DEVELOPING AN INNOVATION ECOSYSTEM:
POLICY, SKILLS AND OPERATIONS

Report from the North East LEP Innovation Observatory

PREFACE

The North East LEP (NELEP) is taking forward an ambitious programme of activity to deliver innovation-led growth in the North East; this is an essential part of the Strategic Economic Plan, adopted in 2014. Innovation lies at the heart of NELEP's approach recognising the imperative for new products, processes and services to drive growth. Successful innovation needs to be able to draw on up to date research and evidence to inform and facilitate new interactions. To enable this, a core element of the strategy is to support "On-going strategic intelligence to understand and build on existing innovation assets, our expertise and capability, and market insights." The absence of this has reduced awareness of the opportunities and threats from global innovation trends for communities, businesses and organisation in the North East.

An Innovation Observatory, the first of its kind in the UK, was therefore proposed in response to this. The Innovation Observatory provides up-to-date, accurate and academically-robust intelligence on key innovation themes, translated for the North East environment. This also sets a clear, shared understanding of innovation in the North East, its characteristics and potential, based on business strengths as well as research capabilities. The model is explicitly intended to respond to practical business and service needs setting out new thinking and opportunities in a relevant and understandable manner.

In this report, an analysis of wide-scale secondary data, North East firms show proficiency in innovation in some respects, mostly depending upon specific sector and organisational contexts. These innovation indicators are presented in more detail later in the report. Mainly, it is expected that these indicators do not function solely in isolation, but rather in combination will lead to a better predictor of innovation success.

An integration of the 2017 Gartner hype cycle of emerging technologies with the competencies and industries of the North East is also presented, to look ahead to opportunities and threats to the region's companies from a rapidly developing, increasingly tech-focused dynamic world marketplace. Findings show that some sectors within the North East are much more affected by this development than others. Where some will be quick to adopt to change, others may need increased support in taking up new technologies in order to survive.

Recommendations – We identify a broad number of areas where further investigation would be useful in order to inform the development of targeted and effective interventions.

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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

This report builds on previous work aligned with the North East Economic Review (Adonis, 2013), and more specifically the North East Local Enterprise Partnership Economic Strategy (2017)[1] that acts as the most recent benchmark of the earlier Economic Review, as well as reports aimed at stimulating North East[2] economic growth through initiatives such as promoting the region as an economic corridor[3]. Using an analysis of wide-scale secondary data, North East firms show proficiency in innovation in some respects, mostly depending upon specific sector and organisational contexts. These innovation indicators are presented in more detail later in the report. Mainly, it is expected that these indicators do not function solely in isolation, but rather in combination will lead to a better predictor of innovation success.

An integration of the 2017 Gartner hype cycle of emerging technologies[4] with the competencies and industries of the North East is also presented, to look ahead to opportunities and threats to the region's companies from a rapidly developing, increasingly tech-focused dynamic world marketplace. Findings show that some sectors within the North East are much more affected by this development than others. Where some will be quick to adopt to change, others may need increased support in taking up new technologies in order to survive.

Recommendations – We identify a broad number of areas where further investigation would be useful in order to inform the development of targeted and effective interventions.

Context – From a mining and manufacturing heritage, the North East is now heavily reliant on service sector jobs for its sustainability and prosperity. The innovation indicators highlighted through a review of wide-scale secondary data helps to show particular areas of strengths, and opportunities, as well as potential weaknesses and threats across the North East. If these innovation indicators could be supported effectively it could have huge financial and technological benefits to the North East, in terms of job growth and bottom-line performance.

Policy Insights: The policy landscape is complex and shifting but there are major national Government initiatives with which the NE LEP should seek to align and on which it can build as there are resources available that could make significant difference.

Chapter 1: Innovation Indicators – A review of the innovation literature identified 18 'innovation indicators', relating to how an organisation may be able to innovate more effectively. Of these 18 indicators, 7 were more easily accessible, through secondary data. Wide-ranging analysis was conducted, but was also found to be challenging in some areas, e.g. dirty data. Case studies of four North East based firms are used to further support the desk-based research conducted for this report.

Chapter 2 – Gartner Hype Cycle (2017) for North East Industries – Each year, renowned information technology analysts Gartner release a 'hype cycle' based on emerging technologies. The 2017 version details 32 such emerging technologies. These were mapped against the industries and competencies of the North East, as well as the NELEP Smart Specialisation Areas[5]. This coding was then translated to a 1-5 scale, indicating the likelihood of impact across the North East.

Chapter 3 – The role of skills in enabling innovation – a short investigation highlighting the often neglected role that vocational training can play in reducing barriers to firms' innovation activity.

Conclusions.

RECOMMENDATIONS

Recommendations are given with the view of being of use and to plan towards implementation within the short, medium and long term.

Broad, strategic recommendations are:

- **Short term** – Further research on the data gained for this report should be conducted. There are at least 11 innovation indicators identified that were beyond the scale of this report, but given more resources could obtain a richer picture of North East innovation. In addition, the data obtained here could be integrated more effectively, to aid both researchers and practitioners alike.

- **Medium term** – A more integrated approach towards promoting innovation in the North East is necessary. Progress is being made in this respect, with help from NELEP and the Northern Powerhouse for instance. However, as results have shown, much remains to be done. The North East needs to be seen as a location to grow, as well as to start-up, if the regional economy is to develop sustainably.

- **Long term** – Areas of strengths, weaknesses, opportunities and threats can all be helped and addressed by investing in education, people and emerging technologies. Firstly, the North East needs to be seen as an attractive proposition for graduates, to reduce the 'brain drain'[6] to London and the South East. This will require better collaboration between Universities, authorities and local businesses in order to be successful. Secondly, much more needs to be done to promote wide-scale awareness of the potential impact of emerging technologies. Companies need to be supported and encouraged to embrace change and adopt new technologies in order to survive in a competitive global marketplace, to grow and ultimately, to innovate further and drive the future success of the North East economy.

We also offer the following more targeted recommendations:

- Investigate the under-investment in R&D identified by the date from the Smart Specialisation Hub and develop strategies to encourage business R&D spending.

- It would be helpful to understand the discrepancies between the sectors highlighted in the Smart Specialisation work and the recent evidence of mixed levels of growth. This would enable a decision as to whether to further support the four smart specialisation areas to be at the forefront of innovation in the region or to re-evaluate these in terms of their potential contribution.

- Follow up recommendations of second wave SIA's relevant to the NE and identify future opportunities.

- Continue to collaborate closely on third wave of SIA's and identify any similar opportunities for an in depth innovation audit into remaining smart specialisation area of advanced automotive technology as this is the only are not subject to an SIA.

- Carry out work horizon scanning and understanding the impact of Brexit on innovation in the NE, in particular around digital, patents and health and life sciences.

- Identify ways to maximize the value of its specific strengths around advanced manufacturing, life sciences, energy and the digital economy within the Northern context. What alliances and USPs can be drawn out to help build a distinctive base for growth? Identify specific sub-sectors within the NPIER prime capabilities where the North East has a distinctive and comparative advantage and can thus position itself?

- Consult the business community on how to facilitate their exposure to wider markets – even nationally – as part of exposing them to sources of new ideas and competitive pressures.

- Put in place a programme of training and awareness raising in partnership with the Intellectual Property Office on IP protection and build a network and events where businesses can share effective practice.

- Organise a seminar engaging key skills and technician experts at a national and local and leading experts in key innovation sectors to inform the further development of a strategic regional "skills for innovation" policy.

- Engage with the new opportunities for Mayoral Combined Authorities to set priorities for adults skills training and explore the potential to secure funding from the European Social Fund, with a particular focus on sectors highlighted in the Smart Specialisation analysis and Science and Innovation Audits.

- Explore how the NE road map programme to decarbonise heavy industry can unlock business and innovation opportunities.

- Building on the innovative approaches in Newcastle to take a long term perspective on housing growth which can support Modern Methods of Construction, can more be done to support the sizeable construction sector in the NE?

- In the use of Social Impact Bonds the NE is accepted as a market leader and is redesigning health services locally to focus on outcomes and finance, CICs and charities in a thorough redesign of delivery. How can more be made of this work to support growth?

1. https://www.vonne.org.uk/sites/default/files/files/The%20North%20East%20 Strategic%20Economic%20Plan%20-%20March%202017.pdf

2. For the purpose of this report, the North East region encompasses County Durham, Gateshead, Newcastle, Northumberland, Sunderland and Tyneside.

3. https://www.nelep.co.uk/wp-content/uploads/2017/09/NEL223-SUD-STRATEGY. pdf

4. https://www.google.co.uk/?gfe_rd=cr&dcr=0&ei=ciGGWvPYMKLP8AeYqZy4CA

5. https://www.nelep.co.uk/wp-content/uploads/2014/10/NE-LEP-ESIF-Strategy-Full-23-June-2016.pdf

6. http://www.centreforcities.org/wp-content/uploads/2016/11/16-11-18-The-Great-British-Brain-Drain.pdf

CONTEXT

The North East of England has been at the forefront of innovation with notable contributions in the area of rail, transport and hydraulics among many others. This study identifies good regional innovation practice and maps global patterns and trends that contribute to the North East of England being an innovative ecosystem that can not only survive in an increasingly competitive global marketplace, but can also develop and grow to meet future demand. This report shows that a variety of factors contribute to the way in which a firm is able to innovate most effectively in this complex environment, with the aim of the creation of a user-friendly 'innovation dashboard'. Findings from this report not only inform best practice for industry but can also be used to inform regional policy.

This region is very well connected via road, rail, sea, and, airports with excellent urban infrastructure in its major cities Durham, Newcastle, and, Sunderland. There is a population of around two million people with highly diverse and specialist skills. The region is also home to more than 50,000 micro, small, medium and large organisations, some notable names include Nissan, Komatsu, Caterpillar, Thorn Lighting, Stanley Black & Decker, etc.

Based on previous work by NELEP, we know that there are many strengths and opportunities projected by the North East as an area of innovation, such as the digital and creative sectors (NELEP Economic Strategy, 2017, p. 14). However, this may not be the case in all sectors, where the ability to embrace change may be less swift. The North East Innovation Observatory (NEIO), which is a partnership of regional universities (Durham, Newcastle, Northumbria, Sunderland and Teesside) and the NELEP have conducted a wide-ranging study of innovation activity in the North East, primarily mapping areas of strengths, weaknesses, opportunities and threats across the region and all relevant sectors.

The Department for Business runs a Community Innovation Survey on a regular basis and has just published the headline findings from

the 2014- 2016 survey. The headlines from the 2014-2016 survey findings are not encouraging for the North East and point to an urgent need for action. While innovation activity generally decreased across the country, the fall in the North East and Yorkshire and the Humber was particularly marked.

As part of the Innovation Observatory project, we conducted a systematic literature review to identify the indicators for innovation at a firm level. These indicators may include activities directly related to innovation such as research & development, patents, intellectual capital, etc. There may be other indicators at the firm level that are not so obvious such as size of the firm, ownership characteristics, etc. The third kind of indicators is more about the eco-system in which the firm is operating. Overall these indicators determine the level of innovation at the firm level, which aggregately determine the innovation in the region. Overall 18 indicators were identified of which secondary data was available for 7 indicators. Data for these 7 indicators were collected from a number of sources and cross-verified to ensure the quality of the collected data. This data was then analysed to identify the particular areas of opportunity, as well as potential threats and weaknesses across the region. The report also identifies the emerging technologies and mapped it across the industry sectors in the region to identify the key technologies and their impact of the sector. This analysis aims to provide a futuristic insight to the regional industry about the potential disruptions.

The results are highly encouraging as it shows the impact of the innovation indicators on firm performance and job creation in the region. There is a need to identify interventions to support these innovation indicators for the prosperity of the region. It is also to be noted that the data was available only for the 7 indicators from secondary sources, which might be collected for a totally different purpose. If data for all the 18 indicators was available for the companies in the region, it can provide a much better and realistic picture of the level of innovation in the region.

Regional level differences

Figure 4: Proportion of innovation activity by region, 2012-14 and 2014-16

Unweighted base = 10,331 in 2014-16 and 11,913 in 2012-14
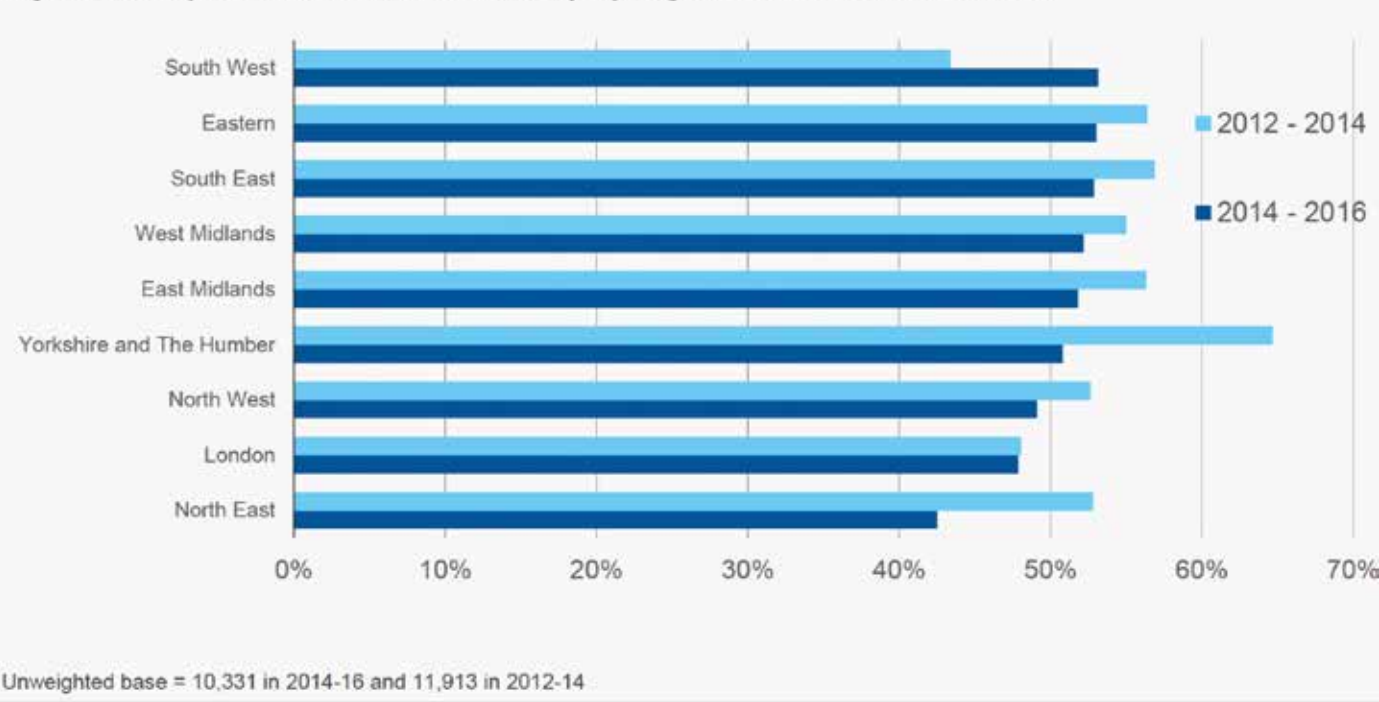
POLICY INSIGHT

Current Innovation Insights in the NE

Innovation activity is widely recognised as a critical factor in stimulating business growth regionally and nationally. As such there has been a lot of business, government and academic interest in this space and there are a large number of reviews, reports and audits already analysing innovation across regions, sectors and from a number of perspectives. Understanding current activity clarifies existing understanding, identifies knowledge gaps and helps shape the outputs of this report and future work to contribute to the LEP Economic Strategy.

Smart Specialisation Hub

The Smart Specialisation Hub is jointly funded by BEIS, Innovate UK and the European Development Fund. Their core remit has been to map, analyse and compare innovation in England at the LEP level to provide insights into strengths and capabilities, identify high performing clusters and promote 'place-based policy'. Their report Mapping England's Innovation Activity shows encouragingly broad innovative capabilities across a range of sectors in the NE. Comparatively regionally, the NELEP capability average is judged to be second behind Leeds but ahead of Tees Valley, Sheffield, York and Humber. The data shows strong innovation activity in a range of sectors with particular strengths across infrastructure and manufacturing sectors.

NELEP Profile by the Smart Specialisation Hub

The Hub has also conducted deep dives into the data for each individual LEP and the resulting profile for the NELEP provides valuable insights around several key innovation metrics such as higher education research funding, business R&D funding and patents registered. These present a more complex picture than the high level data. Some stand out results to consider are that innovation in business and industry judged by the number of Innovate UK grants shows that bio-sciences and the built environment far outperform other sectors regionally and the national LEP average. It also shows a healthy research and consultancy market with interactions between higher education institutions and business well above the LEP average. The four areas for smart specialisation chosen by NELEP do not map directly onto the sectors analysed by the Smart Specialisation Hub but the data does show that these areas are not currently displaying noticeably higher levels of innovation by the measures used by the Hub, which is something that future work by the NELEP should explore.

