MIDLANDS ENGINE

OBSERVATORY

Insights

Quantum technology ‘New Economy’ cluster snapshot

INSIGHTS

Quantum technology has the ability to transform the way we live our lives. While still emerging in application, it has the potential to enable smart cities, revolutionise healthcare systems and drive innovation in key industries including cyber security, logistics and manufacturing amongst many others in the Midlands.[1]

Backed by government funding and direction, the UK is developing a thriving quantum ecosystem. Published earlier this year, **The National Quantum Strategy** sets out a 10-year vision for the UK to be a leading quantum-enabled economy, centred around more R&D investment (£2.5bn in the next decade), training and education, and business, investment and infrastructure support.

The Midlands has already benefited from existing investment through university involvement and leadership in the **UK Quantum Technologies Programme (NQTP)**. There are ample opportunities for the region to grow its academic strength in this space, but also to develop a dynamic quantum industry in the private sector – from technology-driven software and service firms, to the advanced manufacturing supply chain in electronics and photonics. Critical to this will be the simultaneous development of the right skills and infrastructure to support a flourishing quantum cluster in the Midlands.

There is currently limited data available for accurately quantifying quantum technology activity in the UK and its regions. However, this document attempts to pull together available information about quantum technology in the Midlands, produced by Midlands Engine Observatory. Due to the rudimentary nature of data in this sector and the cluster’s relative nascency, the findings should, therefore, be taken with some caution.

1 For the purposes of this document, the “Midlands” is defined as the 65 Local Authorities that form the Midlands Engine Partnership geography; slightly different to the traditional West Midlands and East Midlands regional (ITL1 geographies).

Quantum technologies are one of the five critical technologies identified within **the UK Science and Technology Framework (2023)** and the **International Technology Strategy**. These are defined:

> ***"Devices and systems which rely on quantum mechanics, to provide capabilities that 'classical' machines cannot".***

Generally, quantum technologies refer to a broad group of technologies which benefit from the use of quantum mechanics principles to perform challenging or impossible tasks. Quantum technologies rely on a branch of physics describing matter and energy at the smallest scale i.e., atoms and subatomic particles, introducing counterintuitive concepts like superposition[2] and entanglement[3].

They make new technological advances possible, including unprecedented increases in computing power, precise sensors and enhanced communications.

Methodology

This document's evidence collection has followed a similar process to the recent Midlands Engine **"Exploring the Investment Potential of Midlands Clusters"** report and its individual cluster snapshots.

It has been supported by the expertise of The Data City, especially its Real-Time Industrial Classifications (RTIC) methodology. The principal data source is the **Quantum Economy RTIC**, utilising The Data City's AI-driven tool to identify companies operating in new economy clusters.

This tool allows us to investigate cluster features at the local level, helping us understand economic value and the firms driving it. The Data City identifies companies in the Quantum Economy RTIC as those that have a specific focus and/or product offer related to quantum, as opposed to simply usage. This includes a wide range of companies involved in software development, component manufacture, quantum computer development and photonics (the physical science of light waves).

The Midlands Engine Observatory has collated further relevant evidence from other sources to supplement the insight provided by The Data City.

Midlands Quantum cluster in context

65 businesses - 10% of the UK total. 44% growth since 2013.

1,866 jobs (estimated) - 9% of the UK total.

5 high growth companies (6% of the UK).

£100m 2 companies with £100m turnover.

6% of Midlands university graduates (over 8,000 total) in 2021 studied subjects relevant to quantum technology, including from 4 of the top 25 UK universities for Computer Science.

By some measures, the Midlands has received a relatively low level of funding in Quantum despite making up around 10% of the UK industry; for example, it has received 3% of relevant Innovate UK awards and less than 1% of total equity by high-growth companies in relevant sectors.

INSIGHTS

2 Superposition refers to particles being able to exist in multiple states simultaneously.
3 Entanglement refers to one particle being dependent on aspects of another particle; no matter how far they are physically separated.

Business ecosystem

62 total businesses active in the Midlands

- 10% of the UK quantum technology business population; with 44% growth between 2013 and 2022.
- 2 strategic (£100m+ turnover) companies.
- 16.7% of the strategic quantum technology companies in the UK have a Midlands location.

