

MIDLANDS ENGINE

Observatory

MIDLANDS ENGINE 2020 - 2021 UPDATE REPORT - SCIENCE AND INNOVATION

MARCH 2021

Table of Contents

1) Background and Introduction	3
a) Figure 1: 2020-21 Midlands Engine Examples of Work to Advance Science and Innovation Audit Priority Areas.....	4
2) Innovation in the Midlands Engine	5
a) Existing Evidence Base	5
b) Evolving Work to Integrate Innovation Metrics.....	7
i) <i>Midlands Engine Emerging Innovation Indicators</i>	8
3) Building on the SIA to Mitigate Identified Challenges	10
a) Identifying Key Challenges	10
b) Advancing work on the SIA Market-Driven Priorities	10
i) <i>Future Food Processing</i>	11
ii) <i>Next Generation Transport</i>	12
iii) <i>Medical Technologies and Pharma</i>	14
iv) <i>Energy & Low Carbon</i>	16
4) Conclusions and Future Activity.....	18
Annex: Indicator Data Sources.....	19

1) Background and Introduction

Innovation has been at the heart of the Midlands Engine’s focus since its inception, with “increasing innovation and enterprise” outlined as a key ambition in the ‘Midlands Engine Vision for Growth’.¹ A Midlands-level Science and Innovation Audit (SIA) was undertaken in 2016 to focus on analysing regional strengths and identify mechanisms to realise their potential.² This remains our central basis for influencing innovation policy and for targeting action.

This update report / SIA deep dive reviews recent Midlands Engine work (2020-2021) to continue progress within the innovation workstream. It also covers how Midlands Engine Observatory (MEO) are working with partners to further integrate innovation metrics and indicators into reporting processes.

We place a particular focus on showcasing how, in the last year, the region has continued to accelerate research, policy and programme delivery with regards to the 4 “market-driven priorities” identified in the SIA:

- Future food processing
- Next-generation transport
- Medical technologies and pharmaceuticals
- Energy and low carbon

Specifically, the Midlands Engine recently commissioned five pieces of research through regional academic institutions, each investigating the resilience of supply chains – including a focus on the four market-driven priorities. As our update report will show, the research’s findings extend our understanding of supply chain resilience and innovation, adding to our knowledge bank to inform regional policy.

Maintaining momentum on increasing innovation is critical in the backdrop of major economic, social and environmental shocks. While it’s long been known that increasing innovation is likely to boost productivity, this is now more important than ever given Covid-19. The pandemic has forced Midland’s businesses to innovate, to pivot to other sectors and change their processes to survive. Furthermore, the major challenges of EU Exit and achieving net-zero will only be overcome by a healthy level of innovation.

Moreover, achieving a cleaner and fairer economic recovery is somewhat dependant on a strong innovation ecosystem, of which the Midlands Engine is committed to influencing. We have aimed to reflect the current environment in our innovation work in the last year and will continue to do so as the UK and the world begins to emerge from the pandemic.

Our ambition to accelerate innovation and enterprise remains the same: *By strengthening and growing links between our universities and businesses, we will drive innovation, productivity and competitive advantage in regionally significant sectors, many of which are already thriving in the Midlands. Working together, we are fostering a community of ideas, increasing access to finance for SMEs and accelerating the impact of innovation across every part of the Midlands.*










¹ <https://www.midlandsengine.org/wp-content/uploads/Midlands-Engine-Vision-for-Growth.pdf>

² <https://www.midlandsengine.org/wp-content/uploads/2017/04/Midlands-Engine-SIA-Volume-1-Report-01-Nov-1-2.pdf>

But this is now clearly being delivered in a different world, providing even greater need to harness innovation to support productivity and levelling up for the 10 million people who live in the region, x 4 million people who work in the region and almost 400,000 businesses that are based in the region

Figure 1 below summarises the key findings and pillars of the ME SIA and recent work we have undertaken in response.

a) *Figure 1: 2020-21 Midlands Engine Examples of Work to Advance Science and Innovation Audit Priority Areas*

ME SIA Priority	Work / Collaborations Undertaken	Example Partner Organisations
Future Food Processing	Supply Chain Research: Anti Covid-19 Capabilities Underpinning Resilient Supply Chains Framework: Evidence from the food supply chain in the UK Midlands.	
	Supply Chain Research: The resilience of advanced manufacturing supply chains across the Midlands.	
Next-generation transport	Emerging work on new fuel technologies such as hydrogen and its use within our economy.	
	Joined up thinking and working with Midlands Connect	
Medical technologies and pharmaceuticals	Supply Chain Research: Sector deep dive for the advanced manufacturing sector supply chains (including MedTech).	
	Midlands Engine Health: A unified voice for health and life sciences in our region.	
Energy and low carbon	Supply Chain Research: Towards net-zero: Exploring the current state of low carbon supply chains in the Midlands.	
	Midlands Engine Green Growth Conversation and emerging Preliminary Report.	
Cross-Cutting	Supply Chain Research: Opportunities and challenges for building resilient supply chains in the Midlands region: A systematic review.	
	Working in collaboration with dedicated innovation bodies	
	Monitoring innovation performance quantitatively and qualitatively through ME Observatory, inc. use of metrics.	

