sure, but if anything happens to that sector, a lot of smaller companies are affected. Crucially, many have lost the skills/capabilities to adapt to new challenges, but the bigger issue is there isn't the breadth of the supply chain (number of Engineering companies) to call upon locally, to foster interaction and hence innovation.

How to achieve this? We can't just magic up companies without immediate demand for their services. I'd give a big encouragement to small engineers, education, hobby/DIY engineers, in the same way that amateur football clubs are recognised as the longterm the lifeblood of the Football League.

Innovation

What is innovation if not problem solving? As in the Pixar film 'Robots' – "see a need, fill a need." The trick is to see the need, the right need. That requires creative and imaginative people with laser focus on what that need is, rather than getting distracted on something 'interesting'. They shouldn't need guidance, such as Technical Governance, but ownership of the problem and the consequences of that problem – with that, they can guide themselves far better than a relative outsider.

In the context of the Midlands Manufacturing Commission, can we not set up professional (and why not amateur?) 'Maker Faire's' locally? I hear Maker Faire UK is struggling to survive – surely as the MTC, we have a key role to promote these type of activities?

Once again, taking a 5-10 timescale, to encourage innovation, I'd be actively looking to promote the new generation, DIY Engineers as the lifeblood of the industry.

Maybe the MTC/WMG are the modern Maker-Faire's, but we've got to be a lot more agile, flexible, quick, etc. I'd turn the MTC into a facilitated 'play area' and get more industry professionals on-site to do the work (using the facilities available), rather than trying to run it as a fully staffed consultancy.

Productive (productivity?)

What does this mean? Are we talking being more efficient in mass-manufacture? More creative? Fewer people? Better design? Lots of interpretations and hence lots of possible answers.

Adopting emerging technologies

We need to look outside and see what those technologies are. I don't see many (ok, some) outward facing workshops in the MTC, where others present to the MTC rather than us to them. I don't see a patent officer (to hunt for new innovations). I don't see

many trade journals on site. Sadly many of the major industrial exhibitions are outside the UK (NEC) these days - so government funding to attend?

We've got to be realistic on what we can achieve in terms of adopting technologies - major multinationals will spend many times the MTC budget on a single aspect of a technology - we can only skim the surface so need to focus on the areas where we can deliver value. A good example is the electric motor project in MTC - we're not going to be experts in 'electric motors' anytime soon - I suspect no one is. But we might get good at a particular element of them - the problem is these products are (already) becoming so specialist that we may not know the area where we can be most effective, without the close guidance from those specialists.

Support for SME's

The MTC PMI team seem to do a decent job here. I don't know what WMG have as an equivalent. My only concern is the apparent discrepancy between the major equipment in the MTC workshops (to support Aero and other sectors) and the equipment that is more accessible to smaller companies to use or potentially lease/buy.

To me, it's about creating a culture where SME's can work together, on their terms, communicate directly between each other. Maybe a government supported online network, a bit like the Maker Faire forum?

We need to think about how to support those SME's now we're in a remote/virtual world - just as staff are working offsite, getting SME's onsite at the MTC (or WMG) is a physical disincentive.

My old company used to publish a trade journal, except they did it discreetly and didn't tell anyone who was sponsoring it - they quietly used it to collate all sorts of industry knowledge! But ultimately it supported the whole industry they worked in.

Market analysis for SME's

Is there an SME specific roundtable? I suspect they are best placed to explain what kind of market analyses they need, for the MTC and WMG to support as appropriate. I'm mindful that the mindset of the MTC/WMG is VERY different to a startup SME - they need to be talking the same language.

Banks and financial institutions/investors are pretty good at analysing markets - are they involved?
Can they be?

Vision for the MTC (and WMG)

I've worked in both institutions, for that is what they are - they both have strong cultures in different ways and both can, in principle, be a good melting pot for ideas. This needs to continue.

My vision is for two 'divisions' in the MTC (similar for the WMG, plus their undergraduate work):

Inward facing division, led by MTC staff similar to what we have today.