Also of particular concern to the NELEP is the fact that business spending on R&D stands significantly below the LEP average. This is in contrast to higher than LEP average higher education spending on R&D. The disparity in business spending on R&D has also been picked up in the data in this report as going back ten years. The next step should be to fully understand the reasons for the sustained underinvestment in R&D so that the NELEP can develop strategies to encourage greater business commitment to R&D.

Science and Innovation Audits (SIA)

The core aims of science of innovation audits are to identify areas of potential global competitive advantage across the UK, provide an evidence base for strategic decision making on local innovation priorities and encourage collaboration. The government invited consortia of business and academia to bid for projects to conduct science and innovation audits within specific sectors in specific geographical areas.

The second wave of SIA's included two SIA's covering The NE. The first was the SIA into the Bioeconomy of the North of England which examined the potential for the North of England to become a hotspot for bioeconomy businesses and set out a vision for delivering this. In March 2018, the Government announced a £10m investment in the North East with funding to improve commercial research from four North East Universities and to boost the bioeconomy across the Tees Valley.

The second SIA into Offshore Renewable Energy was led by Newcastle University and analysed Northern England and Scotland's ability to collaborate to produce world class competitive innovation in offshore renewable energy. One of its key findings was that with sufficient policy focus the number of people directly employed in offshore wind in the UK could double between 2017 and 2032. It also identified an immediate need to join up education and training providers with the future industry demand for a higher-skilled workforce.

Both SIA's are excellent sources of analysis and include recommendations to further growing regional strength in these fields.

A third wave of science and innovation audits announced in December 2017 include three more audits based in the north and covering the NELEP. These are:

- Northern Powerhouse Chemicals & Processing Science (led by Tees Valley Combined Authority with support from North East, Humberside, and Liverpool City Region LEPs)
- Northern Powerhouse in Health Research (led by Northern Health Science Alliance and includes LEPs, universities and teaching hospitals from across the Northern Powerhouse) and
- Applied Digital Technologies (led by North East LEP)

Digital and health are both NELEP smart specialisation areas so these are well aligned with the NELEP's strategic objectives and indeed NELEP are leading on Applied Digital Technologies. All three SIA's are opportunities to showcase the NE, to bring together innovative businesses and to create a long term blueprint for future development of these sectors in the area. Once the third wave SIA's are complete this will represent an SIA into each of the NE's smart specialisation areas with the exception of automotive advanced manufacturing capability. In light of this, it may be worth considering if any comparable process can be undertaken to further support this strand of smart specialisation work sector.

Understanding the wider policy context

Examining the wider national and international policy context deepens our understanding of the wider strategic objectives that business, academia and government decision makers are focussed on and how this may impact businesses regionally.

International Level: Brexit

As details around Brexit solidify, it becomes clear that there will be significant impact on indicators that we know have considerable impact on innovation. The House of Commons Science and Technology Committee convened an inquiry in February 2018 to further discuss this issue. A key issue affecting all areas of innovation is the potential risks of losing funding and collaboration opportunities as well as access to facilities. The uncertainty surrounding the UK's continued involvement in the EU Framework Programme for Research and Innovation in turn contributes to uncertainty in academia and business, undermining confidence to commit to research spending.

A second issue raised by the inquiry in their final report include particular concerns around future membership of the European Medicines Authority (EMA) and the adoption of new regulation for clinical trials. As one of the NE smart specialisation areas is health and life sciences, this has the potential impact on NE businesses so further analysis of possible impacts, outcomes and opportunities needs to be prioritised.

Finally, in light of the region's strength in digital technologies there are critical questions around how the EU will treat Britain in relation to data privacy laws and whether Britain will continue to be considered a safe third party country so that personal data can be still be transferred from the EU to the UK.

These are just a few of the potential challenges but deeper analysis may also identify opportunities for businesses too. The key recommendation is that as well as looking at companies' readiness to adapt to new technologies identified in the Gartner Hype cycle, there should also be a horizon scanning of future changes in funding, collaboration and regulatory environments.

National Level

On 27/11/17 the Government published its Industrial Strategy White Paper. The White Paper sets out a long-term plan to raise productivity through investment in the skills, industries and infrastructure of the future.

It also sets out 4 grand challenges - major social needs which can give direction to private sector investment and help strengthen supply chains:

- Growing the Artificial Intelligence and data driven economy
- Clean growth
- Future of mobility
- Ageing society

These grand challenges will be developed through policy levers such as funding, regulation and sector deals and details will be set out in the coming months. Expert advisors will be appointed to work alongside Ministers.

The Industrial Strategy sets out five foundations to a transformed economy:

- Ideas: the world's most innovative economy
- People: good jobs and greater earning power for all
- Infrastructure: a major upgrade to the UK's infrastructure
- Business environment: the best place to start and grow a business
- Places: prosperous communities across the UK

There are significant future opportunities to secure funding for the region through the sector deals and grand challenges announced as part f the industrial strategy.

The North East can play a strong role in delivering the strategy through its industrial and innovation strengths in advanced manufacturing, life sciences, energy and the digital economy. Also, North East strengths in areas like ageing and smart data can contribute to addressing the grand challenges identified in the White Paper whilst the focus on skills will provide new economic opportunities for local people.

The North East will no doubt be positioning itself to understand opportunities for new investment to drive innovation, for example through the Strength in Places Fund and through the successor arrangements to ESIF (UK Shared Prosperity Fund). The decision to create a North of Tyne Mayoral Combined Authority will also unlock new opportunities and enhance the national and international profile of the region.

Annex I sets out the five foundations in more detail and raises questions and issues that could usefully be explored in relation to the relevance of each for the North East.

Regional Level

The 11 Northern LEPs are carrying out some early stage work with IUK and other partners to understand how they can best promote and progress innovation in the North of England. The partnership is assessing how they can harness the distinctive and world class science and industry assets and capabilities across the North.

The ambition is that more effective coordination will help to more effectively leverage them to attract international investment, develop and secure new value chains within the North and also facilitate wider economic benefits through new supply chain opportunities for local businesses and improved diffusion of innovation. This would help to close the North's £37 billion productivity gap, as outlined in the Northern Powerhouse Independent Economic Review (NPIER).

The Northern Powerhouse Independent Economic Review (NPIER) was commissioned by the TfN partners, collaborating with the wider Northern Powerhouse partnership.

The Review looked to understand the North's distinctive 'capabilities' and international-class assets: expertise, research and businesses that are distinctive for the North, are highly productive, and can compete on the national and international stages.

The Review identified the North as having four prime capabilities:

- Advanced manufacturing, with a particular emphasis on materials and processes
- Energy, in particular expertise around generation, storage and low carbon technologies, especially nuclear and off-shore wind
- Health innovation, with a focus on Life Sciences, Medical Technologies/ Devices, e-health, and emerging new models of service provision
- Digital, focusing particularly on computation, software tools/ design and content, data analytics and simulation modelling, and wider media strength

North East

The North East Strategic Objectives Plan sets out ambitious targets to:

- To increase the number of jobs in the North East economy by 100,000 by 2024
- To ensure that 70% of the jobs growth is in better jobs.

It also aims to close the gap in performance compared with other parts of the UK across four other key economic indicators.

In order to continue to deliver against these targets there has been particular focus and investment in innovation and the NELEP innovation strategy includes eco-system development, infrastructure building and smart specialisation.

The Northern Powerhouse Independent Economic Review identified the North East's smart specialisation areas as automotive manufacturing, offshore and subsea technologies, digital and health and life sciences. These are the core smart specialisation areas that underpin the NELEP innovation programme however data from the Smart Specialisation Hub profile of the NE does not demonstrate that these sectors are currently the most innovative regionally and the data from this report identifies a 14% drop in growth in subsea technologies. In light of this, it would be helpful to understand the discrepancies and to further support the four smart specialisation areas to be at the forefront of innovation in the region.

CHAPTER 1:
INNOVATION INDICATORS

Background

A review of the innovation literature resulted in a long list of 18 innovation indicators that were likely to lead to improved innovation within an organization or sector, as follows:

1. Attracting external finance.
2. Investing in innovation (i.e. having a 'readiness' to invest).
3. Size of establishment.
4. Technological opportunity / appropriability; industry structure / market concentration.
5. Knowledge spillovers from other firms – same / other industry in different proximities (i.e. location of company relative to others).
6. Absorptive capacity (i.e. learning; or the ability to internalize external knowledge).
7. Markets served, particularly through exporting.
8. Ownership characteristics (i.e. private or public, home or foreign ownership).
9. Barriers to innovation (e.g. cost of finance).
10. Impact of government policy (e.g. subsidies, or fiscal constraints through taxation).
11. Intellectual capital (i.e. the knowledge and skills of the employees within the organization).
12. Level of research and development (R&D) expenditure.
13. Barriers to R&D.
14. Information and cultural asymmetries.
15. Planning investments in intellectual capital (i.e. investing in training and development of employees).
16. Internal communication / management of intellectual capital (i.e. how well human resources are utilized within the organization).
17. External reporting of intellectual capital.
18. Number of patents (i.e. either active, or granted to any given organization).

From this long list, the first objective was in categorizing which indicators could be most easily accessed, in order to create a user-friendly innovation dashboard. The following 7 indicators were analysed using secondary data:

1. Size of establishment.
2. Technological opportunity / appropriability; industry structure / market concentration.
3. Absorptive capacity (i.e. learning; or the ability to internalize external knowledge).
4. Markets served, particularly through exporting.
5. Ownership characteristics (i.e. private or public, home or foreign ownership).
6. Level of research and development (R&D) expenditure.
7. Number of patents (i.e. either active, or granted to any given organization).

However, there were some challenges to analysing this data. For example, in many cases, we were met with either missing or incomplete data, having therefore to rely on proxy data to address some indicators. Additionally, many more of the indicators could be addressed, but only through exploratory, primary data. This would mean interviewing firms on a one-to-one basis to assess how each of the rest of the indicators contribute to innovation. All apart from one of the indicators (i.e. knowledge spillovers from other firms – same / other industry in different proximities (i.e. location of company relative to others) could be addressed using this approach. Being able to analyse these indicators in more detail would certainly contribute to the rich picture of innovation that this report has begun to formulate. The next sections of the report will go through each of the 7 accessible innovation indicators in detail.

The national innovation picture

England had the highest share of innovation active businesses at 51% with the lowest share (40%) in Northern Ireland. The South West became the English region with the greatest share of innovative businesses, at 53%, and was the only region or country to see an increase in the proportion of businesses which were innovation active.

The proportion of innovation active firms has fallen slightly. In 2014-16, 50% of businesses were innovation active, compared to 53% of businesses in the previous survey which covered 2012-14. This fall was the result of a decline in innovation activity among small and medium-sized businesses.

Large firms were more likely to have innovated than small and medium enterprises (SMEs). 63% of large firms were innovation active, compared to 49% of SMEs.

Cost factors were the highest rated constraint. In general cost factors were all rated as being similarly important. 14% of all broader innovators cited 'availability of finance' but this was relatively less of an issue for larger firms.

More detail has been published from the previous survey, and this enables us to make comparisons between the North East and the national average. These findings are included within this report where relevant.

In terms of type of enterprises engaged in innovative activity by type of activity, the NE has a similar profile to rest of the country except for having a higher proportion (44.7% vs 42%) involved in "wider innovation" and fewer (16.4% vs 19.2%) being "product innovators".

Size of Establishment

Background

The relationship between innovation and size of establishment is shown strongly in the literature. For instance, Damanpour (1992) reports a positive relationship between size and level of innovation in a meta-analysis of 36 correlations from 20 previous studies on the topic. In an even more comprehensive analysis, Camison-Zornoza et al. (2004) supported this finding from a review of 87 correlations across 53 previous studies. Additionally, and more recently, Laforet (2008) found a positive correlation between size of organization and innovation in a random sample of 500 UK-based SMEs.

The Office of National Statistics provides the NOMIS database as a reliable source of secondary data statistics relating to the UK labour market. It is For ease of use and understanding, data was further segmented into micro (i.e. 0-9 employees), small (i.e. 10-49 employees), medium (50-249), large (i.e. 250+ employees) and total (i.e. a combination of all organization sizes) by each industry sector. Additionally, the data was coded by SIC code to categorize into the four Smart Specialization Areas defined by past NELEP research[7].

Findings

Across all 273 industries between 2010-2017, there was a 23% growth in the total number of companies operating in the North East, from 42,645 in 2010 to 52,365 in 2017. However, this does not take into account the size of the organization itself. When looking more closely at the growth across micro, small, medium and large firms, there is a 24%, 12%, 18% and 9% increase in the number of firms in these categories, respectively. The next section will look at the overall picture (i.e. all firms in the North East) per sector, before detailing the results by size of organization (i.e. micro, small, medium and large firms) separately, before presenting results and further analysis of the four Smart Specialization Areas between 2010-2017 also.
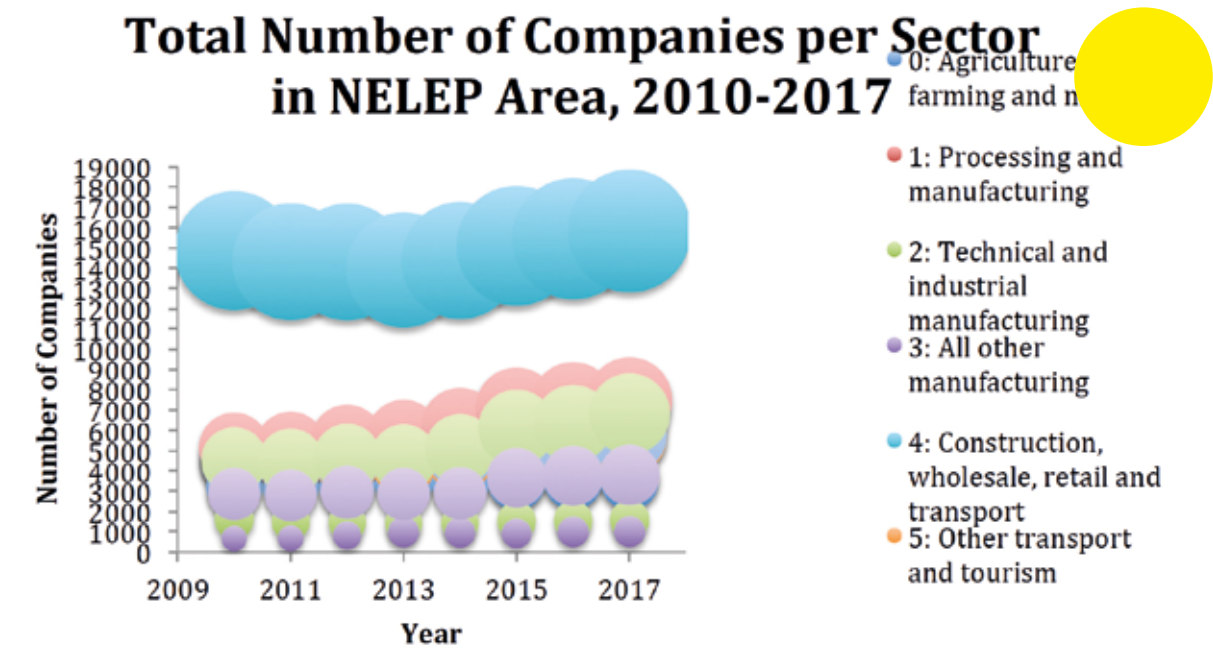
Total

Table 1. Total number of companies in each sector by SIC code, between 2010-2017.

TOTAL	% Change (2010-2017)
0: Agriculture, farming and mining	9
1: Processing and manufacturing	9
2: Technical and industrial manufacturing	-2
3: All other manufacturing	50
4: Construction, wholesale, retail and transport	7
5: Other transport and tourism	26
6: Communications and real estate	30
7: Management, consultancy and research	46
8: Education and care	51
9: Creative and entertainment	33
Overall:	23

Table 2. Percentage growth of total number of companies by sector, 2010-2017.

Micro

Table 3. Total number of micro companies in each sector by SIC code, between 2010-2017.

MICRO	% Change (2010-2017)
0: Agriculture, farming and mining	9
1: Processing and manufacturing	11
2: Technical and industrial manufacturing	1
3: All other manufacturing	61
4: Construction, wholesale, retail and transport	7
5: Other transport and tourism	23
6: Communications and real estate	29
7: Management, consultancy and research	49
8: Education and care	62
9: Creative and entertainment	37
Overall:	24

Table 4. Percentage growth of micro companies by sector, 2010-2017.

