

# East of England Science and Innovation Audit

## Summary

A Science and Innovation Audit Report sponsored by the Department for Business, Energy and Industrial Strategy

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### **Cover page images**

Top left: Quadram Institute (under construction), Norwich Research Park

Bottom left: An artist's impression of Harlow Science Park (which will be home to ARU's proposed MedTech Innovation Centre)

Top right: Cambridge Biomedical Campus - An artist's impression of how the Campus may look on completion of Phase 2

Bottom right: Rothamsted Research, Harpenden

# Foreword

## *From the Chairman of GCGP LEP Area Science Industry & Innovation Council*

The East of England is an amazing place. It is a region rich in science and innovation assets and awash with the finest talent – but our **audit demonstrates that we could go even further, driving translation and capitalising on our research excellence for the benefit of the region and the country.** We must continue to invest in our scientific and industrial research base, develop our local skills base and attract the very best minds and investment from around the globe. We have sought to determine, in the chosen four Themes of Life Sciences, Agri-Tech, Advanced Materials & Manufacturing and ICT, what is the very best of our region and present to Government and industry the findings in a coherent and useful fashion, so that the true contribution that our science and innovation makes to the local and national economy is understood. We also aim to widen the economic benefit throughout our region, which is by no means uniformly affluent.



**Professor Nigel Slater, FREng FICHEM E**

## *From the East of England Science and Innovation Audit Steering Group*

The Steering Group is proud to present this survey of science and innovation in our region, which has been marshalled, edited and presented by SQW.

Collaboration has been the watchword of the Audit, with equal representation from all four Themes and all four LEP areas. One of the main drivers for bidding to conduct an SIA was to refresh our collective knowledge of our own region's science and innovation strengths, and to catalyse useful activity within, and between, those clusters.

The East of England is uniquely placed to explore and exploit areas of convergence, given the confluence of world-class universities and industry with wide and in-depth sectoral expertise, and our exceptionally strong innovation ecosystem. With a strong focus on enhancing commercialisation and collaboration across the Themes, just some of those exciting opportunities are suggested in the illustrative proposed interventions contained in this report.

Our full Science and Innovation Audit report and associated appendices for each Theme, as well as the Executive Summary, are available to download from <http://www.gcgp.co.uk/east-england-sia/>

Pascal Soriot, CEO of AstraZeneca, which has moved its Global HQ to the region, very recently said: *“As a long-standing investor in UK science, we believe Cambridge offers a tremendously vibrant academic and life-sciences ecosystem that can truly catalyse discovery and innovation. Together with*

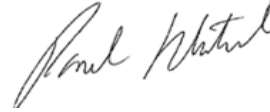
*our partners, we will push the boundaries of science to deliver innovative medicines that transform patient care around the world."* A compelling quotation from Dr Andy Richards CBE is provided below.

We have committed to continuing to work together in partnership to implement the vision of the SIA consortium.



Steven Wilson, Head of Innovation

Greater Cambridge Greater Peterborough LEP (Chair)



Paul Witcombe, Enterprise & Innovation Manager

Hertfordshire LEP



Jane Locke, Economic Development & Strategy

Norfolk County Council (for New Anglia LEP)



Paul Dodson, Head of Commissioning,  
Growing Essex

Essex County Council (for South East LEP)



Dr. Martino Picardo, CEO

Stevenage Bioscience Catalyst



Dr. Andrew Spencer, Head of Knowledge  
Exchange and Commercialisation

Rothamsted Research



Jonathan Legh-Smith, Head of Partnerships &  
Strategic Research

BT Technology, Service and Operations



Peter Oakley, Associate Director

TWI Ltd



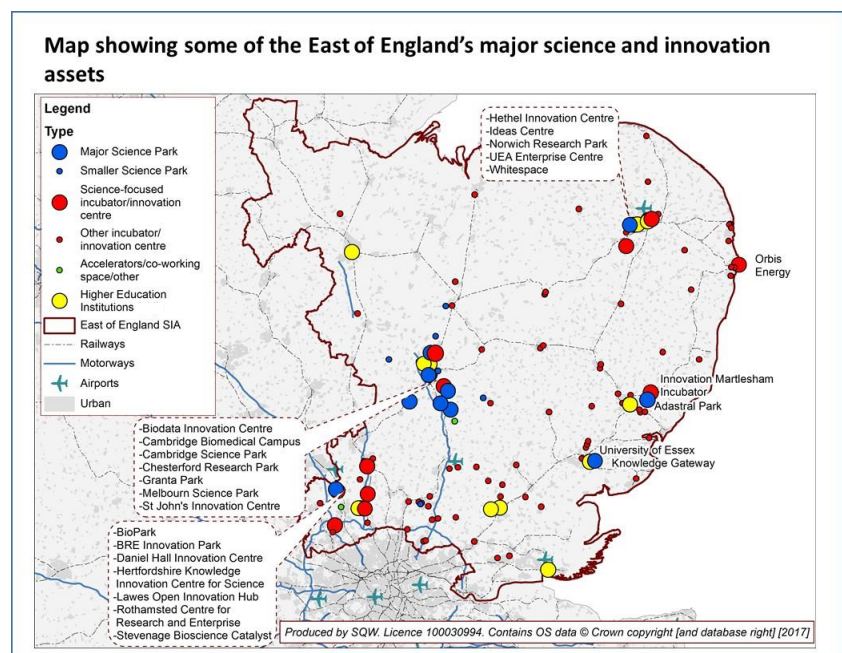
*“The East of England Science and Innovation Audit has been a really significant piece of work creating a core data set on which an ambitious 'industrial strategy' can be formulated; its importance especially for the life-science sector cannot be overemphasised. What it reveals is a deep, vibrant and concentrated cluster with determined intent to translate world class research into products and services that will ensure sustained global impact. The connected nature of this ecosystem makes it a key engine of growth for the UK economy: delivering science into protectable and investable ventures, propelling quality start-ups to scale-ups and accelerating ambitious scale-ups to be the independent global players of the future; and with additional direct benefits for the health of UK patients. It is perhaps at its most exciting at the interfaces where biology combines with the physical sciences, where medicine melds with data science and where entrepreneurs and investors interact openly with uncompromisingly excellent researchers. The output of the Audit is impressive but the true asset is its people and here it only hints at future potential that this talent pool can create”.*