The other division would be as a 'facility' for companies to come and use, factory space, access to machinery, conceiving areas, meeting rooms, test facilities etc. - staffed by industry people, plus a very limited skeleton of MTC staff to act as facilitators, ensure H&S etc.

Put the two in 'competition' to drive each other to produce results (clearly not a simple challenge in itself).

Study places like Nottingham Hackspace and try to emulate them, maybe not the physical environment, but the culture and mindset of 'shed engineering'. The grassroots of new ideas?

Reach out to, and engage with, voluntary groups in Engineering, such as Remap. Again, they've created solutions which have gone on to spawn a whole range of new business startups in the healthcare sector.

We live in a globalised world. Most businesses are multinational in their nature and can/will transfer production around the world as needed. My old company (TRW, was Lucas, now ZF) moved not only production, but design and research around the world. So much innovation is now done outside the UK, a lot in Asia. Hence another vision for the MTC is to pro-actively, and more aggressively pull in those innovations from outside the UK and share them with businesses locally. That may involve sending Engineers out to selected trade events, or conferences, or arranging secondments to partner research organisations around the world.

Invest where necessary in innovative products to understand how they work - buy a Tesla and tear it down to understand how it was made?

Barriers for the MTC (and WMG)

Despite aspirations to be 'part of industry', both organisations have an academic culture at heart, signified in part by 'Technical Governance' which echo's the Tutor/student relationship at University.

The project management structure (in the MTC at least, I'm less familiar with that at WMG) actively discourages innovation by forcing people to plan ahead their hours. Can innovation be planned in this manner?

The MTC (and WMG) are both 'flagship' organisations, with very comfortable surroundings. Of course, it's part of the marketing the business and very understandable. But to quote the 'Yes Prime Minister' series on TV, one danger is that "Ministers get taken in by their own speeches". Whilst cleanliness is of course vital, the luxury of the environment is at odds with some of the audience the business is trying to engage with. We need to keep the buildings clean for sure, but we need to take active measures to keep our staff 'in the real world'.

The MTC (and WMG?) appear very hostile to 'processes'. They are considered to be restrictive, not agile, bureaucratic, slow. Its ironic that these are increasingly the words I've heard being used to describe the MTC! In all the successful companies I've worked for, they are highly process driven, but the processes are electronic, not manual, and in practice are largely transparent to the user. Done well, they free Engineers to do the creative stuff they're paid for, unencumbered by the bureaucracy.

It's links with highly regulated and security conscious organisations such as Defence. These companies understandably have a conservative approach in several respects - they are in any case large, traditional organisations closely linked to government. A risk is their conservative mindset is transferred to the MTC, compromising the agile and responsive approaches we need to deliver. For instance, cloud computing is rapidly growing, and major companies such as Toyota are using it more and more. It is a key driver for the IoT and Industry 4.0. However the MTC appears hand-tied by its

links to Defence. Does the MTC need to split off the Defence/Aero side of the business, simply to allow other areas to adopt (or at least evaluate) these newer technologies?

The business is another barrier. Company culture, in most businesses, carries a lot of inertia and is very slow to change. Maybe the MTC needs to focus on its strengths and spin off another business (division?) which can be more agile and responsive, where this is appropriate?

I appreciate and apologise for this being a bit of a ramble, and I need to get back to the day job, but I'd like to continue to be actively involved with this if I can.

Karol Pawlowski

Dear Sir/Madam,

Please find some ideas regarding the resilience of manufacturing from business systems point of view.

One of the fundamental thing hindering operational efficiency is lack of business systems implemented. Mostly its regarding ERP/MRP/MES/MOM. Companies are struggling to maintain their efficiency by growing self-created tools to support data management. The implementation of new business system is extremely difficult, time consuming and expensive. Can we do something to encourage and help SMEs to start this journey? When SME is managing their data correctly then they are ready to adopt more advanced technologies which in most of the cases are strongly connected to data management. SME need that foundation for future development and they need to unleash the hidden potential in their organisation now utilised in cumbersome manual tasks.