Table 1 shows the total number of companies in each sector by SIC code, between 2010-2017. Overall, companies in the North East of all sizes have grown by 23%, between 2010-2017, or 9,720 new companies across all sectors in this timeframe. This compares to a 27% increase over the same period across the UK, as an average. However, the overall figure masks a few interesting, key findings, in terms of percentage growth per industry. This is shown in table 2. From further analysis of tables 1 and 2, it is clear that the North East is very much dependent on Construction, wholesale, retail and transport firms for growth and innovation. However, this sector has only grown by 7% between 2010-2017. It is clear from table 2 that other sectors of the North East economy, although smaller in number, are growing at a much more significant rate (e.g. Education and care, 51% and Management, consultancy and research, 46%). This could be a reflection of economic conditions of the area, or indeed a result of changes in the economic landscape overall. Although, a growth of 23% compared to the national average of 27% suggests that more could still be done to support growth and innovation across all sectors and sizes of companies in the North East. A more detailed picture emerges when looking at companies in these sectors by defined sizes.
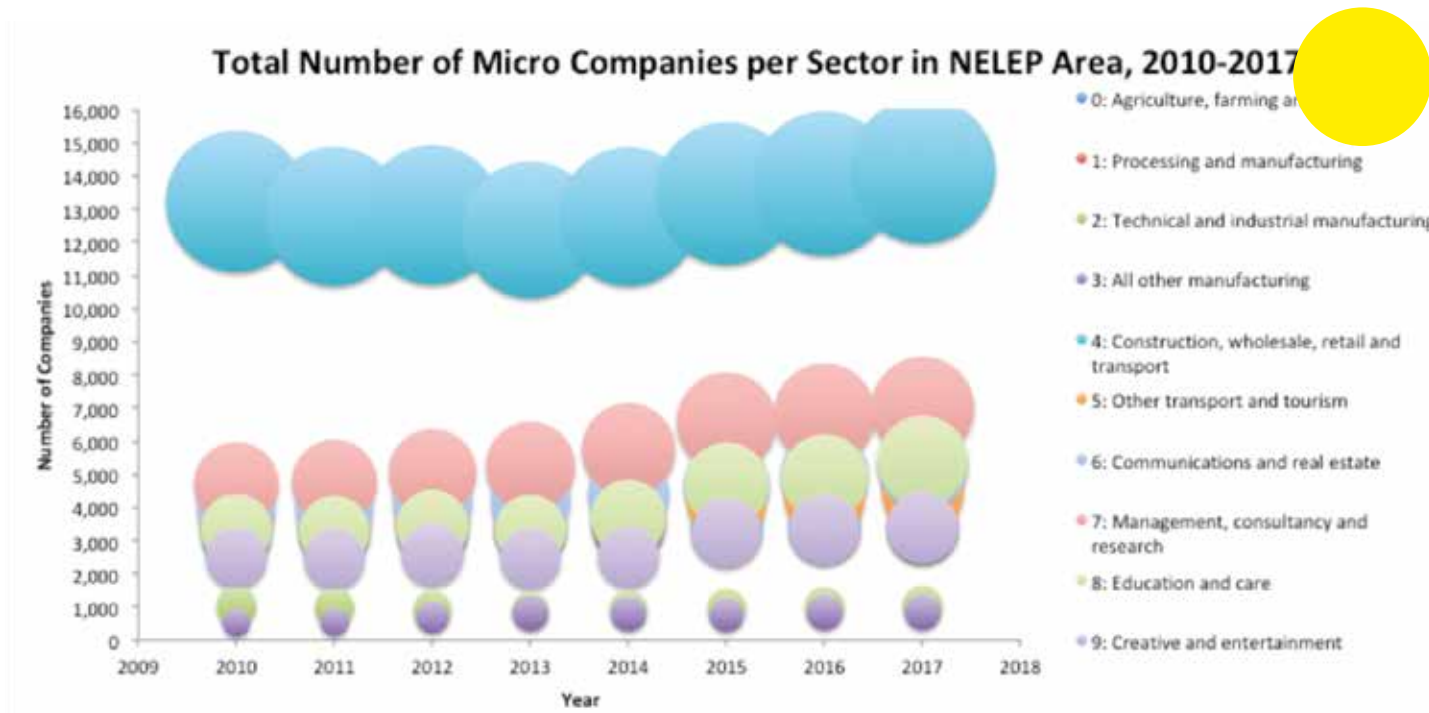
Analysing the figures shown in tables 3 and 4 in detail, it is clear that micro firms have experienced significant levels of growth, across almost every sector of the North East economy. Again, the construction, wholesale, retail and transport sector is the most significant in terms of number of companies, but mirrors the 7% growth seen in the sector overall between 2010-2017. As seen in table 4, the picture of innovation in the North East becomes more interesting on a by-sector basis. For example, growth in 'All other manufacturing' and 'Education and care' micro firms increased by 61% and 62% respectively over this period, with the majority of micro firm industries reporting double-digit growth figures. There could be a multitude of reasons to see this pattern developing. For instance, a move from manufacturing to service level jobs could be enabling individuals and small groups to start up their own companies. Further research is required to see exactly why micro firms are growing at such a rate, but the figures presented in tables 3 and 4 point to a great level of innovation, albeit in newer, small-scale firms.
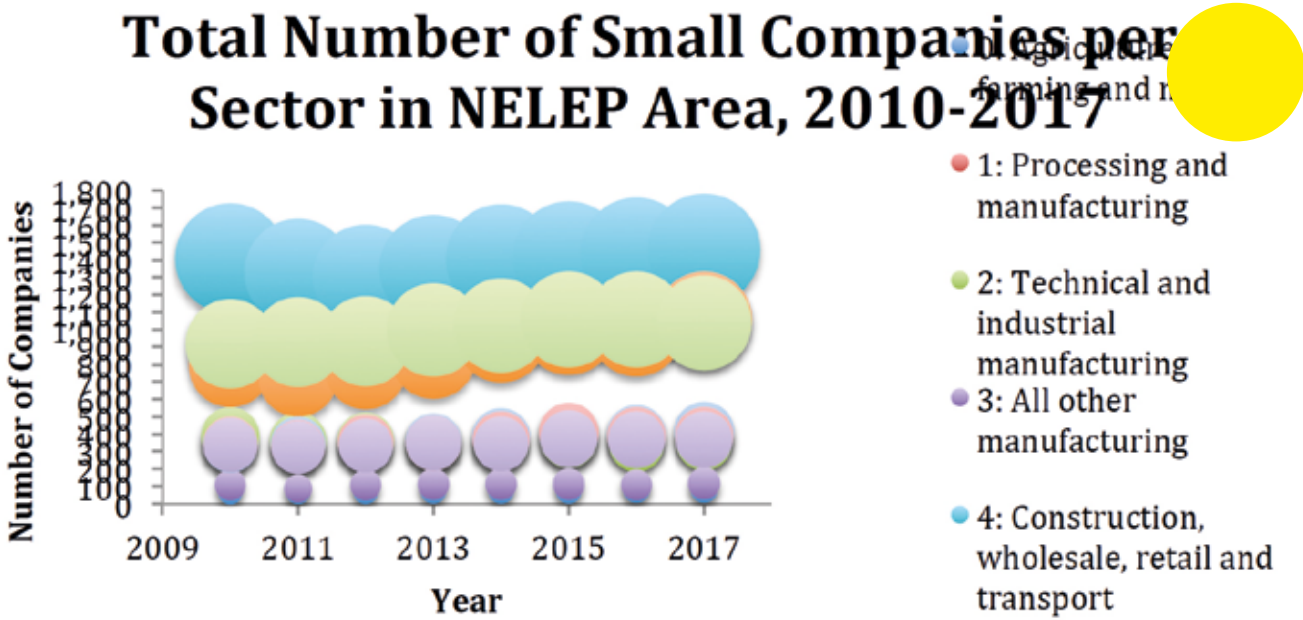
Small

Table 5. Total number of small companies in each sector by SIC code, between 2010-2017

SMALL	% Change (2010-2017)
0: Agriculture, farming and mining	31
1: Processing and manufacturing	0
2: Technical and industrial manufacturing	-10
3: All other manufacturing	9
4: Construction, wholesale, retail and transport	4
5: Other transport and tourism	33
6: Communications and real estate	24
7: Management, consultancy and research	13
8: Education and care	13
9: Creative and entertainment	9
Overall:	12

Table 6. Percentage growth of small-sized companies by sector, 2010-2017.

As can be seen in tables 5 and 6, small firms experienced a 12% growth between 2010-2017, across all sectors. Construction, wholesale, retail and transport, as well as education and care, continue to be the primary sectors in terms of number of companies, although again more significant growth is seen in other sectors. Referring to table 6, it can be seen that 'Agriculture, farming and mining' firms increased by 31% in this period, whereas 'Other transport and tourism' companies grew by 33%. These significant rises in numbers of medium-sized companies in these sectors could be accounted for in a variety of ways. For example, based on a sample of approximately 450 companies, as of 2017, SIC code 561 'Restaurants and mobile food service activities' increased by 83.7% between 2010-2017. This could be due to a development in the North East as an area of culture and outdoor events, e.g. the bi-yearly Lumiere event in Durham and Kynren in Bishop Auckland.
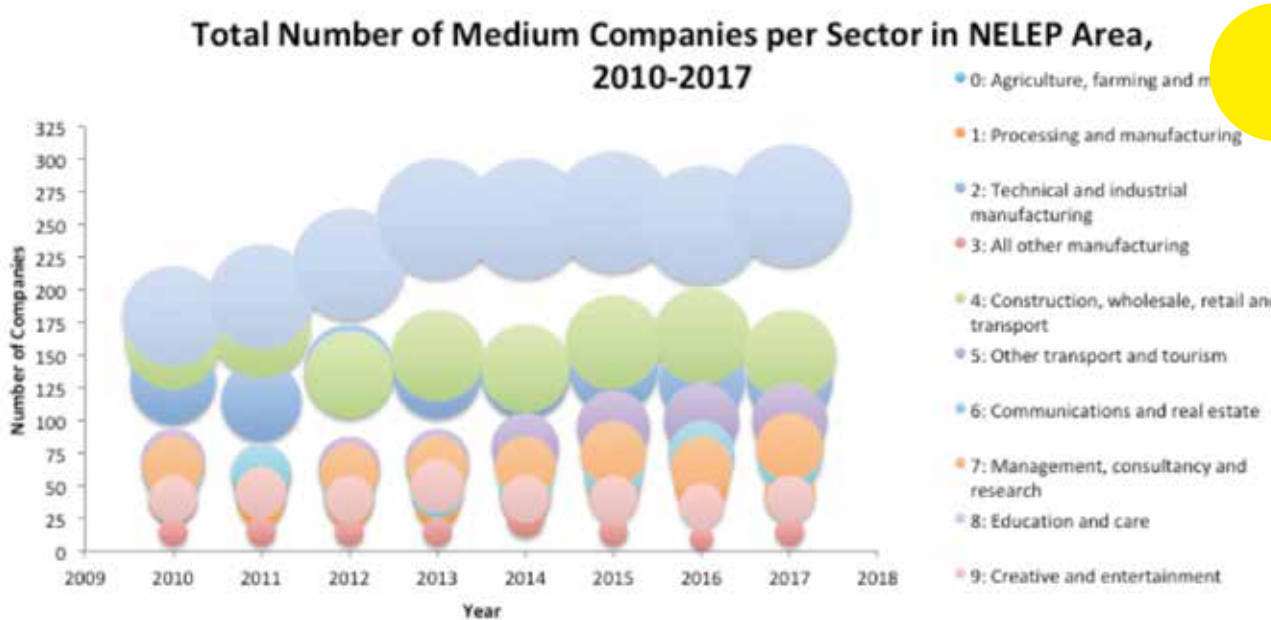
Medium

Table 7. Total number of medium companies in each sector by SIC code, between 2010-2017.

MEDIUM	% Change (2010-2017)
0: Agriculture, farming and mining	0
1: Processing and manufacturing	12.5
2: Technical and industrial manufacturing	0
3: All other manufacturing	0
4: Construction, wholesale, retail and transport	-6
5: Other transport and tourism	43
6: Communications and real estate	17
7: Management, consultancy and research	23
8: Education and care	47
9: Creative and entertainment	0
Overall:	18

Table 8. Percentage growth of medium-sized companies by sector, 2010-2017.

Tables 7 and 8 illustrate the growth in medium-sized companies between 2010-2017. In line with what has been shown in micro and small-scale firms, again, 'Construction, wholesale, retail and transport' and 'Education and care' sector companies account for the biggest proportion of medium-sized firms. Additionally, similarly impressive levels of growth are found for medium-sized firms, that has shown an increase of 18% across all sectors of the North East economy. For example, as shown in table 8, there has been a 43% growth in this time for the number of medium 'Other transport and tourism' companies, as well as a 47% increase over the same period in the 'Education and care' sector. However, although accounting for the most firms in this size category, 'Construction, wholesale retail and transport' has actually experienced a 6% reduction in growth, perhaps a symptom of issues within the wider economy impacting negatively on North East companies in this sector.
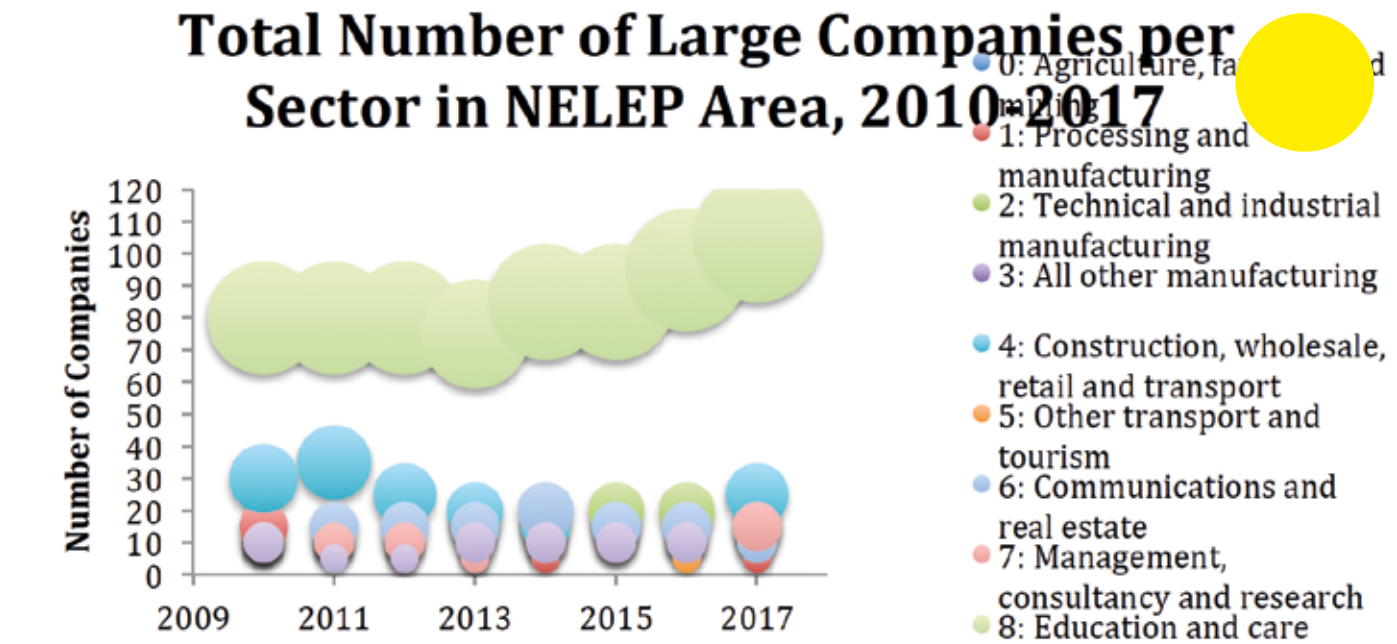
Large

Table 9. Total number of large companies in each sector by SIC code, between 2010-2017.

LARGE	% Change (2010-2017)
0: Agriculture, farming and mining	0
1: Processing and manufacturing	-66.7
2: Technical and industrial manufacturing	50
3: All other manufacturing	0
4: Construction, wholesale, retail and transport	-16.7
5: Other transport and tourism	0
6: Communications and real estate	0
7: Management, consultancy and research	50
8: Education and care	31.3
9: Creative and entertainment	-50
Overall:	9

Table 10. Percentage growth of large companies by sector, 2010-2017.

However, there has also been a decline of larger firms in some sectors, such as construction (-66.7%, or down from 30 to 10 firms at present). This may not necessarily be something that the North East is responsible for and may reflect changes in the wider economy, particularly given the recent collapse of Carillion Plc.

Smart Specialization Areas

The Northern Powerhouse Independent Economic Review identified the North East's smart specialisation areas as automotive manufacturing, offshore and subsea technologies, digital and health and life sciences. These are the core smart specialisation areas that underpin the NELEP innovation programme.

