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University of Leeds MedTech PBIAA – Supporting Evidence

Abstract

This study sought to provide a base of evidence that could be used to support an application by the University of Leeds for Place Based Impact Accelerator Account (PBIAA) funding that can further enhance medical technology research, development and innovation activity within the proposed geography. The study combines qualitative and quantitative research including a desk-based review of national and regional strategies and policies, collation and analysis of company data from various open and proprietary sources and one-to-one consultations with eight strategic external stakeholders from industry, academia, and policy development spheres. The study demonstrates that the proposed PBIAA geography represents a geographically suitable medical technology cluster, aligns with national and regional strategies and policies, and provides detailed data on 238 medical technology companies that can be used for targeted engagement activity and baseline impact metrics. The research also highlights future challenges, including private investment availability, start-up pipeline development, and accessibility of PBIAA activities for companies of various sizes and resources.

1. Introduction

This short report presents findings from a mixed methods research study into medical technology (MedTech) in the Yorkshire and Humber region. The study was commissioned by the University of Leeds to provide an evidence base that would underpin a place-based impact accelerator account (PBIAA) application to UK Research and Innovation's (UKRI's) Engineering and Physical Sciences Research Council (EPSRC). Research comprised desk-based review of national and regional strategies and policies, collation and analysis of company data from a range of open and proprietary sources including the Office for Life Sciences database, Bureau van Dijk, Beauhurst, Lens.org and Gateway to Research, and one-to-one consultation with 7 strategic external stakeholders from industry, academia and policy development spheres.

Table 1.1 below provides a summary of the research undertaken to inform the study, and how it aligns to the requirements of the EPSRC PBIAA.

Table 1.1 – Alignment of Study Research to PBIAA Requirements

PBIAA Requirement	Research Activity	Explanation
1. Evidencing strategic alignment <ul style="list-style-type: none"> - Be aligned with civic ambitions - Encourage collaboration on impact - Establish a thematic focus relevant to the cluster 	Review of strategic landscape (academic and civic strategies & policies)	Identifying where proposed PBIAA activity contributes to strategic objectives of universities and local / combined authorities by matching proposed PBIAA activity to strategic objectives
2. Stakeholder Engagement <ul style="list-style-type: none"> - Be co-created with civic actors - Engage businesses & local stakeholders - Establish cluster aims and objectives - Understand / respond to priorities & needs of stakeholders - Explain why contributions will make a significant difference - Demonstrate engagement & meaningful collaboration - Understanding requirements for building the cluster - Understanding how impact will drive cluster benefits 	One-to-one consultation with up to 8 key stakeholders	Using one-to-one interviews to raise awareness of the application, and to gather evidence of key priorities / stakeholder objectives.
2. Defining & Evidencing the Cluster <ul style="list-style-type: none"> - Clearly defining the R&I cluster geography - Understanding scale (# companies, employees within scope) and absorptive capacity (private investment, internal R&D) 	Analysis of open source and proprietary datasets including Bureau van Dijk (company data), Beauhurst (high-growth, private	Taking a data-driven approach to defining and evidencing the presence of an R&D cluster by analysing open source and proprietary data. Where possible charting impact of previous activity

PBIAA Requirement	Research Activity	Explanation
<p>investment, previous collaborative research activity)</p> <ul style="list-style-type: none"> - Establishing the base of high-quality R&I activity - Pro-actively identifying new businesses for targeting future collaborations. 	<p>investment), and Gateway to Research and REF impact case studies (previous research activity).</p>	<p>e.g., IKC or REF impact case studies.</p>
<p>4. Baselining Impact Metrics (incl. equality & diversity)</p> <ul style="list-style-type: none"> - Establishing economic baseline - Establishing private investment baseline - Establishing FDI baseline - Baselining cluster maturity (SME growth, spin-out activity) - Understanding diversity within medtech business base - Helping to define clear and credible targets and success measures 	<p>Analysis of open source and proprietary datasets including Bureau van Dijk (company data), Beauhurst (high-growth, private investment, diversity), FDI markets (inward investment) and Gateway to Research and REF impact case studies (previous research activity).</p>	<p>Taking a data-driven approach to establishing baseline impact metrics including e.g., number of businesses, revenues, employment, investment in R&D, private investment raising, representation of diverse groups within the business base, number and value of collaborative research projects.</p>
<p>5. Capturing Learning</p> <ul style="list-style-type: none"> - Providing a solid baseline that can be revisited - Allowing monitoring of outputs, outcomes and impacts - Helping to develop capability and capacity for impact measurement 	<p>Providing all underlying data and analyses, working closely with university representatives to transfer knowledge.</p>	<p>Ensuring collaborative working with university representatives throughout the research and committing to providing all</p>

Source: UKRI PBIAA Guidance, Perspective Economics

2. Defining & Evidencing the Cluster

This section presents findings from an analysis of data on 238 medical technology companies across the Yorkshire and Humber region. It seeks to clearly define and justify the research and innovation cluster geography, understand the scale and absorptive capacity of the cluster, establish the base of RD&I activity upon which PBIAA activity will build, and pro-actively identify businesses with which PBIAA can seek to engage.

2.1 Clearly Defining the R&I Cluster Geography

PBIAA scoping activity has been extensive, including a combination of one-to-one discussions between leading academics at universities across Yorkshire and an initial scoping workshop with representatives from more than 20 potential stakeholder organisations spanning academia, industry and economic development. The stakeholder engagement workshop returned a clear message regarding objectively defining and justifying the rationale for focussing on a specific ‘place’. To that end, the study team has combed web intelligence with data from several proprietary and open-source datasets (including Bureau van Dijk, Office for Life Sciences and Beauhurst), to identify a total of 238 medical technology companies across the Yorkshire and Humber region.

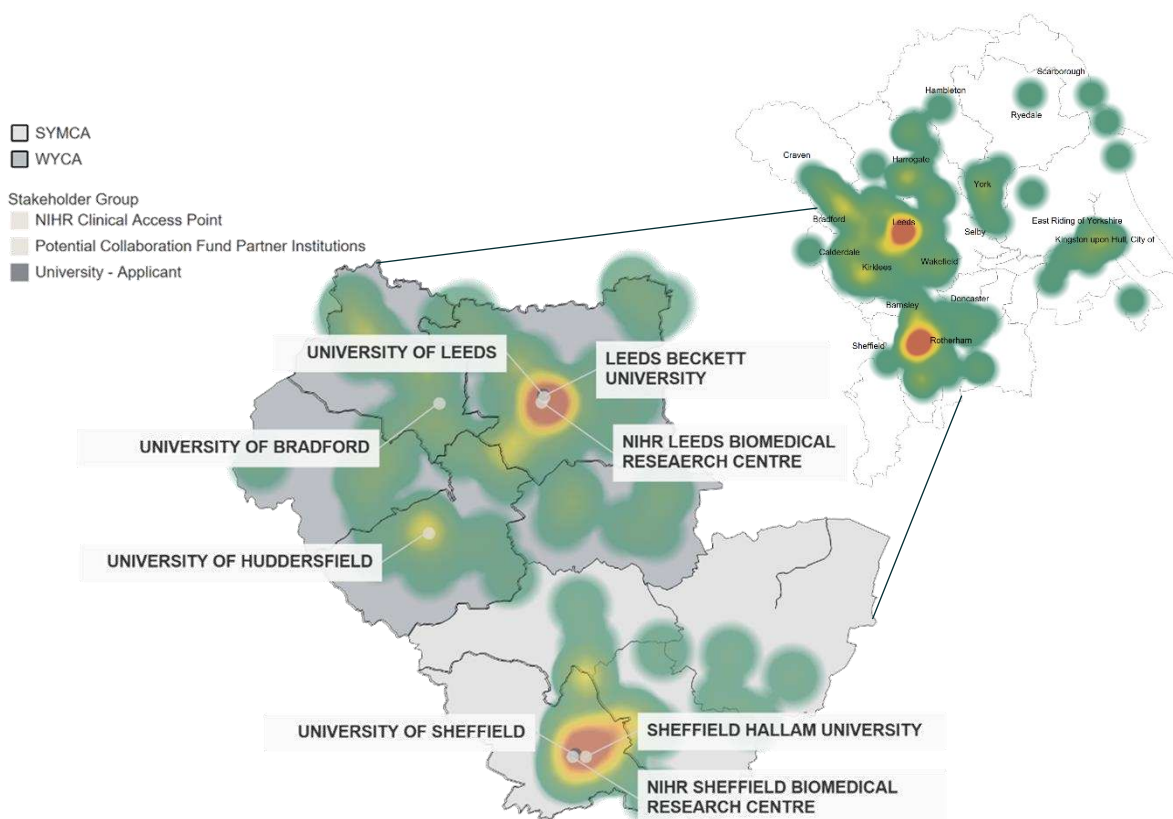
The proposed PBIAA geography (West and South Yorkshire Mayoral Combined Authorities) is home to approximately three quarters of the companies identified (n=174). Figure 2.1 overleaf shows the density of medical technology businesses within the proposed West and South Yorkshire geography vis-à-vis the wider Yorkshire and Humber region. It highlights the extent to which medical technology business activity is clustered around Leeds, Bradford, Kirklees and Sheffield, with most notable concentrations in close proximity to strategic research and innovation assets including but not limited to the region’s universities and biomedical research centres.