Dr Andy Richards CBE  
Life-science entrepreneur and investor

## 1: Introduction

In Autumn 2015, the UK Government announced regional Science and Innovation Audits (SIAs) to catalyse a new approach to regional economic development. SIAs enable local consortia to focus on analysing regional strengths and identify mechanisms to realise their potential.

The East of England<sup>1</sup> – defined in relation to four Local Enterprise Partnership geographies<sup>2</sup> – is home to some of the UK’s **foremost scientific research strengths and innovation capabilities**. These are vested in a dynamic private sector and across world class universities and research organisations. They are being animated through more-or-less formal networks (of entrepreneurs, investors and researchers) which are now well-established within a distinctive and world class **innovation ecosystem**.



<sup>1</sup> The East of England defined here is not the same as the (old) Government Office Region with the same name. Some data are only available at the level of GORs and where that is the case, tables/charts/maps are labelled accordingly

<sup>2</sup> Greater Cambridge Greater Peterborough Enterprise Partnership; Hertfordshire Local Enterprise Partnership; New Anglia Local Enterprise Partnership; and that part of South East Local Enterprise Partnership which is north of the River Thames

The immediate focus of our SIA is **four Themes: Life Sciences, Agri-tech, Advanced Materials and Manufacturing (AM&M) and ICT<sup>3</sup>**.

From within these Themes, the region has grown some of the world's most influential businesses – ranging from ARM Holdings and HP Autonomy to MedImmune. It also continues to attract substantial investment in “*the next generation*” of early stage businesses: it is, for example, estimated that over £500m has been invested in Life Sciences companies on Babraham Research Campus over the last two years alone. In addition, the region is attracting the interest of the corporates. Major recent investors include Huawei, Google, Apple, Microsoft, AstraZeneca and Pfizer.

**However our Audit is not just about individual Themes. Instead, it is about the opportunities which are unlocked by processes of convergence.** As one of well over 200 stakeholders that contributed to our Science and Innovation Audit explained:

*“I believe the active investors here – who are coming from all over the world – are investing in artificial intelligence, big data software, machine learning and then into the life sciences, bioinformatics and medical technology, and bringing it all together”*

*“The focus here, in the universities and in the business communities, on artificial intelligence, machine learning and robotics, combined with genetics and genomics, presents huge possibilities. Connecting that up in a small place like this could be dramatic”*

*East of England SIA stakeholder consultations, March/April 2017*

## 2: Our Vision

*We will build on our position as the leading UK region for science and innovation for the benefit of people within the region, the UK and internationally.*

We will achieve this by **accelerating the process of convergence**. Already open innovation is a defining feature, but remaining boundaries between disciplines and institutions will dissolve. Researchers, entrepreneurs and investors – and, in Life Sciences, clinicians – will work alongside end-users (whether patients, industry or customers) on a daily basis. This will **enable and accelerate a process of translation, which will be fuelled – across the piece – through the creative and extensive use of data**. The outcomes will be economic impacts of national significance – and societal benefits that will be enjoyed worldwide and will, literally, be life-changing.

## 3: Our strengths

Our Vision is ambitious. However, it is entirely achievable. Our confidence is founded on the strength of our scientific capabilities and innovation assets. **These are impressive when considered individually, but they are outstanding when placed in the context of our innovation ecosystem as a whole**. Some of the building blocks within this are set out in the graphic below. But the “blocks” are less important than the “wiring” – literally, what “*makes the whole greater than the sum of the parts*”.

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<sup>3</sup> These were chosen because they were considered by the Consortium to be particular strengths of the East of England that might usefully be examined through the Science and Innovation Audit. The case for them was made in an Expression of Interest and supported by BEIS

This is defined, first and foremost, by the **people working within and across our innovation ecosystem**. These people – whether researchers, entrepreneurs, investors or clinicians – constitute some of the world’s best talent. They are our strongest asset, alongside the people working with and to them.

