



Advanced Manufacturing and Engineering

Sector Report: Final

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EXECUTIVE SUMMARY

1. This report is part of a suite of papers looking into the priority sectors within the Coast to Capital region. They will make up part of the evidence base when looking at sector specific strengths, advantages, issues, and needs in the Coast to Capital region. This report is focused on the Advanced Manufacturing and Engineering (AME) sector as a key part of the local and national economy and its future growth, looking into the assets, weakness and challenges that characterise the sector.

BUSINESSES, EMPLOYEES, AND PRODUCTIVITY

2. There are 3,400 Advanced Manufacturing and Engineering businesses in the Coast to Capital region, accounting for 4.4% of total businesses. Similarly the sector accounts for 4.3% of employment, which amounts to 33,000 people. These are both slightly lower than in the South East. Across the Area Partnerships there are similar levels of business share, although it is much lower in Brighton & Hove and Lewes, but there is more variation in the level of employees across the partnerships.
3. There has been a 12% growth in AME businesses between 2010 and 2014, around 2% slower than in the South East, but growth has been seen in twelve out of the fourteen Local Authorities. It has been highest in Epsom and Ewell, Worthing, and Mole Valley, each growing by over 22%. Employment has also grown but not as strongly, between 2009 and 2014 it grew by 2.9%, which is less than the South East where it grew by 3.6%. This growth has reversed the decline in AME employment seen from 2009 to 2012 however, and there have been growth in eleven of the fourteen Local Authority areas. Worthing is again in the top performers for growth, followed by Brighton and Hove, and Chichester.
4. Gross value added (GVA) in the Manufacturing¹ sector was £2.88 billion in 2012, accounting for 6.6% of the Coast to Capital regional GVA. Since 1997 it has grown by 1.1% per year on average, the lowest of all the sectors. GVA per worker is strong however, despite falling employment levels it has been growing and it stands at £80,000 per worker, which is the 5th highest out of the 39 Local Enterprise Partnerships.

SECTOR TRENDS AND DRIVERS

5. There is projected to be an increase in employment in the Advanced Manufacturing and Engineering sector compared to a decline in the wider Manufacturing sector, this can be seen in the rise in Managers, Professionals, and Associate Professionals, and the increasing demand for higher level skills.
6. Globalisation is one of the key drivers for the sector, increasing competition is coming from countries such as China and Brazil as they move up the value chain and more research and development is conducted internationally. It is also increasing opportunities for companies to outsource their production, which in turn is increasing demand for supply chain management skills. Furthermore it is

¹ No GVA data is available for the Advanced Manufacturing and Engineering sector.

opening up new opportunities and markets for local companies, as other countries increase in prosperity and new demographic shifts happen around the world.

7. There will also be increasing 'servitisation' of the Manufacturing sector, whereby companies offer additional service activities, including bespoke design and development, which links to the trend of 'mass personalisation' of products based on each client's specifications. As an energy intensive industry government legislation aimed at reducing carbon emissions and generating power from renewable sources that will have an impact on the sector.

SKILLS AND EMPLOYMENT DEMAND

8. Employment in the Advanced Manufacturing and Engineering sector is projected to grow by 10% by 2022, compared to a 9% fall in the Manufacturing sector. This come from a rise in the number of Managers, Professionals, and Associate Professionals, which in turn will push up demand for employees with high levels of qualifications and skills. Furthermore these skills and qualifications will be increasingly specific and specialised.
9. Specific skills that are being sought by businesses include strategic management, supply chain management, production and process control and quality assurance skills, and more advanced digital and software package skills. These skills are required across all occupations in the sector as customer demands become more specific and technological changes increase complexity of products and components that can be produced, thus creating a more complex manufacturing process that no one person can effectively manage. The increasing interaction between different parts of the internal Manufacturing process and the external supply chain is also increasing the need for soft skills such as interpersonal and communication skills, negotiation skills, and personnel management.

ISSUES AND BARRIERS TO GROWTH

10. The rapid pace of technological change is one of the key barriers (and also opportunities) to growth, as it is difficult for companies and managers to keep track of, and be proficient in, the latest changes and the strategic possibilities it presents to the company. This rapid change links into reported worries about providing training, both in identifying the correct type of training and the cost of undertaking it. There are also more general worries about workers being trained and then poached by rival firms.
11. Training is important however, as there are higher rates of reported hard to fill vacancies, skills shortage vacancies, and skills gaps in the Advanced Manufacturing and Engineering sector compared to Manufacturing as a whole and the wider economy. Linking back to skills demand, the main reason for skills gaps are the lack of job specific or technical skills and strategic management skills.
12. There are less sector specific issues when it comes to exporting, whilst the Advanced Manufacturing and Engineering sector has a higher rate of exporting than the wider economy, those that do not export have issues around gaining access to contacts, networks, and market overseas, and have difficulties navigating unfamiliar business environments and regulations.

SUB-SECTORAL MAKE-UP

13. Using size, growth, and location quotients to highlight Advanced Manufacturing and Engineering sub-sectors that have strengths in the Coast to Capital region. The sub-sectors where there are absolute and relative strengths for employees are:
- 291: Manufacture of motor vehicles
 - 265: Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks
 - 266: Manufacture of irradiation, electro-medical and electrotherapeutic equipment
14. Applying the same process to businesses yields fewer areas of strength, but there are some sub-sectors where there is potential for strengths to emerge if they can continue their growth:
- 263: Manufacture of communication equipment
 - 279: Manufacture of other electrical equipment
 - 291: Manufacture of motor vehicles
 - 332: Installation of industrial machinery and equipment
 - 7112: Engineering activities and related technical consultancy

LABOUR MARKET CHARACTERISTICS

15. The sector is well qualified, 44% of Advanced Manufacturing and Engineering employees hold a level 4+ qualification compared to 31% in Manufacturing as a whole. Employees in research and development, consulting, and testing and analysis are very well qualified, over 60% have level 4+ qualifications. There is a strong but steady level of apprenticeships in Manufacturing and engineering and those university leavers in STEM subjects has increased over the last year and over 50% went on to find work in the Coast to Capital region.
16. These skills are in demand and being put to use, there are a lower levels of 'over skilling' than in the wider economy and STEM graduates are more likely to be in graduate level employment than those taking non-STEM subjects. Though the high levels of skills gaps and skills shortage vacancies suggests there is still demand for more skilled workers, which is reflected in the higher than average levels of pay in the sector. Some of this could be met by encouraging more females into the industry, currently the majority of the workforce is male and the sector has the third highest wage gap between males and females.

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INTRODUCTION

17. The Coast to Capital Local Enterprise Partnership (LEP) spans the UK's two most successful and important economic regions; it extends from South London to the coast, from Chichester in the west along to the city of Brighton and Hove and on to Lewes in the east. The LEP comprises the whole of West Sussex, the London Borough of Croydon, the City of Brighton and Hove, East Surrey, and the Local Authority district of Lewes which is part of East Sussex. It has a resident population of nearly two million and an estimated 116,000 businesses. The Coast to Capital LEP has always had one clear aim; to foster exceptional growth and productivity gains in the local economy.
18. This report is part of a suite of papers looking into the priority sectors within the Coast to Capital region; the others being Financial and Business Services, Health and Life Sciences, Creative, Digital and IT, and Environmental Technologies and Services. They will make up part of the evidence base when looking at sector specific strengths, advantages, issues, and needs in the Coast to Capital region, providing a reference point for partners, potential bids for funding by local organisations, or foreign direct investment inquiries.