All 273 industries within the North East were coded into the four Smart Specialization Areas, as well as 'Miscellaneous', i.e. industries that did not strongly fit into any of the Smart Specialization Areas. Table 11 shows the growth of these areas when miscellaneous industries are removed.

Referring back to tables 11 and 12, most Smart Specialization Areas have experienced growth between 2010-2017. Excepting Subsea and Offshore Technology, the other three areas grew between 19-29%, compared to overall growth for the region of 23%. This likely indicates support of the NELEP Economic Strategy in focusing on such specific areas of the economy, which deliver such levels of revenue and innovation to the region.

Data from the Smart Specialisation Hub profile of the NE does not demonstrate that these sectors are currently the most innovative regionally and the above data identifies a 14% drop in growth in subsea technologies. In light of this, it would be helpful to understand the discrepancies and to further support the four smart specialisation areas to be at the forefront of innovation in the region.

Implications for Innovation in the North East

From the data presented here, the North East economy is highly reliant on the success of SMEs in order to remain successful and sustainable. Some sectors are performing better than others, although this does not mean that there is not a huge amount of innovation already occurring in the North East.

The literature would dictate that larger firms are the most innovative, but perhaps, in practice, the wider story is not as straightforward. In his study of SMEs, Laforet (2008) highlights that it is not merely the size of the organization that predicts innovation ability, but rather, specific market conditions, an ability to be more flexible to change and having an open organization culture that can be most critical in creating innovation opportunities.

Limitations and Further Research

This work is robust, but not without limitations. For example, the NOMIS database only rounds, at best, to the nearest 5 companies, meaning it may not be a true reflection of the population of North East firms. Further data could look at gaining a more accurate picture, or looking at other factors of size, such as turnover or gross value added (GVA). Additionally, much work and investment goes into the scaleup of businesses, e.g. growing from small to a medium-sized firm. Further work could look in more detail at how successful this is in the North East, complimentary to the data presented here.
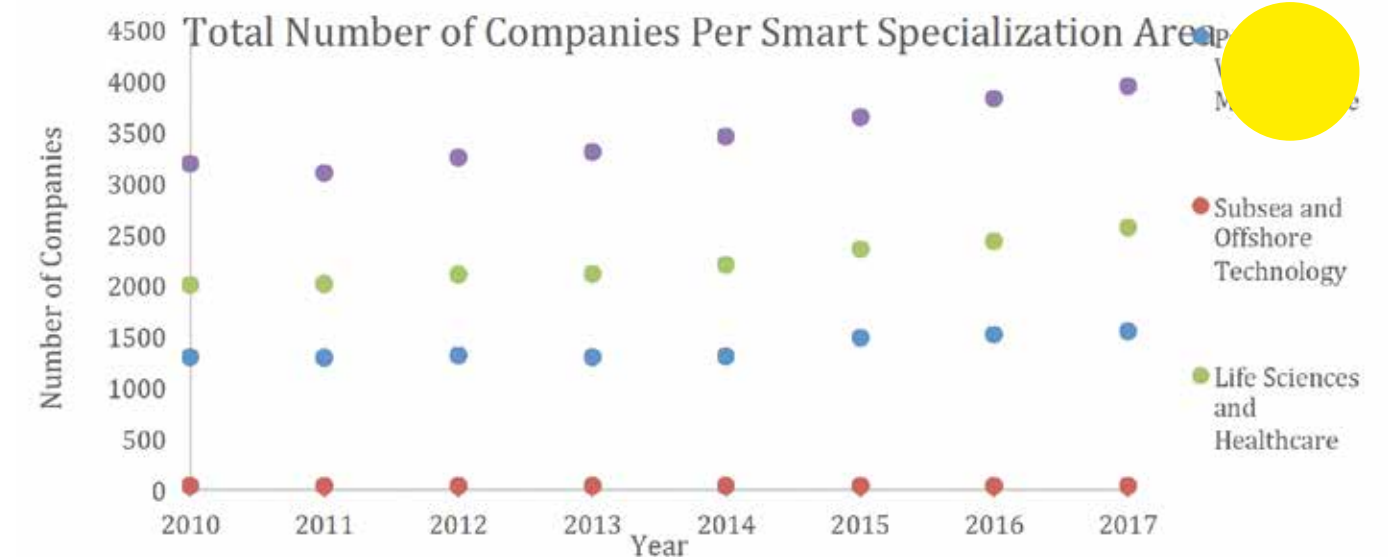

Table 11. Total number of companies per Smart Specialization Area, 2010-2017.

Sector	Total Growth (2010-2017)	% Change (2010-2017)	UK % Change (2010-2017)	D...
Passenger Vehicle Manufacture	250	19	21	-2%
Subsea and Offshore Technology	-5	-14	-4	10%
Life Sciences and Healthcare	570	29	49	-20%
Creative, Digital, Software and Technology-based Services	755	24	35	-11%
Miscellaneous	8150	23	25	-2%
Total	9720	23	27	-4%

Table 12. Growth by Smart Specialisation Area, 2010-2017.

Case Study 1: Energy Professionals Group

Energy Professionals Group, with its head office based in Washington, Tyne and Wear, is a bespoke recruitment and employment services firm, engaging with clients worldwide and operating primarily in the offshore and onshore energy sectors. When asked how being based in the North East has helped to innovate and grow their business, Managing Director Gareth Allen responded:

"The simple answer is the people, our business has achieved the successes to date merely because of our dedicated and flexible staff. They have driven our services, our brand and our business forward with passion and desire to be better than all our competitors. I also feel the North East is a great location in terms of logistics and transportation, as a regular international traveller with business the commute to London via train in less than 3 hours is superb, I can be in Aberdeen via Eastern Airways flights in 45 minutes, Dubai direct from Newcastle in less than 7nhours and can fly to Schiphol one of the aviation's key hubs to fly onwards to key locations globally very easily. This has been key to our business development strategy".

Market Concentration

Background

There has always been a strong link between the size and market power of an economic organisation and its ability to innovate. Indeed, big companies possess the necessary resources to use to innovate in order to defend their competitive advantage or create and sustain new ones. However, the narrative of big, powerful companies relying on their own strengths is challenged within the recent open innovation paradigm.

Innovation is a far too complex phenomenon for a single organisation to master and control and anecdotal evidence show many cases of disruptive innovation challenging the dominant position of large companies. To avoid this, and reinforce their own innovation capabilities, companies aim to create strategic alliances. Older,

bigger and more powerful companies benefit from smaller and younger ones through constant transfer of new knowledge and ideas to overcome their own path dependencies. On the other hand, younger companies benefit from the market position, resources and reputation of older, well established companies that increases their chances of success and survival.

Consequently, entrepreneurship is equally important factor when studying innovation. Understanding the interplay between innovation and entrepreneurship in the North East of England is crucial to inform relevant and timely policies that aim to support and boost innovation in the area. In this section we analyse the geographic and demographic distribution of companies in the North East and attempt some initial insights on the entrepreneurial map of the area.
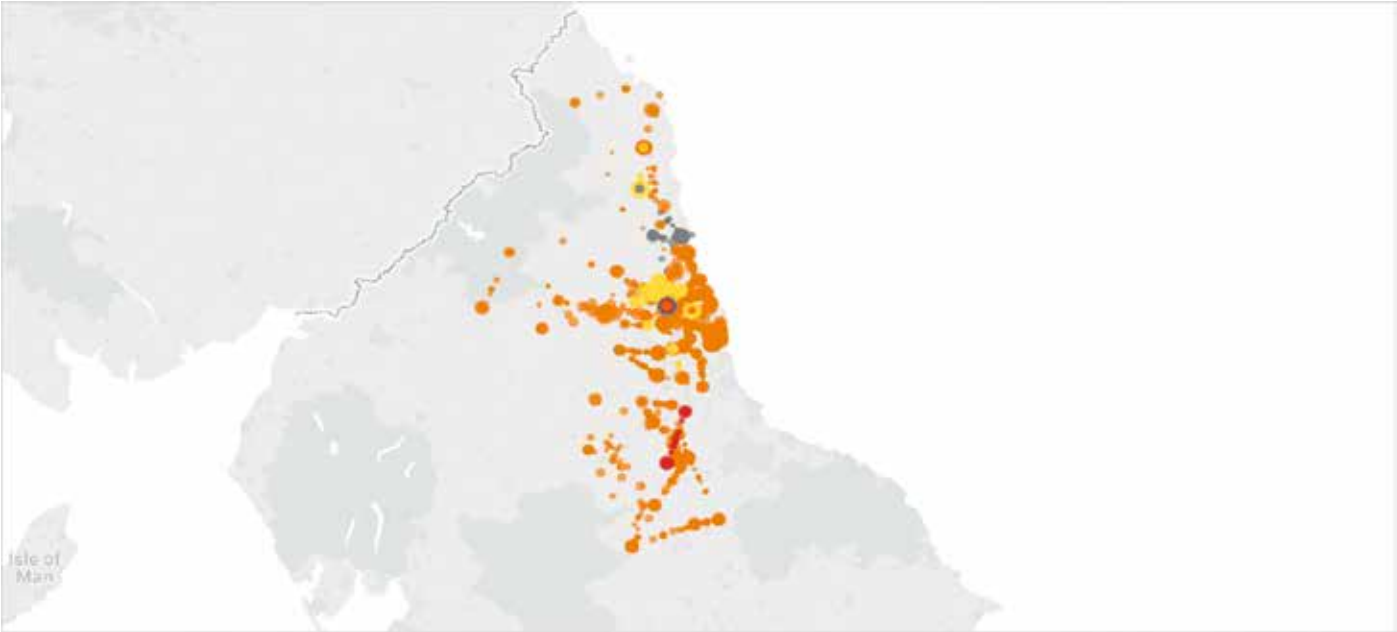
North East Entrepreneurial Geography

North East Smart Specialisation Demographics

Map shows the geographical distribution of all companies in the North East of England coded by Smart Specialisation (Colour) and age (Size).

Figure 13 shows the geographic distribution of all active firms in the North East of England. Each dot represents a single company. Companies are coding according the their smart specialisation (colour) and age (size). The geographic spread of North East allows as to identify three main clusters of smart specialisation: Creative, digital and software-technology (yellow colour), Life sciences and healthcare (grey colour), and Passenger-Vehicle Manufacturing (red colour). However,

there is a number of sub-clusters of all smart specialisations located in the urban areas of the North East. Figure 13 also indicates that Creative sector is one of the most well established and old sectors in the North East with some old players operating within Healthcare and Manufacturing. On the other hand, subsea and offshore technology has a small footprint in the North East.

Market Concentration and Innovation

Market concentration refers to the percentage of the corresponding market controlled by the biggest 4 companies in the sector. Market concentration is a very important measure because it provides insights regarding the survivability and growth potential of new and small companies. Increased market concentration means that the competition between smaller and bigger companies is limited which provides the necessary resource space for small companies to survive. On the other hand, growth potential for small companies are limited because as they grow they have to compete more and more agents the larger companies and consequently threatened.

Healthcare has a significant socioeconomic footprint in the North East of England. The NHS, for instance, is the largest employer in the area. The concentration of the two main markets related to Life sciences and healthcare, home care and consumer health, experience a concentration level of 67% and 32% respectively. Consequently, these two markets have different profiles regarding survivability and growth of new entrants. Survivability of new entrants in the home care industry is expected to be higher compared to the new entrants in the consumer health industry. However, moving beyond survivability and focusing on growth potential the relationship is reversed with consumer health companies having more space to grow compared to those in the home care sector. This is a significant implication for the consumer health sector which may lack the influential presence of certain "champion" champion that can potentially substitute the selection mechanism of new innovations additionally to market selection.

Similar to consumer health sector, passenger and vehicle sector market experiences a low market concentration of 35%. On the other hand, digital, creative and software-technology smart specialisation, the online markets for digital business are fragmented and dominated by many young and small companies given the lower entry barriers. Within this context, policies should focus on supporting growth and creating champions in the region that will act as additional selection mechanisms of innovations.

Range of market reach

The Government's innovation survey found that the market distribution of innovative firms in the NE show a marked contrast to rest of the country – they are more engaged in regional markets (75% vs 70.1%) but less in national (50.7% vs 56.7%) and international (21.1% vs 28.7% for EU and 15.2% vs 21.5% for rest of world).