The apparent significance of physical clustering for medical technology companies was supported by evidence from qualitative research with medical technology businesses. As one consultee put it:

“While our headquarters are in Blackpool [the company took] a strategic decision to choose Leeds due to the medical hub and collaboration with University.”

MedTech Industry Stakeholder

Figure 2.1 – PBIAA MedTech Company Heatmap



Source: Perspective Economics

While PBIAA activity is expected to be inclusive, fostering MedTech collaboration across the Yorkshire region and beyond, on the basis that physical clusters of medical technology businesses derive benefits in terms of innovation and competitiveness, knowledge spillovers, technology transfer and other network benefits, company location data suggests that the choice of academic partnership (University of Leeds and University of Sheffield) and Civic partners (West Yorkshire Combined Authority and South Yorkshire Combined Authority) provides an appropriate reflection of the cluster.

2.2 Absorptive Capacity

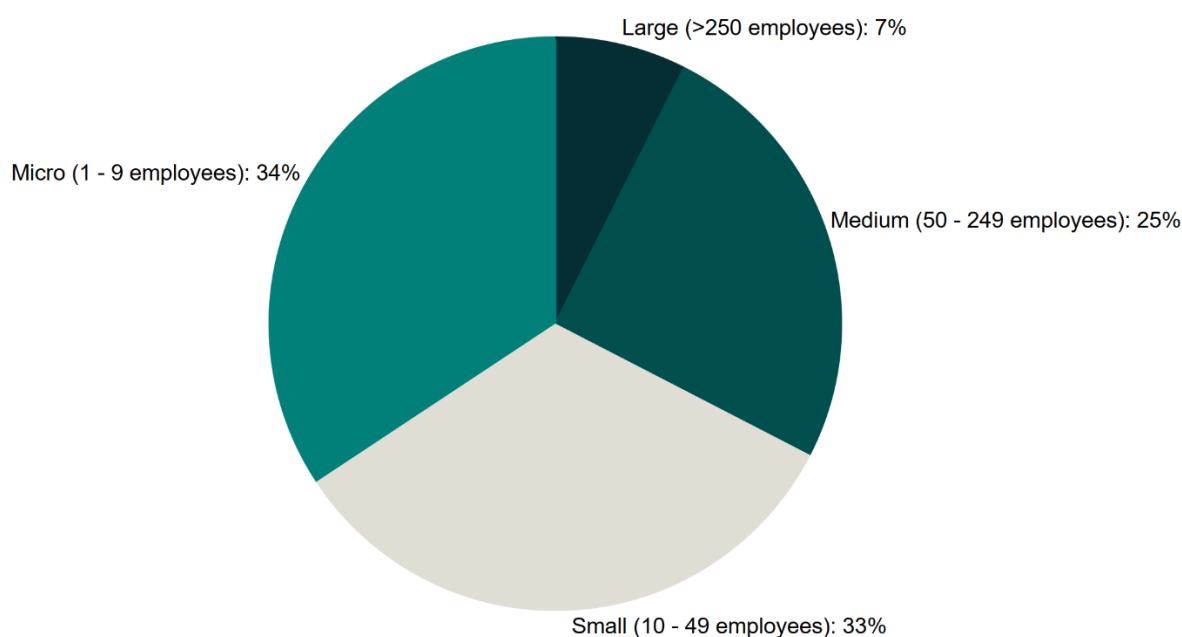
Physical connectivity (illustrated via location data presented in Section 2.1) has also been cited as one of several dimensions required to build absorptive capacity – the ability of a firm to recognise the value of new external information, assimilate it and apply it for business purposes¹. In addition to physical connectivity, various other factors are thought to contribute to the absorptive capacity of clusters, including the scale and firmographic profile of the cluster, knowledge intensity and human resources (among several others). This section presents findings from analysis of data on the scale, profile and R&D activity of the 174 MedTech companies identified within the proposed West and South Yorkshire geography as evidence of the potential absorptive capacity of the cluster.

¹ Cohen, W. M., and Levinthal, D. A. (1990). Absorptive capacity: a new perspective on learning and innovation. *Adm. Sci. Q.* 35, 128–152. doi: 10.2307/2393553

2.2.1 Scale & Firmographic Profile

Analysis of estimated firm size shows that the proposed PBIAA geography contains a healthy balance of different sized MedTech companies, from micro enterprises to large corporates, offering benefits of scale with respect to investment in research, development and innovation activity, opportunities for collaboration within supply chains and across industry segments and therefore also bolstering the potential for absorptive capacity across the cluster.

Figure 2.2 – Scale of PBIAA MedTech Companies



Source: Bureau van Dijk

Applying artificial intelligence (AI) technology to descriptive information about each company enabled classification of the PBIAA companies according to OLS's bioscience and health technology segments². Where automated classification did not return a decisive result, AI was used to generate relevant tags from descriptive data and a small number of additional classifications were assigned via manual review. Approximately 84% of the PBIAA located companies were categorised into the top 10 segments, as illustrated in Figure 2.2. Once again, firmographic data identifies a mix of MedTech companies across the value chain spanning everything from design and manufacture of orthopaedic devices, surgical instruments, re-useable and implantable devices, to contract manufacturing and clinical research organisations.

² 203 of the 238 companies (85%) were automatically categorised into OLS segments.

Figure 2.3 – PBIAA MedTech Company Classification




Source: Perspective Economics

2.2.2 Knowledge Intensity & Human Resources

In 2021 companies in the PBIAA geography invested more than £33m in research and development, and they have invested more than £150m in R&D since 2018. This substantive investment in R&D is indicative of high knowledge intensity and absorptive capacity within the cluster. Prominent investors in R&D include companies such as DePuy Synthes (orthopaedics | £87m), Drive DeVilbiss (medical, clinical, social care and independent living devices | £2.6m), Paxman Coolers and Hugh Steeper (scalp cooling and prosthetics / orthotics respectively | c.£1m each).