Coast to Capital Area Local Partnerships

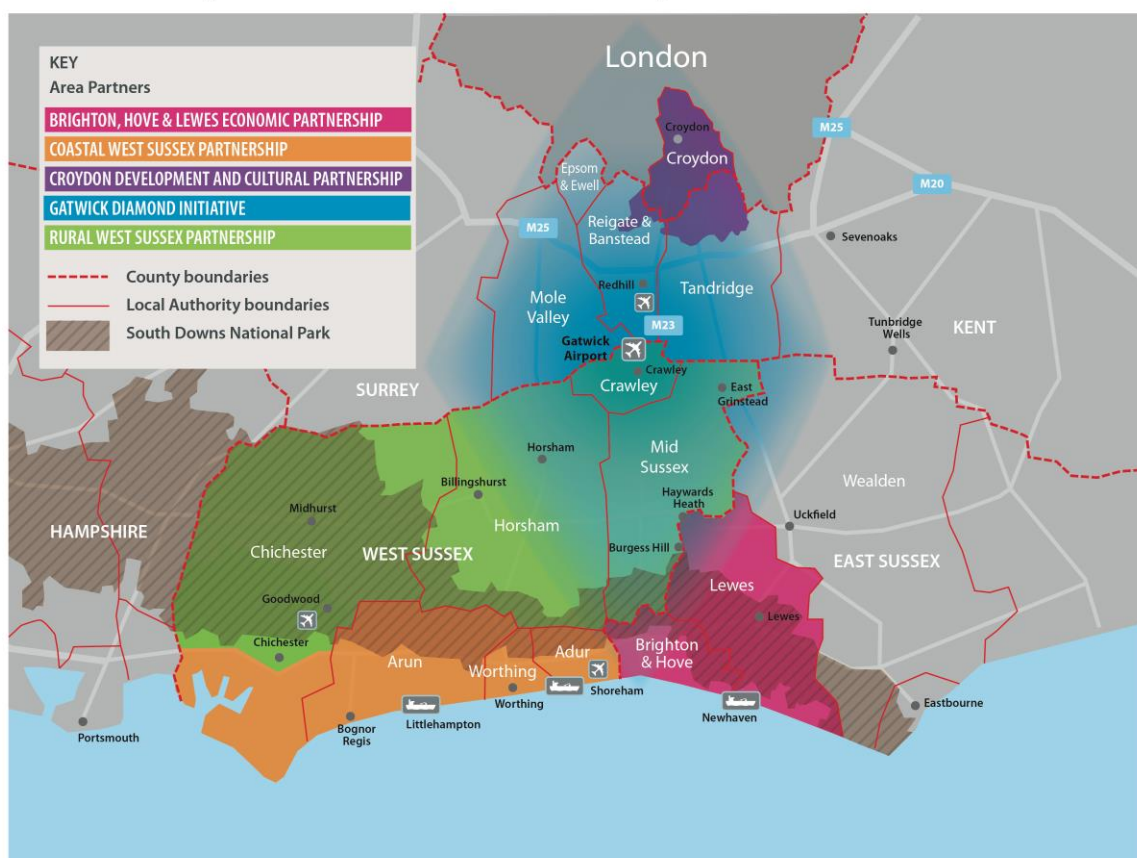


Figure 1 – Coast to Capital Region

19. The paper makes reference to the local Area Partnerships and Local Authorities, which are set out in figure 1. It should be noted that some of these Area

Partnerships overlap in places such as Chichester and Arun which are in both the Rural and Coastal West Sussex partnerships. The Gatwick Diamond comprises of Epsom and Ewell, Mole Valley, Reigate and Banstead, Tandridge, Crawley, Horsham, and Mid Sussex; the last two are also in the Rural West Sussex Partnership.

20. The Advanced Manufacturing and Engineering (AME) sector is a key part of the local and national economy and its future growth, particularly in driving innovation and increased productivity, and capturing high value activity and passing these gains through the local supply chain.
21. Advanced Manufacturing and Engineering is defined as 'activities that apply high-level design and scientific skills to produce technologically complex products'². This sector drives innovation in products and services through the application of new technologies, such as the development and use of energy efficient components or composite materials that have a range of applications across different sectors.
22. Set out below are the Standard Industrial Classification (SIC) codes used to define the AME sector. Using a recent UKCES report³ and our own work reviewing the SIC codes has created as full and accurate a picture of AME as can be captured by SIC codes.

ADVANCED MANUFACTURING & ENGINEERING 2007 SIC CODES

- 20 - Manufacture of chemicals and chemical products
- 21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations
- 26 - Manufacture of computer, electronic and optical products
- 27 - Manufacture of electrical equipment
- 28 - Manufacture of machinery and equipment n.e.c.
- 29 - Manufacture of motor vehicles, trailers and semi-trailers
- 30 - Manufacture of other transport equipment
- 33 - Repair and installation of machinery and equipment
- 7112- Engineering activities and related technical consultancy

23. There are both small and large niche companies that cut across a diverse range of sectors and subsectors such as the aeronautical; healthcare; motor vehicle; marine; and high-technology horticultural sectors. There is also a strong link between the AME sector and the growth in the environmental goods and services sector which drives innovation in energy efficient products and components.
24. The topics that are covered include analysis of the sector in terms of business and employee numbers and growth, along with the makeup of the sub-sectors within AME and the sub-sector strengths of the Coast to Capital region and the Area Partnerships. The current characteristics of the AME labour market and near future sector trends, drivers, skills and employment demands, issues and barriers to growth in the sector are explored using both national sources and local data. The

² 'Foreign Direct Investment Sector Propositions for Coast to Capital' This is Regeneration March 2012

³ UK Commission for Employment and Skills - Skills and performance challenges in the advanced manufacturing sector 2015

historical productivity of the sector is also examined and projections have been used to look at potential productivity growth over the next ten years.

25. Where possible the analysis is explored both by businesses and employees as businesses are more visible than employees in an economy and they often define a sector through their activities and the growth and value they create. This is not to discount the importance of employees; if businesses drive economic activity then employees are those who make it successful.

BUSINESSES – STOCK, SHARE, AND GROWTH

26. There were 3,430 Advanced Manufacturing and Engineering (AME) companies in the Coast to Capital region in 2014, this makes up 4.4% of all businesses in the region, which is up slightly since 2010, and in the South East AME businesses make up 4.7% of businesses⁴. The Gatwick Diamond has the highest share of AME businesses at 4.8%, but it is a fine margin. There is more variation at the lower end where AME share of total businesses in Brighton & Hove and Lewes is only 2.9%. Croydon has a slightly lower number of AME businesses as a share of total businesses but it stands out because it is the only area to have a decrease in share between 2010 and 2014.

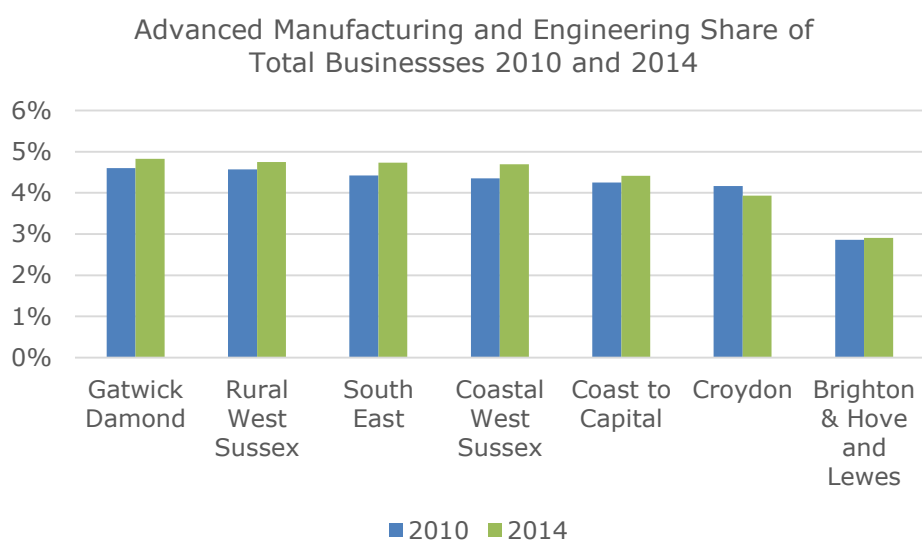


Figure 2 – Source: ONS Business Counts 2010-2014

27. At the Local Authority level the area with the highest level of AME businesses as a share of total businesses is in Arun (5.5%), followed by Crawley (5.3%), Horsham (5.2%), and Mid Sussex (5%). Those areas with the lowest shares are Croydon (3.9%), Lewes (3.2%), and Brighton and Hove (2.7%). Some areas have seen a fall in the share of AME businesses, they are Horsham, Adur, Reigate and Banstead, Croydon, and Lewes.
28. AME businesses levels have grown faster than overall businesses stock in the Coast to Capital region from 2010 to 2014 but growth has been slower than the AME businesses in the South East, 12% compared to 14%. Across the area partnerships growth was lowest in Rural West Sussex, where AME business stock grew by 8.3%, followed by Croydon where it grew by 9.6%. The fastest growing area for AME businesses is in the Gatwick Diamond area, AME business stock grew by 12.5%, followed by Brighton & Hove and Lewes and Coastal West Sussex, which both grew by 11.1%.
29. There have been areas of strong growth in Local Authority areas such as Epsom and Ewell (32%), Worthing (23%), and Mole valley (22%). Lewes is the one area

⁴ ONS Business Counts 2014

that saw a fall in AME businesses stock over this time, down 3.6%, whilst areas such as Adur (0%), Reigate and Banstead (4%), and Horsham (4.5%) had low or now growth in AME business stock.

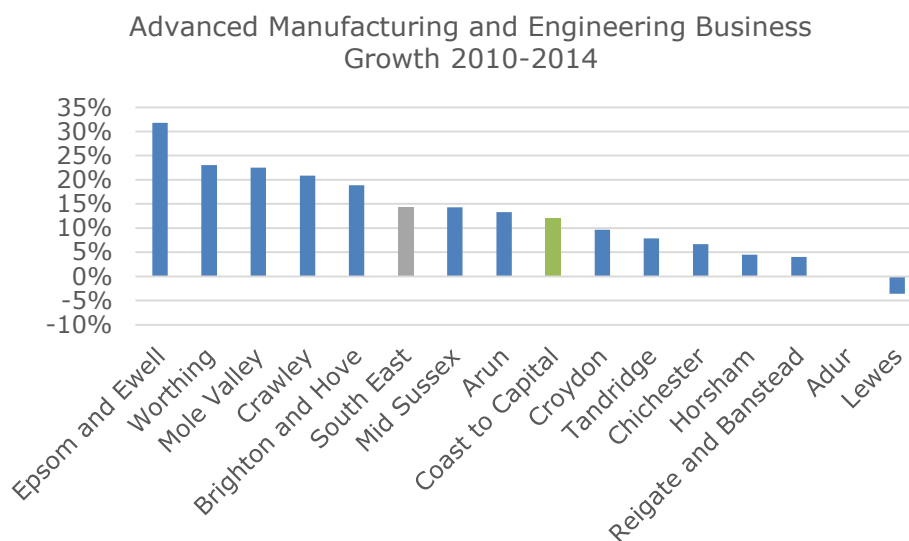


Figure 3 – Source: ONS Business Counts 2010-2014

- 30. Business incorporations in the AME sector have been increasing by an average 3.2% per year between 2008 and 2013, this is slower than the total business average of 6.2% per year. The three year survival rate for an AME business started in 2011 is 70%, this is much higher than the rate for businesses on average in the Coast to Capital region, which have a three year survival rate of 55%⁵.
- 31. Businesses in the sector are dominated by micro businesses, those that employ 0-9 people, they made up 90% of businesses in 2014. A share that has risen by 2% since 2010⁶. In the South East micro businesses make up 88% of the AME sector, this has also risen by 2% since 2010. Small businesses, those employing 10-49 people, have a 7% share of AME businesses, this has fallen by 2% since 2010, losing share to micro businesses.
- 32. In the South East small businesses make up 8.5% of the AME sector, this is down by 1.7% since 2010. Medium sized businesses, those employing 50-249 people, account for 2% of AME businesses, this has not changed since 2010. Large businesses, employing over 250 people, make up just 0.1% of AME businesses, this may be smaller than the actual share due to rounding methods applied by ONS to the data. In the South East large businesses account for 0.7% of