**The East of England’s scientific strengths and innovation capabilities which define the Innovation Ecosystem**



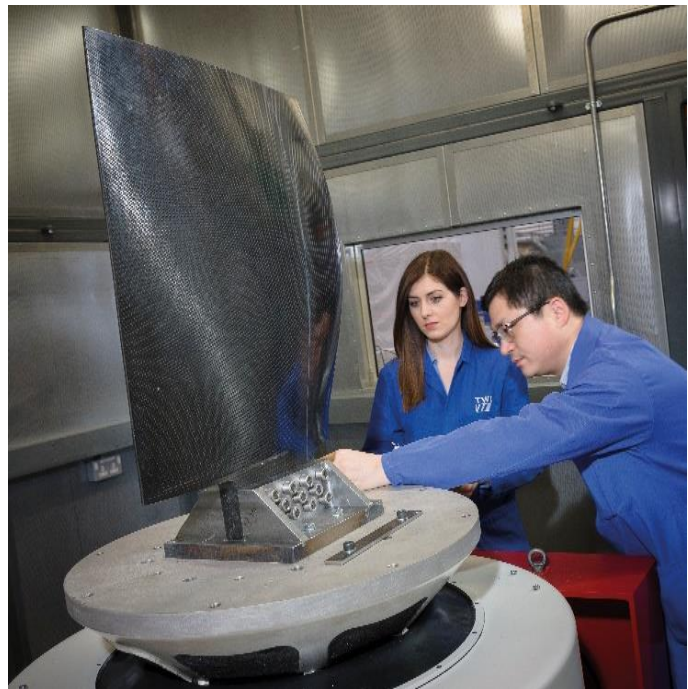
Beyond this, particular strengths found **across our four Themes** include:

- **Our ability to both attract and grow talent:** Our universities generate a pool of outstanding graduates and post-graduates, many of whom are quickly employed within our innovation ecosystem, whether by major research-intensive private sector businesses (like GSK and BT); or within small, vibrant start-ups and spin-outs; or as entrepreneurs in their own right. At the same time, our businesses, research institutions, universities and hospitals provide a magnet for talented people from around the world.
- **The strength and depth of our networks:** Cambridge has been described by serial entrepreneur, Andy Richards, as a “*low risk place to do high risk things*”, mainly because of the nature of our informal and formal networks. Our places – such as Cambridge, Norwich, Colchester, Ipswich and Stevenage – are big enough to bring scale but small enough to ensure a depth of relationships with which large cities cannot compete. These are animated more formally and more broadly through outstanding networking organisations, some of which are now well established (e.g. One Nucleus, Eastern Academic Health Science Network, Cambridge Network, Cambridge Wireless, Agri-Tech East, Cambridge Cleantech) whilst others are quickly emerging (e.g. Tech East, SyncNorwich, Innovation Martlesham). These complement each other and they provide invaluable connectivity across our innovation ecosystem.
- **Our ability to generate and attract investment:** Linked closely to the strength of our networks is the vibrancy of investment processes. Within the East of England, there is a growing body of serial entrepreneurs-cum-investors, who provide both early stage investment and a good deal of wisdom and know-how; effectively, they propagate both knowledge and wealth within the ecosystem. The region has its own cadre of locally-based angel investors and venture capitalists, and it also attracts a good deal of interest from the London-based investment community. Increasingly, the East of England is a destination for international investment, both through multinational companies (such as Apple, Google, Huawei) and through global investors.
- **Our support for highly innovative early stage business:** Our network of science parks, innovation centres, incubators and accelerators is second to none. It includes locations which are seen as exemplars around the world (e.g. Cambridge Science Park, St John’s Innovation Centre, Norwich Research Park, Wellcome Genome Campus, Adastral Park); more recent

ventures which have very quickly become recognised parts of the national innovation infrastructure (e.g. Stevenage Bioscience Catalyst, BioPark, Cambridge Biomedical Campus, Rothamsted Centre for Research and Enterprise (RoCRE)); and some very new and exciting ventures which are really still emerging (e.g. University of Essex Knowledge Gateway, University of Suffolk's Waterfront Innovation Centre, and Future Business Centre, Peterborough). In all cases, these are far more than property schemes. They are nurturing business, encouraging open innovation and providing a material input into the region's networking strengths described above.

- **Our industrial “lineage”:** The history of our regional economy is not that of a manufacturing powerhouse, founded on 19<sup>th</sup> century technologies. This makes the region really quite distinctive. Our history in relation to intensive arable agriculture and horticulture, particularly on land that itself had to be reclaimed, conveys something of our ingenuity. Beyond that, our region benefitted from the growth of major knowledge-based businesses in the early 20<sup>th</sup> Century that have created an enduring legacy in terms of skills and aptitudes – aerospace in Hertfordshire and automotive in Essex are two examples. We have industries which are changing profoundly, but not in the sense of structural decline; restructuring processes are instead premised on knowledge, ideas and connectivity – core features of our innovation ecosystem.
- **Our locational advantages and international outlook:** The East of England abuts London to the south, and our relationships with London are increasingly strong ones. These are evidenced through flows of people, ideas and money – in both directions. They have been accelerated through major – and highly complementary – investments in London. The location of the Francis Crick Institute and Alan Turing Institute are especially notable in relation to our four Themes. The East of England has the physical capacity to commercialise knowledge to a level that London cannot, and this in itself is a substantial asset and strength<sup>4</sup>. In addition, we are well placed in terms of connections to Oxford and the wider Golden Triangle (infrastructure issues notwithstanding); and to the Midlands and North (on the East Coast Mainline, A1(M) and A14 especially). Crucially, we also have an exceptional location for international connectivity, through both ports and airports.