	2018 – 2021 Revenue Growth	c.£1m
	2018 – 2021 Employment Growth	+22
	R&D Investment (2018 - 2021)	£87m
<p>DePuy Synthes' long association with the West Yorkshire region is well documented. DePuy International Limited was originally established in Leeds in 1956, worked closely with pioneer hip replacement surgeon Sir John Charnley before acquiring a factory on St. Anthony's Road, Beeston in 1957. The company was acquired by Johnson & Johnson in 1998 and became DePuy Synthes following a merger with Synthes in 1998. In 2015 the company significantly expanded its operations in Leeds when it opened a new world-leading centre of excellence for orthopaedic R&D at the St. Anthony's Road site. That site is now the company's European Research and Development Centre. Between 2018 and 2021 DePuy Synthes has invested almost £90m in MedTech R&D in the UK – an average of more than £20m per year. The company continues to have strong ties to Leeds, including with researchers at the University of Leeds and is recognized as a key stakeholder in proposed PBIAA activities.</p>		

The extent of knowledge intensity within the cluster is also reflected in an analysis of patent data. Across the wider Yorkshire and Humber region, 27 of the companies identified have had MedTech patents published since 2018³, 18 of those companies (67%) are located within the proposed PBIAA area of which 16 are headquartered there.

	2018 – 2021 Revenue Growth	c.£1.5m
	2018 – 2021 Employment Growth	+3
	Patents Published (2018 - 2021)	4
<p>Founded in 1991 and headquartered in Wetherby, Kapitex is a market leader in the development and manufacture of medical devices for use in tracheostomy and laryngectomy. Kapitex products help to maintain and ensure respiratory function in tracheostomy and laryngectomy patients and also provides specialist Ear Nose and Throat (ENT) products in the UK for airway stenting and laryngology. The company has had four patents granted and published since 2018, including with respect to a speaking valve to allow inspiration and controllable expiration through a tracheostoma comprising a valve element movable by finger pressure of a user. Patent number GB2580598 (A).</p>		

In terms of human resources, the MedTech companies identified across Yorkshire and Humber employ around 15,600 people. Companies within the PBIAA geography employ approximately 11,000 people – people with the necessary skills, expertise and networks to

³ Based on a search for granted EU or UK patents published since 2018 within medical technology relevant IPC Classes A61 (B, C, D, F, G, H, J, L, M, N) and H05G.

absorb, assimilate and deploy new knowledge generated via PBIAA activity⁴. The vast majority of this employment (c.93%, n=10,200) is concentrated within companies that are headquartered in the PBIAA geography. This employment figure represents more than three fifths of total employment among all MedTech companies identified across the Yorkshire and Humber region⁵. Table 2.1 below shows the top 10 PBIAA headquartered companies by measure of employment growth.

Table 2.1 – Top 10 Employment Growth MedTech Companies

Company Name	Rank of Employment Growth (2018 - 2022)
BLUETREE MEDICAL LIMITED	1
B. BRAUN MEDICAL LIMITED	2
FINSBURY (INSTRUMENTS) LIMITED	3
MEDISOFT LIMITED	4
IDEXX LABORATORIES LIMITED	5
HARVEST HEALTHCARE LIMITED	6
HERIDA HEALTHCARE LIMITED	7
ORCHID ORTHOPEDIC SOLUTIONS LTD	8
ARTHREX LIMITED	9
SWANN-MORTON LIMITED	10

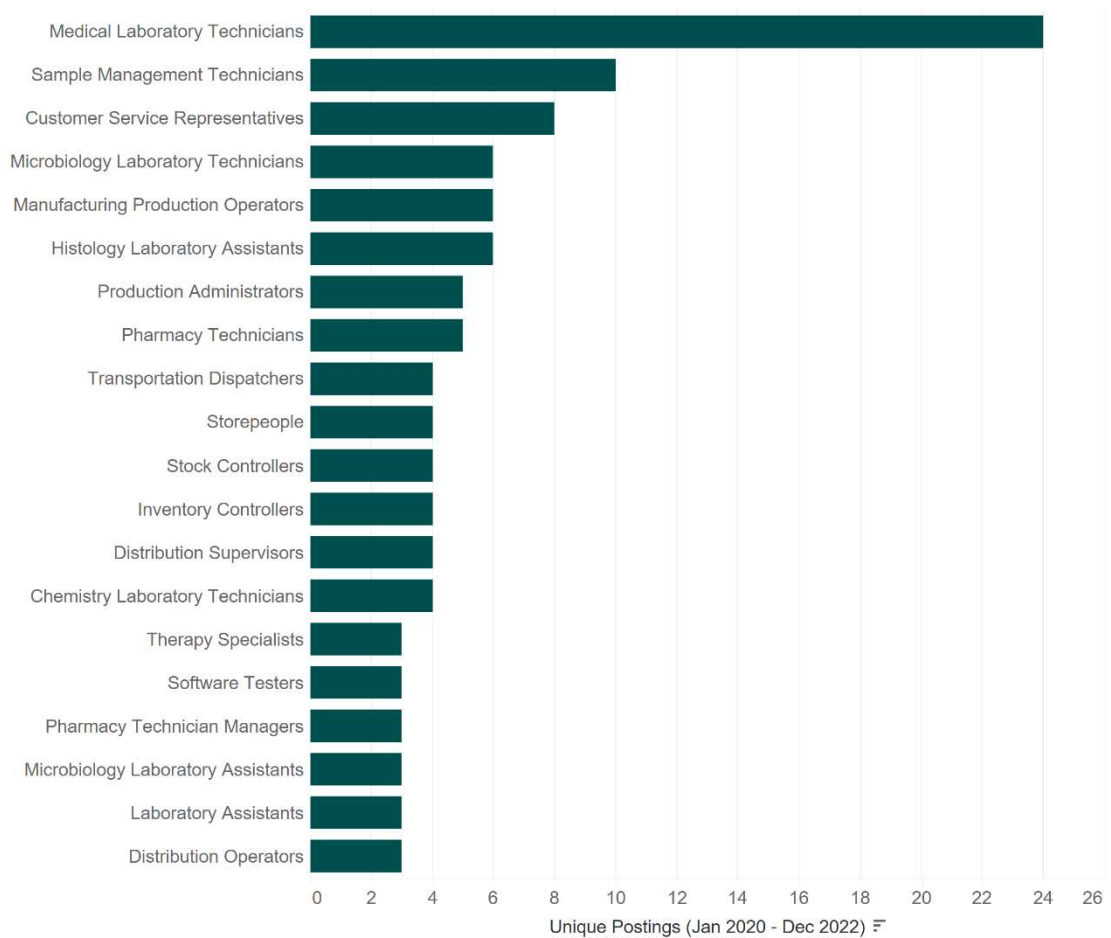
Source: Bureau van Dijk

Analysis of job post data for these companies between 2020 and 2022 illustrates the high-value nature of the employment opportunities that they create. Over the past two years, these companies have issued 265 unique job posts. Associated salary data suggests that the median advertised salary across all roles is £50k (50% above the median UK salary of £33k) with an upper salary bound of £113k. Figure 2.4 below provides an illustration of the advertised job titles, highlighting a wide range of MedTech related opportunities, from laboratory technicians to manufacturing and logistics operatives and software developers.

⁴ Analysis excludes 5,500 people recorded as employed by holding company Launchchange Instrumentation Limited.

⁵ Figures relate to the last financial year in which company accounts are currently available – typically 2021 and in some cases 2022.