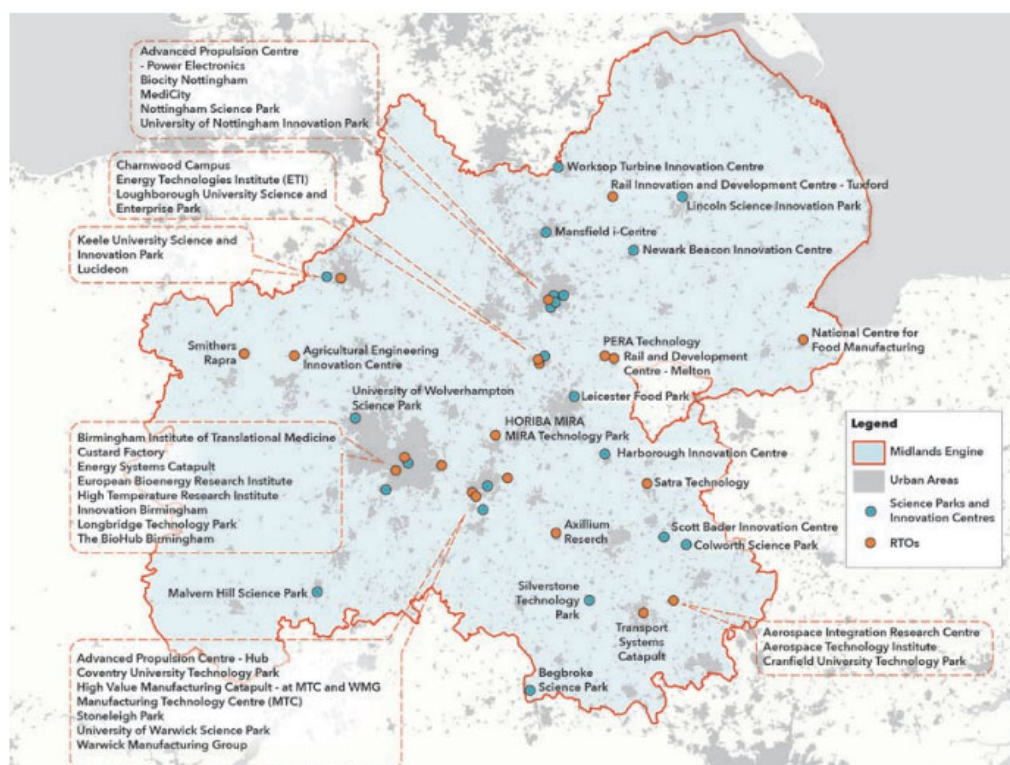
2) Innovation in the Midlands Engine

a) Existing Evidence Base

The Midlands Engine Independent Economic Review (IER)³ concluded its findings in 2020 (pre-Covid), including a section on Ideas and Innovation. Echoing and building on the SIA, with regard to innovation and R&D it **positively reported** that:

- The Midlands is home to a number of nationally significant clusters and highly productive sector specialisms that are seen as key to driving future economic growth, many of which are common and/or complementary across the Midlands.
- Clusters include advanced manufacturing and engineering, next generation transport, medtech, food processing and energy/low carbon, digital technologies and data, and systems integration.
- The Midlands is home to some major world-class assets and “innovation anchors”, many of which are at the forefront of the industrial digitisation agenda nationally and internationally. This includes 25 high tech/science business parks and innovation and technology centres 25 universities (including a collaboration of eight research-orientated universities) and 54 Further Education Colleges, and eight Enterprise Zones.
- The region has successfully attracted large amounts of FDI in some of the region’s high productivity priority sectors.

Figure 2: RTOs and Science Parks in the Midlands Engine



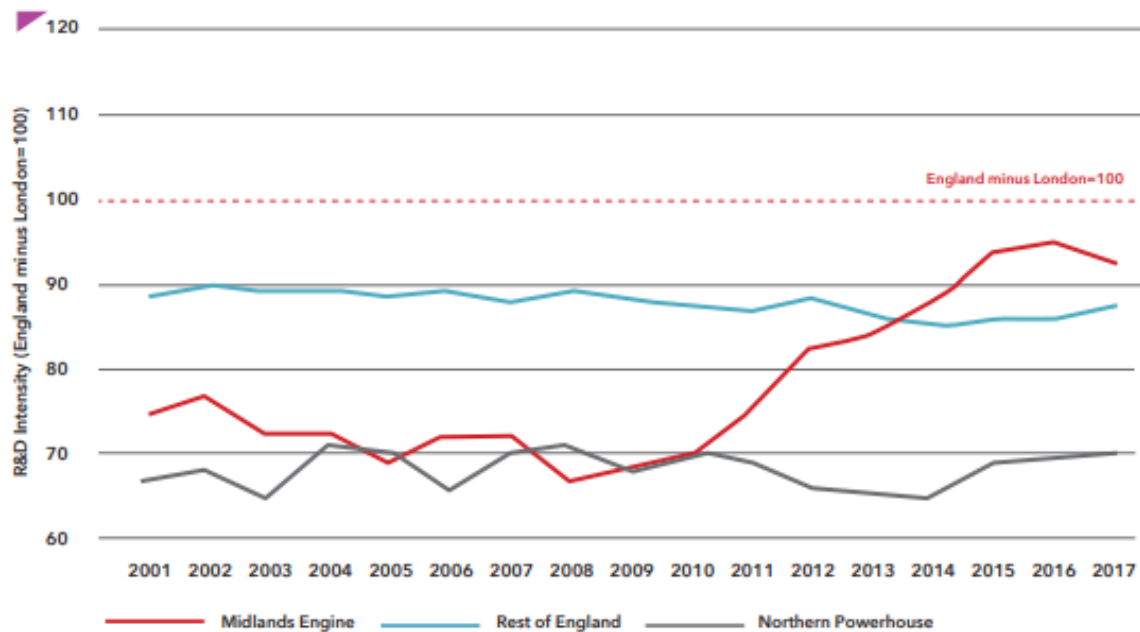
Source: SQW (2016) Science and Innovation Audit. Note: the map covers the nine LEP areas currently covered by the Midlands Engine, plus SEMLEP

³ <https://www.midlandsengine.org/wp-content/uploads/Midlands-Engine-IER-Full-Report.pdf>

However, **low comparative innovation performance and key challenges were also identified:**

- The Midlands under-performs against the England minus London benchmark for R&D intensity, but has made significant progress in closing the gap since the early 2010s.

Figure 3: R&D Intensity Index Gap Analysis



Source: CE calculations, ONS

- While the Midlands accounted for 17% of firm-level expenditure on R&D performed in UK businesses in 2017, private sector R&D spend per capita was below the UK average.
- Finance for business growth and innovation (especially the second valley of death and pathway to commercialisation) is commonly cited as one of the most significant challenges for businesses in the region.
- Knowledge generation and R&D spend is often concentrated in a small number of highly innovative firms and leading research institutions, and Midlands-level averages mask considerable variation in performance within the region.
- There appears to be slow diffusion of innovation and knowledge from the region's science assets to the wider business base, and absorptive capacity issues.
- All of the above contribute to a lower-than-average productivity rate that stunts growth & regional prosperity.