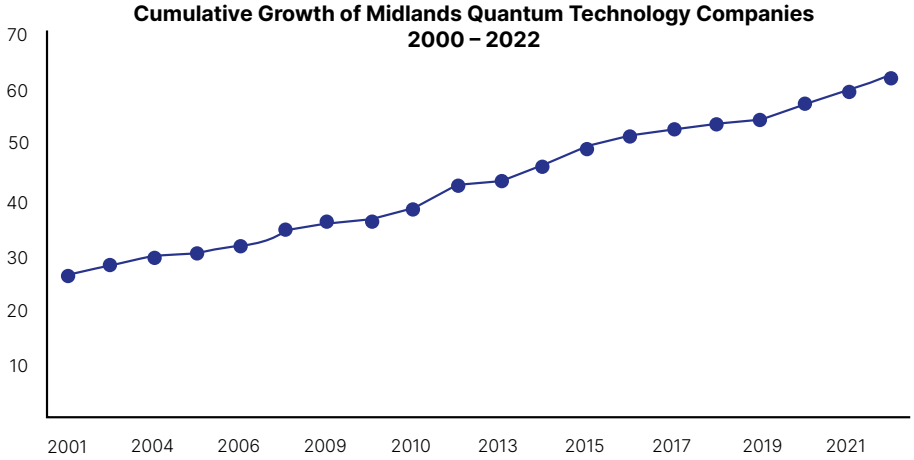
5 high growth companies[4]

- 6% of the high growth quantum technology companies in the UK have a Midlands location.

11 incorporations between 2017 and 2022

- 6% of UK quantum technology incorporations between 2017 and 2022 have a Midlands location.
- 4 quantum technology companies in the Midlands are identified as "scale-ups" and a further 3 "large scale-ups".

Cumulative Growth of Midlands Quantum Technology Companies 2000 – 2022



Quantum Technology Companies by Company Stage (UK and Midlands)

Company Stage	UK Companies	Midlands Companies	Midlands % of UK
Seed	0	0	N/A
Start-up	115	10	16.1%
Scale-up	88	4	4.5%
Large scale-up	45	3	6.7%
Unicorn	1	0	N/A
Established	187	28	15.0%
SME	176	17	9.7%
Total	**612**	**62**	**10.6%**
Linked to university spinout	**47**	**3**	**N/A**

Companies working in Quantum Technology and operating in the Midlands include:

Taylor Hobson Limited (Leicester)
Taylor Hobson is the world leader in surface and form metrology and developed the first Roundness and Surface Finish measuring instruments. They are pioneers in developing their product lines for next generation technologies including Optics, Bearings, Space, Defence, aerospace, automotive, medical and renewable technology.

Litron Lasers Limited (Rugby)
Litron Lasers is a designer and manufacturer of high energy solid-state pulsed and CD Nd:YAG and Nd:YLF lasers with nanosecond pulse widths. Their products are designed for research and engineered for industry.

ELUXI (Loughborough)
ELUXI specialises in the supply of premium photonics products and solutions for UK and Ireland. Their product offering also includes quantum dot lasers and gain chips which are small semiconductor structures and quantum cascade lasers.

BBN International (Shrewsbury)
BBN International is a specialist supplier of fibre optic instruments, components and consumables to the telecom, datacom, aerospace, research and sensor markets, with quantum system applications.

Delta g (Birmingham)
Delta g is a quantum technology and gravity gradiometry company on a mission to make gravity sensing technology as ubiquitous as GPS, radar and telecoms. Their technology is the world's first quantum technology-based gravity gradient capability to successfully detect buried features from their gravity profile alone.

Cerca Magnetics (Nottingham)
A spinout from the University of Nottingham, Cerca Magnetics have developed and brought to market the world's first commercial, fully integrated brain imaging device based on Optically-pumped magnetometers (OPMs).

4 Estimated 20%+ company growth percentage per year.

Innovation ecosystem

Midlands universities have received £55.6m (10.2% of the UK total) UKRI funding for quantum projects since 2017, according to **Gateway to Research**.[5] The top 5 Midlands university recipients from these active awards are:

1. University of Birmingham: £39.5m+
2. University of Nottingham: £8.1m+
3. University of Warwick: £5.5m
4. Loughborough University: £1.1m
5. Aston University: £870k+

Since 2018/2019 the Midlands has received over £6.3m (3.2% of UK) innovation funding with an average award of £171.6k.[6]

Quantum technology projects funded through this include:

UK Quantum Technology Hub for Sensors and Metrology (led by University of Birmingham; £35.5m as part of the UKQTP) The Hub creates a seamless link between science and applications by building on established knowledge exchange activities in quantum technologies. The University of Nottingham are also a partner organisation in the hub.