Figure 2.4 – In-Demand Regional MedTech Jobs

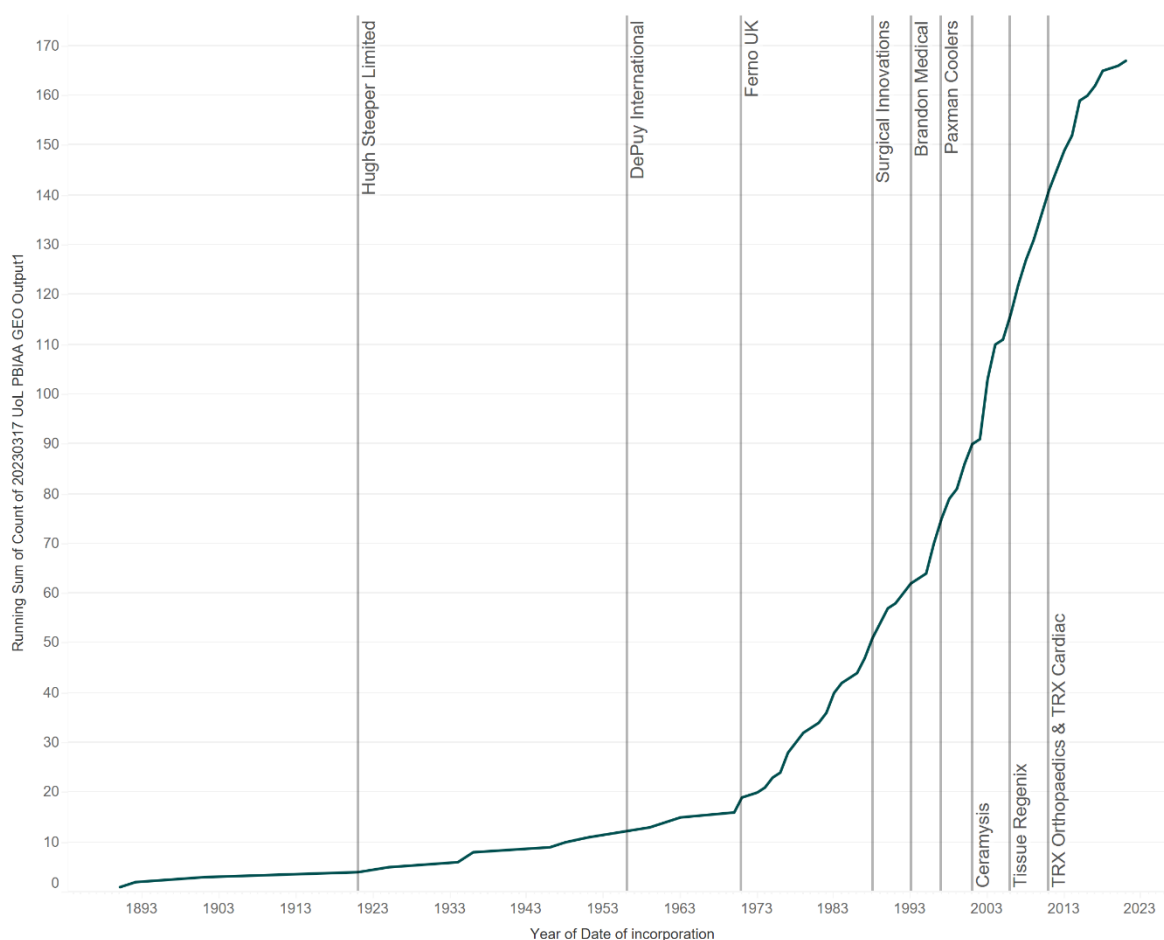


Source: Lightcast

2.2.3 Start-Up & Investment Activity

A vibrant start-up and investment ecosystem points to greater scope for absorptive capacity within a cluster as new companies seek to build on original knowledge through research and innovation. PBIAA-supported research, development and innovation activity can act as a catalyst for private investment by establishing a credible pipeline of research with commercial potential, helping to make investment in the sector more attractive, and more frequent. The PBIAA region has seen a steady flow of new MedTech company incorporations since the early 1970s, including one or two new additions every year between 2015 and 2021 (Figure 2.5).

Figure 2.5 – MedTech Company Incorporations



Source: Bureau van Dijk (n=167)

Despite strong growth of the cluster over time, data on start-up and investment activity within the proposed PBIAA geography also emphasises the importance of PBIAA funding to help sustain a pipeline of new, innovative MedTech firms that will carry regional and national ambitions for economic growth and recognition as a science superpower.

Despite significant allocation of own funds among regional MedTech businesses to research, development and innovation activity (2.2.2), data on grants and investment raising activity suggests that only around 10% of companies identified within the PBIAA geography have secured grants or external investment (n=17). While this apparent non-reliance on grants and external investment can be viewed as a strength in the current economic environment, it also suggests a need for groundwork that will enable more innovative new MedTech start-ups and scale-ups in future. In total, MedTech companies identified in the PBIAA geography have secured just under £20m in grants and external investment since 2012 and average investment raising equates to just £1m per firm.

Of the companies that have secured grants or fundraising, just over half are categorised as being at more dynamic Seed, Venture or Growth stages (35%, 6% and 12% respectively), and just under one quarter are Established⁶.

	2018 – 2021 Revenue Growth	c.£975k
	Investment (2015 - 2018)	£500k
<p>Incorporated in 2014 and headquartered in Huddersfield, Innovate Orthopaedics has secured £500k in external investment to design and manufacture innovative surgical devices. Since securing its last investment in 2018 the company has grown revenues by almost £1m and employs more people in quality and regulatory roles.</p>		

2.3 Economic Contribution

MedTech companies headquartered within the proposed PBIAA geographic area generated revenues of almost £2bn in the last financial year⁷ and contributed more than £760m in Gross Value Added (GVA) to the UK economy⁸. Average GVA per FTE among PBIAA headquartered companies is £56,850 – between 12% and 25% above average GVA per filled job in West Yorkshire (12% above), South Yorkshire (16% above) and the wider Yorkshire and Humber region (25% above). Data compiled to inform this report will be used to pro-actively engage with numerous high-innovation, high-growth MedTech companies, ensuring a targeted approach to collaborative research that is most likely to deliver strong economic benefits in future. The University of Leeds has a strong track record of delivering tangible impacts from its collaborative research activity, evidenced by successful delivery of the Medical Technologies Innovation and Knowledge Centre (IKC) and Grow MedTech. Backed by funding from EPSRC and Research England, these two previous initiatives produced dozens of case studies demonstrating real world impact through collaboration with industrial and charitable partners alike.

⁶ **Seed:** A seed-stage company is a young start-up, with low employee count, valuation, and total equity investment raised. There may still be uncertainty as to whether its product or service has an adequate market, or it may be working to gain regulatory approval. The most common sources of funding for this stage of company are grant-awarding bodies, crowdfunding platforms, and angel investors. **Venture:** Venture-stage companies have developed their business models and technology over multiple years, typically securing investment and a valuation in the millions. They will likely have some revenue and may be expanding their initial product range. Venture rounds typically involve private equity and venture capital funds, although may tap into crowdfunding. **Growth:** When a company has been operating for more than five years, and has grown to multiple offices, they're more likely to have reached the Growth stage of evolution. A growth-stage company will also have regulatory approval and is likely bringing in significant revenue and investment, with a valuation in the millions. It will be continuing to expand its product range and international activities. **Established:** An established-stage company has been trading for 15+ years, or 5-15 years with a three-year consecutive profit of £5m+ or turnover of £20m+. As you may expect, these businesses usually have several offices and a widely recognised brand. Funding at this stage is often deployed by corporates, private equity firms, banks and specialist debt funds, or major international investors.

⁷ Note that analysis excludes c.£1bn in revenue recorded within holding company accounts for Launchchange Instrumentation Limited which includes several companies such as Leica Biosystems, Puridify Limited, Sciex UK Limited and Cytiva Biosciences.

⁸ Note that these estimates are based solely on known data reported by a sample of companies within the dataset. Further work beyond the scope of this study would be required to produce more detailed estimates which would be expected to result in a notable increase in both turnover and GVA figures as small company data could be robustly estimated and included.

2.2.1 Meeting Stakeholder Needs

A series of seven consultations with industry and policy stakeholders were undertaken to inform this study (Table 2.2).