Another aspect of that is the proper selection of ideal tool and lack of knowledge about what is actually needed. MTC provides a down selection and discovery processes and this proves that it can bring a huge benefits to the organisation.

Andy Norwood and Product Manufacturing Incubator Team

Hi,

I work as a Technical Specialist / Business Development Manager in the MTC's Product Manufacturing Incubator that was set up to support businesses and bring ideas to market. This unique technology and manufacturing incubation centre provides up-and-coming entrepreneurs, start-ups and businesses with the expertise, tools and space to develop their product in a de-risked environment.

Here are our teams thoughts in regards to the Midlands Manufacturing Resilience Commission questions:

Ideas for our region:

Critical to enable automotive industry suppliers and OEM's to diversify to produce goods for other sectors as car ownership decreases (increase in use of shared transport systems, reduction in commuting etc).

MTC's Product Manufacturing Incubator could support by identifying start-ups or SMEs with relevant needs and matching them to potential suppliers - see virtual supplier network comments below.

Ideas for our manufacturing sector:

Cross pollination of ideas between industries is critical to creating an agile and responsive manufacturing sector in the region, forums, working groups and events that facilitate this will be welcome.

How we can become more 'resilient' and reach our potential:

- Joined up relationships
- Less competitive more collaborative relationships
- Forums for engagement and support
- How can we be more innovative or productive:
- FastTrack university spin out products
- Define market trends and determine future needs
- Utilise new manufacturing processes and

materials

- Virtual supplier network and engagement

Support supplier engagement - creating RFQs, supporting visits to suppliers to offer support to SMEs, host supplier assessment days? Identify suppliers who could diversify to produce or assemble the required products or components.

How can we better adopt the emerging technologies:

- FastTrack university spin outs and technologies

What support does a start-up company need or for that matter, an SME, to grow:

- Development support
- Technical support
- Design and development support etc.
- Manufacturing support
- It is very challenging to move to a working prototype and get investment to manufacture in volume (we see this a lot)
- Patent and IP lawyers
- How to make this cheaper and easier
- Funding
- An understanding of what funding is available
- Flexible approach to applying reach funding for SME and start-ups / entrepreneurs
- Support emerging technologies and products
- Don't limit the amount of reach per year
- Funding groups, and investors,
- low interest loans
- Knowledge for crowed funding/Kick start
- Bid writing support
- LEPS
- Discretionary fund

What are the market failures hindering our SMEs:

- An over-reliance on aesthetically pleasing CAD renders rather than early prototyping and development of physical, working models.
- Understanding market trends
- SME and start-ups not understanding what is involved or the cost of developing an idea
- The value of MTC's Product Manufacturing Incubator Discovery Workshops, we define the requirements, resource and pathway

What is your vision for our identity entity in the next 5 to 10 years and what are the barriers to achieving that vision:

- The "Trusted Advisors" to product-based start-ups and SMEs across the Midlands and beyond,
- Offering high quality advice, services and support to enable the best possible chance of a new product being manufactured in the Midlands/UK and successfully brought to market.
- This vision can be delivered using a combination of our in-house expertise and our connections with specialists across wider industry.

Linus Fon

Quality 4.0 Concept: (Total Productive Quality)

Quality 4.0 is an industrial transformational, coordinated quality approach that leverages technology and integrate them with traditional Quality. This integration, creates significant improvement in industrial operations and performance. Insights from quality information and data capture, through manufacturing execution system (MES) or asset performance management (APM), have significant effect on revenue and profit margin.

Traditionally, quality usually operates in silo. This often brings challenges in understanding business approach and understanding of Quality. Most QMS often sit as a standalone entity, not fully integrated with other ERP and management systems. Reasons why Quality is often looked as additional cost. As such, funding for many Quality Technology initiatives are often late or not prioritised. This, accounts for document-centric and low-veracity of quality data. Therefore, In order to get more value from Quality, it will require system integration and quality to be designed and/or factored into projects. This can be archived through the development of Quality 4.0 concept (Integration of traditional quality with Technology).