**Vibration induced fatigue test for an aircraft open rotor propeller blade**



Photograph courtesy of TWI

<sup>4</sup> For a discussion of the relationship between the East of England and London in relation to science and technology see “*Mapping London's Science and Technology Sectors*”, Final Report to the Greater London Authority by SQW, October 2015



- **Our research assets:** The final piece in our innovation ecosystem relates to the depth and breadth of our research excellence which is, simply, outstanding. The UK Research Councils (BBSRC and MRC especially) and the major charities (notably Wellcome Trust and CRUK) have invested substantially in our research base. We are home to the Sanger Institute, the Babraham Institute, the Laboratory for Molecular Biology (LMB), the Earlham Institute, the National Institute for Agricultural Botany (NIAB), the John Innes Centre, Rothamsted Research and – from 2018 – the Quadram Institute (on Norwich Research Park). Across research fields that are absolutely germane to Life Sciences, Agri-tech and ICT, these are conducting world-leading research that is changing the way disease is understood and data are used, *and* they are enabling the two to be brought together to unlock world-changing possibilities. Alongside the research institutes are our universities. The University of Cambridge is consistently among the top 5 on worldwide university rankings and it has a huge depth of research excellence across all four of our Themes. The University of East Anglia, University of Essex, Anglia Ruskin University and University of Hertfordshire also all have world class specialisms, and they have been recognised in these terms in national comparative reviews, such as that conducted by Lord Witty. Finally, we would flag the scale, depth and excellence of the research conducted within our businesses: GSK, BT and Microsoft Research, for example, undertake prolific research, increasingly moulding the innovation ecosystem which surrounds them.

#### BioRealty@Babraham



Image provided by BioMed Realty

## 4: Growth opportunities

All four of the Themes which provided the focus for our Science and Innovation Audit are defined around growth opportunities in national and international markets. As “sectors”, all four are relatively large on conventional metrics compared to UK averages, particularly at a sub-regional scale. Considered narrowly as “sectors”, growth prospects are inconsistent. They are strong in Life Sciences, Agri-tech and ICT and more modest in relation to Advanced Materials and Manufacturing – although we consider AM&M to be of foundational importance to the other Themes (even if the pace of investment and growth is slower).

However, we are not identifying “growth opportunities” in linear sectoral terms. Instead, we are seeing them through the lens of our innovation ecosystem and its ability to adapt and respond to societal challenges and imperatives – both those that emerge through the market and those where government, in some capacity, intervenes. These growth opportunities are difficult to define very precisely, but they are real ones – and they are ones for which the East of England is uniquely well equipped because of accelerating processes of convergence within and across our innovation ecosystem.

This means that we can respond to and (to a degree) precipitate five overarching growth processes that are driving market opportunities in the UK and internationally, and which transcend individual technologies and sectors:

- **Cost savings and imperatives relating to productivity:** Among public sector service providers and across the private sector, there is a relentless imperative to reduce input costs. The adoption of robotics in Agri-tech will reduce the requirement for manual labour and the East of England is in the vanguard in terms of quickly-emerging responses. More generally, in the context of population growth worldwide, there is a need for more productive, nutritional and environmentally sensitive crops; new molecular techniques will be vital to achieving this, and through the work of organisations like the John Innes Centre, NIAB, Rothamsted Research and the University of Cambridge, the East of England is tremendously well-placed. In the healthcare domain, there are huge cost pressures of many different forms. In terms of preventing illness, the potential of the microbiome is enormous and – particularly on Norwich Research Park – the region has outstanding (and growing) assets. Future screening programmes could well rely on innovation in the region in the sphere of medical devices; Cambridge-based Owlstone Medical, for example, is developing a breathalyzer for disease with the overall mission of saving 100,000 lives and \$1.5bn in healthcare costs.
- **Precision, stratification and personalisation:** Linked fundamentally to the imperatives for cost savings and efficiency is a raft of different opportunities relating to precision and personalisation. Through Agri-tech, the region is well-placed to apply, and benefit from, new technologies in precision and smart agriculture, including the application of robotics, sensors and diagnostics to increase the efficiency, speed and precision of applying fertilizers and pesticides, and of harvesting. There are also substantial opportunities in the Life Sciences. Many diseases are much better understood now than they were two decades ago (in part because of the impact of the human genome project in which Cambridge-based scientists played a crucial role) and this is unlocking substantial advances in personalised medicine. Our innovation ecosystem is world-leading in this context, partly because it has been able to bring together fundamental medical research (including in relation to cell and gene therapy) with the possibilities of data, the day-to-day interests of clinicians and – increasingly – the potential linked to medical devices. The result is huge advances in stratified and personalised medicine and far more effectively tailored treatments. These are improving health outcomes and they represent a substantial opportunity across global healthcare markets which are growing quickly. There are challenges too – not least regulatory ones – but the region’s innovation ecosystem is uniquely well positioned to respond.
- **Cleaner and resource-efficient solutions:** A third overarching opportunity relates to the imperative for solutions that are environmentally efficient. Again, this manifests itself in many different ways. The East of England is a dry region and innovative Agri-tech businesses are finding ways to reduce the use of water in commercial agriculture and horticulture. The East of England is also a fast-

