

## Transforming Medical Technology & Biotechnology

### Medical and Health Innovation

Healthcare technologies and medicines in the UK represents a £52bn industry with a world-leading role in pharmaceuticals, medical biotechnology and medical technology ranking second after the US and establishing itself in key future growth areas such as regenerative and stratified medicine. The NHS is a unique selling point for the UK, with the vast patient databases providing opportunities for clinical trials and investigations and also as an established model of healthcare provision that can be used to offer solutions to emerging economies.

### Drivers

There are a number of key drivers that will stimulate innovation and create growth opportunities in the medical and health sector:

- **Ageing population:** Projected increases of the population over 60 will drive demand for healthcare, including pharmaceuticals and medical devices.
- **Investment in regenerative medicine:** Regenerative medicine is one of the 'eight great technologies' with significant investment to be channelled into this sub-sector.
- **Technological advances:** The increasing importance of Big Data and the development of robots and autonomous systems, synthetic biology and new advanced materials will also have implications for this sector. Furthermore health innovation is encompassed in four of the 'Eight Great Technologies' namely, Regenerative Medicine, Synthetic Biology, Advanced Materials and Big data.
- **Increasing prevalence of health conditions:** Global population growth and the rise in the number of people with serious health conditions will place greater demand on health services.
- **Higher interest in personal health and rising incomes:** Global increases in concerns over health combined with rising incomes and increasing consumerism will also increase demand for healthcare services and products. This will also be reflected in greater socio-economic concerns about widening inequalities in society.
- **The personalisation agenda and independent living:** Policy changes are underway to enable adults to have more control over the support that they need, with impacts on how healthcare is delivered.

### UK Sector

Companies in the medical technology sector are those whose major business activity involves the development, manufacture, or distribution of medical devices as defined by European Union Medical Devices Directive (93/42/ECC) and companies who have significant activity in supplying specialist services to the medical technology sector.

Currently the UK medical technology sector is comprised of 3,309 companies (25% conducting R&D), which employ just over 76,000 and have a combined annual turnover of £17bn. All of the Top 10 global medical technology companies have activity in the UK and 28 companies have turnovers greater than £100m.

- The largest segments in terms of employment and turnover are single use technology, in-vitro diagnostics, orthopaedic devices, wound care and professional services.

- Employment and turnover in these sectors grew at an annual rate(s) of 6-8% and 1-5% respectively over the period 2009-2013.
- All the largest segments grew in terms of turnover and employment except for professional services
- The five fastest growing segments based on turnover were cardiovascular devices, ICT & E-health, infection control, mobility access, and anaesthetic technology.
- The majority of the sector companies are SMEs with 99% employing less than 250 staff and 31 companies employing more than 250 people. 85% of these SMEs have turnovers less than £5m.
- Economic activity for the medical technologies sector is more widely dispersed across the UK compared to other life science sectors but with significant concentrations of companies in the East and West Midlands of England and the Southeast and East of England.

### **Yorkshire & Humber**

The region possesses one of the UK's largest clusters of health and bioscience businesses with several operating across a number of sub sectors including orthopaedics, regenerative medicine, surgical instrumentation, wound management, bio technology, and assistive technologies. This cluster sits alongside a wealth of health-related expertise associated with the regions extensive university base including the UK's largest grouping of nationally funded centres of medical technology research and innovation.

### **Key facts**

#### **Companies and employment**

- The region is home to 294 medical technology companies who have a combined turnover of £1952 million and employ 8698 people.
- Since 2009, employment in Life Sciences has increased by 37% - the largest increase across all key sectors in the Leeds City Region.
- Leeds has seen a 17% increase in healthcare employment since the recession hit in 2008, to more than 50,000 jobs and a further increase of 13% is forecast by 2022.
- There are a strong cluster of orthopaedic, medical device and surgical instrumentation companies within the region include De Puy International, Smith and Nephew, Reckitt Benckiser, Croda, Ceramisis, Surgical Innovations, B Braun Medical and Jrl orthopaedics offering SME's supply chain opportunities (Appendix 1)
- Investment by Surgical Innovations in a manufacturing and clinical training centre in Leeds is seen as a "catalyst" for an anticipated healthcare hub to encourage foreign companies into the region
- Sheffield City region benefits from world-class expertise in the design and implementation of advanced materials and manufacturing technologies and a comprehensive end-to-end supply chain.