In every industry and organisations, much attention has been given to HSE by senior management and employees, influenced by government legislation or regulations. Little is being done to govern and/or regulate quality. As such, Quality if often looked as the responsibility of the Quality manager or Quality Department. Therefore, creating a culture where everyone sees quality as a collective responsibility, empowering them to take responsibility and action in the event of any variation, will trigger their commitment to quality.

Development of Quality 4.0 Concept (Total Productive Quality), will address current manufacturing quality challenges, from: conception, design, procurement, assembly, commissioning, installations, performance management, after market and end of life.

Colleague Responses to M2R Commission

WMG

David Greenwood - Professor, Advanced Propulsion Systems

Whatever we do here will need to link well to Manufacturing Made Smarter - and I think we could argue strongly for the Catapults to be the portal to this for manufacturing companies

We need to see a better structured offering for companies of different sizes and TRLs - with high intervention rates and small projects for smaller, earlier stage companies, and larger, more structured (and less publicly funded) programmes for larger companies

Embedding net zero thinking (and simple toolsets to support it) will be a challenge but a necessary one

And digitalising the workplace and the supply chain remains an uphill struggle in the UK outside of the largest companies

Engagement of private and venture capital funding needs to improve in both volume and quality

And core issues of energy costs, trade tariffs, logistics costs and skills need addressing at sectoral level and/or national level.

LEPS aren't working as well as RDAs. Too many of them with too poor a joined up view of supply chains across broader regions, Also too little money for them to make a difference.

Jay Bal - Professor - International Institute of product and Service Innovation

Move from supply/capability support to demand led support. Lord Bhattercharrya always said "Resources will follow demand" - create a start-up culture and support environment. This is not funding but creating areas that are hip, and stimulating to be in!

To create the demand, create an online community that reflects the capability (aggregated) of midlands manufacturing. Actively promote it to the world. Actively generate and feed opportunities to them.

Both start-ups and existing zombie businesses need the same support. Creating better "product - market fit". We have a business transformation methodology that helps businesses achieve this. A measure of how poor a companies product market fit is the effort they have to make to make a sale. Perfect product market fit means customers are throwing their cash at you.

Market failure is just a consequence of poor "product market fit" or "business - market fit" - the inability to scale up the business to market demands.

Create and promote a global identity - Dynamic, Innovative engineering businesses, focusing on agile development and production of new products and services, fed by ideas from Midlands education partners. Taking in ideas from our students from all around the world.

A unit to study societal trends to inform midlands business of where the market will be. The most important success factor for a business is to be in a growing market. To identify the teen products, the skills required to make them and who in the midlands has the closest skills match to the growing need.

Barriers. Too many established/entrenched business support partners. Suck away resources doing what we have done for many tens of years before. No room for new thinking. We need a crisis before current ecosystems are challenged sufficiently.

A unified vision of the what the West Midlands Business Cluster will be in the next 10 years. "we will convert ideas to products for the world?"

Xiao Ma - Associate Professor - International Institute of product and Service Innovation

How can we be more innovative or productive?

Macro level: we need to scan the horizon of new trend, new demand, new opportunities to assess their advantages and barriers considering political, economic, societal, technological, environmental and legal aspects. Essentially, define blue ocean for companies to work on, and lead them to avoid red ocean.

Meso level: how do we identify capability gaps to form key business clusters to form new supply networks to address opportunities defined above. This requires a good due-diligence (DD) on manufacturing businesses. However, from our line of work, too many manufacturers have lost their touch on DD, have got too far away from users, key points on the value chain and from investment opportunities. We need benchmarking-led due-diligence of businesses, form business clustering, attract demand-led investment, etc.

Micro level: innovation and productivities are delivered by people, more specifically, innovators and leaders. How do we better equip innovators and leaders? Here in wmg, we are piloting new forms of education and training programme that make leaders to make better decision when innovate, considering their macro, meso and micro aspects.

How can we better adopt the emerging technologies?

Wrong questions. This should start with WHY? Why should we adopt an emerging technology? We've seen too many technology push failures. We should be asking what demand side opportunities we are addressing, and identify the technology which could suit the development in short and long terms. Then decide how!