Ricardo PLC

Turnover: £257m

Profile: Founded in 1915 and headquartered in Shoreham-by-sea since 1919, Ricardo develops engines, transmissions, vehicle systems, intelligent transportation systems and hybrid & electric systems to serve transport, defence, and clean energy markets around the world. The company employs around 880 people.

⁵ Experian Market IQ Database – May 2015/Coast to Capital 2015

⁶ ONS Business Counts 2014

businesses, down by 0.2% since 2010. The share of businesses sizes in the AME sector is similar to the overall make up of businesses sizes in the Coast to Capital region.

EMPLOYMENT – LEVEL, SHARE, AND GROWTH

33. Around 33,400 people were employed in the AME sector in 2014, 4.3% of the Coast to Capital regions total employment down from 4.4% in 2009; in the South East AME employment accounts for 4.8% of total employment, this is down by 0.1% since 2009⁷. In Rural West Sussex and the Gatwick Diamond the share of AME employment has fallen by 0.2% and 0.3% respectively. In Coastal West Sussex there has been no change and in Croydon and the Brighton & Hove and Lewes region the share of employment has risen by 0.3% and 0.1% respectively.

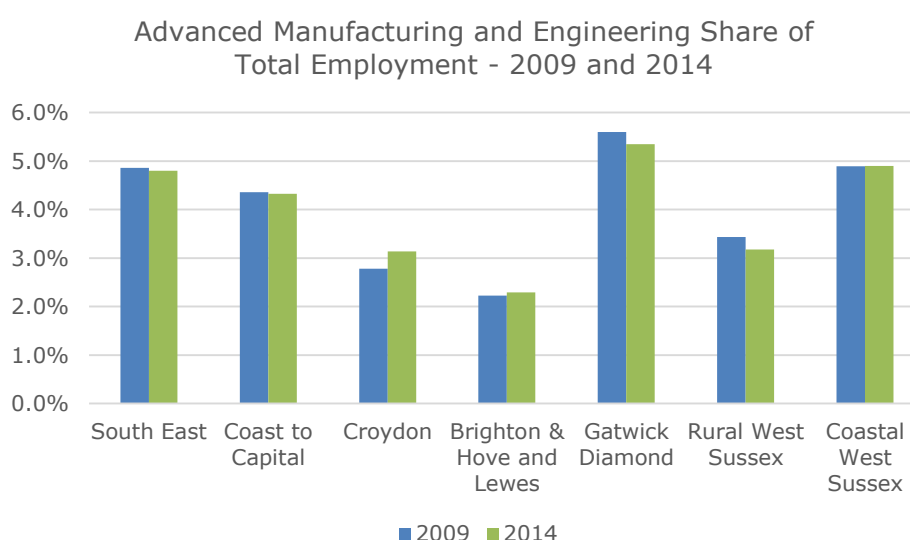


Figure 4 – Source: Business Register and Employment Survey 2009-2014

34. Mole Valley is the Local Authority area that has the highest AME employment base, at 7.9%, it has replaced Adur which has fallen from 10% to 7% between 2009 and 2014; Epsom and Ewell (7.2%) and Crawley (6.2%) also have higher levels of AME employment. Brighton and Hove has the lowest AME employment base, making up 1.8% of total employment in the area; the next lowest AME share can be found in Tandridge (3%), followed by Croydon (3.1%). Tandridge, Horsham, Crawley, and Adur are the four areas where AME employment shares have fallen.
35. The level of employment has risen by 2.9% between 2009 and 2014 in the Coast to Capital region, an increase of just under 1,000 jobs. There has been a strong growth in 2013 and 2014 in AME jobs, reversing the decline from 2009 to 2012. In the South East AME employment has risen by 3.6% over the 2009 to 2014 period. Brighton & Hove and Lewes had a 10% growth in AME jobs, followed by Croydon where they grew by 7%, and Coastal West Sussex where they grew by

⁷ Business Register and Employment Survey 2014

4.9%. In the Gatwick Diamond there was no growth and in Rural West Sussex the number of AME jobs fell by 1.4%.

- 36. There are some areas where there has been large growth in AME employment at Local Authority level; Worthing had 28% growth, Brighton and Hove grew by 15.5%, Chichester by 13.4%, and Reigate and Banstead is up by 12%. The largest falls came in Adur (down by 31%), Tandridge (down by 28.6%) and Horsham, which has fallen by 17.7%.

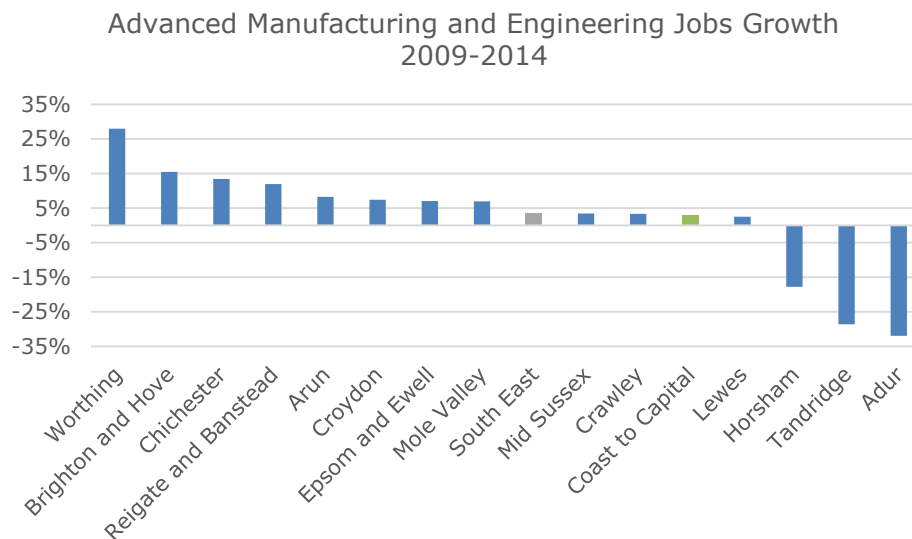


Figure 5 – Source: Business Register and Employment Survey 2009-2014

- 37. In figure 5 the growth of each sub-sector and the contribution to total sector growth has been mapped out to show how the size of each sub-sector should be taken into account when looking at growth. The Engineering activities and related technical consultancy (7112) sub-sector grew by 9%, relatively small compared to other sub-sector growth, but contributed nearly 150%⁸ of the whole AME sector’s growth due to the fact the sub-sector makes up 46% of the AME sector’s employment. Alternatively the Manufacture of optical instruments and photographic equipment (267) sub-sector grew by over 100% but contributed around 8% to the total AME sector growth due to its relatively small size. The list of sub-sector codes can be found on page 22.

⁸ Contributions to growth can be over 100% as other sectors declined to balance out the net growth

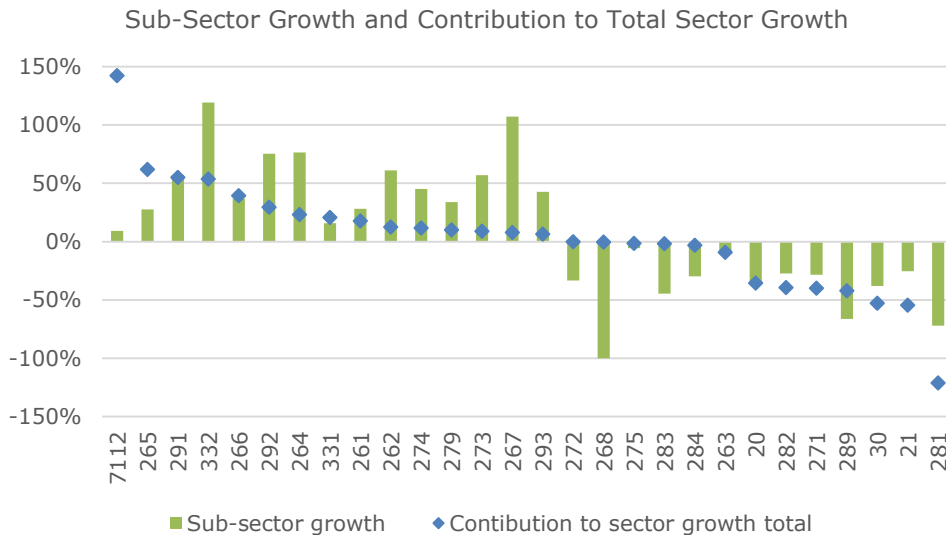


Figure 6 – Source: Business Register and Employment Survey 2009-2014

38. The sector is geared heavily towards full time workers, 89% are employed full time in the Coast to Capital region in 2013 compared to 65% in the wider economy, and this has increased slightly since 2009. In the South East full time employment accounts for just under 90% of employment in the sector, this has fallen slightly as the number full time employees has fallen quicker than the number of part time employees, whereas in the Coast to Capital region part time AME employee numbers have fallen faster.