The existing SIA and IER provide us with a strong understanding of the strengths, weaknesses, challenges and opportunities of the Midlands innovation ecosystem. These are supported on an ad-hoc basis by additional research and insight. For example, the Midlands Manufacturing Resilience Commission provides a sector-focus on innovation in the region, and MakeUK release regular 'Innovation Monitors'. There is also activity and data collection at the regional and local level: for example, the Innovation Ecosystem Assessment and Strategy of the West Midlands (MIT REAP).

b) Evolving Work to Integrate Innovation Metrics

There is clearly a wealth of information and insight being collected about innovation performance in the Midlands, yet the intelligence is not always up-to-date or joined together effectively. The Midlands Engine Observatory has therefore began collating together all existing data and sources while adding new metrics; the intention being to understand innovation metrics more clearly and on an ongoing basis.

By building innovation metrics into our reporting mechanisms, Midlands Engine and partners will have a faster, more up-to-date understanding of Midlands innovation performance, being more able to respond effectively through policy and delivery.

An initial collection of data sources and data is provided on the following page. This is not an exhaustive list of data and insight but provides an initial innovation evidence base for the Midlands to build on. Innovation data at specific geographic levels is often hard to access also; therefore many of the indicators below use a compilation of the West Midlands and East Midlands region as a proxy for the Midlands Engine area as a whole.

While the data is imperfect and there is often a data lag with innovation data, identifying information we can access is a really important part of the policy and programme development process / logic chain. Within this context, it should be noted that the vast majority of the data below reflects activity before the Covid pandemic, however as will be noted in the next section we are using external sources and qualitative research to get the best up-to-date picture as possible.

The data and insight collected extends our knowledge of strengths, weaknesses and challenges within the Midlands Engine ecosystem, providing a more structured framework for responding. This has been utilised in recent activity in the last year, such as the commissioning of 5 supply chain research projects – this was identified as a key action given the pressures on regional supply chains due to Covid and EU Exit (see section 3).

An annex is provided at the end of this document with the indicator sources and references.

i) Midlands Engine Emerging Innovation Indicators⁴

Indicator	West Midlands	East Midlands	UK	Trends
% of 'Innovative active' firms	38.7%	37.0%	37.6%	WM is above national average and most other regions. Both EM and WM have decreased over 20% on previous survey periods - in line with all regions and the national average.
% firms who are 'Product Innovators'	19.8%	18.1%	18.0%	WM is the highest region outside of London & SE while EM scores just above average.
% of firms who are 'Process Innovators'	14.6%	12.8%	12.7%	WM second highest scoring region while EM also scores above average. The Marches (22.1%) has the highest % of Midlands LEPs.
% of firms both product AND process innovator	10.0%	7.9%	7.9%	WM highest % of all UK regions, while EM is in line with national average – above North East, North West, East, London & Scotland.
% of firms undertaking R&D	20.0%	21.0%	19.3%	EM second highest region behind South East, WM also above average. LEP-level internal R&D show a high % of Worcs LEP firms (24.7%) and low levels in the Black Country (9.1%) & Lincs (8.5%).
% of firms acquiring machinery, equipment, software	10% Machinery 14% Software 14% Training	8% Machinery 15% Software 13% Training	8% Machinery 14% Software 11% Training	EM is the highest and WM second highest for % of firms acquiring training for innovation. WM also scores well for purchasing of advanced machinery while EM is high for computer software.
Innovation Expenditure by Area, Proportion of Total Innovation Spend	42% int. R&D 14% ext. R&D 23% capital 12% design 10% other	55% int. R&D 5% ext. R&D 26% capital 9% design 5% other	50% int. R&D 7% ext. R&D 21% capital 14% design 8% other	EM is relatively high for internal R&D, capital and training whereas WM is high for external R&D, knowledge and capital. Both regions are below the UK average for proportion of spend on design and market introduction of innovations.
% of firms identifying barriers to innovation as "highly important"	19% Finance Cost 19% Finac Avail. 16% UK Gov 13% EU Regs	21% Finance Cost 19% Finac. Access 17% UK Gov 15% EU Regs	18% Finance Cost 18% Finac. Avail. 12% UK Gov 9% EU Regs	A higher proportion of firms in the ME are more concerned with the cost and availability of finance for innovation than and of government / EU regulations as a barrier – the top 2 of all regions.
Average proportion (%) of employees that hold a degree	10.2%	8.0%	14.3%	Both ME regions perform below the national average on degree-level skills, with the EM having the lowest %.

⁴ Sources and dates of data are provided in this document's Annex

Indicator	West Midlands	East Midlands	UK	Trends
Private Sector R&D Investment (BERD)	£2.4bn	£1.9bn	£23.5bn	ME total = £4.3bn in 2019, 16.5% of the UK total. ME has the highest BERD spend outside of London / SE / East.
Private Sector R&D Investment (BERD) – equivalent employment	26,000	20,000	263,000	ME total = 46,000 jobs supported by BERD, 17.5% of the UK Total.
Government spending on R&D (GERD): Gov & UKRI	£74m	£90m	£2.5bn	ME total = £164m, 7% of the UK total. Both regions are among the lowest for R&D spend from gov / UKRI.
Government spending on R&D (GERD): Higher Education	£455m	£348m	£8.7bn	ME total = £803m, 9% of the UK total. Both regions level of funding has grown steadily in recent years.
Research Council Spend	£128m	£102m	£2.4bn	ME total = £230m, 10% of the total. Per capita spend below competitor regions, with WM and EM receiving the lowest in the English regions.
Innovate UK Spend	£133m	£99m	£941m	ME total = £232m, 25% of the total. WM received the highest IUK spend of all regions, and the WM and EM have the highest two spends per capita.
UKRI Overall Spend	£363m	£301m	£5.4bn	ME total= £664m, 12% of the UK total. WM has the lowest per capita spend of English regions, EM second lowest with North West. This reflects underinvestment in ME regions.
Yearly Patents Granted	392	132	3,559	ME total = 1,359 patents filed; 524 patents granted, 15% of UK total. WM 45% filed to granted conversion – the highest of all regions. EM in line with national average.

The data provided reinforces the Midlands’ innovation challenges and opportunities. Midlands Engine partners will regularly review and update these metrics to ensure an up-to-date understanding of innovation that can inform policy across the region.