### **National Health Service**

- The region is also home to two of Europe's largest teaching hospitals (Leeds Teaching Hospitals NHS Trust and Sheffield Teaching Hospital NHS Trust) and Europe's largest healthcare IT delivery team.
- Leeds is home to the headquarters of four of the most important UK national health service bodies: NHS England, responsible for £100bn+ annual healthcare spend; the Health & Social Care

Information Centre, home of the national health and social care data collections; the NHS Leadership Academy; and Health Education England, the national body responsible for organising health and healthcare education and training

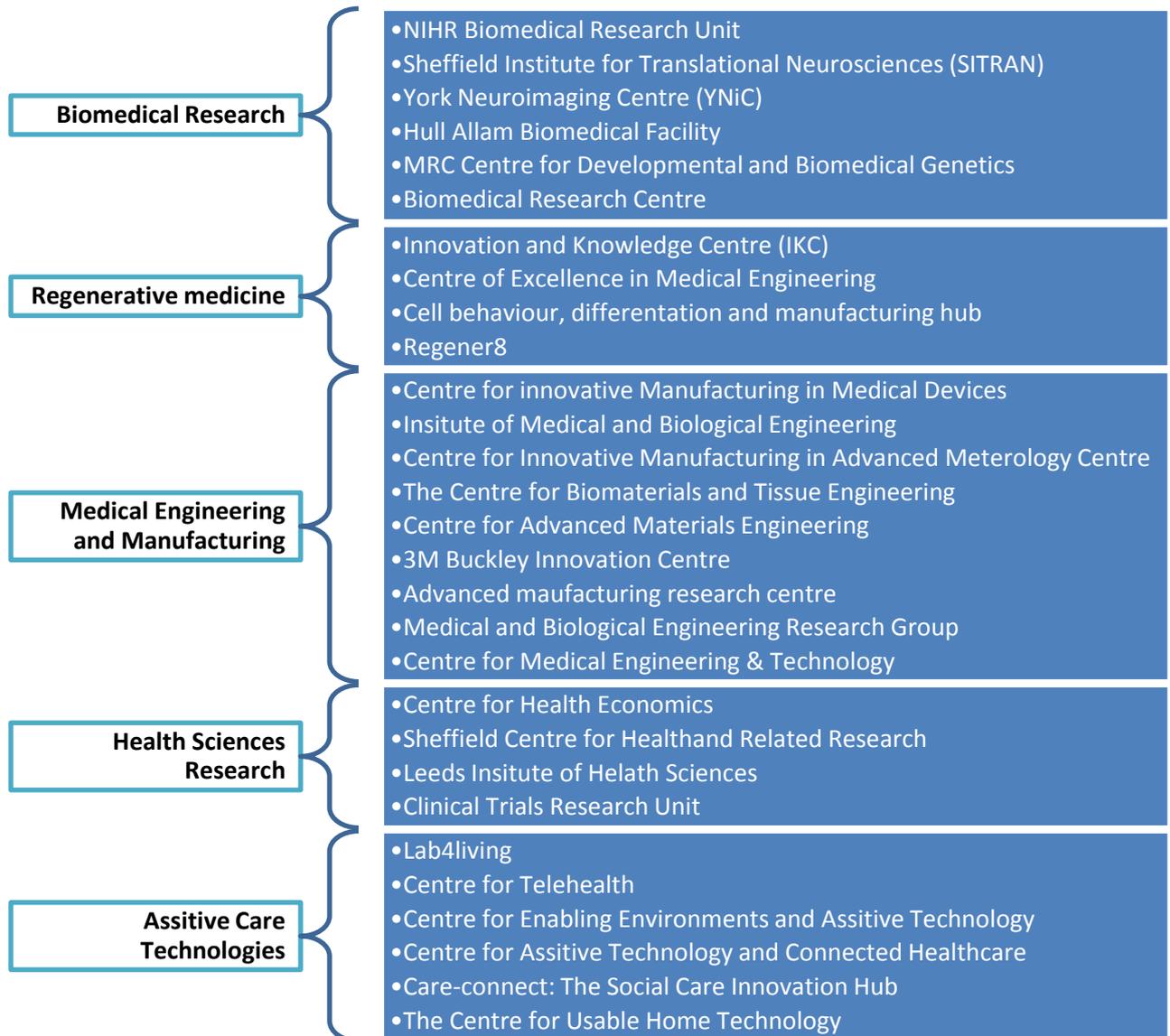
- Medilink is a specialist business consultancy service in Health Sciences in Yorkshire and Humber, providing innovation events and support to businesses in the area to assist with business growth through services such as access to funding and market research.
- Medipex is the NHS Innovation Hub for Yorkshire and Humber, linking the NHS, the healthcare industry and academic institutions to improve healthcare by facilitating knowledge transfer between these organisations.