SECTOR TRENDS AND DRIVERS

39. Globalisation of the value chain is becoming increasingly common as products become more complex and firms outsource certain parts of the value chain as they no longer have the capability in-house. One of the main activities being outsourced is research and development, particularly in pharmaceuticals where clinical trials are increasingly contracted out. This has been facilitated by advances in information and communications technologies, the geographical spread of multi-national companies, and the increased science and technology skills and competencies of companies in developing countries⁹.
40. The increased science and technology capabilities in developing countries is raising competition from developing countries moving up the value chain, in particular China, but there will be increasing competition

Osborne

Turnover: £308m

Profile: Founded in 1966 in Chichester and with its headquarters recently moved to Reigate, Osborne works in design, project management, property maintenance, construction, property development and investment across the South East and Midlands. The company employs around 900 people.

⁹ BIS Economics Paper 10A – Manufacturing in the UK: An Economic Analysis of the Sector 2010

from the other BRIC countries (Brazil, Russia, India, and China) in areas where UK companies have traditionally had the competitive advantage¹⁰.

41. This increased globalisation has made companies more exposed to global crises, in response manufacturing companies are aiming to shorten their supply chains so that the source of materials, components, or expertise is within 24 hours of the location of assembly. There is also increase pressure on the supply chain to create products with 'zero defects', this is leading to increased investment in skills, processes, and technology at all levels to meet demand¹¹.
42. There are opportunities arising from globalisation in manufacturing however, the BRIC countries present potentially large markets where incomes are rising; part of the reason for the outsourcing of operations to these countries is to gain a foothold in the market. Demographic changes will also present new market opportunities, especially in Life Sciences, where more will be spent on healthcare as the population ages, and in Electronics and ICT, as demand increases for more sophisticated medical devices, telemedicine, and telemonitoring. This will require the maximising of export opportunities, the Advanced Manufacturing sector already has a higher level of exporting than the Manufacturing sector as a whole and building on this will be key to growth.
43. The competition from other countries has led to manufacturers adopting more combined manufacturing and service activities to add value to their products, it has been referred to as the 'servitisation' of manufacturing. These services include bespoke design and development, systems and solutions, maintenance and support, and retail and distribution. Services are estimated to account for 15%-20% of revenue for manufacturers¹².
44. This increasing competition can be met by increased investment in research and development. Advanced Manufacturing companies are placed to do this as they already spend large amounts on R&D and have strong collaborative research links with universities. The key issue will be turning innovations into growth, whilst there are a high number of patents from UK companies the level of investment in new products is lower than competitors in the US and Eastern Asia¹³.
45. Due to the sectors intensive use of machinery and equipment it is well placed to take advantage of productivity gains from improvements in technology. This is

Varian Medical Systems

Turnover: £107m

Profile: *Founded in 1948 in America and with a head office and manufacturing location in Crawley. The company is a leader in radiology oncology treatments and software, including radiotherapy, radiosurgery, and x-ray imaging. It employs over 6,000 people worldwide.*

¹⁰ UK Commission for Employment and Skills - Sector Skills Insights: Advanced Manufacturing 2012

¹¹ Ibid

¹² Ibid

¹³ UK Commission for Employment and Skills – Skills and performance challenges in the advanced manufacturing sector 2015

one of the reasons that the sector has been able to remain competitive despite losing half of its employees since the 1980s. This high use of machinery requires matching levels of capital investment, research and development, and high skilled workers, which require long term investment decisions for both tangible and intangible assets.

46. There are also expected to be opportunities arising from new enabling technologies such as¹⁴:
- Low carbon and environmental technology
 - Advanced materials, e.g. composite materials
 - Nanomaterials and nanotechnology
 - Biotechnology
 - Digital technology (including 3D printing)

These technologies have potential to drive innovation in a range of industries, not just in Manufacturing. However, the Advanced Manufacturing sector will be at the forefront in applying them to production processes where they can improve efficiencies, produce complex products at a large scale, and innovate new products and materials.

47. The future of manufacturing report¹⁵ highlights four key characteristics that will influence the manufacturing industry in the near future. The first is being faster, more responsive, and closer to customers, this will involve increased customer input for 'mass personalisation', more distributed production with smaller factories located in urban areas, and the digitisation of the value chains, which will improve customer relationships, process control, product verification, logistics, and safety systems.

Kellogg Brown and Root

Turnover: £515m

Profile: KBR is global technology, engineering, procurement and construction company serving the hydrocarbons and government services industries. Worldwide it employs 25,000 people to deliver its construction, infrastructure, and consulting activities.

48. The second is that companies will become exposed to new market opportunities in the BRIC countries and also the 'Next-11'¹⁶, but also through changing demographic factors in developed countries, and the fragmentation of the value chain as it is increasingly moved to separate parts of the world.

49. Third is the move towards sustainability in manufacturing, influenced by changing consumer demand for more environmentally friendly products, the volatility of supply as urban areas grow and demand for raw materials increases, the vulnerability of global supply chains to climate change, and increasing regulation promoting the reduction of waste and pollution. There is also government legislation to contend with, the UK is committed to; reducing greenhouse gas

¹⁴ UK Commission for Employment and Skills - Sector Skills Insights: Advanced Manufacturing 2012

¹⁵ Foresight (2013). The Future of Manufacturing: A new era of opportunity and challenge for the UK - Project Report - The Government Office for Science, London

¹⁶ Bangladesh, Egypt, Indonesia, Iran, Korea, Mexico, Nigeria, Pakistan, Philippines, Turkey, and Vietnam

emissions to 20% lower than 1990 levels by 2020; generating 20% of energy from renewables; and increasing energy efficiency by 20%.

50. The fourth is that companies will be increasingly reliant on highly skilled workers as much of the job growth is expected in managerial, professional, and technical positions, which will require technical specialism combined with commercial and problem solving abilities, and the workforce will continue to decline in size and have an older age profile which will require high skilled workers to maintain output levels.
51. Government policy also has an impact on the sector, manufacturing was described as being central to the UK's recovery from recession and government is keen to drive growth in the sector. It has set up high value manufacturing catapult centres designed to provide companies the platform to quickly develop and bring ideas to market, although they are based outside of the Coast to Capital region. It has also launched the 'Advanced Manufacturing Supply Chain Initiative' which will encourage the co-location of the supply chain and the prime producers to improve quality control and reduce supply disruption. More information on support organisations available in the Annex.

SKILLS AND EMPLOYMENT DEMAND

52. Strategic management skills are one of the most in-demand as competition increases, advances and innovations in technology open up potential new market opportunities, and the number of jobs in managerial positions is expected to grow faster than in other occupations in the sector. Strategic management skills have been identified as one of the key challenges for the sector¹⁷. These skills are important as managers need to be able to identify long term trends, their impact upon their business, and to be able to respond with cost effective measures or with a strategy to exploit a market opportunity. There is a particular problem for small and medium enterprises (SMEs) in attaining these skills as they have less resource to develop them. At management level there will also be increasing demand for skills in supply chain management, purchasing, contract negotiation, and large scale project management¹⁸. There is potential for the business and technical management roles to be split into two separate roles.
53. The mass production process relies on high skill levels to control the production process, with the lower skills used to work on the production line. There is

Mott MacDonald Limited

Turnover: £579m

Profile: Headquartered in Croydon, this company is a global management, engineering and development consultancy that delivers transport and infrastructure projects around the world. It is one of the largest employee owned companies in the world and employs 15,000 people worldwide.

¹⁷ UK Commission for Employment and Skills – Sector Skills Insights: Advanced Manufacturing – 2012

¹⁸ UK Commission for Employment and Skills – Skills and performance challenges in the advanced manufacturing sector – 2015

increasing potential for developing advanced manufacturing in low volume, high complexity sectors of the market, which will require an increase in skills levels to meet this potential and be competitive in the sector. However, in both the high volume and the niche sectors the ability to be flexible and adaptable to new market opportunities, whatever form they take, is increasingly seen as essential, requiring both the management skill to see the opportunity and the technical skills to meet the demand. These skills will include digital techniques, computing, numeracy, analytical thinking, machine ergonomics and interface development, risk analysis, and understanding of design methodologies¹⁹.