Table 2.2 – Study Contributors

Organisation Name	Organisation Type	Consultee Role
Invivio Limited	MedTech Industry Stakeholder	Head of Product Development
Medipex Limited	MedTech Industry Stakeholder	Head of Innovation
Nexus Leeds Limited	MedTech Industry Stakeholder	Health Technology Lead
Y&H Academic Health Science Network	NHS RD&I Stakeholder	Director of Enterprise & Innovation
University of Leeds	Academic Stakeholder	Professor of Biomedical Engineering
University of Sheffield	Academic Stakeholder	Professor of Biomaterials Science
West Yorkshire Combined Authority	Policy Stakeholder	Health Technology Policy Lead

Key themes emerging from this element of qualitative research included:

- A resounding enforcement of the strength of the region with respect to medical technology research and innovation – industry representatives highlighted the value of being located in the proposed PBIAA geography, while policy stakeholders stressed the high level of ambition for medical technology research, development and innovation in future.
- Confidence in established academia – industry – healthcare research, development and innovation networks. Consultees indicated that despite increasing pressures on the NHS, well-established relationships with NHS and academic networks mean that research and development activity can still be effectively ‘pulled through’.

“Access to the NHS is becoming more and more difficult. What we have in the ICSs within West and South Yorkshire are good supportive research connectors so even though the NHS is stretched, by working together with AHSN, the NHS we have the routes and structures already in place to draw that [R&D activity] through.”

Strategic External Knowledge Exchange Stakeholder

- A shared sense that the proposed combination of West and South Yorkshire geographies would provide complementary strengths and therefore additional research, economic,

health and sustainability benefits – consultation with academic and policy stakeholders in both West and South Yorkshire Mayoral Combined Authority areas outlined differing yet complementary strengths in terms of research, development and innovation focus, the availability of facilities and equipment, and the type of business supports available across the proposed PBIAA region.

- A collective view that issues of equity of access and clear fit with future clinical needs should be a key consideration from the earliest stages of research – consultees suggested that designing considerations regarding equity of access and fit with clinical needs into early stage research would contribute to a more sustainable pipeline of research, development and innovation activity.
- The importance of previous university-led initiatives such as the Medical Technologies IKC and Grow MedTech to building the region’s MedTech reputation. Consultees felt that similar initiatives would be important in future to continue building the region’s reputation as a national and international centre for medical technology research and development.

Industry representatives were, however, also keen to stress the need for swift-response, non-bureaucratic, and comparatively low-cost options for engaging the breadth of the region’s MedTech business base in PBIAA research and innovation activity. As one consultee put it:

“Often SMEs want support from universities and the university comes back with a 3 year programme that costs 200k but in actual fact the SME needs something quick and relatively low-cost. [PBIAA activity should seek to] Support the development of the technology in the company itself. Companies would see that as a huge benefit – but it needs to be quick, both in terms of decision-making and starting.”

MedTech Industry Stakeholder

3. Strategic Context

Medical technology has long been recognised as a major strength within Leeds City Region (LCR). In 2017 a government sponsored Science and Innovation Audit (SIA) highlighted that LCR had “a concentration of knowledge based innovative health sciences organisations, alongside broader healthcare industries and recognised strengths in digital health innovation and the manufacture of medical and dental instruments⁹”.

In 2019 a further study into medical and digital health technologies across the wider Yorkshire and Humber region reiterated medical technology strengths in West and South Yorkshire. At that time, Office for Life Sciences (OLS) data showed that there were around a 20% more value-adding MedTech firms in the LCR Local Enterprise Partnership (LEP) area than in any other LEP region, and that the LCR LEP also ranked in the top 10 LEP regions in terms of high value-adding biopharma and digital health business counts (ranks of 7th and 4th respectively).

The 2019 study also identified a cluster of health technology SMEs in South Yorkshire and highlighted that the wider Yorkshire and Humber region was home to some of the most forward-thinking and accessible routes into the NHS, including organisations such as the Yorkshire & Humber Academic Health Science Network (YHAHSN)¹⁰, the National Institute for Health Research (NIHR) Med-tech and In-Vitro Diagnostics Co-operatives (MICs), academia / industry collaboration programmes such as Nexus (Leeds)¹¹, 3MBIC (Huddersfield)¹² and Grow Med-tech (cross geography multi-institute)¹³, the Digital Health Enterprise Zone (Bradford)¹⁴, and progressive NHS institutions such as the four teaching hospitals in Bradford, Leeds, Sheffield and York¹⁵.

3.1 Contribution to National Strategies

MedTech activity in West and South Yorkshire continues to make a substantive contribution to health and economic strategies and plans at both UK and local authority levels. The sub-sections below provide a summary of how proposed MedTech PBIAA activity can contribute to these national and local strategic objectives.

3.1.1 UKRI Strategies

PBIAA activity will very clearly contribute to UKRI strategies and plans over the 2022 – 2025 period, including but not necessarily limited to the **UKRI Corporate Plan** and EPSRC’s Strategic Delivery Plan. PBIAA activity will contribute to four of the six strategic objectives set out in the UKRI corporate plan, including:

- Places: by continuing to support world-class medical technology research in one of the UK’s foremost medical technology research and innovation centres, PBIAA activity will

⁹ University of Leeds, 2017 “Opportunities and Growth: Medical Technologies in the Leeds City Region”, Department for Business, Energy & Industrial Strategy, 2017

¹⁰ <https://www.yhahsn.org.uk/>

¹¹ <https://nexusleeds.co.uk/>

¹² <https://3mbic.com/>

¹³ <https://growmed.tech/>

¹⁴ <http://dhez.org/>

¹⁵ Perspective Economics, 2019 “Digital Health Sector Report”, West Yorkshire Combined Authority

contribute to securing the UK's position as a globally leading research and innovation nation with outstanding institutions, infrastructures, sectors and clusters across the UK.

- Ideas: by applying medical engineering minds to research and innovation challenges, PBIAA activity will advance the frontiers of medical technology knowledge by enabling the UK to seize opportunities from technological trends such as biomedical engineering, robotics and further integration of sensing and data analytics.
- Innovation: by working collaboratively with some of the UK's foremost medical technology companies PBIAA activity will support innovation activity that delivers iterative improvements in efficiency, productivity and sustainability that can deliver impact at scale.
- Impacts: by strategically aligning with national and regional strategic challenges and objectives (illustratively set out in the remainder of this Section) PBIAA activity will contribute to longer-term impacts on knowledge creation, economic growth, health and social care and sustainability.

Aligned to UKRI's Corporate Plan, **EPSRC's Strategic Delivery Plan (2022 – 2025)** sets out the same strategic objectives to which PBIAA activity is expected to also contribute. EPSRC plans are framed around eight cross-cutting priorities that seek to provide a balance across its portfolio spanning discovery research, mission-oriented research and an effective underpinning ecosystem. PBIAA activity will contribute to these cross-cutting priorities as follows:

- Discovery Research: contributing to long-term economic, social and environmental benefits by creating a pathway for practitioners to inform discovery-oriented research questions.
- Mission-Inspired Research: helping to deliver world-class impacts via medical technology that pushes the boundaries of artificial intelligence digitalisation and data, and that transforms health and healthcare.
- Effective Ecosystem: enabling a more inclusive, connected and resilient ecosystem by building on existing strengths in multidisciplinary research skills, excellent research and innovation infrastructure and further catalysing business co-creation and investment across the UK.

3.1.2 UK Life Sciences Vision (2021)

PBIAA activity will also contribute to broader national strategic health and life sciences objectives. For example, building on the 2017 Life Sciences Industrial Strategy and Sector Deals, the UK Life Sciences Vision, published in 2021, emphasises how the Life Sciences sector is amongst the most valuable and strategically important to the UK economy, and at the same time critical to the country's health, wealth and resilience. The Life Sciences Vision highlighted the benefits of combining existing academic and industrial strengths with new ways of working including, for example, adopting an 'at-risk' mindset, while ensuring that progress and outcomes could be tracked through clear and measurable objectives and metrics.