### **Higher Education**

- Yorkshire and Humber has a strong and diverse Higher Education (HE) sector, with nine universities, three higher education institutions (HEIs) and a regional arm of the Open University
- Leeds and Sheffield City Regions has the largest concentration of universities in Europe, with 10 institutions producing over 80,000 graduates a year. Part time students – overwhelmingly living and working in our region – represent some 68,000 students.
- Many of the regions students remain after graduation bringing high-level skills to support further economic development. The impact of the expertise and knowledge gained by learning and research activities feeds directly back into the businesses and communities of our region.
- The region is home to three medical schools; Hull York Medical School and at the Universities of Leeds and Sheffield.

### **HEI Health Innovation Assets**

Universities have a range of expertise in the medical and health expertise. A number of the regions primary medical and health innovation assets have been divided into the broad themes detailed below.



**Biomedical Research**

The region undertakes a vast array of research into all aspects of biomedical science from the molecules and cells which are vital to life, through the disease process to clinical and public health research into improving the quality of healthcare.

- **NIHR Biomedical Research Unit** – centre of excellence for patient focused translational musculoskeletal research activities between the Leeds Teaching Hospitals Trust and the University of Leeds.
- **Sheffield Institute for Translational Neurosciences (SITRAN)** -SITraN enables basic through to applied research in neurodegenerative disease by bringing together under one roof, state-of-the-art laboratories and equipment with a collaborative, multi-disciplinary

environment including expertise in basic neuroscience, clinical neurology, neuropathology, computational biology, and clinical trials methodology – University of Sheffield

- **York Neuroimaging Centre (YNIC)** – The Centre is the hub of a multi-disciplinary approach to understanding structural, chemical, functional and theoretical aspects of neuronal mechanisms. It houses two of the most powerful brain scanners in the UK enabling the detailed study of a huge range of brain functions and conditions – University of York
- **Hull Allam Biomedical Facility** - this £multi-million institute is equipped with radiochemical PET/SPECT scanners and is home to world-class cardiovascular and metabolic research and cancer research – University of Hull
- **MRC Centre for Developmental and Biomedical Genetics** –stimulating the translation of findings from model systems to the development of novel therapies and clinical practice - University of Sheffield
- **Biomedical Research Centre** – Sheffield Hallam University

### Regenerative Medicine

Regenerative medicine was one of the ‘eight great technologies’ announced by the Chancellor in November 2012, with £600 million investment going into these technologies, including £50 million in upgrades to research equipment and laboratories.

- The **Innovation and Knowledge Centre (IKC)** in medical technologies at the University of Leeds was founded around Europe’s largest integrated multi-disciplinary medical engineering centre and is home to more than 250 researches across 10 departments- University of Leeds.
- **Centre of Excellence in Medical Engineering (Welmec)** at the University of Leeds with the Leeds Teaching Hospitals NHS Trust
- **Cell behaviour, differentiation and manufacturing hub** – One of four interdisciplinary and complementary research Hubs funded by research councils as part of Stage I in the development of a £25M UK Regenerative Medicine Platform (UKRMP). This hub is to lay foundations for a generic translational pipeline from the derivation of clinical grade pluripotent stem cells to potential cell therapies – University of Sheffield
- **Regener8**: Regener8 enables the translation of university and industry research in regenerative medicine into commercial products and clinical benefits though links with other networks across the UK, the N8 universities, international partnerships, research institutions and clinical centres of excellence in regenerative medicine throughout the UK – Hosted by the University of Leeds