What support does a start-up company need or for that matter, an SME, to grow?

Jay's got the key point - product -market fit. Extending that a bit.

Start-up: support should be around help founding

team to identify gaps in their key capabilities, to bring a market viable solution to the end customers. Software companies do this all the time, but few engineering firms do that. we need to change founding teams' mentality to be more market driven! Even with some market leading firms in manufacturing, we found the management team isn't demand driven. We are designing a gateway programme to help to switch.

Established SME: existing support are mainly around better their production and solve tech challenges. New support should be around how to better the product value proposition to improve their competitive advantages. interestingly, this doesn't necessarily from technical advancement. This is not about NPD, but identifying higher-margin market (other sectors or countries). Again, as suite of methods needed here.

Fast scaling ones: international benchmarking and addressing industry gaps. There is some early work done by MXStart, and could be optimised to help fast scaling businesses to better scale up. Here we have a strong need to understand the global landscape across major economies. Support should be around help with competitor analysis globally, and predicting the speed and trajectory of "red ocean" development, so as to keep business thriving in the long run.

What are the market failures hindering our SMEs?

Can't ride the wave anymore: Demand was raising when the businesses was first established. But it has changed

Falling into zombie status: Market has gone to red ocean. They can only reduce prices & cut price. Too little room for innovation.

Have managers not leaders: Many businesses see the above, but have no clue on the direction of transformation, and no idea how to do so

Don't speak today's money. This is a major failure for many SMEs we've seen. Innovative manufacturers thinks and act like an Internet company these days. They are in close contact with the end user, key stakeholders and investors all the time. They understand that today's markets are interconnected among sectors and across counties. They understand that "tractions" of manufacturing businesses are not

just no. of unit made. That is why company like Tesla beat Toyota in valuation, despite the no of cars made were in huge differences. That's why company like DJI can dominate consumer drone market before they even got mass production capability. This is why a ride share platform is defining new taxi specification rather than their manufacturing contractor who has a long pedigree of making cars (sorry can't disclose names due to confidentiality). Manufacturing companies needs a new generation of leaders who can speak today's money and understand how to embrace various of markets and stakeholders.

What is your vision for our identity entity in the next 5 to 10 years and what are the barriers to achieving that vision?

Change from "Made in the Midlands" to "created in the Midlands"; get sector leaders to start "unifying" the supply and value chain. We've seen commoditised manufacturing moving away, and more and more major economies moving towards high value-added manufacturing. Leading companies are now piloting and fast tracking NPD with great agility to achieve higher profit margin. we've worked with a few leaders in the space to witness that how a manufacturing business can "reversely" unify the supply and value chain to hop into serving end users directly. What has stopped us from doing the same?

My observation:

We've lost the edge on international benchmarking. We don't seem to take other countries' success seriously to help our decision making. Covid management has given us too many such examples...

We aren't globally focused. The world is our market, or at least our competitors are consider the whole world as their market. We need much better intelligence on who needs what globally, - demand from every country. What do they need? Can we make for them? Who's competing etc.

Leaders not trained. Emerging business leaders can't stop their learning journey. Look at EMBA numbers from emerging countries vs UK, we know why so much new and thriving businesses are from emerging countries but not here. Subsequently, this led us to not having enough leaders speaking today's money as above.

Risk averse innovation fosters. Many innovation fosters - programmes, hubs, incubators, etc, are set out to follow rather risk averse culture, guidelines and bureaucracy enforced by its parental institutions, ie. A university. When people who are tasked to bring innovation to live has to aim for a high success rate, and navigate through red tape everywhere, I can hardly believe any disruptive innovation will become reality through such routes. If anything, it kills innovation. On the contrary, emerging economies have benefit so much by removing red tape.

The need to look beyond manufacturing. While digital businesses are booming, partially because they are happy to take concepts and methods from any other sectors, manufacturing is still very much manufacturing focused. We have seen so many businesses transformed themselves by learning from completely different industries, but manufacturing sector seemed still very much in its own bubble. We have to bear in mind that Uber kills taxi companies, Airbnb kills hotels, etc etc. manufacturers will face fatal competition from a company who's not even in the industry yet. The sector needs to set out much wider horizon scanning scheme across many other sectors and globally.