Interestingly, there is also a marked difference with businesses in the rest of the UK in terms of the sources innovative businesses in the NE use to get their information. Thus a smaller proportion report using Suppliers (20.1% vs 23.3%), competitors or others in your industry (11.6% vs 13.3%), consultants or private R&D institutes (3.6% vs 4.4%), Govt or public research institutes (0.7% vs 1.9%), conferences/events (3.9% vs 5.5%), professional associations (2.7% vs 5.6%).
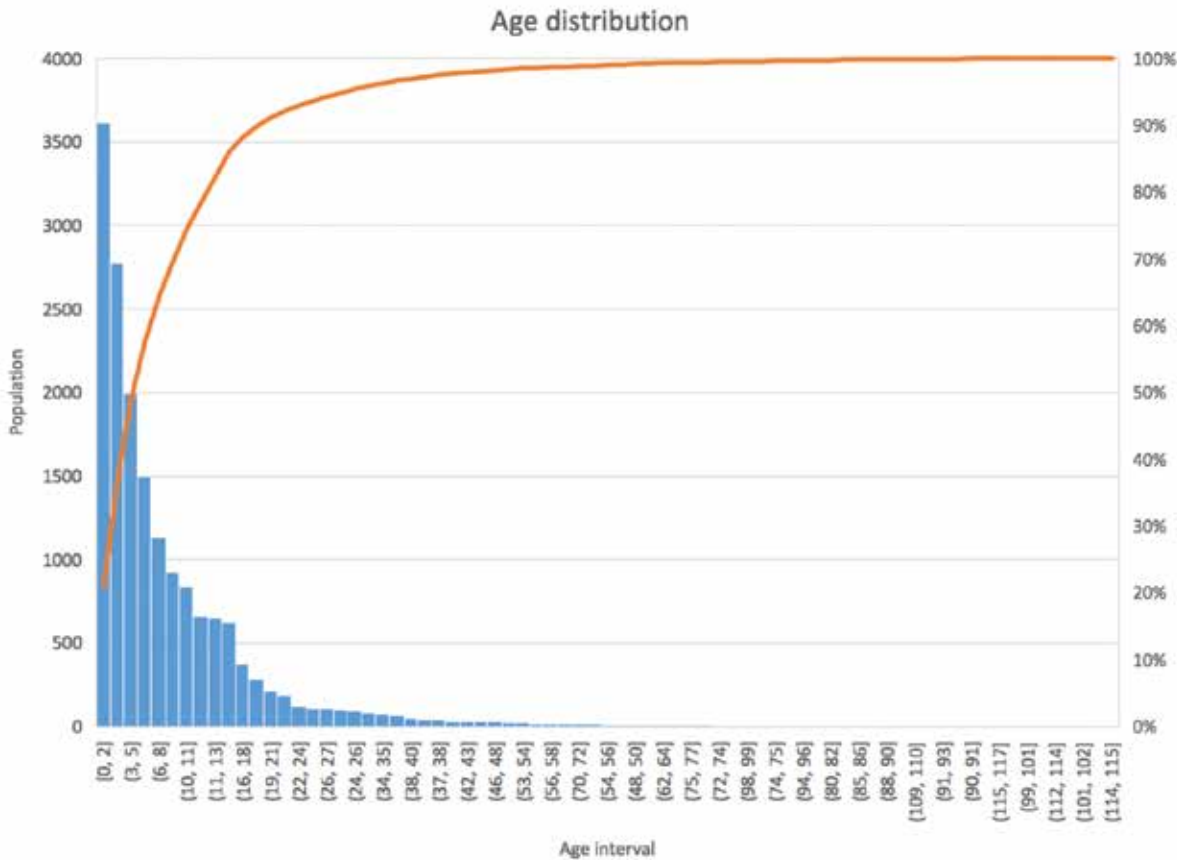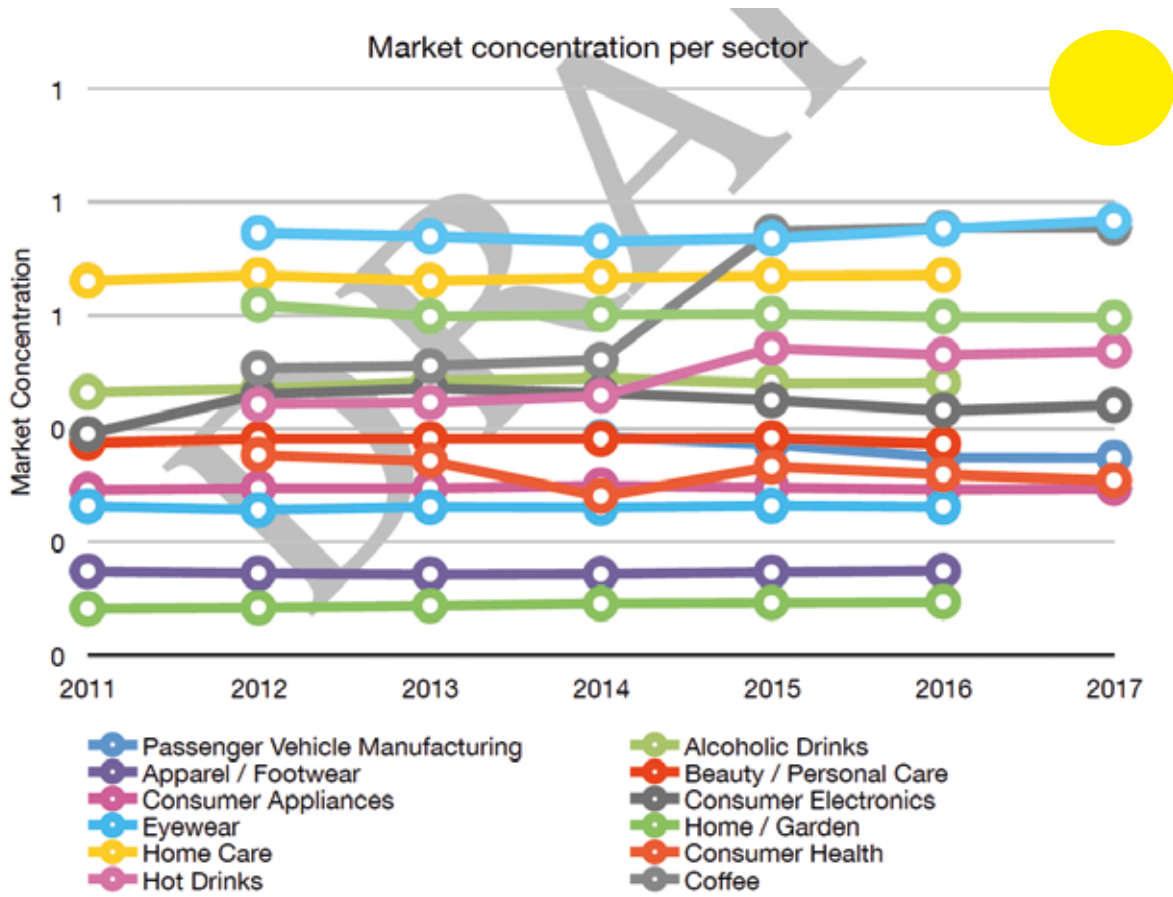
All this points to the community of businesses in the NE being more isolated from the wider commercial landscape and correspondingly less able to benefit from them for innovation.
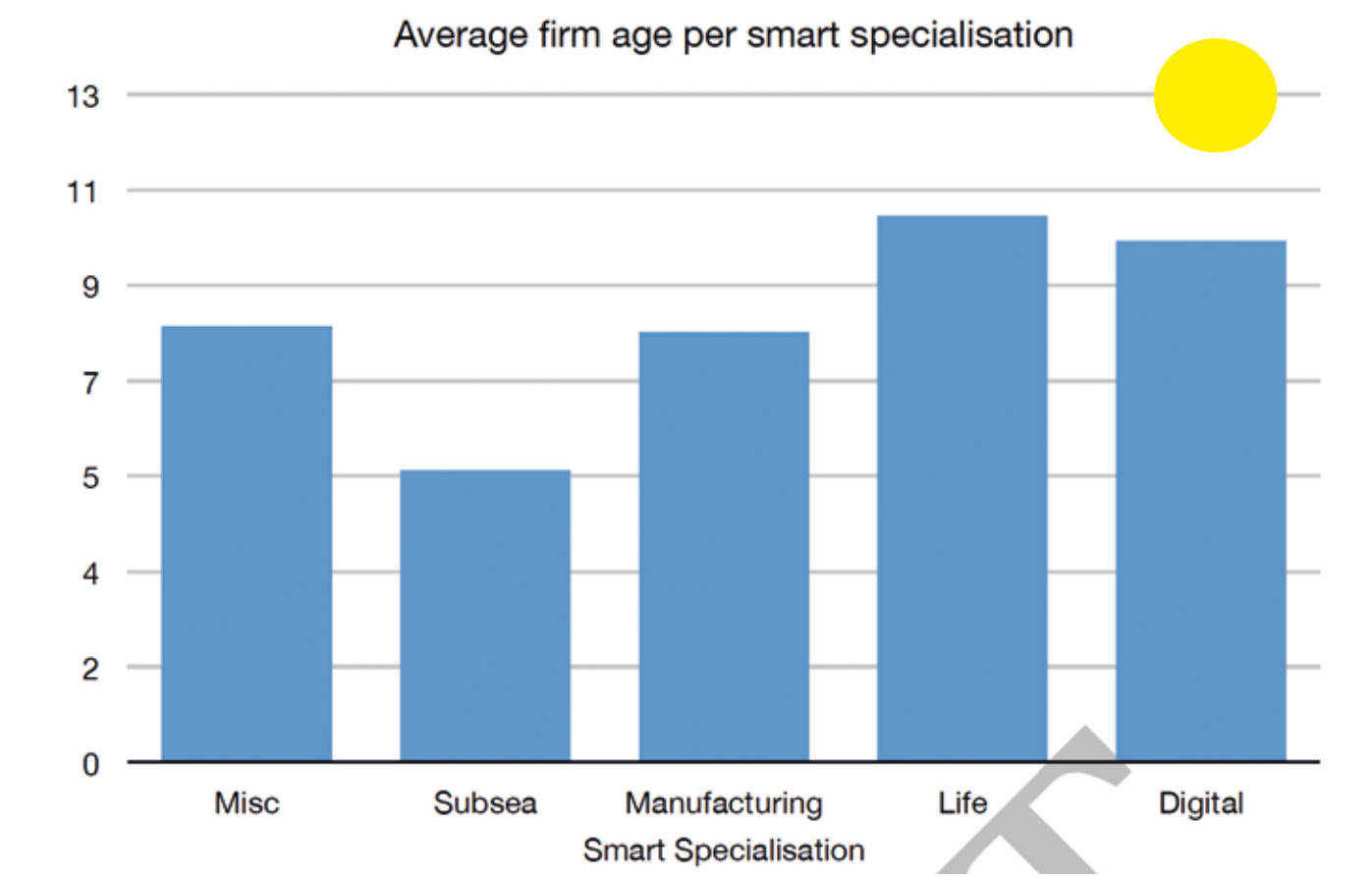
Absorptive Capacity

Background

Studying the demographics (age distribution) of entrepreneurship in the North East can have valuable policy implications related to the survivability and growth potential of companies in the area. The age distribution of all active companies in the North East is shown in Figure 15. Age is presented in intervals and the figure presents the population (and percentage of population) per age interval. For instance, the age of 38% of the population lies between 1 and 5 years, while 40% of the companies survived more than 10 years. The corresponding two demographic groups require different policies: New and small companies require support to reinforce their survivability while older companies require an environment that provides growth potential. Different sectors require different policy portfolios to balance this tension. Moreover, "champion companies" need to emerge or be attracted that can reinforce the innovation selection mechanism in the area.

Exploring the average age of companies per smart specialisation area can provide further insights. Healthcare, one of the prominent sectors in the North East has the highest expected lifespan among all 4 main specialisation areas. One would expect manufacturing to follow because of the long tradition of manufacturing in the North East, but instead its plane is take by Digital and creative sector which an average lifespan of 10 years. However, this picture is slightly misleading because the sector includes both technological intensive and creative industries such as publishing. Indeed, publishing includes some of the oldest companies in the North East. Finally, subsea sector includes some of the youngest companies, given the technological advancements took place during the last decade and requires polices that would first support survivability of entrepreneurship followed by growth opportunities.

Market concentration per sector

Legend:
- Passenger Vehicle Manufacturing
- Apparel / Footwear
- Consumer Appliances
- Eyewear
- Home Care
- Hot Drinks
- Alcoholic Drinks
- Beauty / Personal Care
- Consumer Electronics
- Home / Garden
- Consumer Health
- Coffee

Age distribution

Average firm age per smart specialisation

Ownership Characteristics

Many studies portrayed that North- East England as a peripheral region in UK with lower level of research and development and innovation activities (Seddighi, 2012; NELEP, 2016, Duke et al., 2006). According to the ONS (Office for National Statistics, 2015), among the regions in the UK, North East England is one of the regions with a lower GDHA[8] (see Appendix. Figure.1) and GVA[9] (Round, 2016, Appendix. Figure. 2). In addition, the latest statistics (ONS, 2016) indicate that North East England witnessed an infinitesimal number of business start-ups over the last year. Similarly, it is interesting to note that the number of manufacturing firms in the region was the lowest in the country in 2016 (3,900 firms), where the national average was 12,711 firms (House of Commons Briefing Paper, 2016). In this respect, this region is currently undergoing regeneration and given the strong links between firms' innovation / R&D activities and regional growth, such work would be of some academic and policy interest.

1. Nature of ownership.

Figure.16 : Nature of ownership of firms

Figure 16 categorises the firms operating in North East England according to ownership. Of the 330 firms, participated in the academic survey (2016), the largest portion (237 firms, 71.8%) were independently owned. Subsidiary firms were the second largest category (54 firms), accounting for 16.36% of the total firms. The data suggests that only 3.05% of the firms were foreign-owned companies, which questions the attractiveness of this region for foreign direct investment. The results seem to be in line with the observations of Seddighi and Dixon (1996). In terms of ownership, a small portion (29 firms, 8.79%) of the firms were either plants or branches of their parent companies operating elsewhere in Britain, which many argue restricts the financial freedom to allocate funds for research and innovation activities in this region.

2. Length of operation

Figure 17 below illustrates the distribution of the firms (330 firms) in accordance with their length of operation.

Figure 17: Length of operation of firms in North East England

Of the 330 responses received, the major portion of the firms (134 firms, 41.21 %%) had been operating for more than ten years. Further, 120 firms (36.37%) had been operating for a period of 5–10 years. Only 71 firms had commenced their operations after 2011. That is, nearly 21.51% of the firms in the region had commenced their business operations in the last five years. It is very interesting to note that very few firms (0.9%) had been operating for less than a year10, which points to the low level of start-ups in this region. This has to be read with the figures reported by Office of National Statistics. Only 10,000 business start-ups (including retailers) were recorded in North East England in 2015, but 7,000 firms ceased their trading during this period (Office of National Statistics 2016).
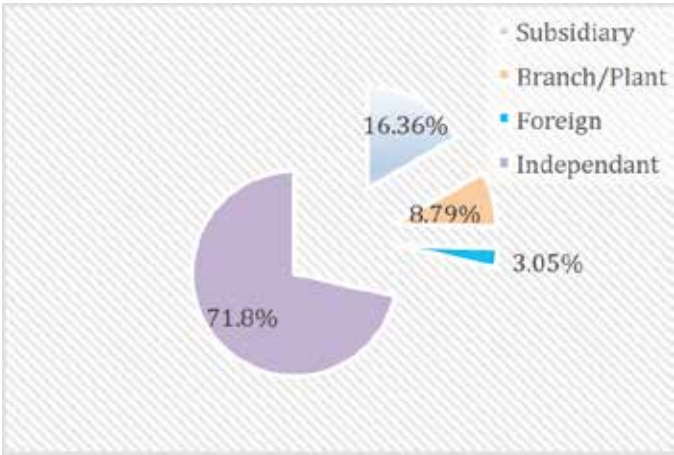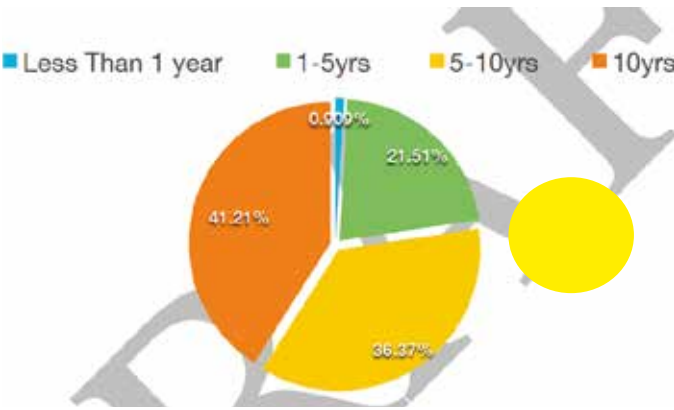
Case Study 2: Adkins and Cheurfi

Adkins and Cheurfi is a specialist hospitality recruitment firm, based in Sunderland. Established in 2016, they were recently awarded a 2018 North East Business Award for outstanding new firms in the region. Asked how being a newcomer to such a competitive industry enabled them to learn from those around them in the industry, Managing Director Dean Adkins stated:

"As a new business I would say we are always looking for inspiration, whether that be from another company or brand that we may find interesting or relevant to ourselves. I especially take note in companies that I believe to be forward thinking or modern in their approach with regards to the way they market themselves or connect with clients. Ultimately I believe that a company's brand should truly represent you, the business owners, and if that's the case then you can inspire and influence others, including your own employees, who are the true company representatives.

And how can none of us not be inspired by our surroundings and the beauty of the North East".

---

8. Gross disposable household income.

9. Gross value added.

10. The academic Survey was conducted during the period of September-December, 2015.

Markets Served, Particularly Through Exporting

Many consider exports as a good indication of a well-developed core competence and innovation of a firm (Gourlay et al., 2005; Love and Mansury, 2009; Ganotakis and Love, 2011; Saemundsson and Dahlstrand , 2005). In this respect, Figure 18 examines the export rates of the firms in North East England. The results suggest that, of the 330 firms responded, majority of the firms in the region (190 firms, 57.6%) do not engage in exports. Moreover, 32.33% (106) of the firms in the sample reported low export rates at less than a quarter of their sales. Only 10.3% (34) of the firms reported having good export rates that accounted for at least quarter of their sales. However, a handful of the firms (3.6%) had achieved high export rates, as more than 50% of their sales were exports. The data suggests that the vast majority of the firms in the region did not have the potential to convert their knowledge into successful commercial exports. This indirectly questions their innovation activities (see Bonjour and Micallei, 2009).

The results are commensurate with similar observations made by various studies, such as those of the ONS (2014, 2015) and the IPPR (2016). They reported and exposed the low export intensity of this region relative to their regional counterparts (Round, 2016). It has been found that the majority (62%) of the North East's exports come from automotive (40.9%) and pharmaceutical firms (22.4 %), which constitute less than 30% of the total population of firms (Round, 2016; IPPR, 2016).

Comprehensively, the above discussions suggest that North East England is a perfect fit for the dimension of a 'peripheral region' illustrated by Davies and Michel (2011). One of the key reasons scholars have identified for the deterioration of this region is the lack of innovative activities (Duke et al., 2006). In this respect, an innovation observatory mechanism generates two-fold advantages for the firms in the region. First, this study attempt to develop a practical software tool which enhance the firms to identify their potential, which in turn help both policy makers and firms to make strategic decisions. Second, it signals the key competencies of the region to kick start innovation at regional level.
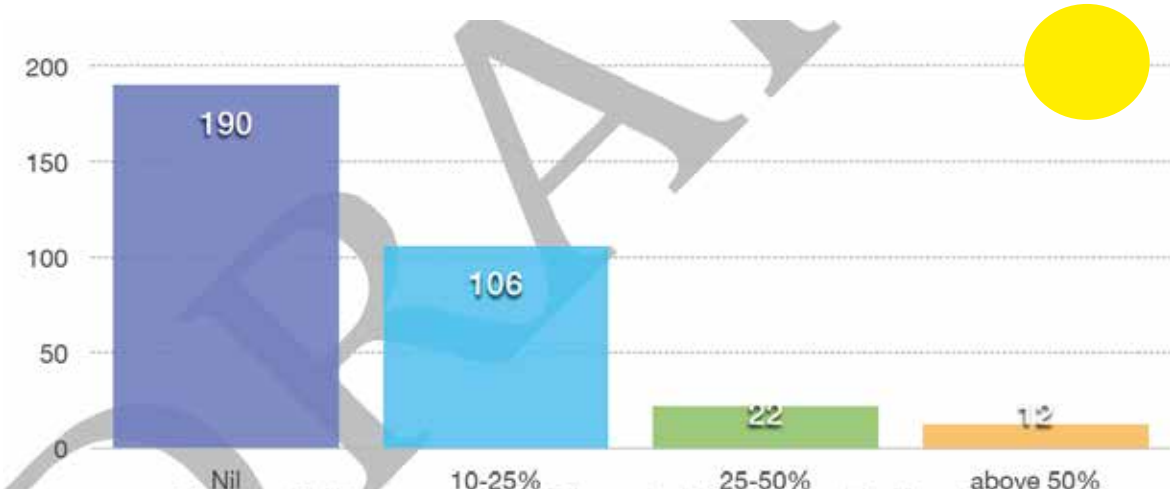

Figure. 18: Export rates of firms in North East England

Level of Research and Development (R&D) Expenditure

Background

The level of research and development (R&D) expenditure is calculated as the percentage of turnover within a firm that is spent on R&D. A traditional view of the innovation process is that it follows a linear path, originating with R&D, which in turn leads to prototypes and ultimately commercially available products and services (Freeman & Soete 1997). A greater level of R&D expenditure might therefore be expected to lead to a greater rate of innovation. However, in practice, studies have found this is not always the case. Various factors, such as the type of competitive environment in which the company operates and its ability to commercialise R&D outputs, can disrupt the relationship between R&D expense and innovation output.