### Medical engineering and manufacturing

There is a vast amount of activity in this sector within in the region. These are just some examples,

- The **Centre for Innovative Manufacturing in Medical Devices (MeDe)** based at the University of Leeds (Sheffield and Bradford are partners) will bring together leading companies and five UK centres of excellence in medical technology and manufacturing (Newcastle, Nottingham, Sheffield and Bradford). It will also develop a network of over 300 industrial partners, academics and clinicians who will lead the development of new international standards to overcome barriers to adoption in global markets and support the adoption of new technology in the NHS by working with the new Academic Health Science Networks.

- **The Institute of Medical and Biological Engineering (iMBE)** - The largest multi-disciplinary orthopaedic engineering research group in Europe which has pioneered work on longer-lasting joint replacements, revolutionary spinal interventions and biological scaffolds for tissue repair that grow with the body - University of Leeds
- **The Centre for Innovative Manufacturing in Advanced Metrology Centre** houses over 30 researchers and research students from a variety of disciplines including mechanical and electrical engineering, maths, physics and computer software who are working on cutting edge research in surface metrology, optical instrument development, machine tool accuracy, mathematics for metrology, precision engineering and in-process measurement - University of Huddersfield
- **The Centre for Biomaterials and Tissue Engineering** fosters multidisciplinary interactions, bringing scientists, engineers and clinicians together within the broad areas of research expertise. The centre focuses on the following research areas: biomaterials; tissue engineering; devices, implants & bioreactors; stem cells; imaging and analysis; and computational systems biology – University of Sheffield
- **Centre for Advanced Materials Engineering (AME)** is the Centre of choice for external bodies in the development of smart materials for high added-value products aimed primarily at health and wellbeing - medical devices, biomedical products, and 'resource efficient' speciality materials and products - University of Bradford
- **3M Buckley Innovation Centre (3M BIC)** at The University of Huddersfield houses bespoke equipment dedicated for industrial use with flexible access mechanisms. The sectors supported through the centre include advanced manufacturing and design and healthcare.
- **Advanced manufacturing research centre** – The Medical AMRC is a new group dedicated to applying the combination of innovative design, cutting-edge manufacturing technologies, access to world-class research and development and clinical expertise to the healthcare sector - University of Sheffield
- **Medical and Biological Engineering (MBE) Research Group** its expertise lies in modelling and simulation in biomechanics and biomedical engineering applied in particular to understand the mechanobiology of bone and its use in predictive biology – University of Hull
- **Centre for Medical Engineering and Technology** at the University of Hull brings together a broad range of activities concerned with the modelling and simulation of medical and biological systems and the development and application of technology in medicine. It has secured **ISO 13485 Medical Device certification** supporting provision of advice from initial concept through product design and manufacture, regulatory approvals and clinical trials.
- **Vertual Ltd** is a successful company spun out of the University of Hull and is the leading provider of virtual reality training systems in radiation therapy. It has provided high-tech solutions to every teaching hospital in the UK and to major clinics around the world.

### Health Sciences Research

The regions Universities have the largest and most influential group in the areas of health technology assessment (HTA), economic modelling, decision science, outcome measurement, medical statistics and study design.

- **Department of Health Sciences, Centre for Health Economics (CHE) and Centre for Reviews and Dissemination** brings together the best aspects of research and consulting by universities and private sector companies. It combines academic rigour and innovative

project design with competitive charges and commercial delivery standards. The Consortium is a wholly owned subsidiary of the university providing consultancy to private and public sector providers of healthcare, including many leading pharmaceutical and medical device companies – University of York

- **Sheffield Centre for Health and Related Research (SchARR)** is a centre of excellence in research, teaching and consultancy across health services research, health economics and public health - University of Sheffield
- **Leeds Institute of Health Sciences (LIHS)** is a multi-disciplinary Institute that delivers applied health research, professional training and teaching programmes aimed at enhancing health and health care nationally and internationally - University of Leeds
- **Clinical Trials Research Unit (CTRU)** works with NHS partners and University colleagues, providing academic support and infrastructure to enable local, national and international researchers, design and undertake high quality, rigorous, multi-centre trials to MRC/ICH Good Clinical Practice guidelines – University of Leeds
- **NIHR Research Design Service for Yorkshire & the Humber (RDS YH)** supports researchers to develop and design high quality research proposals for submission to the NIHR and other national, peer-reviewed funding competitions for applied health or social care research – hosted by the University of Sheffield

### **Assistive Care Technologies**

The region has considerable expertise in the development, evaluation and application of technologies suitable for the delivery of integrated care services, including telehealth, telecare, mhealth and telemedicine.