**Thorvald robot which is being trialled for a variety of Agri-tech uses by the Lincoln Institute of AgriFood Technology (LIAT)**



growing region and substantial house building is planned. In this context, there is an imperative for far more sustainable building materials and approaches to construction; again, the region has world-leading expertise and solutions are ensconced within the AM&M Theme (through, for example, Hertfordshire-based BRE). Also within AM&M are the region's substantial capabilities linked to offshore renewable energy. All of these different elements are regional strengths which are genuine assets because of the wider market opportunities linked to them.

- **Disruption:** We consider that there are exciting possibilities linked to disruptive innovation. By its nature this is unpredictable and it will redefine markets, creating substantial opportunities in the process. Our innovation ecosystem has a depth of research excellence and an increasing agility in applying it – through convergence – that will mean that we are uniquely well placed both to initiate disruption and to respond to it. The convergence of Life Sciences with all sorts of data analytics is starting to effect profound changes and the East of England's innovation ecosystem is leading the way. Numerous examples could be cited – from GSK's collaboration with Google to, for example, the Centre for Therapeutic Target Validation (CTTV, now called Open Targets), an open innovation consortium based on the Genome Campus at Hinxton which is committed to sharing data across the scientific community.

- **Global profile, confidence and “brands”:** Finally, we consider that there are growth opportunities that present themselves because of the global recognition that our innovation ecosystem has already generated.

“Cambridge” is a global “brand” and a substantial asset in these terms. Equally, around the world, investors associate “Adastral Park” and “BT Martlesham” with pioneering research; “Babraham” and “Hinxton” are no longer (just) “villages in rural Cambridgeshire” but global shorthand for path-breaking Life Sciences research and the life-

BT's Global R&D Headquarters at Adastral Park



Photographer: Malcolm Watson/ VisualMedia

changing possibilities it creates; and “Norwich Research Park” and “Stevenage Bioscience Catalyst” are synonymous internationally with research excellence and open innovation. Add to this both key individuals (e.g. Hermann Hauser) and companies (e.g. ARM, GSK and AstraZeneca) and the strength of the region's brands is simply phenomenal. This is not marketing spin, but a source of global profile and confidence. And this in itself is creating growth opportunities. Crucially, it represents a further stimulus for the growth of the region's innovation ecosystem.

## 5: Gap analysis

At the start of the Audit **two overarching challenges** were, however, identified – **commercialisation** and **collaboration**. Through the Audit, these were examined rigorously. Four Theme-specific hypotheses were tested through both primary research and secondary evidence, and in all four cases,



the hypotheses were supported. **To continue to be world-leading, the challenges must be addressed at the level of the East of England innovation ecosystem as a whole.**

**Translation and convergence are – by definition – statements of “process”.** They are on-going, relentless and demanding, and the bar is set high and rising. The East of England is competing with the most effective ecosystems in the world – some of which are reasonably well known and understood (Silicon Valley, Boston (Massachusetts)) but many of which (particularly those emerging quickly in the Far East) are not. Against this backdrop, there is no room for complacency – or for local politics within the region, or for resourcing squabbles with UK Government. **The East of England innovation ecosystem is world-leading, but it needs to continue to evolve rapidly – and it must be empowered and resourced so to do.**

In accelerating translation and convergence, there are **four main “gaps”**. **These are defined with a view to the ecosystem’s future evolution, not simply its current form.**

### *Unlocking investment in the process of convergence*

The investment process is integral to the commercialisation journey and it is, by definition, risky. The innovation ecosystem in the East of England is better than most in terms of early stage investment; Cambridge, in particular, benefits from a vibrant local investor community, and it attracts the interest of investors world-wide. But the challenges are not “solved” and indeed, some are becoming more acute as the process of convergence accelerates.

The issues were noted particularly within the Life Sciences Theme – although they were also observed elsewhere. Open sourcing – and the use of big data – is a major driver of innovation and it is underpinning and accelerating processes of convergence. There are major opportunities relating, for example, to the convergence of clinical patient data, deep/machine learning, communication technology and connected medical and wellness devices, and the region has huge assets and capabilities in this sphere. However, the process of convergence may well not generate intellectual property in a form that can be easily protected through patents. For investors – who may be sector specialists with limited knowledge of convergence interfaces – this creates uncertainty and risk. Solutions need to be found.