Implications

An important implication of R&D investment in a firm is that it results in additional benefits beyond the direct product or service innovations that emerge. Specifically; it can result in an elevated capacity for the company to learn and absorb ideas and knowledge from the external environment; i.e. it's absorptive capacity (Cohen & Levinthal 1990). This can enhance a firm's prospects for developing future innovation through combining and integrating ideas from outside the firm with its own products and services, in addition to innovations directly in progress. As such, a high level of R&D investment can be taken as an indicator of the longer-term likelihood of innovation success via a variety of more complex mechanisms.

The OECD (1994) and various have used the level of R&D expenditure within firms and industry sectors to create classifications indicating the technological sophistication of innovation within the firm. For example, one classification defines high-tech with an R&D expenditure level of 7% or above, medium-tech with between 2.5% and 7%, and low-tech with below 2.5% (Kirner et al. 2009; Legler & Frietsch 2007).

Limitations

Increasingly it is recognised that in addition to R&D driven innovation, innovations may result from other activities and sources within a firm, and result in not only new products and services, but also improved processes that ultimately benefit the company. Kirner et al. (2009), in a study of 1663 German Manufacturing firms, found that whilst high-technology firms (defined as those with R&D expenditure of 7% or above) realise greater success in service and product innovation, low-technology firms (with R&D expenditure below 2.5%) achieved equal and on occasion better success in developing process innovations. This serves to highlight that relying on R&D expenditure level as an indicator of innovation performance risks ignoring valuable contributions to innovation, and particularly process innovation, made by low-technology and mid-technology companies.

Another consideration is that the optimal strategy for companies to pursue in terms of R&D expenditure is moderated by the type of competitive environment in which the company operates, as shown by (Zahra & Bogner 2000) in their study of the computer software industry. In particular, the study shows that intensive R&D investment in hostile, price-competitive markets, in which the margins on products and services can be driven very low, is likely to be a poor strategic choice for a company; with resulting innovations unlikely to be profitable. In contrast; such market conditions favour low R&D investment and process orientated innovation.

Our Findings

Data Available

The data available to this study in relation to the level of R&D expenditure is limited to yearly average values for Nomenclature of Territorial Units for Statistics (NUTS) level 2 regions in the UK, between 2005 and 2015. In many cases; the values are estimates only. Values in most cases are estimates of the intramural R&D expenditure as a percentage of GDP in the given region are seen in figure 19, below.
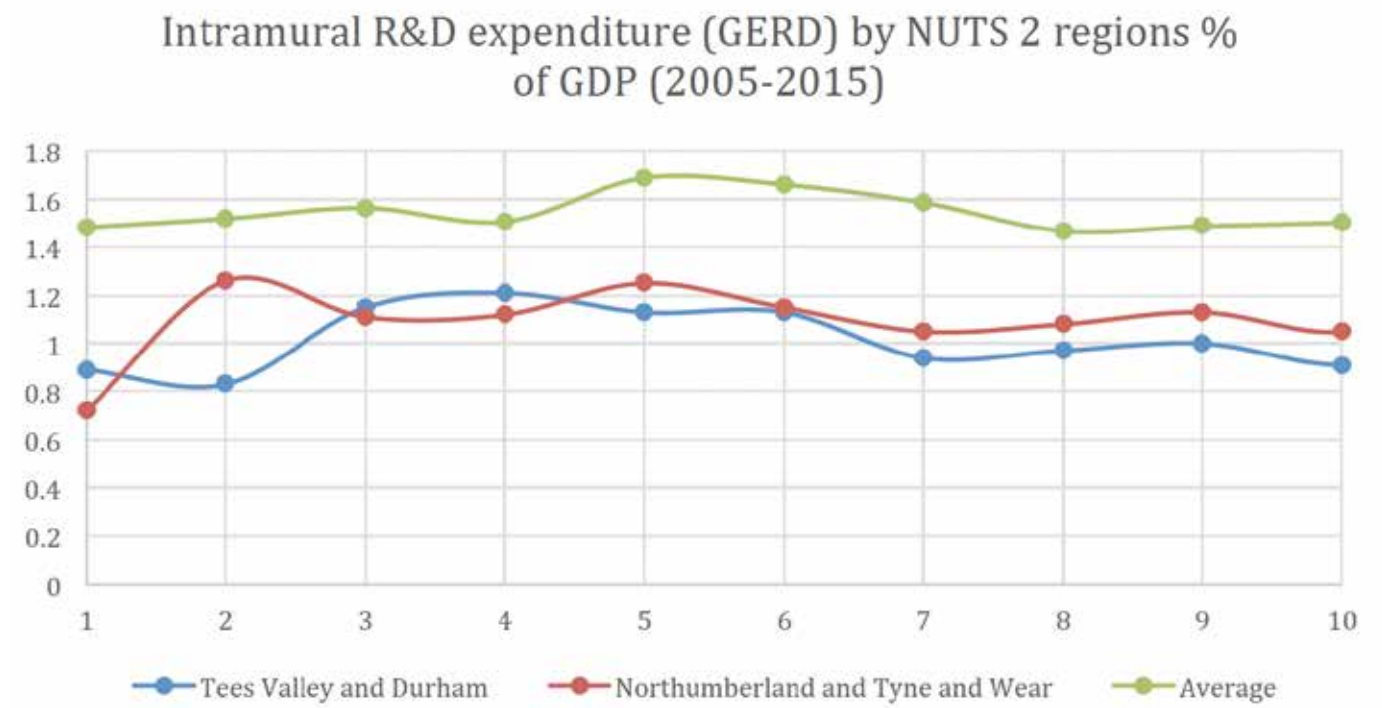

Figure 19. % of GDP by region and the UK average, 2005-2015.

The lower rate of GDP for the NELEP region does indicate a weaker proportion of high-tech and mid-tech industries; and in turn, as suggested by the literature, weaker prospects for the development of product and/or service innovations.

A key concern arising from the results with this particular indicator is the implications for the long-term learning and absorptive capacity of firms within the region. Whilst the short-term implications may mean that innovation is orientated more towards process than product or service innovation; the lower R&D expenditure also means that firms are missing out on secondary benefits from R&D expenditure that would enable them to make greater use of external technologies and knowledge; increasing the prospects for innovation output over the longer term.

The observation about levels of expenditure on internal R&D being low despite high reports of internal R&D activity suggests there are some subtle issues about how firms are approaching their R&D and suggest firms in the NE are wanting to carry out R&D but having to do this with minimal investment.

Case Study 3: Arquer Diagnostics

Arquer Diagnostics is a scientific and technical firm, developing and commercialising non-invasive immune-diagnostic tests for cancer and cancer monitoring. Asked how research and development has helped their business to innovate and adapt to emerging technologies, CEO Nadia Whittley said:

"At Arquer we have spent the last few years focusing on R&D to fully understand the potential of our technology and exploring the boundaries we could push in cancer diagnostics. In our experience, innovation comes through many channels and by leveraging different skill sets, specialties, experiences and resources we have been able to put innovation at the centre of our business. We have tapped into the enthusiasm and the research mind-set of post graduates from the excellent universities in the North East; partnered with local clinicians working in structured, research-friendly NHS North East trusts (amongst others); established international partnerships (both clinical as well as industrial) ; developed strong internal research and development capabilities, all deeply rooted in the territory and keen to demonstrate that London is not necessarily the only hub of innovation! These are just some of the ways we have been able to remain forward-looking while delivering innovation that matters. Research and development is at the core of our strategy for delivering improvements in health outcomes for cancer patients. Our research revolves around understanding in-depth the clinical needs of the sector and the potential of our technology within each sub-sector. This research then guides us in the development of targeted designs that meet those needs".

Analysis

We have calculated the national average level with respect to each NUTS2 region; and plotted this against the R&D expenditure level for the two NUTS2 regions within the NELEP area. It is immediately obvious from this exercise that R&D expenditure in the NELEP areas has been consistently lower than the national average throughout the 10-year period from 2005 to 2015. Taking the NELEP area average relative to the national average; the deficit has ranged from 0.34% in 2008 to 0.68% in 2005 with an average of 0.49%over the 10-year period.

In terms of innovation activity observed in the Government's Community Innovation Survey, the NE respondents have a number of areas where they show a higher level of activity than nationally – internal R&D (18.6% VS 15.5%) and launch advertising (10% vs 7.6%) with training for innovation activities and all forms of design showing slightly higher levels.

This is in marked contrast to the areas of expenditure on innovation where businesses in the region report spending less on internal R&D (34% vs 35.1%) and much less on training for innovation (1.5% vs 3.4%) and all forms of design (2.7 vs 8.8) and market introductions of innovation (1.1 vs 10.8) but more on acquisition on external R&D (12.7 vs 4.4) and acquisition of capital (47.8 vs 36.4).

Implications for Innovation in the North East

In our study; it has not been possible to obtain data at a firm level or industry level for the level of R&D expenditure. Since low-tech industries by definition have lower rates of R&D expenditure, we would expect regional variation due to the portfolio of industries constituent within each region.

For example, agriculture; a traditionally low-tech industry; is prominent in County Durham and would therefore contribute to lowering the R&D expenditure rate. However; as indicated above in the limitations pertaining to this indicator; this fact does not necessarily mean that the industry does not contribute its share of innovation, although the literature indicates that innovations are more likely to be process rather than product or service orientated.

Number of Patents

Background

The link between the numbers of patents a company is awarded and innovation seems a logical one, and indeed this is mirrored in the literature. For instance, in a longitudinal study across 272 firms, over 35 industries, and 19 years, Artz et al. (2010) found a positive association between number of patents and increased innovation. However, a few recent papers (Boldrin and Levine, 2013; Moser, 2013) have argued that patents may actually stifle innovation, depending upon how patents are used (e.g. some can be used as 'swords' to deter competitors, Moser, 2013, p.39) and so some caution must be made in making any wide-ranging implications from the findings of this report.

In obtaining the data for this innovation indicator, the ORBIS database was filtered by postcode, so that only patents granted in the main NELEP postcodes of NE, DH, DL and SR were used. This resulted in a total of 1,584 patents across all sectors.

Findings

Figure 20 below shows the spread of patents by SIC code in the North East. In particular, there are three main SIC codes with a large number of patents, these are:

1. 3711 - Motor vehicles and passenger car bodies (265 patents).

2. 2759 - Commercial printing (not otherwise classified) (192 patents).

3. 7389 - Business services (not otherwise classified) (156 patents).

Patents are recorded in figure 20 across 72 different SIC codes, although it can be seen that some industries are more patent-reliant than others. For instance, SIC code 3: All other manufacturing, accounts for 789 of the total 1584 patents recorded.

Significantly, in relation to protection of innovation – the Government's innovation survey found that businesses in the NE make less use of all approaches such as registering patents or design, copyright, etc. than in the UK average with negligible levels of patenting, design registration or lead time advantages.

Implications for Innovation in the North East

From the above SIC codes reporting very high numbers of patents, we can see that, although none appear in the Smart Specialisation Areas, in comparison to other industries they are very innovative. Clearly, the North East is reliant on its car manufacturing industry, e.g. Nissan, as well as its whole supply chain, to drive innovation and growth. If the literature on patents and innovation is reliable, and certainly, Artz et al. (2010) supports a strong correlation between patents and innovation, then sectors such as these should be supported, not just for themselves, but with regards to the absorptive capacity that can spillover to outlying industries.

Further research would be beneficial in this area. For now, we have gained a snapshot of total patent activity in the North East, but this would be more effective if it could be compared to other regions, to see if the North East does indeed have particular strengths in some of these industries.

The much lower use of different forms of IP protection by NE firms points to a wider issue of training and awareness raising amongst this community of the need and best approach to IP protection.

Case Study 4: Kromek Group PLC

Kromek Group PLC, based at NETPark in Sedgefield, just outside of Durham, is a radiation detection solutions firm, with high-end, leading-edge products in a range of industries and are renowned for their level of innovation. When asked how patents had helped to innovate and develop their business, CEO Dr Arnab Basu stated:

"If you are not innovating, you are standing still, and if you are standing still, you are falling behind. The innovations we make help transform the industries we operate in and keep us ahead of the competition. Once we have made that R&D investment we need to protect it and our patents play a vital role. If these patents were not in place our future innovation would be built on sand, with them we have a firm foundation for moving forward".
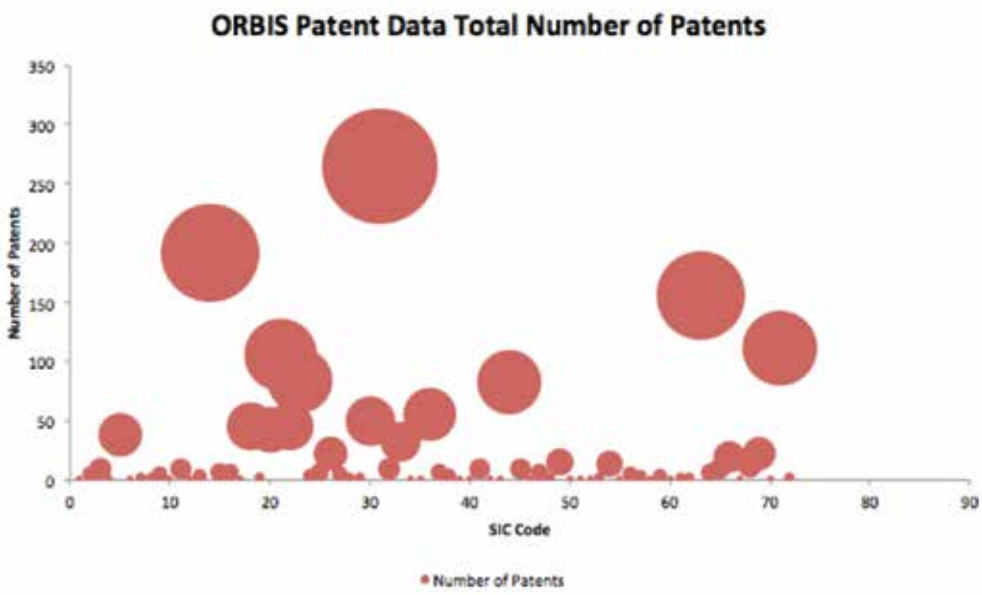