- **Lab4Living** is a collaboration between the Art and Design and Health and Social Care Research Centres at Sheffield Hallam University and the users, consumers or customers. This creative partnership brings together research expertise spanning the fields of health, rehabilitation, design, engineering, ergonomics and user led design – Sheffield Hallam University
- **Centre for Telehealth** - The Centre undertakes combined clinical, service and technological know-how of over 50 academics working together to create technologies which meet real clinical needs and can be deployed in real services, and to develop services suitable to exploit the potential of new technologies .ground-breaking research into the use of remote monitoring technologies for managing heart disease, respiratory disease and diabetes and working with both industry and the health service to develop and implement new telemonitoring equipment and services – University of Hull
- **Centre for Enabling Environments and Assistive Technology** - The Centre is supported by staff from the Faculties of Health and Life Sciences, occupational therapists, physiotherapists and design technology experts. Their expertise includes dementia and other long-term conditions. The team collaborate and share knowledge with partners including manufacturers, public, private and third sector service providers, the general public and students - York St. John University
- **Centre for Assistive Technology and Connected Healthcare** –The Centre specialises in research into technology for people with disabilities, older people and people with long-term conditions. Bringing together and co-ordinating the input of more than 30 research and clinical scientists with expertise in healthcare, engineering, social science and science, the

Centre specialises in areas of personalised healthcare and personal independence -  
University of Sheffield

- **Care-Connect: The Social Care Innovation Hub** The hub draws together a critical mass of interdisciplinary, world-leading and policy-relevant research on social care, establishing Leeds as a unique and distinctive centre of excellence in the field – University of Leeds
- **The Centre for Usable Home Technology (CUHTec)** conducts interdisciplinary research to understand what people want from technology in their homes and offers world-leading training and consultancy for professionals who commission and provide telecare and assistive technology services – University of York

### University partnering with the NHS

There are a number of programmes within the region which enable Yorkshire's Universities, NHS organisations, local authorities and industry to work together and develop services and products that have the potential to transform lives to routine clinical practice, particularly targeted at chronic disease and public health interventions.

- **Academic Health Science Network (AHSN)** and particularly its 'Wealth Creation' strand aims to generate wealth in the region and the UK by stimulating innovation in partnership with companies developing and manufacturing, medical technology, digital health, advanced medical therapies and other commercial enterprises. Specific objectives are to (i) enable industry based in the UK to increase global market share; (ii) enhance supply and adoption into NHS; (iii) harness our research platforms and the knowledge embedded within the NHS and HEIs to create wealth; and (iv) create a culture change in the NHS and HEIs to address innovation and translation to create wealth. This will be achieved by working closely with NHS partners, Universities, local authorities and industry to build on existing strengths of research excellence, in particular, to develop successful innovation, translation, wealth creation in cardiovascular, musculoskeletal, cancer and medical and biological engineering and to identify emerging areas of research excellence on which to build future healthcare technology innovation challenges.
- **Collaboration for Leadership in Applied Health Research Care (CLAHRC)** is structured as a collaborative partnership between the regions universities and its surrounding NHS organisations with the aim of conducting research focused on the needs of patients, particularly targeted at chronic disease and public health interventions. The new Yorkshire and Humber CLAHRC will build on the success of the two pilot CLAHRCs in the Yorkshire and Humber region; success evidenced not only by external evaluations, but also by ongoing feedback from the NIHR which year on year has commended the partnership working with industry. In the current iteration of the CLAHRC, the needs of industrial collaborators and the wealth creation agenda are being addressed specifically in the Telehealth and Care Theme.
- **Healthcare Technology Cooperatives (HTCs)** - The region hosts three HTCs - Devices for Dignity (Sheffield), Wound prevention and treatment (Bradford) Colorectal therapies (Leeds) - which enable NHS organisations to act as centres of expertise that focus on clinical areas or themes of high morbidity and unmet need for NHS patients. Working collaboratively with industry they develop new medical devices, healthcare technologies or technology-dependent interventions that improve treatment and quality of life for patients.