Commensurate with the collaborative spirit set out in the UK Life Sciences Vision, the research, development and innovation activity delivered through this PBIAA funding will bring academic and industry MedTech expertise together in an ecosystem that fosters a pro-innovation mindset, while ensuring that progress is clearly measurable through a combination of the baselining research presented in this report, and an ongoing focus on monitoring processes and outcomes.

The Life Sciences Vision also highlights that, to be sustainable, the NHS requires new predictive and monitoring technologies that can prevent, detect, diagnose and treat disease early, in line with commitments set out in the NHS Long Term Plan¹⁶. This change is recognised as requiring an approach in which new technologies can be tested rapidly and at scale and adopted more quickly and comprehensively within the NHS. Failure to address this challenge, and to create appropriate incentives for manufacturing in the UK, are seen as two of the most significant risks to the UK's international position in Life Sciences.

The MedTech ecosystem in West and South Yorkshire is recognized as having some of the most forward thinking and accessible routes into the NHS. The region is therefore very well placed to support the Life Sciences vision as a prime location for building on the UK's science and clinical research infrastructure, supporting the NHS to test and spread innovative new technologies, and to create the right business environment to support world-leading MedTech advances.

Lastly, the Life Sciences Vision sets out four preconditions for success which must be met over the next decade for the potential of the Vision to be fulfilled. The four preconditions are: i) having the NHS as an innovation partner; ii) ongoing investment in Life Sciences research and innovation; iii) governance and oversight of health data that is more conducive to research and innovation; and iv) access to finance.

West Yorkshire is home to several significant government health head-quarters, including NHS England, NHS Digital and NHS Leadership Academy. Strong and long-term relationships among MedTech actors in West and South Yorkshire will help to ensure a collaborative and productive approach to NHS engagement on medical technology. Securing PBIAA funding, and contributing to new impetus on increasing private investment in the region will support ongoing investment in medical technology research and innovation.

¹⁶ <https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/>

3.1.3 UK Medical Technology Strategy (2023)

Published as a policy paper in 2023, the UK's Medical Technology Strategy aims to pave the way for the UK becoming a global leader in the development and adoption of medical technologies that have the potential to improve patient outcomes and boost economic growth.

“MedTech is a vitally important industry for the UK economy, representing over half of all life sciences employment, with businesses situated across the UK and contributing billions of pounds to the economy.”

UK Medical Technology Strategy, 2023

Building on recognition of the significant role that medical technologies played in dealing with the COVID-19 pandemic, the recent Medical Technology Strategy highlights how the UK MedTech sector can boost economic growth, help to ease pressure on the NHS, promote levelling up and create a world-leading regulatory environment. To do so, the strategy highlights a need for strong collaboration between industry, academic and healthcare providers to maximise the potential of innovative MedTech solutions.

“Moving forwards, we have the opportunity to make the UK an even more attractive market for businesses by improving access, shaping our own regulatory framework, leading in research and development, and maintaining a strong international market presence.”

UK Medical Technology Strategy, 2023

PBIAA funding will leverage the knowledge, facilities and entrepreneurial spirit of one of the largest and most concentrated MedTech clusters in the UK. As a location for large global MedTech businesses and home-grown MedTech SMEs alike, with access to considerable MedTech academic expertise at several prominent UK universities, West and South Yorkshire can serve as an exemplar of the strong industry-academia-healthcare collaboration required to realize the ambitions contained within the UK Medical Technology Strategy.

3.1.4 Accelerated Access Collaborative & MedTech Funding Mandate (2023)

Formed in response to the Accelerated Access Review published in October 2016, the Accelerated Access Collaborative (AAC) was established to help make the UK one of the most pro-innovate health systems in the world by bringing together decision-makers and innovators together to accelerate impactful and cost-effective products for patients, clinicians, industry and investors¹⁷.

The MedTech Funding Mandate (MTFM) builds on the AAC by providing a set of guidelines and objectives for commissioners and NHS providers that are intended to support the adoption of MedTech and diagnostic technologies across almost 200 healthcare services.

¹⁷ <https://www.england.nhs.uk/aac/about-us/>

According to National Institute for Care Excellence (NICE) resource impact assessments, the potential savings from the Funding Mandate's support for four technologies in 2021/22 are expected to be £25m per year compared to the cost of more traditional technologies. In its second year (April 2022 – March 2023) the Funding Mandate was being expanded to include an addition seven technologies across a variety of clinical conditions with potential savings of £44m per year by enabling high quality outcomes from fewer resources, reducing theatre time and length of stay. The policy aims to foster collaboration and encourage the use of innovative technologies so that patients can access clinically effective medical technologies more quickly and equitably.

By bringing together research and innovation know-how from industry and academia, the activities funded via this PBIAA will contribute substantively to a sustainable pipeline of early stage research and development that increase the chances of later stage development and adoption in future.

3.1.5 NHS Innovation Accelerator

The NHS Innovation Accelerator (NIA), commissioned by the AAC, supports individuals to scale promising innovations across the NHS in England for greater patient and staff benefit. Established in 2015 and delivered in partnership with the 15 Academic Health Science Networks (AHSNs), the NIA has helped innovations scale and delivered insights to the health and social care system by identifying NIA Fellows and providing support through a network of NIA Mentors. To date, the NIA has supported 82 Fellows to spread innovative products and services across almost 3,000 NHS sites.

By generating new knowledge that acts as a catalyst for connecting researchers, innovators and clinicians around new MedTech products, this PBIAA will contribute to the base of talent and technology developments upon which the NIA can build in future.

3.2 Contribution to Regional Strategies

Medical technology and broader life sciences activity has been a prominent feature within regional economic development and innovation strategies for almost a decade. The paragraphs below highlight the relevance of MedTech research and innovation to recent strategy and policy objectives in West and South Yorkshire.

3.3.1 West Yorkshire Context

As early as 2014, **Leeds City Region** LEP's European Structural and Investment Fund (ESIF) Strategy emphasised the region's significant advanced manufacturing and health and life sciences sectors. The 2014 strategy highlighted how the region's tradition of innovation and excellence in machine manufacture had enabled cutting medical technology companies to flourish.

The **LCR LEP Strategic Economic Plan (2016 – 2036)** has regional expertise in medical technologies as a core tenet of economic growth in the West Yorkshire region, recognising the globally significant capability that the region has in areas such as bioscience, digital health and medical technology.

In 2017 a government sponsored **Science and Innovation Audit (SIA)** highlighted that LCR had “a concentration of knowledge based innovative health sciences organisations, alongside broader healthcare industries and recognised strengths in digital health innovation and the manufacture of medical and dental instruments¹⁸”.

In 2019 a further study into medical and digital health technologies across the wider Yorkshire and Humber region reiterated medical technology strengths in West and South Yorkshire. At that time, Office for Life Sciences (OLS) data showed that there were around a 20% more value-adding MedTech firms in the LCR Local Enterprise Partnership (LEP) area than in any other LEP region, and that the LCR LEP also ranked in the top 10 LEP regions in terms of high value-adding biopharma and digital health business counts (ranks of 7th and 4th respectively).

This PBIAA will continue to build research and innovation collaborations with many of the cutting-edge companies identified in the ESIF strategy, including companies such as Surgical Innovations and Brandon Medical. By generating new knowledge and new, early-stage medical technologies it will further build upon the regions nationally recognized strengths in MedTech research and innovation thereby helping to ensure that the region makes a substantive contribution to the UK’s position as a leading location for medical technologies.

In 2021 the **West Yorkshire Investment Strategy (WYIS)** outlined how the West Yorkshire region will make use of pooled investment as part of its devolution agreement to deliver its priorities for transformational change. The WYIS emphasises the need to tackle market failures that help to drive inclusive growth and productivity via strong sectoral strengths, including health technology. Further, the WYIS points to start-up activity within the health technology sector as a critical driver of economic growth out of challenging economic times. Health technology is specifically referenced as a priority area for investment, in line with ambitions set out within the West Yorkshire Innovation Framework (WYIF).