Figure 20. Total number of patents per sector in the NELEP region

CHAPTER 2:
GARTNER HYPE CYCLE (2017) FOR NORTH EAST INDUSTRIES

Background

Technology research firm Gartner[11] annually reports a 'hype cycle' of emerging technologies. This is used as an indicator of the technologies that are likely to be of increasing importance to a range of companies (but typically those that rely on new technology), if not in the given year, but sometimes as much as 10+ years after publication of that year's hype cycle. This approach has received some persistent criticism from its inception[12], such as being overly optimistic (Aranda, 2006). However, it is generally seen as the industry leader in forecasting future trends and aids in making informed decisions about a company's investment in future technology (Lajoie and Bridges, 2014). Table 21 below shows the 2017 iteration, highlighting 32 emerging technologies, which can be seen more clearly in table 22:
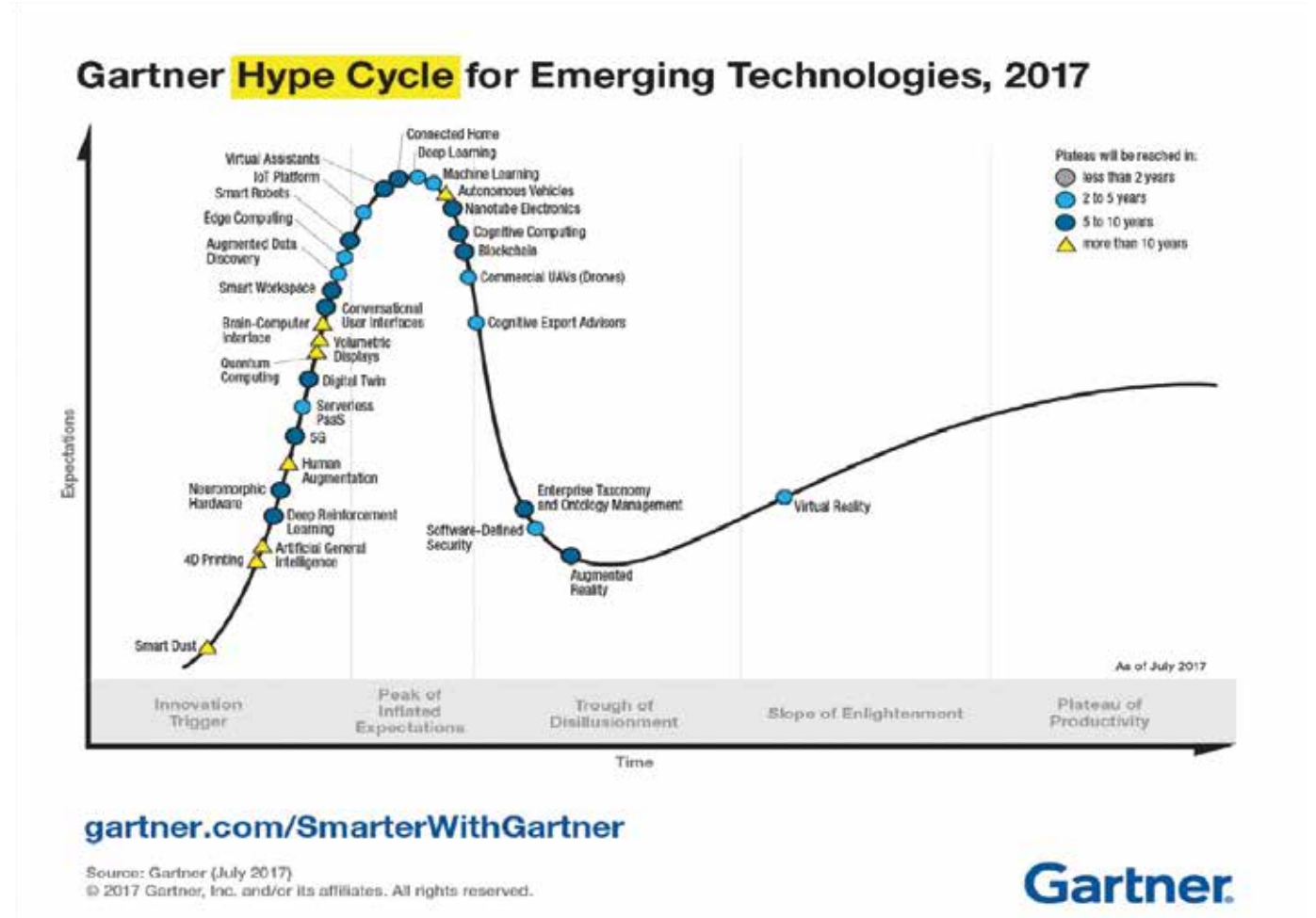
Table 21. Gartner hype Cycle of Emerging Technologies for 2017[13].

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11. https://www.gartner.com/technology/home.jsp

12. https://catenary.wordpress.com/2006/10/22/cheap-shots-at-the-gartner-hype-curve/

13. https://www.gartner.com/smarterwithgartner/top-trends-in-the-gartner-hype-cycle-for-emerging-technologies-2017/

Less than 2 years	2-5 years	5-10 years	10 years+
N/A	Serverless PaaS	Deep reinforcement learning	Smart dust
	Augmented data discov	Neuromorphic hardware	4D printing
	Edge computing	5G	Artificial general intelligence
	IoT platform	Digital twin	Human augmentation
	Deep learning	Conversational user interfaces	Quantum computing
	Machine learning	Smart workspace	Volumetric displays
	Commercial UAVs (Dron	Smart robots	Brain-computer interface
	Cognitive expert advisor	Virtual assistants	Autonomous vehicles
	Software-defined securi	Connected home	
	Virtual reality	Nanotube electronics	
		Cognitive computing	
		Blockchain	
		Enterprise taxonomy and ontology management	
		Augmented reality	

Table 22. Summary of 32 emerging technologies for 2017 according to Gartner, by the time expected for mainstream adoption.

The methodology Gartner undertake to show the yearly hype cycle is illustrated on their website[14], but to clarify, Gartner report that each technology goes through five sequential stages before that technology can be considered to be accepted as a mainstream technology; as follows:

• Innovation Trigger. Initial hype based on early reports.

• Peak of Inflated Expectations. Examples of success and failures of prototypes and early adopters.

• Trough of Disillusionment, Hype turns to exasperation and disappointment that the technology does not meet original high expectations.

• Slope of Enlightenment. Greater research and development investment leads to the initial failures of the technology being 'ironed out' and solved, or even improved.

• Plateau of Productivity. The technology receives mainstream acceptance through proof of effectiveness and ultimately, market profitability.

Methodology

With this in mind, this report has analysed the potential impact of these 32 emerging technologies on all 273 industries within the North East. This is clearly an innovative approach and is sure to benefit a significant number of companies, employees and the region generally. To do this, researchers systematically assessed the 32 technologies across 273 industries using pre-determined questions (i.e. in terms of the impact on day-to-day business functioning, the impact on the wider sector and whether or not the technology offers competitive advantage) then scaled this impact on a 1-5 Likert scale (with 1 being very unlikely to impact on the industry and 5 being highly likely to impact the given industry). In the first instance, this was assessed on a 'yes / no' basis, before a 1-5 figure was agreed upon. From this, a graph of ereging technologies for North East companies as well as heat map of anticipated impact could be created to illustrate findings more clearly. These will be shown in the next section.

Findings and Implications

Tables 23 and 24 below illustrate the number of companies that could potentially be impacted by the 32 emerging technologies reported by the 2017 Gartner Hype Cycle[15].

	Technology	Total Number of Companies per Technology (2017)	Total
1	Serverless PaaS	235	
2	Augmented data discovery	17025	
3	Edge computing	3665	
4	IoT platform	3665	
5	Deep learning	3170	
6	Machine learning	2890	
7	Commercial UAVs (Drones)	17945	
8	Cognitive expert advisors	13735	
9	Software-defined security	4365	
0	Virtual reality	4345	71040
1	Deep reinforcement learning	3540	
2	Neuromorphic hardware	3765	
3	5G	4210	
4	Digital twin	3180	
5	Conversational user interfaces	1145	
6	Smart workspace	2200	
7	Smart robots	2050	
8	Virtual assistants	3000	
9	Connected home	2765	
0	Nanotube electronics	6875	
1	Cognitive computing	14200	
2	Blockchain	7685	
3	Enterprise taxonomy and ontology management	13695	
4	Augmented reality	8655	76965
5	Smart dust	4495	
6	4D printing	10450	
7	Artificial general intelligence	1955	
8	Human augmentation	1625	
9	Quantum computing	2260	
0	Volumetric displays	5025	
1	Brain-computer interface	4960	
2	Autonomous vehicles	4955	35725
	Total		183730

Table 23. Table of total number of companies expected to be impacted by emerging technologies, adapted from the 2017 Gartner Hype Cycle.

14. https://www.gartner.com/technology/research/methodologies/hype-cycle.jsp

15. Number of companies is rounded to the nearest 5, and is the most accurate and up-to-date data available from the NOMIS database at time of writing.
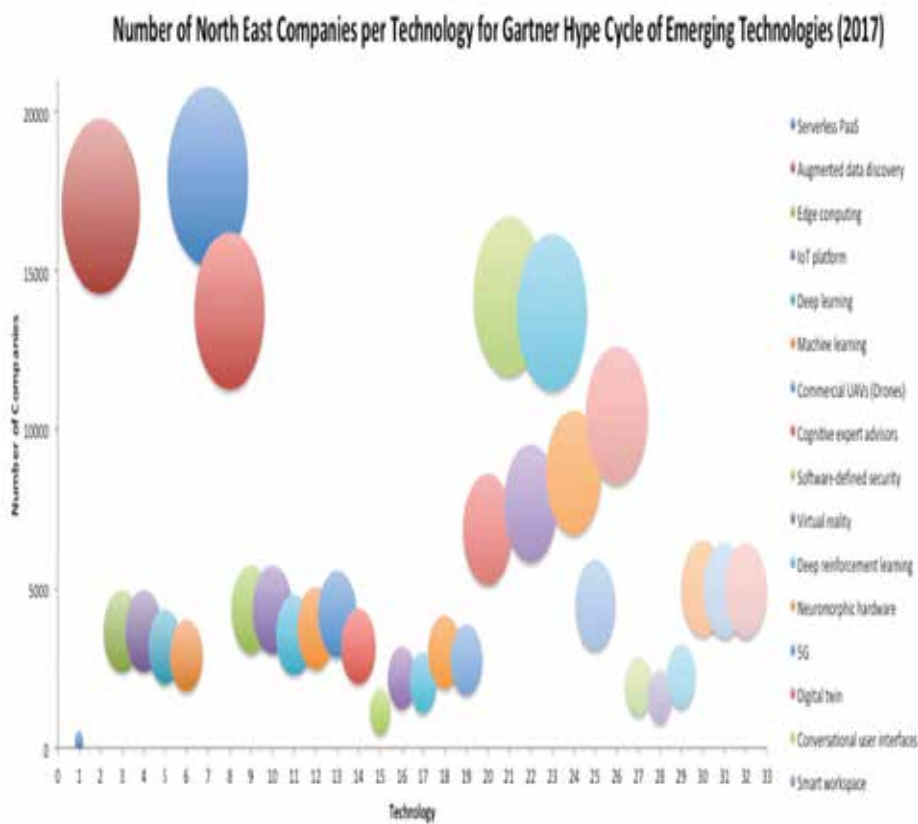
Table 24. Graph of total number of companies expected to be impacted by emerging technologies, adapted from the 2017 Gartner Hype Cycle.

Heat Maps

Figures 25 and 26 below are screenshots of both the overall heat map and the Smart Specialisation Area heat map, as the full versions are too expansive to show in their entirety.
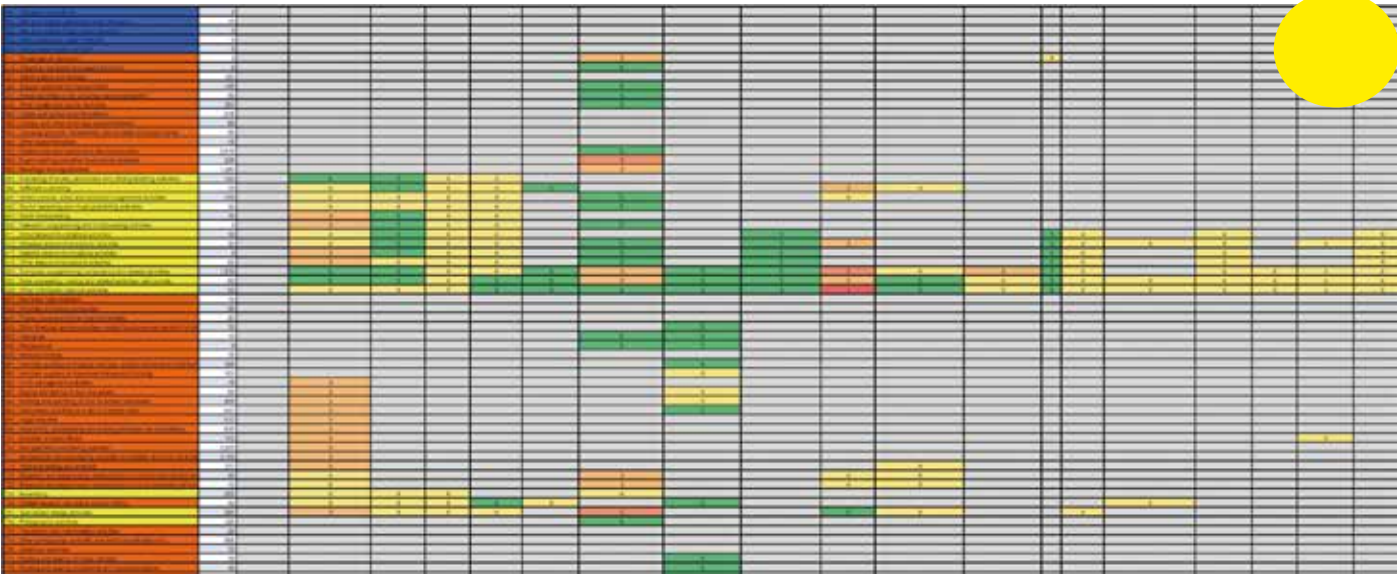

Figure 25. A screenshot of the overall heat map, showing impact of technology per industry.
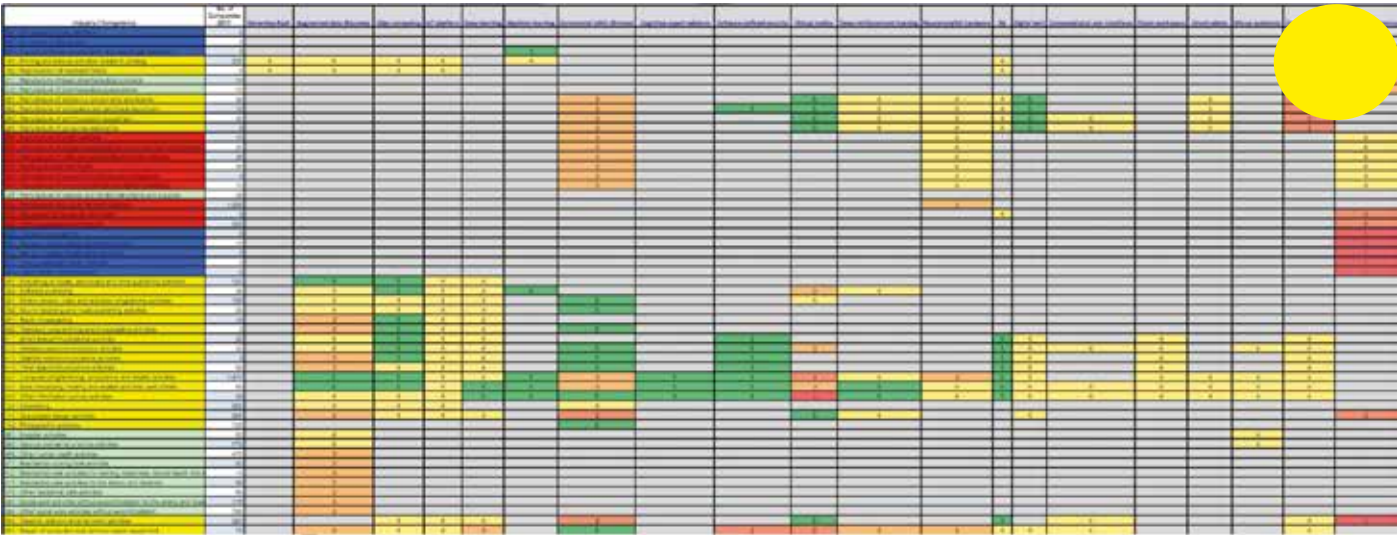
Figure 26. A screenshot of the Smart Specialisation Area industries, showing impact of technology per industry.

From tables 23 and 24, it can be seen that there are some technologies that are likely to impact a significant number of North East companies in coming years. Some of these are yet to be fully realized, and some are already in use, but have not yet been readily adapted by a great number of firms. For example, commercial UAVs (i.e. drones) have started to be used as part of some firm's business practices, but this is not yet part of everyday practice across the sector or the wider economy. Some technologies have perhaps more than ten years before becoming fully realized, e.g. 4D printing, but from these tables we can see that their potential impact is huge, and planning for this will become crucial as a drive towards developing competitive advantage. One implication is that early planning is essential, rather than reacting to these technologies once they are more readily adapted. One of the key aims of this report is to give as much early warning as possible to help companies to appropriately plan for these technologies, by showing their potential impact. The next section of this report takes this a step further, by illustrating the potential impact per sector.

Findings and Limitations

From figures 25 and 26, we can see that there are some industries that are likely to be impacted more than others, and some technologies that are likely to also have a bigger impact relative to others, particularly in the North East. For example, technologies such as 5G and 4D printing are likely to impact a wide-range of industries, and so additional planning should go into preparing North East firms for these technologies. On the other hand, cognitive expert advisors impact relatively much fewer firms in more specialist industries. This may mean they are already aware of this technology, or that bespoke planning needs to be geared towards these more specialist industries.

The objective of this groundbreaking work was to show the path ahead for the North East, in terms of emerging technologies and their potential impacts. However, this is not without limitations. For example, results should be taken with caution, as only a small sample of researchers objectively analysed all 32 emerging technologies and 273 industries. It is impossible to tell whether this assessment will be accurate or not, until closer to the point of adaptation. It would therefore be wise to gain a more representative sample of opinion, particularly from experts within the industries.