54. Innovation occurs commonly at an interface, for example, between technologies and methodologies and requires skills linked to merging and adaptation of technologies. These problem solving skills will be needed at all levels of the organisation, allowing lower levels to be innovative in implementing process and technique change and managers will need the skills to recognise and manage this change. For biological scientists increasing R&D will boost demand for new entrants with highly specialised degrees and research skills. The industrial manufacture of biological products will also increase the need for production control and quality assurance skills²⁰.
55. There will also be a need for improved soft skills, such as interpersonal skills, as supply chains become supply networks there will be more interaction between companies at all levels. This will lead to less regulation of workers who will have to be more responsible for their own work and training and managers will have to improve their delegation skills and increasingly manage and monitor the process rather than the production to achieve 100 percent quality. The use of diverse and complex design packages and bespoke software is requiring production managers to widen their skill sets. IT literacy is becoming more important across all levels of the production chain as computer controlled machines become more commonly used.
56. The number of people expected to be employed in manufacturing in 2022 will be lower than in 2012, but is predicted to be a shift to higher level occupations who have higher levels of education, leading the sector to be more reliant on higher level skills. This shift to higher level occupations is indicative of the prediction that despite the fall in employment in the wider Manufacturing sector the Advanced Manufacturing sector is predicted to grow, the European Competitiveness Report 2013 suggests that the global market for Advance Manufacturing will double to £750 billion by 2020. Occupations linked with the Advanced Manufacturing sector are expected

Rolls-Royce Motor Cars

Turnover: £446m

Profile: The company has its headquarters, design, manufacturing, and assembly centre based in Goodwood, Chichester. It makes a number of its flagship vehicles at the plant which are sold all around the world. The plant employs 800 people.

¹⁹ UK Commission for Employment and Skills – Sector Skills Insights: Advanced Manufacturing – 2012

²⁰ UK Commission for Employment and Skills – Skills and performance challenges in the advanced manufacturing sector – 2015

to grow by 10% nationally, compared to a 9% drop in the Manufacturing sector as a whole²¹.

57. At the Coast to Capital level there is only information available for the Manufacturing sector as a whole. From 2012 to 2022 the number of people employed in Engineering and Manufacturing jobs is expected to decline by an estimated 5,000, a 14% drop²². Replacement demand will remain high however, there is expected to be 12,000 jobs that will need to be replaced by 2022, half of which will be in the top 3 occupation levels. Most of this demand will shift to higher level occupations as the lower level occupations are expected to contract by greater amounts; skilled trades occupations are predicted to fall by 25%, administrative roles may fall by 22%, and process, plant, and machine operatives are expected to fall by 32%. However, caring, leisure and other service occupations are expected to rise by 18%, it is the only occupational group to do so but it is also the smallest occupational group.
58. This move towards higher level occupations means that there will be more demand for higher levels of education; demand for employees with qualifications of QCF level 4 or higher is predicted to rise by 7% whilst demand for employees with qualification levels 1 to 3 is expected to fall by 25% and demand for employees with no qualifications is expected to fall by 50%. This will change the composition of the workforce so that those with level 4+ qualifications will go from making up 40% of employees to making up 50%.

GROSS VALUE ADDED

59. Gross value added (GVA) for the Manufacturing sector has only risen slightly since 1997, up to £2.88 billion in 2012 which is the highest level over the 1997 to 2012 period²³. Over this period the growth rate each year has been 1.1% on average, this is the lowest of any sector and the next lowest was Agriculture which grew by an average of 2.1% year on year. This has been highly affected by the growth rate from 2011 to 2012, which was 9% for Manufacturing, without which the yearly average growth rate is only 0.5%. The Coast to Capital regional GVA figure grew by 4.3% on average each year, this explains why Manufacturing's share of total GVA has fallen from 10.8% in 1997 to 6.6% in 2012. Despite this low growth it has grown by more than the South East region as a whole.

²¹ UK Commission for Employment and Skills – Skills and performance challenges in the advanced manufacturing sector – 2015

²² UK Commission for Employment and Skills: Working Futures 2012

²³ ONS Regional GVA estimates 2013

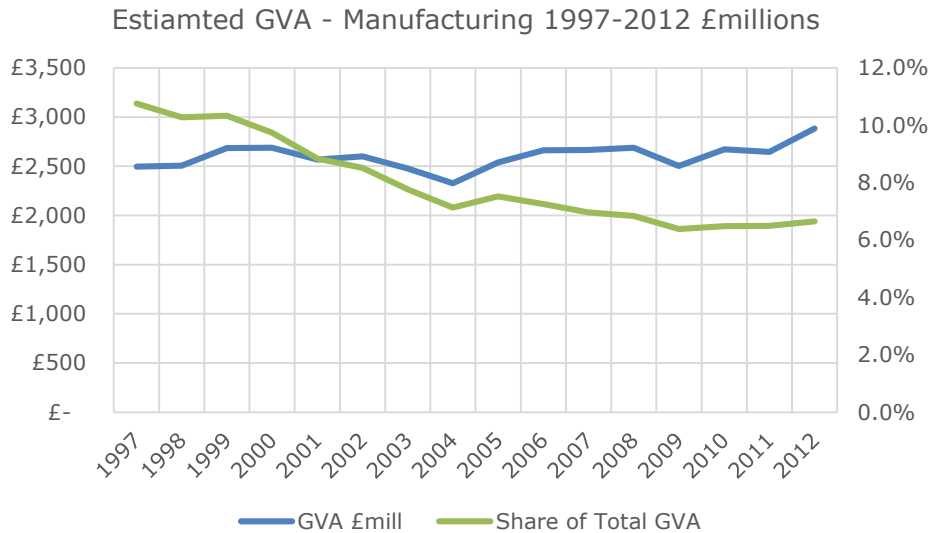


Figure 7 – Source: ONS Regional GVA Estimates 2013

- 60. In England GVA contributions from Manufacturing is £122 billion, which accounts for 9.7% of the total, 3% higher than in the Coast to Capital region. However average yearly growth in GVA has been 0% from 1997 to 2012 and as such the share of total GVA has fallen from 18.5% in 1997 to 9.7% in 2012.
- 61. On the other hand GVA per employee has been steadily rising since 1998 despite falling employment numbers and reached £80,000 per employee in 2012. This proves that although total GVA has not grown much, the productivity of workers has as more capital is used in the manufacturing process. The increased use of machinery has allowed manufacturing firms to boost productivity whilst reducing the number of people they employ. The break in the data is when the methodology changed so the two periods should not be directly compared as a time series but are used to illustrate the long term trends.

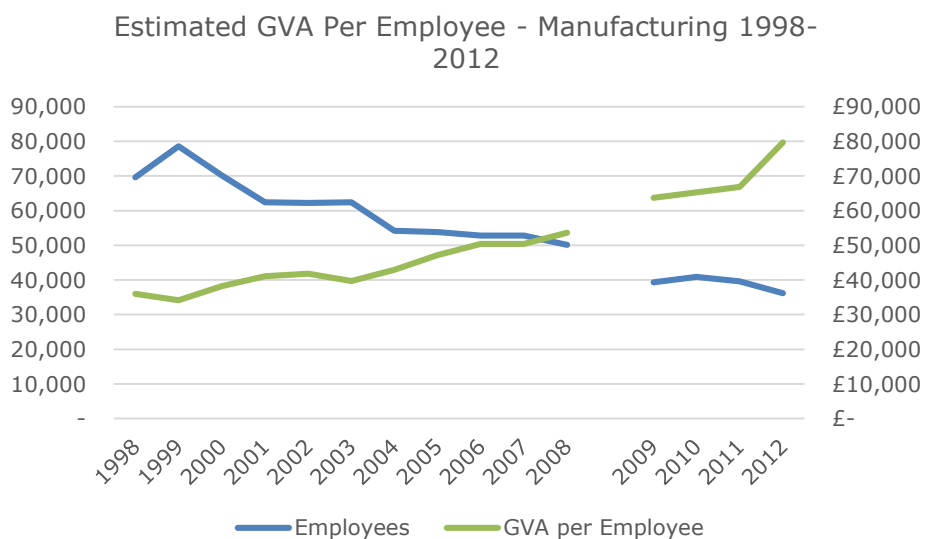


Figure 8 – Source: ONS Regional GVA Estimates 2013/Business Register and Employment Survey 2009-2012/Annual Business Inquiry 1998-2008/Coast to Capital 2015

62. Out of the 39 LEPs Coast to Capital ranks 5th for GVA per worker in the manufacturing sector and compares well with the South East, where GVA per worker is £73,000, and is much higher than England, where GVA per worker is £61,300.

Rank	Top 10 LEPs by Manufacturing GVA per Worker	GVA per Worker
1	Cheshire and Warrington	£103,249
2	Thames Valley Berkshire	£94,166
3	Hertfordshire	£81,449
4	West of England	£79,710
5	Coast to Capital	£79,693
6	Enterprise M3	£79,527
7	Liverpool City Region	£79,240
8	Oxfordshire	£74,355
9	London	£72,476
10	Cumbria	£68,761

Table 1 – Source: ONS Regional GVA Estimates 2013

GROSS VALUE ADDED PROJECTIONS

63. Using the 15, 10, and 5 Average Annual Growth Rates (AAGR) three projections are produced for Manufacturing GVA from 2012 to 2022.

1. In the first projection the 15 year AAGR is used, currently 1.1%, which results in a GVA figure of £3.21 billion by 2022.
2. In the second projection the 10 year AARG is used, currently 1.2%, which results in a slightly higher GVA figure of £3.24 billion by 2022.
3. The third projects uses the 5 year AAGR, currently 1.7% and more affected by the 9% growth between 2011 and 2012, and results in a GVA figure of £3.41 billion by 2022.