3) Building on the SIA to Mitigate Identified Challenges

a) Identifying Key Challenges

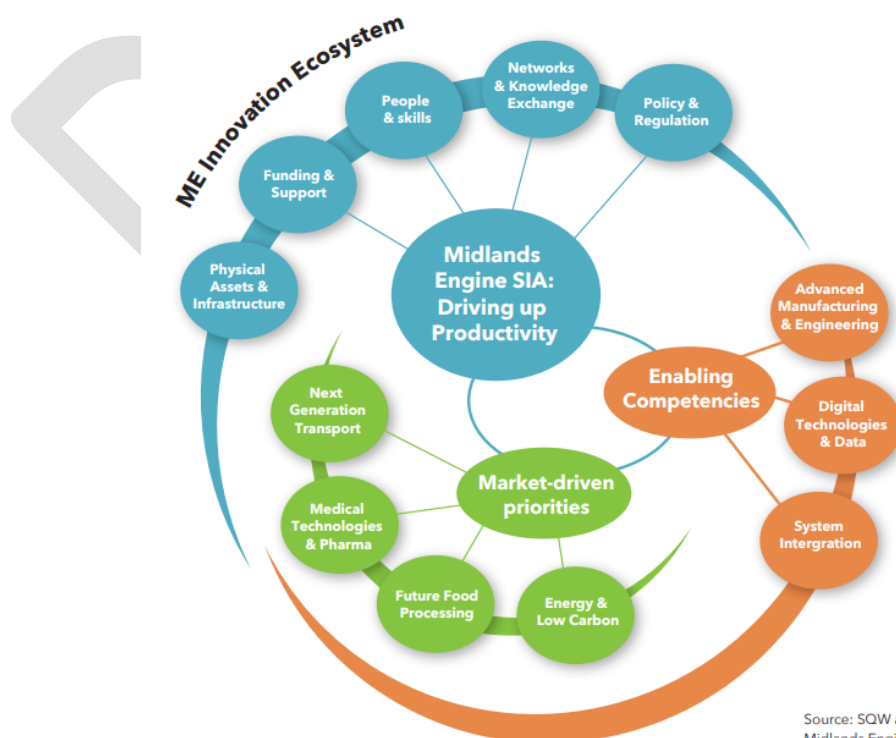
The collation of indicators reflects the Midlands Engine commitment to utilising and extending the work of the SIA. It remains our framework for understanding regional strengths and opportunities for growth, as well as areas of improvement. Monitoring innovation activity in the region through the above metrics is a legacy of the SIA process. This array of continued research and reporting has helped us identify key challenges to the region’s innovation ecosystem, such as:

- An underinvestment in R&D from government despite high levels of private sector investment.
- An R&D Intensity Gap with other parts of the country
- A slow diffusion of innovation and knowledge and absorptive capacity issues across the business base, particularly within SMEs.
- Differences in innovation performance within the region and structural skills shortages.
- Difficulties in firms accessing finance for innovation.
- High levels of innovation potentially too concentrated in a small number of large firms.

b) Advancing work on the SIA Market-Driven Priorities

Activities at the pan-regional, regional and local level are constantly being undertaken to address identified challenges, and the Midlands Engine has a key role to play. This remains grounded within the understanding gained from the SIA, in particular the headline framework developed within this (see Figure 4 below).

Figure 4 Midlands Engine Science and Innovation Framework



Source: SQW and Midlands Engine partners

This is reflected in the role of the above framework in the Midlands Engine IER and subsequent projects and programmes that relate directly to the priorities outlined.

A key recent piece of work to demonstrate this is the Midlands Engine-commissioning of 5 pieces of research about Midlands' supply chains. The research reports, all carried out by Midlands-based academic institutions, focus on the resilience and robustness of regional supply chains in response to Covid-19 and EU Exit. They advance our understanding of local supply chains, their innovative capacities and the policy instruments required to support firms. As displayed in the sub-sections below, each report has relevance to the SIA – particularly the 4 'market-driven priorities' identified:

- **Future Food Processing:** the Midlands Engine region is the source of a significant proportion of the UK's primary food production. Opportunities for major productivity growth are particularly attractive in efficient food processing, zero-waste food chains, and food product innovation.
- **Next Generation Transport:** there are opportunities around technology development (simulation and modelling; advanced digital design and validation; advanced materials and manufacturing; digital manufacturing, supply chain and service management) for aerospace/space, automotive, high value motorsport and rail, including significant complementarities and cross-overs with the Energy and Low Carbon.
- **Medical Technologies and Pharma:** distinctive opportunities exist around diagnostics and imaging, sustaining our activities in pharmaceuticals, drawing on the region's stable ethnic diversity as a living laboratory for improving health outcomes, growing our success in trauma and rehabilitation, and combining health and environmental data to support innovation as next generation transport and low carbon economy opportunities are progressed.
- **Energy and Low Carbon:** Building on institutions like the Energy Research Accelerator to capitalise on opportunities in geo energy, thermal energy systems, nuclear, energy storage and smart integrated energy systems.

The sections below demonstrate how we are advancing the work and focus of the 4 market-driven priorities, including in particular through the supply chain research, but also other relevant ME workstreams.

i) Future Food Processing

As part of the supply chains work, The University of Lincoln recently carried out research on the food & drink manufacturing sector in the Midlands. The paper aimed to identify the main resilience capabilities which protected the food supply chain in the Midlands from severe disruption during the COVID-19 pandemic.

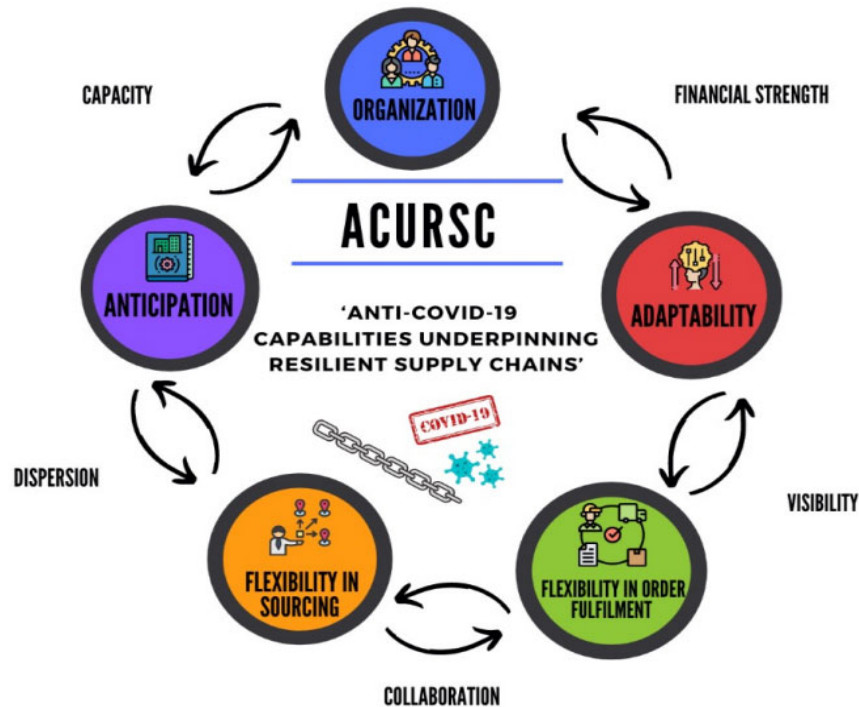
The studies' findings resulted in the production of an original portfolio of resilience capabilities, called the ACURSC (Anti-COVID-19 Capabilities Underpinning Resilient Supply Chains) Framework. The central resilience capabilities of ACURSC are as follows, with innovation at their heart:

- **Organisation:** organisational innovation with a strong emphasis on agile and pragmatic Human Resource Management.
- **Adaptability:** necessary due to dynamic trading and changes in the food market, requiring readiness for an 'every day is Christmas Day' type of demand.
- **Flexibility in Order Fulfilment:** rapid shift from 'food to go' and 'food services' to dominant retailers and new markets, such as direct online sales to customers
- **Flexibility in Sourcing:** identification of alternative pre-approved, pre-audited new regional suppliers for each input in order to cope with further global disruptions, focus

on essential production inputs, reduced mix of products, and regional availability of inputs rather than cost reduction.

- **Anticipation:** preparations for what could have been a no-deal Brexit, adoption of best practices regarding business continuity planning, risk assessment and the supply chain's global exposure.

Figure 4: ACURSC Framework



These 5 capabilities were found to be central in underpinning the resilience of firms in food supply chains during the pandemic, while also shown to create synergy with secondary capabilities, such as collaboration and financial strength.

It is believed that ACURSC can be useful as a benchmarking and policy tool to support the Midlands food supply chain to navigate through the opportunities and adaptations required by the major trends and challenges identified after the pandemic. For example, digital transformation of supply chains, net-zero supply chains and post-Brexit competitiveness.

The report's recommendations focused on building supply chain capacity through a collaboration and system-based approach, elements which lend themselves to innovative capacity at the firm-level. While not only being specific to one of the ME SIA's market-driven opportunities, the research also provides credence to wider aspects of the ME SIA framework: notably system integration, networks and knowledge exchange and advanced manufacturing and engineering.

ii) Next Generation Transport

Transport technologies, including manufacturing sub-sectors like automotive and aerospace, are major sectors in the region, and therefore always a key focus. This was also prevalent in the supply chains research, including an analysis into the resilience of advanced manufacturing supply chains by Birmingham City University. The study had a particular focus on Covid-19 and EU Exit impacts, finding that:

- One of the key impacts of Brexit has been to force changes in the nature of supply chain and logistics linkages. Some of these will take months as companies re-evaluate the efficacy of utilising particular transport routes and modes.
- Having a diverse range of customers lessens the exposure to adverse developments in any individual sector, but moreover points to the clear need for supply chain diversification for suppliers caught out in the event of an OEM plant closure.
- Skills gaps in design and engineering were particularly prevalent in all sectors examined. Historically these gaps had been filled by recourse to a relatively compliant but skilled European workforce.
- It is generally acknowledged by the automotive industry that Covid-19 has caused between 5% and 10% reduction in capacity.

From the perspective of the Midlands innovation ecosystem, the report reported that:

- Diversification is hugely important to success for supply chains.
- Much innovation already being undertaken by forward-looking businesses: the challenge for government and other stakeholders is to create an environment that further facilitates this, e.g., through upskilling, mirroring best practice elsewhere and connecting different stakeholder groups.
- Going forward, the challenge will be to ensure that the necessary innovation takes place to enable the UK to compete as a base for high-value, high-productivity industries.
- A strategic focus for the region should be enabling and facilitating forward-looking opportunities in mobility, especially around programming, vehicle connectivity (vehicle-to-X and X-to-vehicle) and electronics. order to do so, it is importance to maximally leverage existing expertise in the region, so as to:
 - Facilitate and incentivise (even) greater collaboration between universities, other academic institutions and private companies.
 - Continue and strengthen existing programmes to address key STEM skills-gaps
 - Facilitating a greater shift to life-long learning and flexible, bespoke modular delivery working in tandem with manufacturers. This is likely to build on the *Help to Grow* scheme and existing Knowledge Transfer Partnership frameworks.

Additionally, research by the Manufacturing Technology Centre (MTC) on key Midlands sectors (mostly transport-focused) found that the two bottom performing capabilities across all sectors were:

- 1) Innovation and Technical Mastery
- 2) Digital Competence.

These reflect a hesitance to deploy innovation in processes and products, a lack systematic technology development frameworks and the lack of coherent deployment of digital manufacturing and Industry 4.0. this is despite the region being home to many cutting-edge firms in the sector and major research organisations / universities in this space.

Overall, Concurrent Engineering was identified as the weakest capability. This poses significant risks in product and process design and development, as the sequential execution results in long time scales, higher costs for problem resolution and lower quality. Also, low levels of Innovation in Production Processes and lack of Systematic Technology Development Frameworks reduce the Innovation and Technical Mastery of supply chains. This reduces the innovation industrialization

capability of companies in the supply chains, increasing the risk of having the production of innovative products moving overseas.

Figure 6: Key Capability Weaknesses Identified: Midlands Engine Supply Chains

Sub Thread		L1	L2	L3	L4
1.	Innovation & New Tech in Processes	0	7	3	0
3.	Systematic approach to technology introduction?	1	6	2	1
12.	Nature of the relationship with Customers	1	6	1	2
22.	Supply Continuity Management?	0	7	2	1
34.	Operate a lean supply chain? VSM etc.	1	6	2	1
39.	Concurrent Engineering	3	5	0	2

As part of the report’s recommendations, it was highlighted that:

It is vital to strengthen the Innovation and Technology Management capabilities of mainstream supply chains in the Midlands, this could be achieved through a combination of OEM/Tier-1 innovation promotion initiatives, educational interventions, targeted innovation R&D efforts and financial/tax incentives by government.