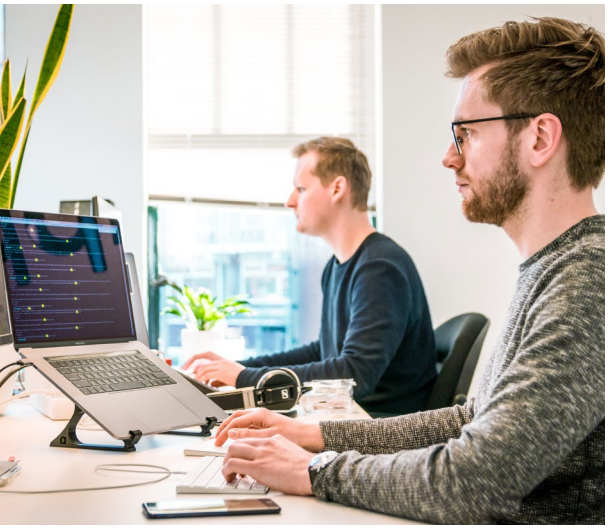
Optical Reference Systems via Additive Manufacturing (ORSAM) (University of Birmingham) (Metamorphic Additive Manufacturing Ltd; £607.8k) ORSAM seeks to address the critical national infrastructure challenge of delivering cost-effective, resilient, distributed timing within the telecommunications core and mobile access networks that we all depend on. This will deliver the emergency service network, data centre access, Industrial IoT, financial transactions and nearly all other forms of data access that are crucial to the future quantum sector.

Quantum for Bio (Q4Bio) The University of Nottingham are one of 12 successful teams worldwide to have been selected to receive funding for the project which aims to accelerate applications of quantum computing to address pressing human health challenges, such as the crucial task of drug discovery for myotonic dystrophy.

Relevant high performing HEI research

There are 8 Midlands universities with high Research Excellence Framework performance in relevant subjects:[7]

- Coventry University
- Keele University
- Loughborough University
- University of Birmingham
- University of Leicester
- University of Lincoln
- University of Nottingham
- University of Warwick



Talent ecosystem

1,866 estimated employees across these quantum technology companies[8]

- 8.9% of all UK quantum technology employees.

8,255 graduates in relevant subjects[9]

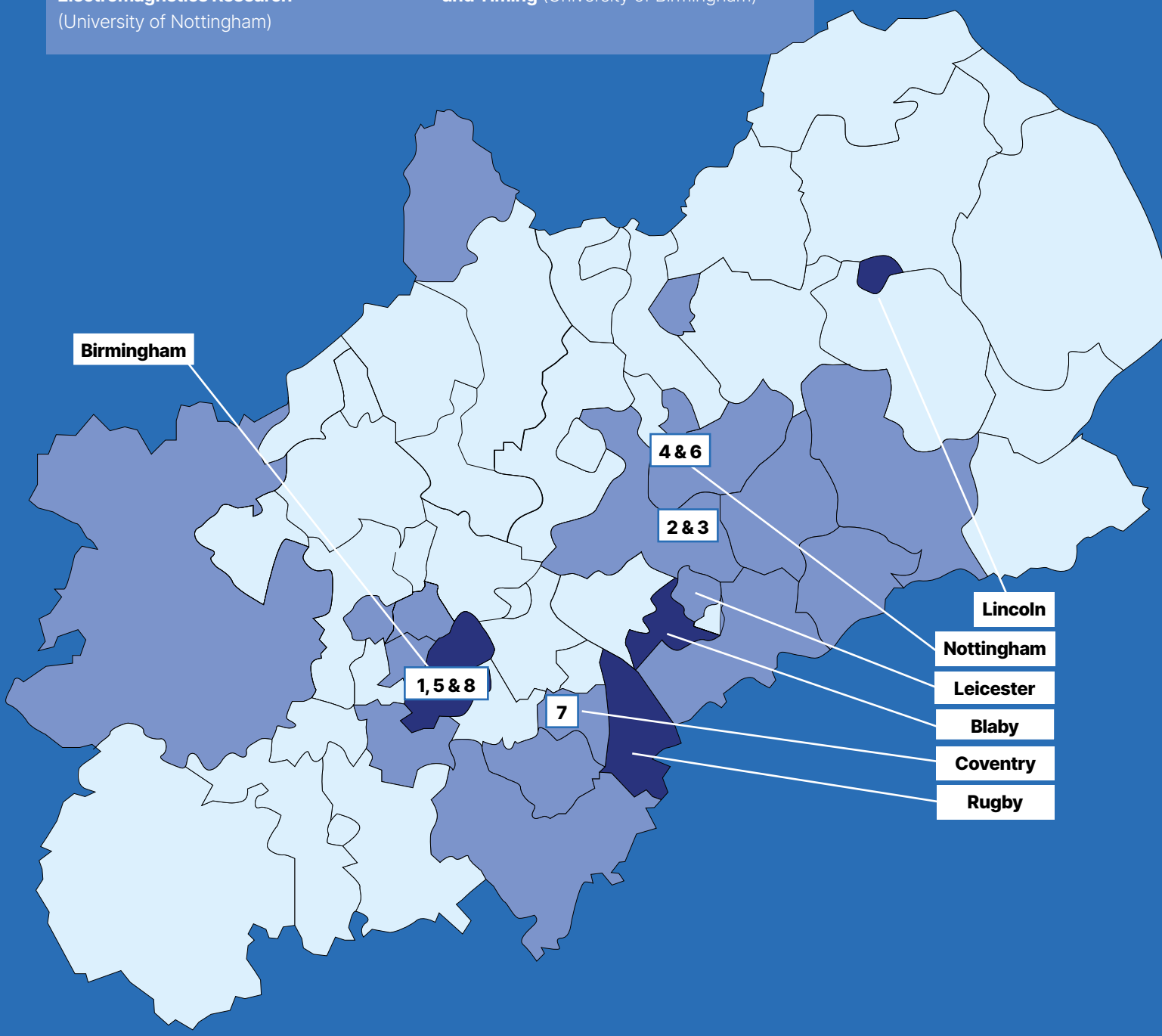
- 6% of Midlands graduates studied relevant subject to quantum technology.