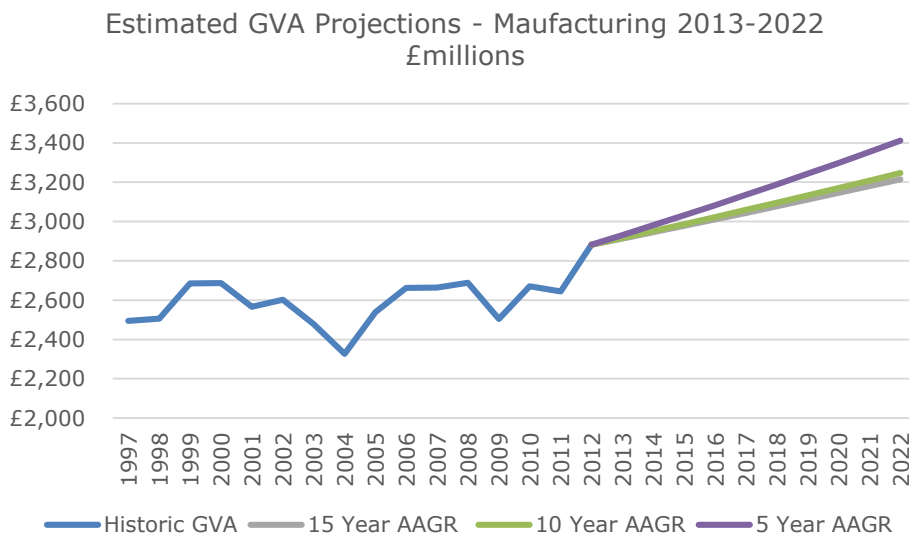


Figure 9 – Source: ONS GVA Estimates 2013/Coast to Capital 2015

64. It is likely the 15 or 10 year projections will prove to be most accurate as they are quite similar and are less affected by the 2011 to 2012 growth which may prove to be a one off when considering the average GVA figure before then is hovering around £2.6 billion; it may even be that the 2012 GVA figure is too high a starting point when taking this into account.



Figure 10 – Source: ONS Regional GVA Estimates 2013/Business Register and Employment Survey 2012/ UK Commission for Employment and Skills Working Futures 2012

65. Using the 10 year AAGR projection and the UKCES Working Futures projections²⁴ for employment in manufacturing a projection for GVA per worker has been calculated for 2017 and 2022. The data suggests this will continue to rise, reaching £95,700 by 2022, continuing the trend of falling employee numbers but increasing GVA per worker that has been seen from 1998 to 2012.

ISSUES AND BARRIERS TO GROWTH

66. Knowledge of and technical abilities to use the latest technological changes in the manufacturing process can be difficult to access, especially for SME's, as it is not widely circulated throughout the sector, likely due to the need to maintain competitive advantage for those companies that have applied new technologies to their manufacturing processes. Even when new technologies are shared, the testing and demonstration of these can be expensive for SME's; this all leads to companies not being fully aware of the range of technology available to them.
67. Skills are one of the main drivers of growth, technological advantages even out over time but skills provide a more consistent advantage, especially if they are continually improved. The cost of training can be high for some companies as some of the skills required are specialised and particularly if they are unsure of the benefits to the company and are worried about poaching of staff from competitors. There is also the fast pace of technological change to consider, as well as the cross cutting of skills, which makes identifying the right training

²⁴ UK Commission for Employment and Skills: Working Futures 2012

required and keeping it up to date difficult. The higher levels of skills shortage vacancies and lower levels of training in the sector suggests increased training would prove to be an ideal way to unlock growth.

68. One of the main areas that effects growth is strategic management skills. All the other barriers and challenges for businesses will require managers of companies to have the strategic skills necessary to navigate them, respond to rapid change, and turn threats into opportunities' as well as taking a proactive long term view of the direction of the business. This may be difficult for SMEs as they are often reflections of their owner and may be resistant to a change in strategy, but also because they may not be able to attract skilled managers or be able to afford the training for their current managers that would help develop their strategic skills.
69. Barriers to exporting are generally the same faced by all businesses that export, such as gaining access to networks and contacts overseas, accessing markets to trade or regulatory barriers, working in unfamiliar business, legal and regulatory environments, and protecting intellectual property rights.
70. Advanced Manufacturing and Engineering is an energy intensive sector and uncertainty about, and changes to, the cost and supply of their energy, or the geopolitical events that affect them, can be a barrier to growth if prices are high or regions that control supply are unstable.
71. The sector is defined by its high levels of R&D and capital investments, around 75% of UK R&D expenditure was in Manufacturing and a majority of that was done in high value industries such as pharmaceuticals, aerospace, and electronics. This makes the sector vulnerable to changes in capital investment and there is some evidence that funding is becoming more difficult to secure and is having a detrimental effect on growth²⁵.
72. Global competition presents another barrier to growth as companies in countries that previously specialised in low value manufacturing competing on low labour costs look to move up the value chain. China is the main driver of this change but countries such as India and Brazil are also expected to do the same in the near future. This in part is a cause of the rising expectations that products are perfect every time which has forced companies in the supply chain to improve their workers skills and the technology they employ. The improving skills and technologies in other countries is also opening up opportunities for companies to outsource their high value manufacturing and R&D, as well as the more traditional low value activities.

Doosan Babcock

Turnover: £481m

Profile: This company provides specialist technologies and services to the energy industry, from oil and gas to thermal and nuclear energy production. The company also has a focus on smart and green energy products. Its main headquarters are in Crawley and it employs 40,000 worldwide.

²⁵ UK Commission for Employment and Skills – Sector Skills Insights: Advanced Manufacturing – 2012

SUB-SECTOR MAKE-UP

ADVANCED MANUFACTURING AND ENGINEERING SUB-SECTORS

- 20: Manufacture of chemicals and chemical products
- 21: Manufacture of basic pharmaceutical products and pharmaceutical preparations
- 261: Manufacture of electronic components and boards
- 262: Manufacture of computers and peripheral equipment
- 263: Manufacture of communication equipment
- 264: Manufacture of consumer electronics
- 265: Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks
- 266: Manufacture of irradiation, electro-medical and electrotherapeutic equipment
- 267: Manufacture of optical instruments and photographic equipment
- 268: Manufacture of magnetic and optical media
- 271: Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
- 272: Manufacture of batteries and accumulators
- 273: Manufacture of wiring and wiring devices
- 274: Manufacture of electric lighting equipment
- 275: Manufacture of domestic appliances
- 279: Manufacture of other electrical equipment
- 281: Manufacture of general purpose machinery
- 282: Manufacture of other general-purpose machinery
- 283: Manufacture of agricultural and forestry machinery
- 284: Manufacture of metal forming machinery and machine tools
- 289: Manufacture of other special-purpose machinery
- 291: Manufacture of motor vehicles
- 292: Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semitrailers
- 293: Manufacture of parts and accessories for motor vehicles
- 30: Manufacture of other transport equipment
- 331: Repair of fabricated metal products, machinery and equipment
- 332: Installation of industrial machinery and equipment
- 7112: Engineering activities and related technical consultancy

EMPLOYEES

73. The chart below shows the share of total sector employment each sub-sector has. Engineering activities and related technical consultancy is the dominant sub-sector for employment, accounting for just over 46%, and has been excluded from the chart due to the distorting effect it has²⁶. The next closest sub-sector, the Manufacture of instruments and appliances for measuring, navigation, and testing, accounts for 8% of all employment. It is likely that much of the employment in Engineering and technical consultancy is made up of self-employment, the number of businesses is also high, indicating a high number of small businesses employing a handful of people each.