These findings and the aforementioned research touch on many points of the ME SIA, advancing the regional understanding and how Covid-19 and EU Exit are changing expectations and policy requirements. There is also a constant theme associated with maximising the opportunity of major new transport technologies, notably electric vehicles. For example, through the building of a ‘Gigafactory’ in the Midlands.

This research builds on a long-standing and continued focus on developing the Midlands as a home to new transport technologies and future mobility. For example, emerging work related to the use of hydrogen in transport and close working with Midlands Connect and Midlands Innovation’s dedicated transport programme.

iii) Medical Technologies and Pharma

The Midlands Engine partnership continues to identify health, MedTech and life sciences as a priority area for our region as the UK and Midlands economy looks to build back stronger, better and greener after the Covid-19 crisis. Advancing the findings of the SIA to suit the Covid era, a [report](#) was recently produced to champion the region’s health and life sciences sector, and forming ‘Midlands Engine Health’. Through Midlands Engine Health, we aim to amplify our impact through partnership - presenting one unified vision of our vast sector strengths and immense potential, both within the UK and globally.

The establishment of Midlands Engine Health is underpinned in data and analysis, with its roots in the findings of the SIA. This is demonstrated in the image below:

Health and life sciences in the Midlands ... at a glance

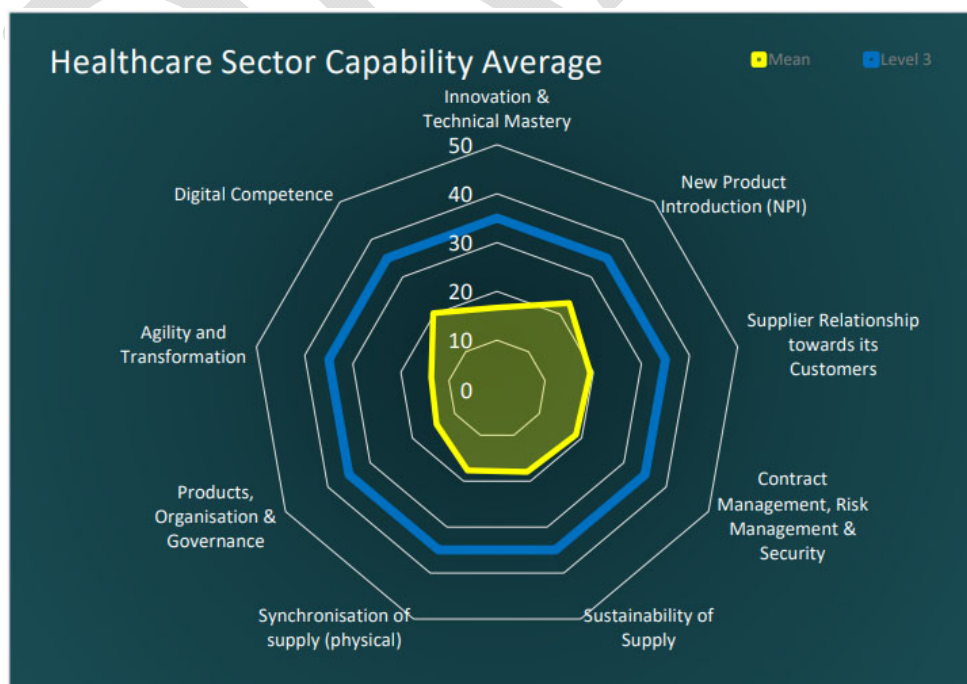
- The highest number of MedTech companies of any region in the UK, generating £1.6 billion for the UK economy every year
- A stable, ethnically diverse population of over 10 million citizens, the ideal test bed for global health and multimorbidity interventions
- 1,200 life sciences businesses and over 33,000 highly skilled jobs
- Two of eight UK Freeports, two Life Science Opportunity Zones and 21 Science and Innovation Parks
- World-leading NIHR infrastructure embedded in our NHS, including the UK's largest Clinical Trials Unit, three Biomedical Research Centres, two Applied Research Collaborations, the Centre for BME Health, the School for Primary Care Research and one of only five UK Patient Recruitment Centres
- Seven leading Medical Schools, producing over 20% of the UK's medical students
- Two of the three largest UK NHS Trusts

Innovation is at the heart of the region's health & life sciences strength and its future opportunities. The Midlands Engine Health prospectus outlines a number of key ambitions that reflect this, including:

- The home of MedTech innovation
- Pioneering innovation to enable people's return to work and life
- Reducing development time and trial costs to innovate faster

Our commissioned supply chain research has also looked into the health and life sciences sector. The studies carried out by MTC and Birmingham City University both found that there were lessons to be learnt by the health and life sciences sector from the supply chain efficiency of automotive and aerospace. MTC's findings in particular focused on the relative immaturity of health and life sciences supply chains, including in relation to innovative capabilities:

Figure 7: Healthcare Sector Capability Average (MTC Supply Chain Readiness Analysis)