Spatial concentrations of talent in the Midlands include Lincoln (albeit skewed by one large employer), Birmingham, and parts of Warwickshire (especially Rugby) and Leicestershire (especially Blaby). See the map on the opposite page for more detail.

5 Projects reported to reference 'Quantum'.
6 Innovate UK Award Data.
7 REF 2021 GPA >3.0 in any of Computer science and informatics; Mathematical Science; Physics.
8 The Data City 2023.
9 Graduates from relevant subjects 2021 (HESA): Information technology; Mathematics; Computer science; Information systems; Software engineering; Artificial intelligence; Physics; Others in computing.

Key quantum technology assets

1. **Aston Institute of Photonic Technologies** (Aston University)
2. **Centre for the Science of Materials** (Loughborough University)
3. **Emergent Photonics Research Centre** (Loughborough University)
4. **George Green Institute for Electromagnetics Research** (University of Nottingham)
5. **Midlands Ultracold Atom Research Centre** (University of Birmingham)
6. **Nanoscale and Microscale Research Centre** (University of Nottingham)
7. **Quantum Technology Lab** (University of Warwick)
8. **UK Quantum Technology Hub Sensors and Timing** (University of Birmingham)



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Investment ecosystem[10]

Encompassing quantum technology, software, and cyber security, Wavteq finds the following with regards to Midlands investment in digital industries:

Investment Metric	Investment Amount
FDI Capex 2017-21	$650.1m; 3% of UK total
DDI Capex 2017-21	$5.22bn; 26% of UK total
Fundraising Volumes	Mean av. £646k fundraising investment; £676m in 1,047 investments (inc. £45.3m across 590 seed investments; £395.5m across 328 venture investments).
DDI Jobs 2017-2021	3,674 jobs; 5% of UK total
FDI Projects 2017-2021	79 projects; 4% of UK total
DDI projects 2017-2021	179 projects; 14% of UK total

The Data City[11] finds £1.5m worth of investment into Midlands companies including:

- **Irresistible Materials** (Birmingham)
- **Laser Optical Engineering Services** (Derbyshire)

However, Midlands-based software companies received just 1.32% of equity investment raised in the UK from 2017 to 2021.

This is despite making up 10.2% of all high-growth software companies in the UK. These businesses also received just 3.26% of all grant money received by companies in this sector.

The lack of funding received by software companies in the Midlands may reflect the allure of London and the south for software companies, given the availability of talent and funding.

10 Wavteq 2022, note broader digital sector definition than just Quantum Technology
11 Dealroom and The Data City, 2023