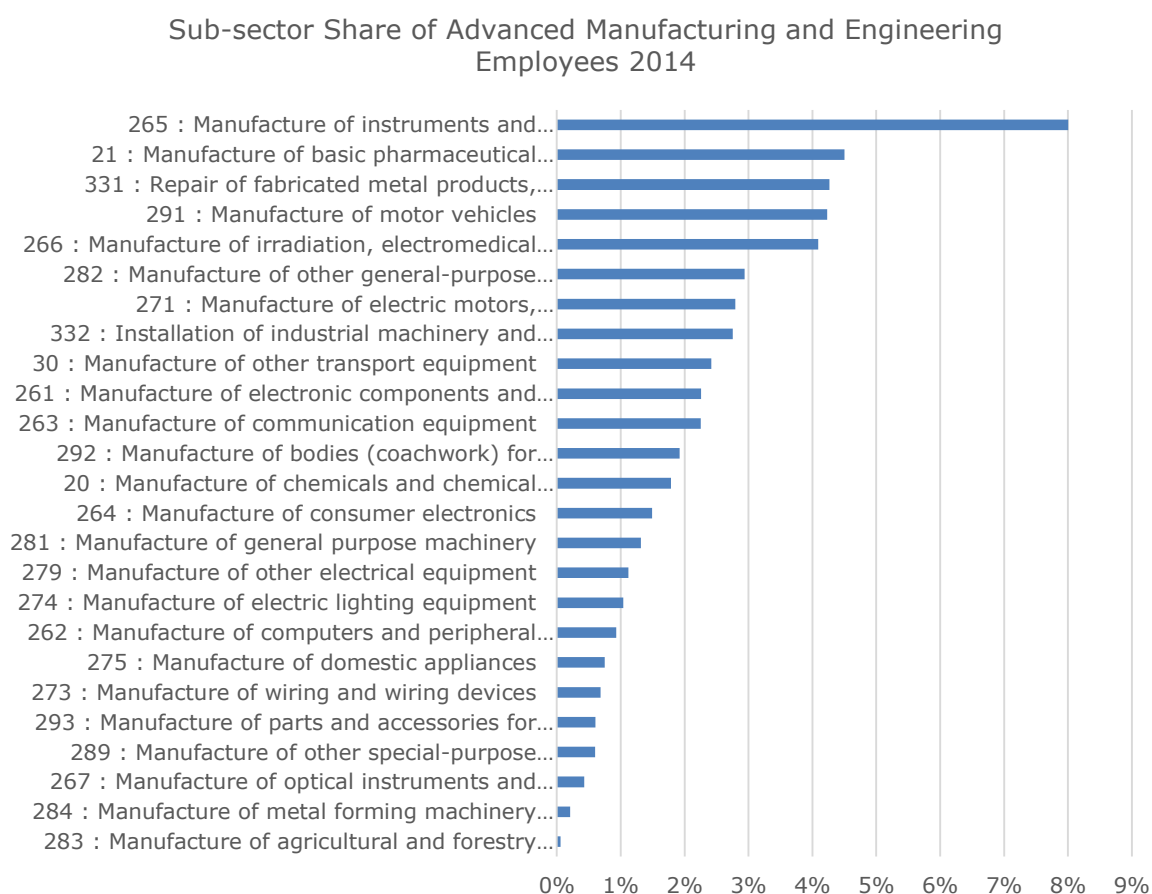


Figure 11 – Source: Business Register and Employment Survey 2014

74. Below a sub-sector scorecard has been produced to visualise performance across the three variables of employment size, growth, and location quotient (LQ)²⁷. Using this method absolute (size) and relative (Growth, LQ) strengths can be analysed as a whole. The scorecard ranks each sub-sector by each variable, splitting the ranks into top, middle, and lower thirds.

²⁶ The sub-sectors 'Manufacturing of Batteries' and 'Manufacturing of Magnetic Media' have also been excluded as they account for 0% of the sector

²⁷ More information on location quotients can be found in the annex

Sub-Sector Scorecard - Employees			
Sub-Sectors:	Size	Growth	LQ
20 : Manufacture of chemicals and chemical products	Yellow	Red	Red
21 : Manufacture of basic pharmaceutical products and pharmaceutical preparations	Green	Red	Green
30 : Manufacture of other transport equipment	Yellow	Red	Red
261 : Manufacture of electronic components and boards	Yellow	Yellow	Yellow
262 : Manufacture of computers and peripheral equipment	Yellow	Green	Yellow
263 : Manufacture of communication equipment	Yellow	Red	Yellow
264 : Manufacture of consumer electronics	Yellow	Green	Green
265 : Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	Green	Yellow	Yellow
266 : Manufacture of irradiation, electromedical and electrotherapeutic equipment	Green	Yellow	Green
267 : Manufacture of optical instruments and photographic equipment	Red	Green	Yellow
268 : Manufacture of magnetic and optical media	Red	Red	Red
271 : Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	Green	Red	Green
272 : Manufacture of batteries and accumulators	Red	Red	Red
273 : Manufacture of wiring and wiring devices	Red	Green	Yellow
274 : Manufacture of electric lighting equipment	Yellow	Green	Yellow
275 : Manufacture of domestic appliances	Red	Red	Green
279 : Manufacture of other electrical equipment	Yellow	Yellow	Green
281 : Manufacture of general purpose machinery	Yellow	Red	Red
282 : Manufacture of other general-purpose machinery	Green	Red	Red
283 : Manufacture of agricultural and forestry machinery	Red	Red	Red
284 : Manufacture of metal forming machinery and machine tools	Red	Red	Yellow
289 : Manufacture of other special-purpose machinery	Red	Red	Yellow
291 : Manufacture of motor vehicles	Green	Green	Green
292 : Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semitrailers	Yellow	Green	Green
293 : Manufacture of parts and accessories for motor vehicles	Red	Green	Red
331 : Repair of fabricated metal products, machinery and equipment	Green	Yellow	Red
332 : Installation of industrial machinery and equipment	Green	Green	Yellow
7112 : Engineering activities and related technical consultancy	Green	Yellow	Green

Table 2 – Source: Business Register and Employment Survey 2009-2014/Coast to Capital 2015

75. The sub-sectors that have mostly green and yellow shadings are those areas where Coast to Capital has strengths in terms of employment and in relation to the South East. The sectors where there are absolute and relative strengths are:
- 291: Manufacture of motor vehicles
 - 265: Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks
 - 266: Manufacture of irradiation, electro-medical and electrotherapeutic equipment
76. Those sub-sectors where there are some strengths are:
- 21: Manufacture of basic pharmaceutical products and pharmaceutical preparations

- 271: Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
 - 7112: Engineering activities and related technical consultancy
 - 261: Manufacture of electronic components and boards
77. It is worth highlighting the 'Manufacture of irradiation, electromedical and electrotherapeutic equipment' sub-sector which has an LQ of 3.2 and accounts for 28% of national employment in that sub-sector. It is a small sub-sector but clearly one where the Coast to Capital region plays a big part.
78. Applying this method to the sub-sector strengths of Area Partnerships it is found that:
- The **London Borough of Croydon** has strengths in the Manufacture of chemicals and chemical products, of Optical instruments and photographic equipment, of Magnetic and optical media, of Batteries and accumulators, and in Engineering activities and technical consultancy.
 - **Brighton & Hove and Lewes** has sub-sector strengths in the Manufacture of computers and peripheral equipment, of Communication equipment, of Electric lighting equipment, of Other electrical equipment, and of Metal forming machinery and machine tools.
 - The **Gatwick Diamond** has sub-sector strengths in the Manufacture of transport equipment, of Irradiation, electro-medical, and electrotherapeutic equipment, of Domestic appliances, of General purpose machinery, and the Installation of industrial machinery and equipment.
 - **Rural West Sussex** has strengths in the Manufacture of electronic components and boards, of Batteries and accumulators, of General purpose machinery, of Agricultural and forestry machinery, and of Motor vehicles.
 - **Coastal West Sussex's** sub-sector strengths are in the Manufacture of basic pharmaceutical products and pharmaceutical preparations, of Consumer electronics, of Electric motors, generators, and electricity distribution, of Motor vehicles, and of Parts and accessories for motor vehicles.

BUSINESSES

79. The AME sector is overwhelmingly made up of businesses in the Engineering activities and technical consultancy sub-sector, which accounts for 68% of businesses²⁸. The next largest sub-sector is in the Repair of fabricated metal products, machinery, and equipment, which has an 8% share of businesses in the sector. The relatively more equitable share of employment among the sub-sectors in figure 12 suggests that there are fewer companies employing proportionally

²⁸ Because of the size of the sub-sector it has not been included in the chart as it distorts the rest of the information. Three other sub-sectors have been excluded (the Manufacture of magnetic media, the Manufacture of batteries, and the Manufacture of domestic appliances) because their share was 0%

more people in sub-sectors that are not Engineering activities and technical consultancy, which is made up of sole traders and smaller companies.