- **The Northern Health Science Alliance Ltd (NHSA)** is a new partnership established by the leading Universities and NHS Hospital Trusts in the North of England to improve the health and wealth of the region by creating an internationally recognised life science and healthcare system – Partners include the universities of Sheffield and Leeds, their associated NHS Trust and Hull York Medical School

### **What are the specific opportunities for the region?**

The key focus of all LEPs is to deliver regional SME and regional growth through strategies which will cut across all industry sectors but will also include sector specific project activity to help accelerate the development and growth potential of key industries. The LEPs have recognised that there are specific areas where alignment of individual plans can add value and enable activity to happen more effectively and efficiently across the whole region.

- **Leeds City Region** has prioritised six sectors that present distinctive opportunities and where investment will yield the best long term returns financially and in terms of employment and economic benefits – these include innovative manufacturing, health and life sciences and digital and creative industries.
- **Sheffield City Region** will be investing in those areas where there is a comparative economic advantage for example in advanced materials and manufacturing where harnessing creativity in advanced engineering will support the development of the emerging Healthcare Technologies Sector, and strengths in software testing, data analytics and simulation will underpin the development of healthcare industries, and the growing digital sector in the region.
- **Humber** has also identified the healthcare technologies sector as an opportunity for high value employment and diversification for firms with technologies and products that can be adapted for healthcare markets. The Humber has strengths in medical devices and advanced wound care, along with growth opportunities in assistive technologies.
- **The York, North Yorkshire and East Riding** LEP will be delivering five, outcome focused priorities to enable business led growth including (i) Profitable and ambitious small and micro businesses and (ii) a well-connected economy. These cut across sectors but will include a high proportion of opportunities within areas identified as strengths in neighbouring LEPs. Cross LEP activity could help to increase innovation within small businesses.

### **1. Utilising and strengthening current HEI, NHS and industry collaborative platforms**

The Yorkshire and Humber region has a strong history of establishing successful collaborative programmes between its HEI, NHS and business base to deliver transformational innovations and improvements in health and social care. There are a number of networks currently funded in the region which aim to address the research-innovation practice gap and create wealth. The YH CLAHRC and AHSN offer unique infrastructure and support for programmes and projects, which is not available elsewhere. They are able to capitalise on the research expertise of the regions universities, clinical expertise within the NHS, a diverse range of regional and national businesses and access to NHS decision makers and commissioners.

In order to further develop opportunities in medical technologies and healthcare innovation for the region should we look at ways to support and strengthen successful programmes such as the YH

CLAHRC and AHSN rather than creating additional initiatives which may dilute true opportunities for driving wealth creation?

## 2. Medical Engineering

The Leeds and Sheffield City Regions are already the UK home of orthopaedic manufacturing, and related medical engineering. There is a long-established history, expertise developed over generations and world-class innovation capacity, which offers an unrivalled business environment – not only for companies in this sector, but for suppliers and global purchasers.

Is there an opportunity to further support initiatives in this area for example the Centre for Innovative Manufacturing in Medical Devices (MeDe) based at the University of Leeds but includes partners from across the region?

## 3. Regenerative Medicine

This is a research and development strength within in the region, primarily focused at the University of Leeds, and is supported by a number of SMEs.

- Investment in regenerative medicine: Regenerative medicine was one of the ‘eight great technologies’ announced by the Chancellor in November 2012, with £600 million investment going into these technologies, including £50 million in upgrades to research equipment and laboratories.
- **HEFCE Catalyst Fund** - This fund aims to drive innovation in the HE sector, enhance excellence and efficiency in HE, and support innovative solutions at a time of changes to funding and regulation. Programmes are usually collaborative, bringing together support from other partners including business, universities and colleges, and other public agencies.
- The **Technology Strategy Board's (TSB) Stratified Medicine Innovation Platform (SMIP)** seeks to build on the UK's strength within the global healthcare industries and put it at the centre of the next generation of medicine. Its seven partner organisations will together invest around £200m over 5 years in the area of stratified medicine. TSB will establish a **Catapult** with a focus on ‘**Diagnostics for Stratification**’. This single centre will act as a rallying point to enable the linkages between biopharma, diagnostics and healthcare systems with diagnostic development (including sensors and engineering), data handling and management and patient cohorts playing an important role in supporting diagnostic tool development giving more rapid feedback into the healthcare system and for companies developing new treatments.