Alexander Hurley - Business Development Officer

SMEs face a wide variety of challenges including attracting new customers, securing finance, maintaining profitability, scaling up and retaining their best employees. They really need the help to develop their products and services in collaboration with organisations that can afford to take the risks and guide them through the process, without dealing with all the other external hindering factors so early on. This would cut out many of the challenges that they face and allow them to concentrate solely on developing the best products and services possible.

One thing I have recently noticed is the amount of accelerator/incubator programmes that are springing up all over the country. In particular CPC seem to be leading the way in terms of digital accelerator programmes. We have our own accelerator programme at WMG funded by the catapult but it again focuses more on digital technology rather than manufacturing. MTC has recently set up the SMA (Smart Manufacturing Accelerator) which I believe will be tremendously beneficial to start-ups and SME's and we need more of them.

Furthermore, I feel that it would be beneficial to set up a steering group of large manufacturing companies within the UK that are happy to openly share their challenges and ideas to the wider group without fear. A policy of open innovation whereby challenges are solved as a team to enable agile solutions using emerging technology. This could also allow start-ups and SME's to understand where they need to be targeting their products and services, allowing them to directly align with these organisations.

Jon King - Strategic Development and Planning - WMG

Increase funding for, and accelerate the delivery of, the Faraday challenge, with a view to making the UK Europe's leading centre for battery research, development and manufacture.

Increase funding for, and accelerate the delivery of, Driving the Electric Revolution, with a view to making the UK Europe's leading centre for Power Electronics, Motors and Drives.

Government to provide significant investment and globally competitive incentives to attract investment in order to establish a multi-GWh/year UK battery gigafactory. A gigafactory in the UK is essential to securing long-term mass production of electric vehicles in the UK. A UK gigafactory must be supported by the development of a strong UK based supply chain covering electrode and cell/module development. Government should support and incentivise the shoring of global Tier 1 suppliers in the UK.

Revive and increase level of AMSCI and RGF; consider an RGF fund with lower thresholds and increased flexibility to support smaller bids and supply-chain to a greater level which large businesses can also access

Increase the level of support and expand the remit of National Manufacturing Competitiveness Levels (NMCL)

UK participation in EU funding calls has been vital to UK automotive R&D investment. The Government should seek to maintain the UK's participation in Horizon 2020, replace lost European Structural and Investment funds (including those from the European Investment Bank) where they have been used to support R&D and clarify the status of already committed but unspent structural funds, especially where these have been match-funded by industry.

Remove plant and machinery from Business Rate assessment to boost international competitiveness, business confidence and investment in the current climate. Simplify and streamline administrative process for Business Rates. Any short-term review of the Business Rate policy should be considered against the current backdrop of political and economic uncertainty.

Increase the Annual Investment Allowance.

Industry is currently facing numerous challenges to its competitiveness, with a downturn in both production levels as well as new car registrations. There may be a requirement to support businesses throughout this period, which is exacerbated by ongoing uncertainty in the UK's relationship with the EU and to introduce a comprehensive scheme to support companies seeking to retain and retrain staff. Implementation of a scheme, such as has existed with models from Wales (ReAct and ProAct) and Germany (Kurzarbeitergeld) would be welcomed.

Take action on the Apprenticeship Levy including the removal of the 24 month expiry date for use of funds. Introduce flexibilities to allow greater utilisation of levy funds for automotive companies.

Create a national funding pot for local authorities to be able to explore greater renewables supply to reduce business energy costs.

DIT should prioritise export support initiatives and export finance delivery for high-value, productive sectors.