### *Providing skills – particularly relating to data*

Across all four Themes, there are major – and similar – skills shortages. The extent and nature of the challenge was summed up by one business consultee from within the AM&M Theme (in this case an automotive business):

**Big Data and Data Analytics Research, University of Essex**



© University of Essex



*"I would look beyond automotive. What are the most valuable skills going forward? Software skills, data management skills, automation skills, robotics, artificial intelligence, machine learning. Bringing users to new services through a smart compelling interface... There is a really hard set of computational skills to bring..."*

*East of England SIA stakeholder consultations, March/April 2017*

Digital technologies are pervasive. Their application is the essential underpinning of the innovation ecosystem. But without sufficient people who are “*educated in real computer science*”, innovation will falter and business growth will stall. The issues are acute already. Moreover, given the global nature of the higher-level skills pool, the risks linked to Brexit are obvious and immediate.

### *Enabling co-location and clustering*

A third finding which was shared across all Themes surrounded the value – and innovation capacity – that is generated through co-location and clustering. Particularly in Life Sciences, there is much to be gained through physical proximity: silos need to be broken down and scientists from different disciplines need to work alongside clinicians, entrepreneurs, investors and patients on a daily basis. Tacit knowledge needs to be generated and shared, particularly against a backdrop of open innovation. Serendipity needs to be engineered.

These observations need, of course, to be contextualised – and they run up against various constraints. First, whilst much value can be generated through physical clustering, considerations relating to Green Belt are also important. Second – and related – even if land can be found, not everything can or should happen in the same physical space. Wider approaches to collaboration across the innovation ecosystem, some of them virtual, need to be developed.

Nevertheless, insofar as the strength of the East of England’s innovation ecosystem rests with localised clusters in which proximity is central to translational processes, those clusters need to be equipped to grow appropriately. Equally, where there is *potential* for clustering around knowledge-rich assets (and a specific emerging opportunity is the new Quadram Institute in Norwich), appropriate physical provision should be made to unlock a future growth dynamic. The relationship between the innovation ecosystem and “*place*” is intrinsic and critical. It needs to be recognised fully in these terms such that the ecosystem as a whole can evolve optimally.

### *Increasing connectivity*

Finally, the importance of connectivity must be acknowledged. Across a relatively large geographical region, the innovation ecosystem will not function well if connectivity (both within and beyond it) is poor.

This observation bites at various levels. At the most mundane, it is very important that broadband connectivity is consistently good. Anticipating emerging gaps in relation to the medium-term evolution of the innovation ecosystem, the issue of digital connectivity needs also to be considered at a more profound level. Looking ahead, data will be transformational across Life Sciences, Agri-tech and AM&M, and within the ICT sector itself. Huge volumes of data will need to be generated, captured, stored, protected, transmitted and used. The region needs a digital infrastructure that can cope – and, indeed, it needs a digital infrastructure that can help to realise the full transformative potential.

## 6: Key ambitions/proposals

### *Eight key interventions...*

To start to fill these gaps, **eight key interventions** have been identified. These fall into two groups, reflecting their intervention focus and route to impact:

- three interventions are, in principle, **region-wide ventures which are concerned with building hard and soft infrastructures and capacities for sustained innovation**, particularly in relation to data
- five interventions are focused on **specific clusters and/or sectors with the aim of accelerating convergence and/or translation**.

All eight interventions are grounded in rigorous evidence and endorsed fully by the Science and Innovation Audit Steering Group (and its constituent members) and by GCGP’s Science Innovation and Industry Council (which has overseen the whole exercise). The table below lists the interventions and provides a very brief description of them. It also shows how they map onto the principal “gaps” identified above.

*Table 1: Priority interventions identified through the Science and Innovation Audit*

Key “gaps” to be addressed in unlocking the full potential of the East of England’s Innovation Ecosystem →	Unlocking investment in convergence	Providing skills, particularly in data	Enabling co-location and clustering	Increasing connectivity	
Priority interventions...					Brief description....
<b>A: Building hard and soft infrastructures and capacities for innovation across the East of England</b>					
Building Innovation Capacity	✓	✓			Cross-cutting venture to build innovative capacity, particularly among SMEs in the ecosystem
East of England Innovation	✓	✓		✓	Initiative to encourage technology transfer, particularly for SMEs outside the main clusters
Smart Enabling Technologies Testbed	✓			✓✓✓	Infrastructure project to achieve high speed and high capacity connectivity
<b>B: Cluster and/or sector-specific ventures to encourage convergence and/or translation</b>					
Centre for AgriFood automation	✓	✓		✓	Venture to provide a regional resource in automation, at Holbeach
MedTech Hubs	✓		✓✓✓		Project to accelerate the development of emerging Hubs and to build synergies
Microbiome Hub	✓		✓✓✓		Innovation Centre anticipating the opening of the new Quadram Institute, on Norwich Research Park
Precision medicine cancer ecosystem	✓		✓✓✓		Radical new approach to precision medicine, building on foremost science
Cell & Gene Therapy R&D Centre	✓		✓✓✓		Provision adjacent to the Cell and Gene Therapy Manufacturing Centre, at Stevenage Bioscience Catalist

*...plus a wider response in relation to crucial skills issues*

Alongside the eight interventions, there is an overarching requirement to address **major issues relating to skills – particularly those relating to data science and computer science**. The Audit found shortages across all four Themes – and the scale of the problem is such that unless addressed, it will stymie business growth.