This PBIAA will deliver new knowledge, skills and early-stage MedTech product innovations that will stimulate further growth of the MedTech cluster in West Yorkshire, thereby contributing to the objectives of the WYIS. The PBIAA will be delivered in collaboration with the Combined Authorities in West and South Yorkshire and will therefore also contribute to health technology business support ambitions outlined in the WYIF.

¹⁸ University of Leeds, 2017 “Opportunities and Growth: Medical Technologies in the Leeds City Region”, Department for Business, Energy & Industrial Strategy, 2017

The West Yorkshire region's longer-term **Strategic Economic Framework** (to 2030) also points to health technology as one of the regions key drivers of future economic growth and prosperity.

“Businesses in West Yorkshire have been at the forefront of exploiting opportunities in textiles, chemicals, machinery and more recently data and health technology. Growth [since 2008] has been as dynamic as our economy with the highest growth happening in a range of specialist areas such as the manufacturing of medical components”.

West Yorkshire Strategic Economic Framework

The **West Yorkshire Innovation Framework (WYIF)** sets a vision for the region to be a place that is globally recognised for developing an open, inclusive, thriving and coherent innovation ecosystem, where SMEs, budding entrepreneurs and individuals are inspired to innovate and collaborate to create new and better solutions for business growth and societal good. Health technology (and medical technology within that) is identified as the region's top innovation strength and is therefore expected to contribute significantly to successes such as more innovation-led businesses doing more 'high-end' research, development and innovation.

By acting as a catalyst for further investment in MedTech research and innovation activity from higher education institutions and businesses in the region, the PBIAA will help to stimulate, create and nurture high-end research, development and innovation activity.

The Combined Authority's '**Mayoral Pledges**' point to similar roles for the regions MedTech sector, including most notably the creation of 1,000 well paid, skilled jobs for young people and support for the most significant and the most innovative businesses in the region.

As evidenced later in this report, many of the medical technology companies that the PBIAA will engage have grown significantly in recent years and are therefore a likely provider of well paid, high skilled jobs for young people, and a key source of start-up and scale up activity in the region.

More recently the **West Yorkshire Manufacturing Task Force Report**, published in July 2022, highlights the critical role that the regions manufacturing businesses – including MedTech manufacturing businesses – play in economic growth and technological advancement.

PBIAA activity is also aligned with regional healthcare strategies, including the West Yorkshire Health and Care Partnership's (WYHCP's) **Five Year Plan and Integrated Care Strategy** (2023)¹⁹ set out the vision for the future of health, care and wellbeing in the region. The Five Year Plan explains how local hospitals will be supported by centres of excellence

¹⁹ <https://www.wypartnership.co.uk/publications/west-yorkshire-integrated-care-strategy>

that will help deliver world class care and push the boundaries of research and innovation. In 2019 the WYHCP signed a 'HealthTech Memorandum of Understanding' that seeks to leverage health technology to reduce health inequalities and provide more jobs. The WYHCP Five Year Plan makes specific reference to the region's health technology cluster, to which PBIAA activity will make a substantive contribution, and the Integrated Care Strategy highlights the benefit of state-of-the-art equipment available within the Partnership's new pathology lab to both patients and pathology staff.

“As a region we have a thriving university sector, over 250 HealthTech businesses, and a strong Academic Health Science Network. By working collaboratively with these partners, to build a thriving health economy that is open to innovative new approaches to delivering healthcare, we will attract new businesses and jobs to the region. This will help drive improved health outcomes and create an environment that supports retention of staff in healthcare across the region.”

WYHCP Five Year Plan

By effectively engaging clinicians via stakeholders such as the Biomedical Research Centres (BRCs), the Yorkshire and Humber AHSN (YHASN) and the Leeds Academic Health Partnership (LAHP), PBIAA activity will understand practical, frontline MedTech requirements and work collaboratively to deliver early-stage research that informs the future of front-line medical technologies.

3.3.2 South Yorkshire Context

The PBIAA activity will make similar contributions to strategic economic and health related strategies and plans in South Yorkshire. The paragraphs below therefore provide a brief summary of similar evidence in South Yorkshire regarding consistency of focus between proposed PBIAA activity and strengths identified in previous nationally commissioned studies, and the alignment of proposed PBIAA activity to strategic objectives in South Yorkshire.

The **South Yorkshire Science and Innovation Audit** report (2016) sets out the regions' strengths in manufacturing and engineering. There has been significant growth in the high value manufacturing sector in the region, but recognition that further productivity growth could be achieved with Government investment and private sector innovation. The report also highlights the health technologies sector as a sector for high value manufacturing in the region, with many health technology companies in the Sheffield City Region using advanced digital production techniques for medical and dental devices, orthopaedics and clinical research.

Stakeholder insight on regional complementarity

Analysis of previous Science and Innovation Audits in West and South Yorkshire highlights an apparent complementarity between MedTech-related research and industry strengths in the two regions. This assertion was supported via consultations with policy stakeholders, one of whom explained that regional complementarity was *“well encapsulated by Nexus (Leeds) and the Advanced Manufacturing Research Centre (AMRC, Sheffield) who provide two very different offerings – the AMRC provides technical infrastructure that medical engineering companies can use for early stage product development while Nexus offers access to specialist medical technology academic expertise and wider business supports”*.

Strategic External Policy Stakeholder

The **Sheffield City Region Strategic Economic Plan** (2021-2024) sets out the region's focus on growth, inclusion, and sustainability. Supporting health economies is emphasised as a priority, particularly given the close relationship between health and the economy. PBIAA activity will support the advancement of healthcare in the SCR by delivering the early stage research required to produce more efficient, effective and intelligence medical technologies of the future.

In 2018 the **Sheffield City Region Mayoral Combined Authority** published a report outlining a plan of work for the SCR Innovation Corridor project (SCRIC). The SCRIC aims to create the UK's largest research-led Advanced Manufacturing cluster. Consultations undertaken to inform this study have highlighted how, following significant disruption to the aerospace sector and knock-on effects for aerospace related RD&I, health and medical technology has become a focus of future growth for the advanced manufacturing cluster.

PBIAA activity aligns with the sectors in focus in the **Sheffield City Region's Investment Portfolio**, which emphasises the region's expertise in high precision engineering and manufacturing for a wide range of global industries, including the medical sector. Health and wellbeing are also noted as focus areas on the basis of strong concentrations of orthopaedic and medical device companies.

The **South Yorkshire Mayoral Combined Authority Economic Plan** (2021) discusses the need to drive inclusive growth through innovative approaches to investment, including new technologies that enhance economic development. The Economic Plan highlights the regions' strength in healthcare technology and the reputation it has built for excellence in the development of innovative healthcare technologies. This strength in healthcare technology is boosted by the presence of world-leading healthcare technology companies including Braun and Swann Morton. The Economic Plan highlights health technology as a major employer, along with other linked areas such as manufacturing and digital technology.

Recently (March 2023), South Yorkshire published its **Integrated Care Partnership Strategy** which focuses on improving outcomes in population health and health care, enhancing productivity and value for money, tackling inequalities in outcomes and access, and helping to diminish inequalities in NHS treatment. The Integrated Care Partnership Strategy sets out the region's ambitious plans for digital transformation, and the need to optimise the use of digital tools and integrate technology into the care system. PBIAA activity will make a substantial difference to the productivity of the healthcare system through early stage MedTech research, whilst helping to tackle inequalities in outcomes and access through automated systems that create a seamless digital experience for healthcare staff and the public.