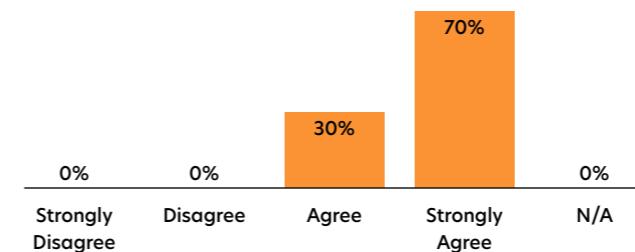
Appendix 13

Data Analysis

Knowledge is power and data is the almighty king wielding that power. Never in the field of human progress was this adage more evident than now. In fact, the whole edifice of Industrial Revolution 4.0 is almost entirely predicated on data. From smart cities to autonomous vehicles, logistics to retail, finance to healthcare, tech to environment, agriculture to the Internet of Things, data is radically improving the human condition and quality of life. Data is now universally acknowledged as the most valuable corporate asset.

In a recent survey, carried out by this Commission in consultation with Manufacturing Made Smarter in the Midlands, on data analysis and how data can help advance manufacturing effectiveness, some significant insights came to the fore. Addressing various dimensions of the data and data use in

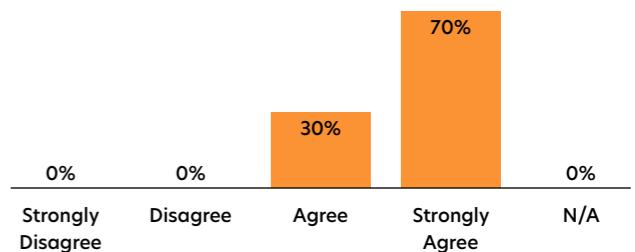
Our organisation treats data as a critical corporate asset



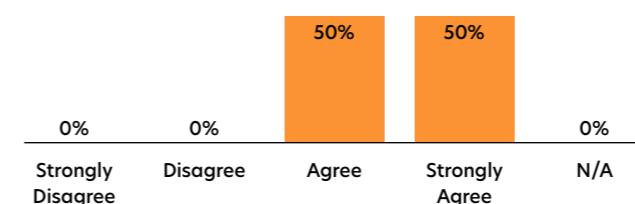
organisations, the questions posed could be grouped, approximately, into four sets: the first four questions gauging the corporate vision vis-à-vis the data and data use; six questions sketching the current state of affairs; five questions about organisational readiness vis-à-vis IDTs; two questions assessing the future outlook; and, five questions about the overall organisational data capability maturity.

Corporate vision: As can be seen from the following four graphics, 100% of the respondents agree or strongly agree with data being a critical corporate asset; data analysis a critical corporate capability; and that the organisations understand and recognise their importance in achieving business objectives, enabling performance, creating efficiency and achieving competitive advantage.

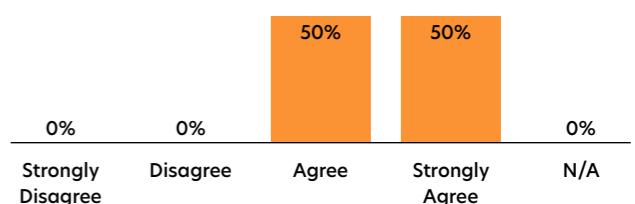
Our organisation treats data analysis as a critical corporate capability



Our organisation understands the value of using data and data analysis for achieving business objectives and enabling performance improvement