CHAPTER 3:
SKILLS AND THEIR ROLE IN SUPPORT OF INNOVATION

Since the Millennium there has been an increasing realisation that new business and innovation in existing businesses has been held back in the UK not because of a shortage of high quality graduates but, because of a long-term crisis in a skilled workforce able to undertake new jobs and new roles.

......recent models of innovation, such as the 'systemic integration' model, allow for more democratic, distributed sources of innovation, involving the skills of the whole workforce. In particular, this model says all workers should have basic 'platform' skills that allow them to be adaptable to changing circumstances and more open to new ideas to be innovative.

How Does Successful Innovation Impact on the Demand for Skills and How Do Skills Drive Innovation?

The "Technician" is now widely understood to be key to resolving this crisis. Lord Sainsbury working with the Dearing Baker Trust have been the leading advocates for this initiative working across Government.

"The technicians of the 21st Century will be key to the decommissioning of our ageing nuclear power stations and the construction and maintenance of new ones; to ensuring that the switchover to digital television occurs on schedule; and to manufacturing the high-tech products we will need to sell to the rest of the world in the future."
Lord Sainsbury, Technician Conference 2010

In 2010 the Labour Government formed a Technicians Council to review the situation chaired by Steve Holliday then CEO of National Grid. The council estimated there will be a shortage of 450,000 skilled technicians by 2020.

The Councils' report "The Professional Technician" (circa 2011) drew a direct link between the need for technical skills and innovation industry. "Promoting and developing a highly skilled workforce and increasing the pool of home grown talent, stimulates growth potential through inward investment, research and development, and innovation."

The North East is particularly challenged in this respect. The FE STEM data project[16] (July 2011) the only national review of vocational STEM skills below degree level showed. Durham and, Tyne Wear and Northumberland occupied two of the bottom three places for level 3 qualifications. The situation was equally poor in respect of women's achievement with both counties being in the bottom 5 places.

This challenging position forms a consistent narrative throughout this significant report and is underpinned by similarly poor achievements in English and Maths.

The Government's Innovation survey (focusing on degrees and "Skills" but not vocational qualifications) found that the average proportion of employees that hold a degree or higher qualification is lower in both innovating and non-innovating businesses in the NE compared to the national average.

Innovators report only 8.1%/9.9% with science/engineering or other subject qualifications compared with 10.0%/14.8% for national average.

Interestingly, however, when asked about specific skills relating to innovation, firms in the NE show a different profile – they report lower levels of employees with design of object/service (8.9% vs 11.0%) or software development skills (12.4% vs 15.2%) but higher levels in relation to engineering/applied science (14.5% vs 9.5%) and mathematics/statistics (14.3% vs 7.2%). Firms that engage in wider innovation activities show a slightly different profile – for these, the NE firms have a higher percentage of employees with multimedia/web design skills (34.7% vs 28.4%) than the national average.

This suggests that the types of innovation that firms in the NE could focus on might be different, or that any focus on skills should aim to compensate for the areas of apparent weakness.

This broader skills situation will remain challenging for the foreseeable future due to the impact of the "employer levy". As FE News noted in their report on the impact of the Levy on apprenticeship Aril 2018 noted: "The decision not to adhere to the internationally-recognised definition of an apprenticeship has therefore created two problems:

• Employers do not have to focus on skilled occupations – they merely have to describe any job or role that they wished to be labelled as an 'apprenticeship'.

• The new apprenticeship standards designed by employers do not have to promote long-term or systematic training, even though this is regarded as a core feature of apprenticeships in other countries."

We recognise the innovative work by the LEP to address this seeking to energise young people to apply for high quality vocational qualifications and diversify apprenticeships and attract women to undertake manufacturing roles. However, we cannot identify this as part of a coherent innovation plan based on detailed analysis of opportunities for growth in the North East.

Skills Funding Opportunities

There are a number of sources of funding for adult skills and education which have the potential to be used by the LEP to improve the capabilities of the workforce.

The LEP will be familiar with apprenticeships and the apprenticeship levy. Any employer, regardless of size and whether or not they pay the levy can hire apprentices. Only employers whose payroll is over £3m per annum pay the levy, so the great majority will not. Non-levy paying employers pay 10% of the cost of training apprentices and the government pays the rest. For levy paying employers it is the other way round, although there are additional contributions that government may make in certain circumstances, such as hiring young apprentices.

Public funding is also available for certain kinds of non-apprenticeship adult training. The government provides support for lower level skills, including English, maths, digital skills and pre-employment training, through the adult education budget. At present, this is allocated directly to a range of providers, including FE colleges and local authorities. LEPs are able to influence the decisions that providers take about what courses to put on if they are represented on governing bodies or involved with senior management in these organisations. From 2019-20, the adult education budget will be devolved to a number of Mayoral Combined Authorities who will become responsible for setting their own priorities for adult skills training and commissioning training accordingly. This represents a great opportunity for adult training to reflect more closely the economic and social needs of the local area. Within the North East, Tees Valley and North of the Tyne Combined Authorities are both expected to take on the adult education budget. Outside of these areas, funding will continue to be directed to providers through the national funding agency.

Outside of devolved funding arrangements, central government provides a loan system, similar to student loans for HE, to adults doing courses at level 3 and above. It also pays for funding for 16-19 year olds and for traineeships, which are a type of pre-apprenticeship scheme. On occasion, the Department of Work and Pensions will provide training for its customers, over and above what is funded through the Department for Education.

The European Social Fund is a source of funding for adult education which has supported many local projects in relatively disadvantaged areas. The current contract arrangements will continue until 2020. After that, the future availability of ESF depends on the course of the Brexit negotiations but it is possible that the government may seek to set up a replacement with similar objectives. The LEP should seek to engage with developments in this area.

16. https://www.raeng.org.uk/policy/education-policy/stem-data

CONCLUSIONS

In conclusion, a number of insights have been gained from this report, for instance:

• Innovation indicators work not in isolation, but rather in combination with each other, to drive innovation within a firm and the North East economy more broadly- competition can be seen as a key overarching driver of innovation.

• Micro-sized firms are the backbone of the North East economy, at least based on the number of micro firms per sector. However, given small, medium and large firms are relatively less populous, it may indicate that although the North East is a good location for start-ups, it is not so good a location to grow a business.

• Across all of the innovation indicators analysed for this report, it can be seen that some sectors play to the strengths of the region (e.g. manufacturing, technology) whereas other sectors show evidence of stagnation or may be under threat from changes in technology or the wider economy.

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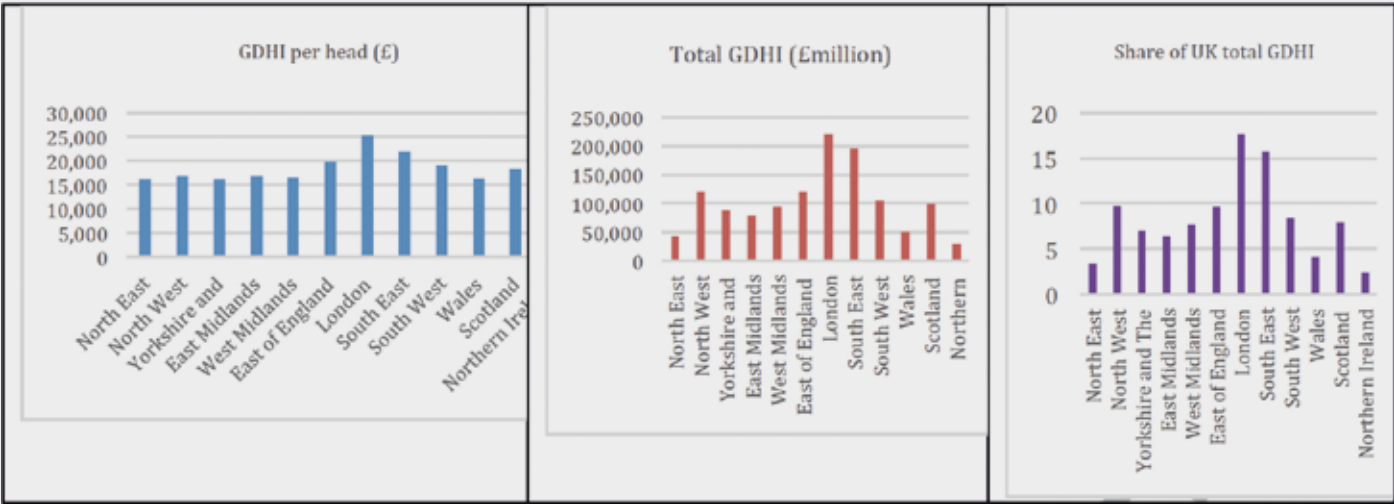
APPENDIX I

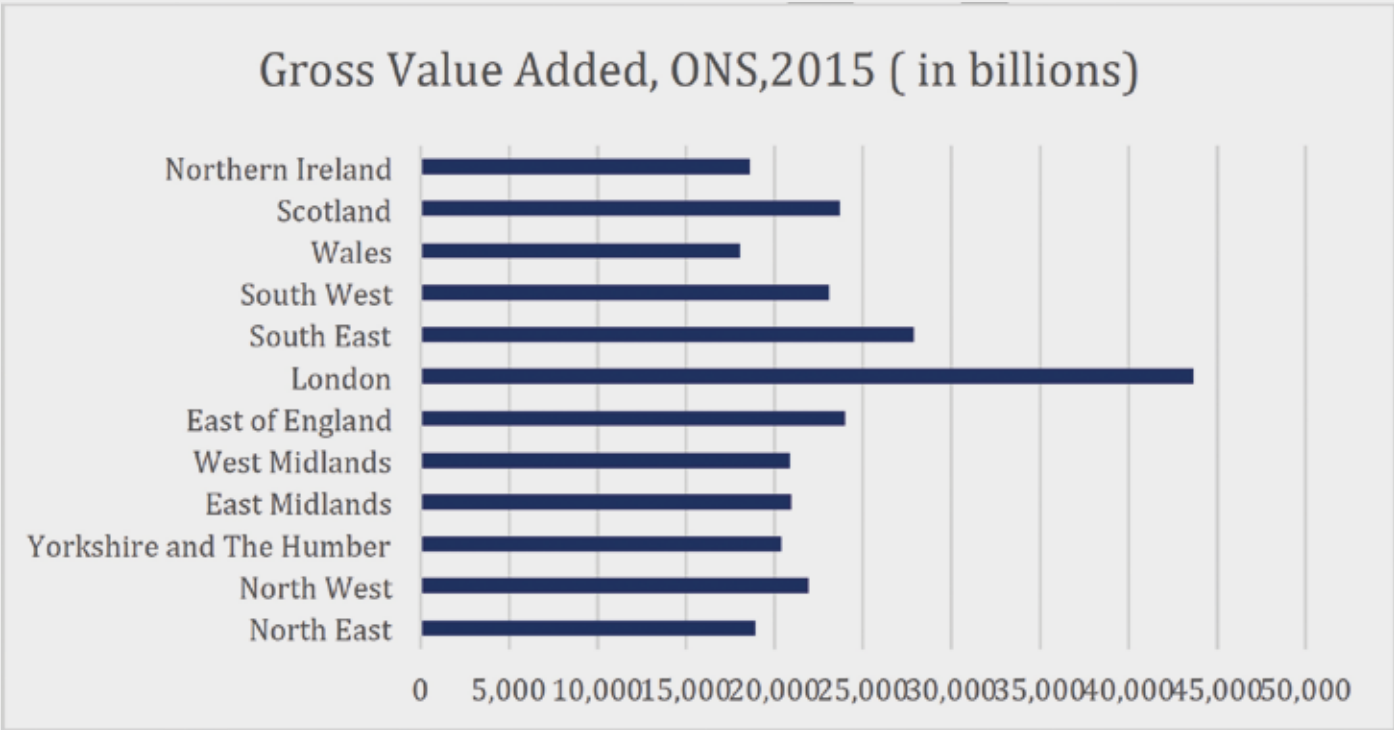Figure.1. Gross disposable household income (GDHI) UK Source: ONS, 2015, United Kingdom

Figure.2 Regional GVA, UK, Source: Office of National Statistics, 2015

APPENDIX II: QUESTIONS FOR THE NORTH EAST RAISED BY THE INDUSTRIAL STRATEGY FIVE FOUNDATIONS

Ideas – to be the world's most innovative economy

• Raising total research and development (R&D) investment to 2.4 per cent of GDP by 2027

• Increasing the rate of R&D tax credit to 12 per cent

• Investing £725 million in Industrial Strategy Challenge Fund (ISCF) programme

Recommendation/Question to explore – *does the NE have a strategic forum/plan for examining its innovation assets/capabilities (as identified through the SIA process) and then leveraging them to access national funding streams like ISCF?*

Recommendation/Question to explore – *based on its innovation assets, international connectivity and emerging global opportunities, what are the value chains that the NE can secure and develop a lead advantage around?*

Recommendation/question to explore – *what is the state of the innovation ecosystem in the NE? What are the specific strengths but also gaps that need to be addressed – eg absorbative capacity of local businesses? Institutional connections and collaboration? Connectivity between local businesses and universities/innovation assets? (DN: these questions may not necessarily be examined through the SIAs which have a narrow sectoral focus)*

Recommendation/Question to explore – *what are partners in the NE innovation ecosystem doing to increase NE businesses "share" of national funding streams?*

People – to generate good jobs and greater earning power for all

• An ambition to establish a technical education system that rivals the best in the world

• Invest an additional £406 million in maths, digital and technical education, helping to address the shortage of science, technology, engineering and maths (STEM) skills

• Create a new National Retraining Scheme that supports people to re-skill, beginning with a £64 million investment for digital and construction training

Infrastructure – a major upgrade to the UK's economy

• Increase the National Productivity Investment Fund to £31 billion, supporting investments in transport, housing and digital infrastructure

• Support electric vehicles through £400 million charging infrastructure investment and an extra £100 million to extend the plug-in car grant

• Boost our digital infrastructure with over £1 billion of public investment, including £176 million for 5G and £200 million for local areas to encourage roll out of full-fibre networks

Recommendation/Question to explore – *how is the North East engaging with these funding opportunities? Although not directly about innovation, how could links be made to innovation strategy and innovation outcomes be delivered? For example, through lead intelligent customer approaches to stimulate innovation?*

Business Environment – the best place to start and grow a business

• Launch and roll-out Sector Deals – partnerships between government and industry aiming to increase sector productivity. The first Sector Deals are in life sciences, construction, artificial intelligence and the automotive sector

• Drive over £20 billion of investment in innovative and high potential businesses, including through establishing a new £2.5 billion Investment Fund, incubated in the British Business Bank

• A review of what actions could be most effective in improving productivity of SMEs, including how to address the 'long tail' of less productive businesses

• A commitment to provide continued funding to Growth Hubs

• Piloting intensive export growth support for potential scale-ups and particularly ambitious medium sized businesses. This includes coinvestment to access commercial export support services, with each eligible business offered a grant on a 50:50 match funded basis. We will work with Local Enterprise Partnership Growth Hubs to ensure joined up and easily accessible export and business growth advice.

• A commitment to support Local Enterprise Partnerships in translating and co-ordinating regulatory frameworks that focus on local business needs, simplifying the way regulation is delivered.

Recommendation/Question to explore – how are partners in the NE coordinating efforts to engage effectively with the Sector Deals process? What are the opportunities?

Recommendation/Question to explore – are thee opportunities for the NE to pilot activities arising from the review of SMEs and productivity and the Business Environment workstream more broadly?

Places – to have prosperous places across the UK

• Agree Local Industrial Strategies that build on local strengths and deliver on economic opportunities. The first local strategies will be developed by March 2019. Government will prioritise areas with the potential to drive wider regional growth, focusing on clusters of expertise and centers of economic activity. Places with a Mayoral Combined Authority will have a single strategy led by the mayor and supported by the Local Enterprise Partnership. They will guide the use of local funding streams and any spending from national schemes.

• Create a new Transforming Cities fund that will provide £1.7 billion for intra-city transport. This will fund projects that drive productivity by improving connections within city regions

• Provide £42 million to pilot a Teacher Development Premium. This will test the impact of a £1000 budget for high-quality professional development for teachers working in areas that have fallen behind.

• Launch a £115m per year Strength in Places fund to support development of R&D excellence and strengthen local innovation ecosystems.

Recommendation/Question to explore – *what preparations are underway for developing a Local Industrial Strategy for the North East? How does Innovation feature?*

Recommendation/Question to explore – *how is the North East engaging with the Transforming Cities fund? How does innovation feature? Are there opportunities to build-in an innovative procurement approach and/ or to develop Smart Cities functionality?*

Recommendation/Question to explore – *how is the North East positioning itself to compete for a share of the Strength in Places fund?*