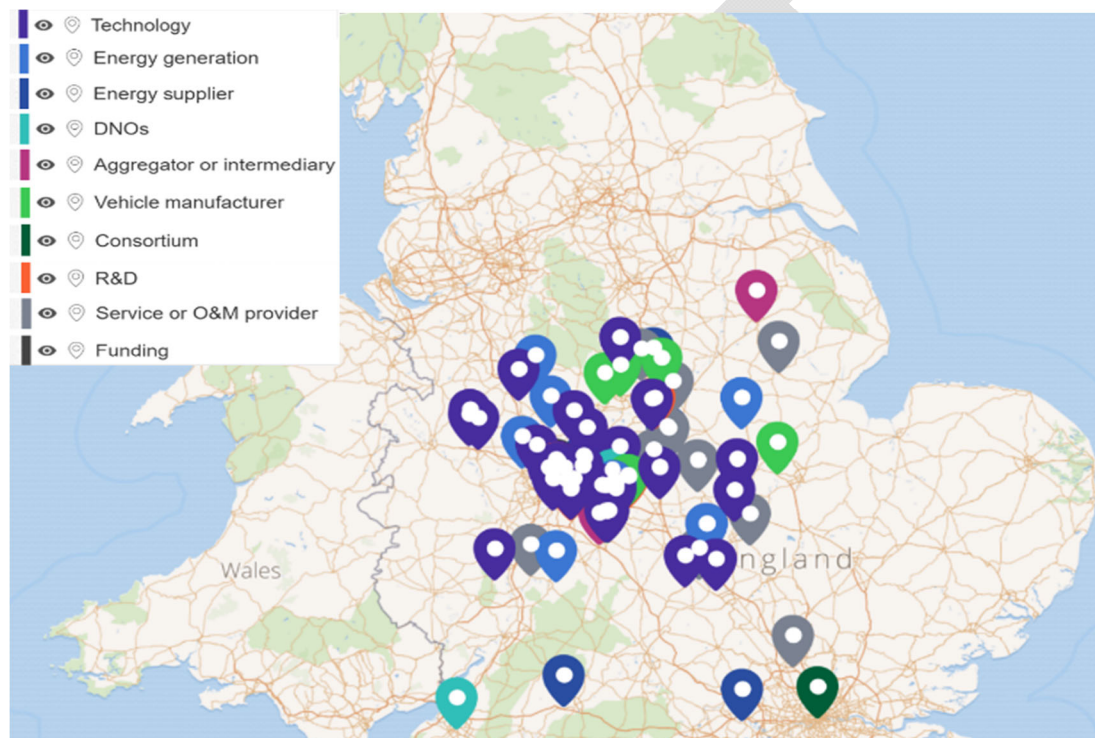


iv) Energy & Low Carbon

As part of our commissioned supply chains research, Warwick Manufacturing Group (WMG) explored the current state of low carbon supply chains in the Midlands. The aim was to support resilience building and public policy options for the low carbon sector and low carbon transition for Midlands manufacturing.

By mapping aspects of the low carbon sector (Figure 8), we have advanced our understanding of the Midlands ecosystem, while the findings of the study begin to explore the innovative capacity of the region to a successful low carbon transition.

Figure 8: Mapping the Midlands Engine Low Carbon Supply Chain (WMG)

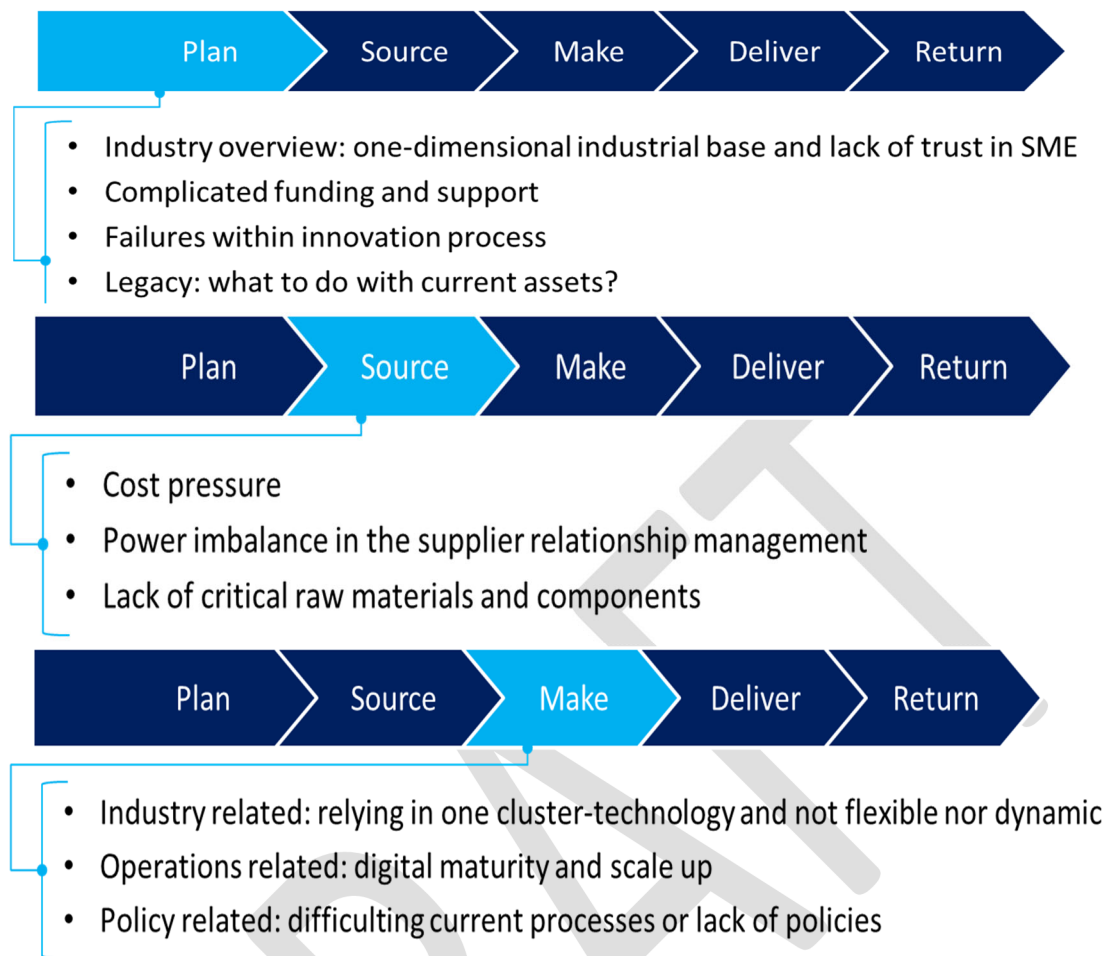


The research finds that, positively:

- The region enjoys a strong R&D and innovation portfolio and a strong reputation for engineering and manufacturing excellence.
- Organisations are increasingly adopting a ‘designing with the end-of-life recyclability in mind’ approach.
- The presence of universities and research centres in the region has a positive impact on the research, development, and commercialisation of low carbon technologies.
- Reflecting unique opportunities for the region, driveline technologies, software for mobility and CAV-related analysis have become more and more popular.

However, vulnerabilities within Midlands low carbon supply chains are identified at each supply chain activity stage: Plan, Source, Make, Deliver and Return. This, as shown in Figure 9 below, is particularly prevalent in planning, sourcing and making:

Figure 9: Low Carbon Supply Chain Vulnerabilities in the Midlands (WMG)



There are important innovation findings here which have implications for future low carbon transition planning, and the importance of the Midlands innovation ecosystem within this. Specifically, the report recommends the following to support building innovative capacity for transition:

- 1) Encourage collaboration between different stakeholders, and promote collectivistic values that would accelerate the transition towards low carbon and national prosperity. Including a single point of information sharing.
- 2) Prioritisation must be explored among technologies with known application, to maximise focus. As such, further research should tackle this issue through the lens of feasibility, viability, as well as desirability for customers.
- 3) Convert & fit existing companies/ sectors into low carbon supply chains through upgrading skills.