This centre is unlikely to be located within Yorkshire and Humber but the region needs to ensure that it participates in the development of its core themes and our expertise can benefit.

## 4. ‘The future is digital’ for social and healthcare

There is a vast range of activity around the theme of ‘digital’ ranging from technology for patients to use in the home to monitor conditions such as diabetes or COPD through to the linkage of patient records with high volumes of molecular data, such as genome sequences. This theme is a research strength across the region’s universities, is supported by a variety of SMEs, features heavily in NHS led innovations and has a rapidly growing national and international market.

- The demand for support of those with long-term health conditions is set to grow rapidly over the next 15 years and beyond. The NHS and other UK will need to make more use of

technology to provide more home-based care and self-care. In a recent government survey over 30% of people said they suffer from a long-term health condition. This group accounts for 52% of all GP appointments, 65% of all outpatient appointments and 72% of all inpatient bed days.

- The CLAHRC has great strengths in this area having led a range of projects through its Telehealth and Care Technologies (TaCT) theme. The recently funded YH AHSN is also committed to using digital technologies to address their overarching goals.
- Government investment in 'Big Data' which was one of the 'eight great technologies' announced by the Chancellor in November 2012, with £600 million investment going into these technologies.
- Two multi-million pound grants (MRC and ESRC) will make the University of Leeds a major centre for 'Big Data' analysis. The focus of the MRC-funded research will allow link up of health records with molecular data in a secure environment which can benefit patients by uncovering the underlying molecular mechanisms of disease, suggest new diagnostic and prognostic tests, help identify therapeutic targets, and monitor how effective medicines are.
- It was announced in the Budget that the Government is to provide £42m in funding for a big data research institute – The tender to house the institute is to be produced later this year, with a view to using either an existing space within a university, or a brand new facility. The funding, coming from the Department for Business, Innovation and Skills, will span a five year period.
- Leeds is aiming to go 'further and faster' to ensure that adults and children in Leeds experience high quality and seamless care. As a national pioneer Leeds will receive national support to build on work to deliver better health and care for adults, children and young people by making services work together more effectively, as well as testing innovative new ideas with the help of national expertise and support.

#### **Funding opportunities to support activity**

- The HEFCE Research Partnership Investment Fund supports large-scale projects that can also attract private investment.
- The HEFCE Catalyst Fund could provide a multi-million pound funding opportunity for innovative projects.
- The Research Councils remain a major source of funding and with the impact agenda then working in partnership with 'users' of the research has advantages.
- European funding – for example the European Institute of Innovation and Technology Knowledge and Innovation Communities (KICs).
- Local funds – EU SIFs 2014-2020 and Local Growth Funds.

**Appendix 1:** A summary of some of the companies based within the region who are currently working in partnership with Yorkshire Universities.

Adact Medical Ltd  
AedStem Ltd  
Avacta Group PLC  
BiteCiC Ltd  
CellData Services  
Reckitt Benckiser  
Croda  
Brandon Medical  
Xiros  
Orchid Orthopedics  
Symmetry Medical  
Smith & Nephew UK Ltd  
Surgical Innovations Ltd  
Tissue Regenix Ltd  
Vascutek Ltd  
Videregen Ltd  
DePuy Synthes Companies  
Glass Technology Services Ltd  
JRI Orthopaedics Ltd  
Kirkstall Precision Ltd  
RDBiomed Ltd  
Neotherix Ltd  
Sheffield Precision Medical Ltd  
Fripp Design and Research  
Materialise  
B Braun Medical Ltd  
Heeley Surgical Limited  
Ceramisis  
Perkin Elmer  
Bosch Healthcare  
Tunstall,  
Longhand Data  
True Clarity