Partners within the East of England are already seeking to address the surrounding issues. But whilst local initiatives and a series of bilateral arrangements between individual businesses and HEIs/FECs are important, they are unlikely to be sufficient, particularly given the systemic nature of the challenges. At this stage, we do not have a fully developed “solution” (and hence there is no specific intervention/business case), but we are committed to working towards one, preferably in dialogue with government.

*...within an overarching commitment to the East of England’s innovation ecosystem*

The eight interventions – and the more systemic skills project – will all need to be delivered as part of a wide-ranging and long term commitment to the East of England’s innovation ecosystem, both from within the region and from UK Government. Regional partners are fully committed to seeing this through. It is important, also, that a partnership is formed with UK Government to drive the wider venture forward. Across the East of England’s world class innovation ecosystem, much will be achieved as a result.

## **7: Networking/collaboration**

The East of England’s innovation ecosystem is defined around networking and collaboration – and much evidence of this is presented within our main report. The process of completing the Science and Innovation Audit has put this under the spotlight – and helped further to build on it.

*...networking/collaboration within the region*

The East of England is a big region. However we benefit from highly effective networks which are central to all four of our Themes. None of these map directly onto the “East of England” in a rigid, boundary-driven, sense and nor would we expect them to: some are localised around specific geographical clusters, while others have a broader geography which extends across boundaries to follow functional economic footprints. This fluidity and flexibility is what makes them work.

Key networks which are of crucial importance to our Themes and have a strong regional footprint include, *inter alia*:

- in **Life Sciences**:  
One Nucleus, Eastern Academic Health Science Network, M11 Health Enterprise Forum, and MedCity
- in **Agri-tech**:  
Agri-Tech East, the Eastern Agri-tech Growth Initiative, FramFarmers and Anglia Farmers Network
- in **AM&M**:  
East of England Energy Group (EEEGR), New Anglia Advanced Manufacturing and Engineering (NAAME), and a series of Manufacturing Clubs (e.g. St Neots, Huntingdon, Peterborough)

- in ICT:

Cambridge Wireless, Tech East and SyncNorwich.

In addition, there are some key regional networks that are cross-sectoral in character. Two important examples are Cambridge Network and Cambridge Cleantech.

As well as more-or-less formally constituted networks, there are numerous examples of collaboration within the region; indeed, these are integral to our whole innovation ecosystem and they are reported throughout our Science and Innovation Audit report. There are many examples of individual companies collaborating with one or more of the region's universities; BT, for example, works with the University of Essex, University of Cambridge and University of East Anglia.

But more than that, we are seeing growing levels of collaboration across parts of the innovation ecosystem that a decade ago would have been quite separate. One very important example is the growing depth and scope of relationships across Life Sciences between hubs in Cambridge and along the A1(M) Corridor. Stevenage Biomedical Campus is located on the site of GSK in Stevenage and it has pioneered approaches to open innovation; a research team from the University of Cambridge is located on site. GSK itself is very active in various initiatives based on Cambridge Biomedical Campus. It is engaged in many different collaborative research projects, not least with the European Bioinformatics Institute (EBI) and Wellcome Trust Sanger Institute. Heptares – a spin out from the Laboratory of Molecular Biology (on Cambridge Biomedical Campus) – was initially based at BioPark (in Welwyn Garden City) before moving to Granta Park (near Cambridge), in part because it had out-grown BioPark and in part because it entered into major collaborative agreements with AstraZeneca and MedImmune. There is therefore a very substantial underpinning of local collaboration across the innovation ecosystem; much of it is “hidden from view” and difficult to measure but it is, nevertheless, central to its functionality.

*...networking/collaboration across the UK*

Businesses, universities and research institutions – and the individuals that run them – are engaged in significant networking and collaboration at a national scale.

Amongst the more formalised examples are:

- in **Life Sciences** – the BioIndustry Association, and the network of Catapults (noting that the Cell and Gene Therapy Catapult's advanced manufacturing facility is being developed at Stevenage Biomedical Campus).

Sector networking event at Stevenage Bioscience Catalyst





- in **Agri-tech** – collaborations across BBSRC’s Research and Innovation Campuses – which span Life Sciences and Agri-tech – recognising that of the five that exist nationally, three are in the East of England (Babraham Research Campus, Norwich Research Park and Rothamsted Centre for Research and Enterprise); and a substantial interest in the national network of Centres for Agricultural Innovation (Agrimetrics, Centre for Crop Health and Protection (CHAP), Centre for Innovation Excellence in Livestock (CIEL) and Agricultural Engineering Precision Innovation Centre (Agri-EPI)).
- in **AM&M** – engagement in national networks and associations, such as the Engineering Employers Federation and the Motorsport Industry Association. Again, there are extensive links across the national Catapult network; OrbisEnergy, for example, works closely with the Offshore Renewable Energy Catapult. In addition, the national Association for Innovation, Research and Technology Organisations has strong representation in the East of England including, for example, from TWI and BRE, both of which work across the UK (and internationally).
- in **ICT** – national research collaborations which are intrinsic to our region. For example, the University of East Anglia, University of Essex and the University of Kent joined forces to form the Eastern Academic Research Consortium (Eastern ARC), a significant new force in research collaboration and training. Our businesses such as ARM, BT, Google and Huawei have extensive research networks with universities and industry across the UK.