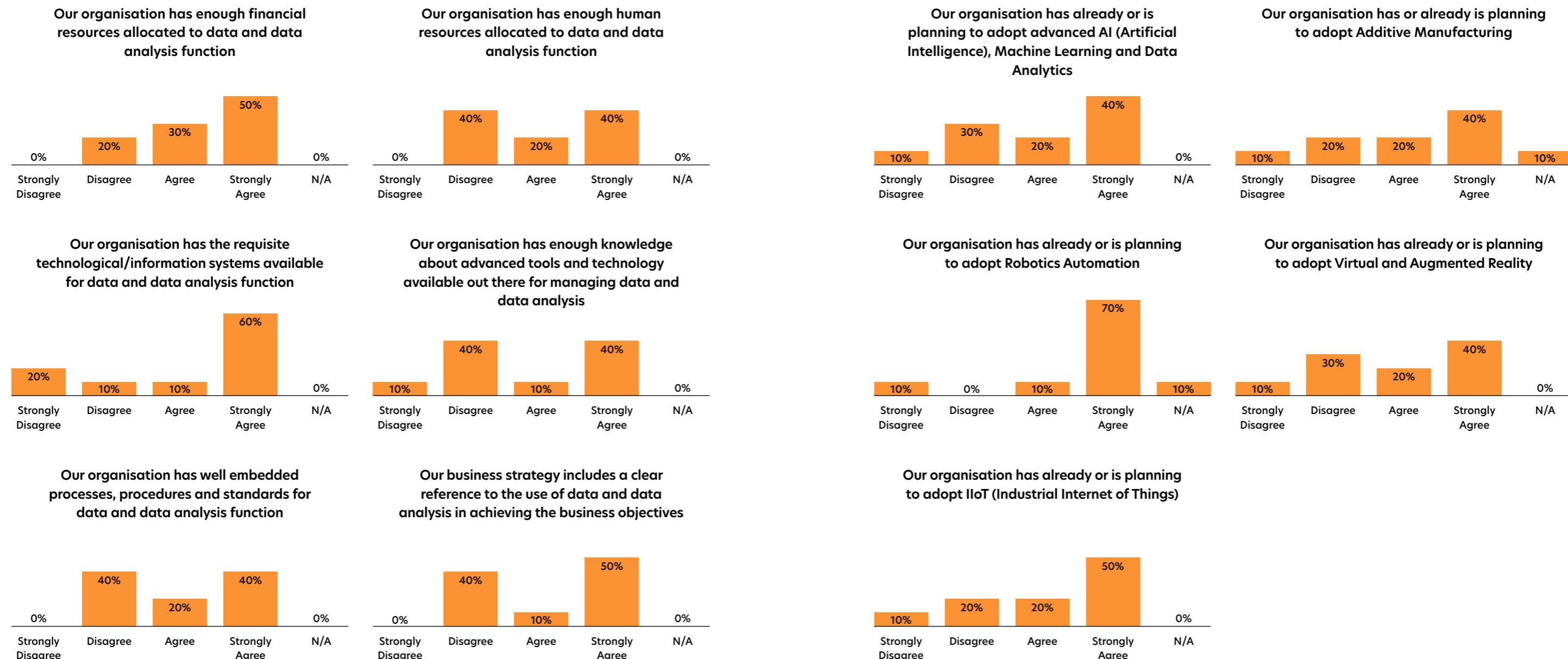


Our organisation recognises the importance of data and data analysis in creating efficiency and achieving competitive analysis



Current state of affairs: Interestingly, only 50% of the respondents mentioned that their organisations have enough knowledge about the advanced tools and technology available for managing data and data analysis; 80% of organisations have enough financial resources for data and data analysis; 60% have enough human resource for the function; 70% have the requisite technology/information systems available; 80% have well embedded processes, procedures and standards for the data function; and, 40% of the organisations do not have in their business strategy a clear reference to the use of data and data analysis in achieving their business objectives.

Application of Industrial Digital Technology (IDT): the respondents were specifically asked about the application of the five most enabling IDTs in their organisations: 40% or the organisations have neither adopted nor are planning to adopt Artificial Intelligence, Machine Learning & Data Analytics; similarly, 30% have neither adopted, nor are planning to adopt, Additive manufacturing; 10% have neither adopted, nor are planning to adopt, Robotics Automation; 40% have neither adopted, nor are planning to adopt, Virtual and Augmented Reality; and, 30% have neither adopted, nor are planning to adopt, the Industrial Internet of Things (IIoT).



Overall Data Capability Maturity: again, the respondents were specifically asked about the overall data capability maturity of their organisations. The questions pointedly included reference to the commonly agreed five stages of the continuum. As it turns out, 20% of the organisations still appear to be at the lowest of the stages (Basic); 50% of the organisations are at Stage-2 (Descriptive); 50% of the organisations at Stage-3 (Diagnostic); 30% at Stage-4 (Predictive); and, only 20% at Stage-5 (Prescriptive).