The findings and recommendations provide food for thought for future policy decisions and programme delivery in the Midlands, advancing the initial identification of strength in the SIA. Concurrent pieces of work at the Midlands level are equally as relevant to this priority, such as the emerging focus and research on hydrogen and research commissioned by BEIS to establish a sector profile and forecast of the low carbon and environmental technologies sector.

4) Conclusions and Future Activity

This report has provided an update on recent Midlands Engine progress on advancing the findings of the 2016 Science and Innovation Audit (SIA). This is particularly focused on the four market-driven priorities outlined, but also other aspects of the framework and wider audit – including the use of relevant metrics to benchmark innovation performance.

Innovation is critical to economic recovery, levelling up and achieving net-zero in the Midlands. This is why it remains a key focus within the Midlands Engine partnership, rooted in the findings of the SIA while evolving to suit the ever-changing economic and social environment.

Advancing our innovation evidence base is a critical underpinning factor, and this is why we have collecting metrics in a more consistent and regularly way, while commissioning expert work through regional universities. Most recently this has been focused on Midlands’ supply chains across key sectors, with clear linkages to the SIA. This work underpins wider work by the Midlands Engine partnership across themes and sectors, such as on the health & life sciences sector or hydrogen technologies.

The Midlands Engine Partnership will continue to prioritise innovation as a key driver of productivity and inclusive growth, underpinned by advancing the work of the SIA. Key actions in the forthcoming year will include:

- Continuing to collate innovation evidence through metrics, and develop reporting procedures for this. Where possible, develop and report on local area and sector-level indicators, and live evidence in relation to Covid-19 and EU Exit.
- Working in partnership with local stakeholders and experts to extend our understanding of Midlands innovation and facilitate the implementation of new programmes / projects within key regional priorities. Collaboration could include, but not be limited, to working with:
 - Midlands Innovation
 - Academic Institutions / universities (including those involved in the supply chain work)
 - LEPs
 - Inward investment organisations (such as West Midlands Growth Company)
 - Sector / Trade bodies (e.g. MakeUK, Midlands Aerospace Alliance)
 - BeTheBusiness
 - West Midlands Innovation Programme
- Learn from expert evidence collated and support the move from research to policy / strategy implementation. For example, learning from the innovation recommendations suggested by Warwick Manufacturing Group’s second supply chain research paper (Opportunities and challenges for building resilient supply chains in the Midlands region: A systematic review):
 - Financial support for innovation and exporting as well as more favourable terms/investment in SMEs
 - Skills and training support, particularly management, technical and young people (via apprenticeships)
 - Regional collaboration across public/private: with trade associations, universities and businesses themselves, including networking events.

Annex: Indicator Data Sources

Indicator	Source	Period	Links
% of 'Innovative active' firms	UK Innovation Survey 2019	2016-2018	https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report https://www.gov.uk/government/publications/innovation-activities-by-uk-businesses-in-2012-2014-2014-2016-and-2016-2018-by-nuts2-geographic-boundaries-and-local-enterprise-partnership-lep-ar
% firms who are 'Product Innovators'	UK Innovation Survey 2019	2016-2018	https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report https://www.gov.uk/government/publications/innovation-activities-by-uk-businesses-in-2012-2014-2014-2016-and-2016-2018-by-nuts2-geographic-boundaries-and-local-enterprise-partnership-lep-ar
% of firms who are 'Process Innovators'	UK Innovation Survey 2019	2016-2018	https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report https://www.gov.uk/government/publications/innovation-activities-by-uk-businesses-in-2012-2014-2014-2016-and-2016-2018-by-nuts2-geographic-boundaries-and-local-enterprise-partnership-lep-ar
% of firms both product AND process innovator	UK Innovation Survey 2019	2016-2018	https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report
% of firms undertaking R&D (internal & external)	UK Innovation Survey 2019	2016-2018	https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report https://www.gov.uk/government/publications/innovation-activities-by-uk-businesses-in-2012-2014-2014-2016-and-2016-2018-by-nuts2-geographic-boundaries-and-local-enterprise-partnership-lep-ar

Indicator	Source	Period	Links
% of firms acquiring machinery, equipment, software	UK Innovation Survey 2019	2016-2018	https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report
Innovation Expenditure by Area, Proportion of Total Innovation Spend)	UK Innovation Survey 2019	2018	https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report
% of firms identifying barriers to innovation as “highly important”	UK Innovation Survey 2019	2016-2018	https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report
Average proportion (%) of employees that hold a degree or higher: All Subjects	UK Innovation Survey 2019	2018	https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report
Private Sector R&D Investment (BERD))	ONS Business Enterprise Research and Development (2020)	2019	Business enterprise research and development - Office for National Statistics (ons.gov.uk)
Private Sector R&D Investment (BERD) – equivalent employment (2018)	ONS Business Enterprise Research and Development (2020)	2019	Business enterprise research and development - Office for National Statistics (ons.gov.uk)
Government spending on R&D (GERD): Government & UKRI	ONS Gross Domestic Expenditure on R&D	2018	Gross domestic expenditure on research and development, by region, UK - Office for National Statistics (ons.gov.uk)
Government spending on R&D (GERD): Higher Education	ONS Gross Domestic Expenditure on R&D	2018	Gross domestic expenditure on research and development, by region, UK - Office for National Statistics (ons.gov.uk)
Research Council spend	UKRI Regional Distribution of Funding	2018-2019	2018 to 2019 regional distribution of funding – UKRI

Indicator	Source	Period	Links
Innovate UK spend	UKRI Regional Distribution of Funding	2018-2019	2018 to 2019 regional distribution of funding – UKRI
UKRI Overall Spend (2018-19)	UKRI Regional Distribution of Funding	2018-2019	2018 to 2019 regional distribution of funding – UKRI
Yearly Patents Filed and Granted	Intellectual Property Office	2019	https://www.gov.uk/government/statistics/facts-and-figures-patent-trade-mark-design-and-hearing-data-2019

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