In addition, we consider that the East of England’s innovation ecosystem is an engine of enterprise which benefits the UK as a whole. There are many examples of companies which have emerged from the region’s innovation ecosystem but have based some or all of their down-stream production activities elsewhere in the UK, generating jobs in other regions. One example is Raspberry Pi which was formed in Cambridge in recognition of the need to build interest and expertise in fundamental computing skills; it is working with Sony’s manufacturing plant in Pencoed, South Wales, to manufacture its boards. Another example is Metalysis. Its expertise derived from within AM&M in the East of England, and it is now creating jobs in Yorkshire.

**Case study of Metalysis – a company created from the East of England’s innovation ecosystem and now generating jobs elsewhere in the UK**

Metalysis is a company that is based in South Yorkshire. It is commercialising a revolutionary process for the cleaner/greener, more efficient production of metal powders.

The process was invented by Prof Derek Fray’s research group in the Department of Materials Science and Metallurgy at the University of Cambridge. The FFC (Fray, Farthing and Chen) process is based on a solid state reduction process that takes place at a lower temperature and requires less energy than conventional methods of metal production. Details of the process were initially published in 2000, and early development work was undertaken in Cambridge.

Metalysis was set up to commercialise this game changing technology. Although initially operating in the Cambridge area, Metalysis moved to one of the UK’s areas of primary metal production, South Yorkshire, in 2005. It has grown subsequently and now employs around 65 people. It is an example of the East of England’s innovation ecosystem creating employment elsewhere in the UK.

*Source: Based on evidence provided to the East of England Science and Innovation Audit*

*...networking/collaboration around the world*

The region's innovation ecosystem is intrinsically networked internationally. It draws in the best international talent and it is attracting international investment of many different forms. There are many specific examples of international networking and collaboration. These include:

- in **Life Sciences** – substantial international networks, some of them animated through One Nucleus (e.g. links to BioJapan). There are also many examples of international inward investment (e.g. the establishment of the Spanish firm, Aglaris, at Stevenage Bioscience Catalyst) and collaborations (e.g. the US firm, Biogen, is one of the major partners in the collaboration with GSK, EBI and the Wellcome Trust Sanger Institute linked to open data).
- in **Agri-tech** – many international research collaborations in which the region's universities and research institutes are involved. For example, the John Innes Centre has formed a partnership with two institutes of the Chinese Academy of Sciences to establish the Centre of Excellence for Plant and Microbial Science (CEPAMS) in Shanghai, and Rothamsted Research has collaborations in more than 58 countries and collaborative Centres in China, India and Brazil.
- in **AM&M** – significant international collaborations, some of them facilitated by Horizon 2020 (or before that, Framework Programme 7). One example is ECOWindS (European Clusters for Offshore Wind Servicing). In addition, Research and Technology Organisations like TWI and BRE are operating across the world.
- in **ICT** – significant international inward investment, much of it following earlier collaborations. Examples include Huawei's acquisition of Cambridge-based Neul and the Centre for Integrated Photonics at Adastral Park; and Apple's acquisition of VocallQ.

**Friction stir welding of titanium propellant tank for the European Space Agency**



Photograph courtesy of TWI

*How the process of the Science and Innovation Audit has itself added value*

The different forms and processes of networking and collaboration outlined above are well established and on-going, and they are integral to the mechanics of the East of England's innovation ecosystem. They are also the motive force in relation to the accelerating process of convergence – and it is that process which defines, fundamentally, our assets, our opportunities and our vision.

All of this has been given additional focus and impetus through the process of the Science and Innovation Audit in early 2017. Its added value has been recognised and applauded across the region. It has included, specifically:

- the dialogue between key investors, entrepreneurs, scientists and businesses from across Life Sciences which has been further energised through six round table events/workshops involving well over 100 stakeholders
- the insights generated through the two-day Hot House which was organised by BT at Adastral Park to define opportunities relating to the use of data and as part of the ICT Theme

- a re-energised dialogue between four Local Enterprise Partnerships focused specifically on the opportunities relating to science and innovation
- links to the Wave 1 Midlands Engine SIA (principally through the contribution of Cranfield University to our process) and to the Wave 2 Innovation South SIA (as South East LEP has been part of both the Innovation South consortium and that for the East of England)
- an on-going dialogue with other Wave 2 SIA consortia, notably those in Leeds City Region (around medtech) and Oxfordshire (particularly in relation to satellite applications and their links to Agri-tech); and in relation to the Offshore Energy SIA.

The East of England's Science and Innovation Audit report and associated appendices for each Theme, as well as the Executive Summary, are available to download from <http://www.gcgp.co.uk/east-england-sia/>