3.3 Contribution to University Strategies

Proposed MedTech PBIAA activity will also contribute to the strategies and plans of its two anchor universities – the University of Leeds and the University of Sheffield. This subsection provides a summary of relevant university strategies and plans and states how the proposed PBIAA activity is expected to contribute to associated objectives.

3.3.1 University of Leeds

The **University of Leeds Strategy** (2020-2030) has three main elements: community, culture and impact. The strategy highlights the need to continue building a two-way relationship between the benefits of research and education. It notes that for the university to succeed, it is important that it accurately reflects the communities that it serves by providing equal opportunities and increasing diversity.

Leeds University fosters a culture of collaboration, encouraging researchers to work together for optimal impact. This collaboration is encouraged both within the university and externally, pushing for collaboration between universities that develop meaningful partnerships and networks that can be used to tackle global challenges and utilise respective research strengths. The Leeds **HealthTech ecosystem** is built upon collaboration between researchers from a long list of university centres and institutes, and wider partnerships with researchers from the Leeds City Region.

The strategy outlines the focus on research areas in which Leeds University can become a global leader, via nationally and internationally recognised medical technology assets such as the **Institute of Medical and Biological Engineering**.

Proposed PBIAA activity will build upon the University's well-established expertise in medical technology, cementing its place as a global leader in medical technology research and development. It will also support the University's wider civic ambitions which are guided by the Sustainable Development Goals (SDGs), particularly with respect to SDG 3 – ensuring healthy lives and promoting wellbeing for all – and is expected to offer opportunities to establish new health-oriented Positive Impact Partnerships²⁰.

²⁰ <https://sustainability.leeds.ac.uk/news/partnerships-to-promote-good-health/>

3.3.2 University of Sheffield

The **University of Sheffield's Strategic Plan** (2020-2025) sets out its goal to deliver life-enhancing research through an ambitious, inclusive and collaborative university community. The strategic plan has four pillars as follows:

- **Research:** Producing high-quality, world-leading innovative research that drives intellectual advances and addresses global challenges.
- **Innovation:** Finding solutions that address problems facing society whilst enabling a culture of excellence in innovation and entrepreneurship across the University.
- **Education:** Delivering research-led programmes that lead a diverse community of students and inspire graduates to stand out with strong values, ethics and standards.
- **One University:** Creating an inclusive and supportive community that encourages collaboration between a diverse group of backgrounds, demographics, and cultures.

Proposed PBIAA activity will contribute directly to the University's research, innovation and education pillars, and via a highly inclusive and collaborative approach to delivery, will also help to create an inclusive and supportive community within the university and externally.

The **Advanced Manufacturing Research Centre** (AMRC) is a world-class research and innovation centre, enhancing collaboration between advanced manufacturing companies around the globe. The AMRC aims to promote growth in the UK Healthcare sectors by helping UK businesses to use innovative technologies that reduce healthcare costs and enhance patient outcomes. As highlighted above, complementarities between medical technology related facilities and expertise across the PBIAA area could deliver a significant boost to capabilities in both West and South Yorkshire.

The University of Sheffield also supports research through the **Centre for Assistive Technology and Connected Healthcare** (CATCH). CATCH is a translational research centre with the goal of using advanced technologies to enhance the lives of older people.

PBIAA activity will benefit from the already established research strength that the university has in manufacturing and health technologies. Further, it will support the University's ambition to diversify and grow AMRC MedTech related capabilities.

3.4 Conclusion

The extensive review of strategies and policies spanning national and regional objectives on research and innovation, the UK life sciences sector and regional health and economic development ambitions has shown how:

- Proposed MedTech PBIAA activity will contribute to and build upon a broad base of strategies and policies that are integral to the scientific, economic and health prospects of the region, and the UK more broadly;
- Proposed activity is clearly aligned with national and regional civic ambitions; and how
- PBIAA activity will further encourage collaboration between institutions and regions that delivers longer-term impacts on the UK's reputation as a leading destination for medical technology research and innovation, the UK economy, and the health of the UK population.

Further, consultation with regional policy stakeholders has highlighted how medical technology, and health technology more broadly will continue to be a major priority for economic development and place-based policy and supports in both West and South Yorkshire in future. As one consultee highlighted:

“Health technology will continue to be a huge priority going forwards. You will see much more of a focus on health technology now than previously through, for example, an open call for Shared Prosperity Fund health technology projects, strategic innovation grants targeted towards health technology companies planned for later in 2023, and engagement in the health technology agenda by civic leaders at the highest levels.”

Health Technology Policy Stakeholder

4. Conclusions

This study has sought to combine desk based and primary qualitative and quantitative research to provide a robust base of evidence that underpins the West and South Yorkshire MedTech PBIAA application.

With respect to defining the appropriate geographic area and evidencing absorptive capacity and an established base of high-quality research and innovation activity: on the basis that physical clusters of medical technology businesses derive benefits in terms of innovation and competitiveness, knowledge spill-overs, technology transfer and other network benefits, company location data suggests that the decision to include the Universities of Leeds and Sheffield, and Civic partners in WYCA and SYMCA provides an appropriate reflection of the cluster.

In addition to physical connectivity, various other factors are thought to contribute to the absorptive capacity of clusters, including the scale and firmographic profile of the cluster, knowledge intensity and human resources (among several others). Analysis of data on the 174 companies located within the West and South Yorkshire geography shows that the proposed PBIAA geography:

- Contains a healthy balance of different sized MedTech companies, from micro enterprises to large corporates, offering benefits of scale with respect to investment in research, development and innovation activity, opportunities for collaboration within supply chains and across industry segments and therefore also bolstering the potential for absorptive capacity across the cluster.
- Includes a mix of MedTech companies across the value chain spanning everything from design and manufacture of orthopaedic devices, surgical instruments, re-useable and implantable devices, to contract manufacturing and clinical research organisations.
- Is home to medical technology companies that invest heavily in research, development and innovation activity, including companies like DePuy Synthes, Drive DeVilbriss, Paxman Coolers and Hugh Steeper.
- Contains two thirds of the regional MedTech companies that have had patents published since 2018.
- Employs more than 10,000 people with the necessary skills, expertise and networks to absorb, assimilate and deploy new knowledge generated via PBIAA activity, and is home to high-employment-growth companies that have significant demand for a breadth of medical technology related roles, including numerous high-value roles offering salaries at 50% above the UK median, and beyond.
- Offers significant economic opportunity in terms of revenue growth and GVA, with average GVA per FTE estimated to be at least 12% - 25% above the regional average.

On the issue of evidencing strategic alignment: extensive review of more than a dozen national and regional strategies and policies has evidenced how proposed MedTech PBIAA activity will contribute to and build upon strategies and policies that are integral to the scientific, economic and health prospects of the region, and the UK more broadly; how

proposed activity is clearly aligned with national and regional civic ambitions; and how PBIAA activity will further encourage collaboration between institutions and regions that delivers longer-term impacts on the UK's reputation as a leading destination for medical technology research and innovation, the UK economy, and the health of the UK population. Qualitative research has also returned strong support for the proposed PBIAA activity, from a combination of academic, industrial and policy stakeholders. Further, policy stakeholders in West and South Yorkshire emphasised that medical technology, and health technology more broadly, will continue to be a major strategic economic development and innovation priority.

With respect to pro-actively identifying new businesses and establishing baseline impact metrics: this study has provided granular data on 238 medical technology companies across Yorkshire, including variables for size, scale, dynamism and absorptive capacity. The data is expected to be used to pro-actively target and engage dynamic medical technology companies throughout the lifetime of PBIAA activity. It can also be used as a baseline against which future progress on research, innovation and economic growth can be measured.

On areas of future challenge: the research has also highlighted challenges to which PBIAA activity will be critical, including for example, the availability and uptake of private investment to which PBIAA can act as a catalyst, ensuring a steady pipeline of medical technology start-ups, and making sure that PBIAA activities are easily accessible to medical technology companies of all sizes and depths of pocket.