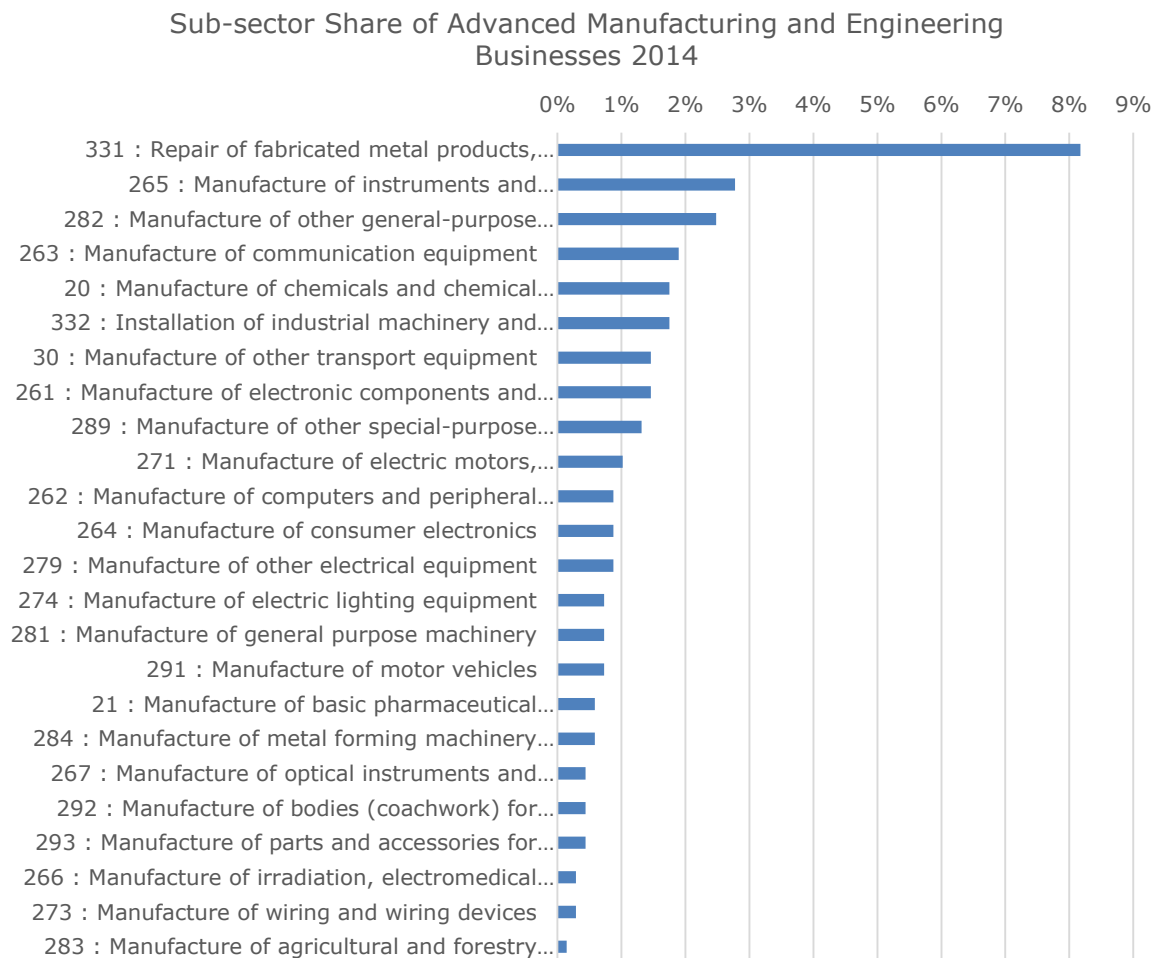


Figure 12 – Source: ONS Business Counts 2014

80. Below a sub-sector scorecard has been produced to visualise performance across the three variables of the size of business stock in 2014, growth in business stock from 2010 to 2014, and location quotient (LQ) in 2014. Using this method absolute (size) and relative (Growth, LQ) strengths can be analysed as a whole. The scorecard ranks each sub-sector by each variable, splitting the ranks into top, middle, and lower thirds.

Sub-Sector Scorecard - Businesses			
Sub-Sectors:	Size	Growth	LQ
20: Manufacture of chemicals and chemical products	Green	Yellow	Red
21: Manufacture of basic pharmaceutical products and pharmaceutical preparations	Red	Yellow	Yellow
261: Manufacture of electronic components and boards	Yellow	Yellow	Green
262: Manufacture of computers and peripheral equipment	Yellow	Red	Yellow
263: Manufacture of communication equipment	Green	Red	Green
264: Manufacture of consumer electronics	Yellow	Yellow	Green
265: Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	Green	Yellow	Yellow
266: Manufacture of irradiation, electro-medical and electrotherapeutic equipment	Red	Yellow	Green
267: Manufacture of optical instruments and photographic equipment	Red	Green	Green
271: Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	Yellow	Yellow	Yellow
273: Manufacture of wiring and wiring devices	Red	Yellow	Red
274: Manufacture of electric lighting equipment	Yellow	Red	Yellow
279: Manufacture of other electrical equipment	Yellow	Green	Green
281: Manufacture of general purpose machinery	Red	Red	Red
282: Manufacture of other general-purpose machinery	Green	Red	Red
283: Manufacture of agricultural and forestry machinery	Red	Yellow	Red
284: Manufacture of metal forming machinery and machine tools	Red	Red	Red
289: Manufacture of other special-purpose machinery	Yellow	Red	Yellow
291: Manufacture of motor vehicles	Yellow	Green	Green
292: Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semitrailers	Red	Red	Yellow
293: Manufacture of parts and accessories for motor vehicles	Red	Red	Red
30: Manufacture of other transport equipment	Yellow	Yellow	Red
331: Repair of fabricated metal products, machinery and equipment	Green	Green	Red
332: Installation of industrial machinery and equipment	Green	Green	Yellow
7112: Engineering activities and related technical consultancy	Green	Green	Yellow

Table 3 – Source: ONS Business Counts 2014/Coast to Capital 2015

81. No sub-sector has had strong performance across all three variables and it should be noted that the framework does not take into account the vast difference in size between the engineering activities and technical consultancy sub-sector and other in the top third for size. Sub-sectors that have potential to become local strengths are:
- 263: Manufacture of communication equipment
 - 279: Manufacture of other electrical equipment
 - 291: Manufacture of motor vehicles
 - 332: Installation of industrial machinery and equipment
 - 7112: Engineering activities and related technical consultancy
82. There are roughly the same number of sub-sectors with strengths across employment and businesses but only two sub-sectors appear in both, they are Engineering activities and technical consultancy, and the Manufacture of motor vehicles.

83. To look at sub-sector businesses in the Area Partnerships a different data source is needed as the number of businesses in sub-sectors at more specific levels of geography become smaller and are hidden by rounding methods that the ONS use. The sub-sector strengths here are based on the Experian Market IQ database.
84. Looking at the Area Partnerships relative strengths in comparison to the Coast to Capital region as a whole identifies:
- The **London Borough of Croydon** has sub-sector strengths in the Manufacture of consumer electronics, the Manufacture of batteries and accumulators, of Electrical lighting equipment, of Domestic appliances, and of Metal forming machinery and machine tools.
 - **Brighton & Hove and Lewes** is found to have sub-sector strengths in the Manufacture of optical instruments and photographic equipment, of Batteries and accumulators, of Electric lighting equipment, of General purpose machinery, and of Metal forming machinery and machine tools.
 - The **Gatwick Diamond** has strengths in the Manufacture of wiring and wiring devices, of Domestic appliances, of other Electrical equipment, of other General purpose machinery, of Parts and accessories for motor vehicles, and the Installation of machinery and equipment.
 - **Rural West Sussex** has sub-sector strengths in the Manufacture of electronic components and boards, Instruments and appliances for measuring, testing and navigations, of Irradiation, electro-medical and electrotherapeutic equipment, of Agricultural and forestry machinery, and the Installation of machinery and equipment.
 - **Coastal West Sussex** has strengths in the Manufacture of computers and peripheral equipment, of Irradiation, electro-medical and electrotherapeutic equipment, of Batteries and accumulators, of Agricultural and forestry machinery, and of Bodies for motor vehicles, trailers, and semi-trailers.

LABOUR MARKET CHARACTERISTICS

85. The Advanced Manufacturing and Engineering sector has a higher than average level of highly qualified employees, 44% hold a level 4+ qualification compared to 41% in the wider economy and 31% in Manufacturing as a whole²⁹. Similarly employees that hold no qualifications make up 5% of the total, the same as in the wider economy, which is lower than the 8% of the Manufacturing sector as a whole.

²⁹ UK Commission for Employment and Skills – Skills and performance challenges in the advanced manufacturing sector - 2015

86. The Science, Engineering, Manufacturing and Technologies Alliance's (Semta) analysis of their footprint in the Advanced Manufacturing and Engineering sector suggests that 40% of workers have a qualifications of NVQ level 4+, with some sub-sectors such as R&D (79%), Consulting, Testing and Analysis (66%), Aerospace (48%), and Electronics (47%) having greater levels of higher qualifications³⁰.
87. The supply of skills in the industry is strong, there are many vocational qualifications in the industry at levels 2, 3, and 4, and along with higher education are the main pathways into the sector. There is also a well-developed private training market which is supported by a number of professional bodies that set the industry standards and encourage continuous training and development.
88. The number of people achieving qualifications in engineering or manufacturing apprenticeships has been steady between 2008/2009 and 2012/2013 in the Coast to Capital region, whereas apprenticeship achievements as whole have been increasing. This may be a reflection of the fact that the level of employment is decreasing in the sector and as such there is no demand for an increase in apprentices; the demand is being met by current output. There is evidence to suggest that those businesses that offer three to four year apprenticeships have a strong supply of applicants, suggesting any constraint on increase supply is not due to a lack of applicants, but because there are not enough opportunities being offered.
89. There is also evidence of increasing graduates in STEM³¹ subjects, there were 3,300 STEM graduates in 2012/2013, which has risen by 16% from 2011/2012³². In 2012/2013 the number of STEM graduates from Universities in the Coast to Capital region who went on to find work in the Coast to Capital region was 51.6%, higher than the rate for graduates as a whole. They are also slightly more likely to be in graduate level employment; 59% of STEM graduates were in a graduate level job six months after graduation compared to 54% of total graduates.

Bowers & Wilkins Group

Turnover: £123m

Profile: founded in Worthing in 1966 this company designs and manufactures high quality speakers that are sold around the world. It has recently designed a stereo system for the new Volvo XC90 and employs an estimated 600 people.

³⁰ Summary analysis of Semta's footprint – October 2014

³¹ Higher Education in Science, Technology, Engineering and Mathematics (STEM) subjects - Science and Technology Committee – House of Lords:

<http://www.publications.parliament.uk/pa/ld201213/ldselect/ldsctech/37/3705.htm>

³² Skills Funding Agency Apprenticeship Data Cube 2014

90. Employees in the Manufacturing sector are slightly less likely to be over skilled for their job, around 43% compared to 49% of all sectors, but this still represents a large body of workers who are a potential untapped source of skills and knowledge that are not being properly utilised. There also appears to be less indication of high performance working practices; the four indicators are identification of high potential individuals, variety of employees work, task discretion, and access to flexible working. It would be expected that good management of the workforce through improving and effective utilisation of skills and ways of working would feed into and strengthen a high value product market strategy³³.
91. The highly skilled Advanced Manufacturing workforce is reflected in the wages levels of the sector, which are 13% higher than the more general Manufacturing sector, and have grown by 11% since 2008 in a deviation from the trend in the wider economy. However, the Advanced Manufacturing sector has the third highest gender pay gap (27%) behind only Financial and insurance activities (37%) and Energy (32%). This reflects somewhat the low numbers of females in the sector and their higher rates of part-time employment.
92. The technology used in Advanced Manufacturing and Engineering changes quickly and the skills required to make use of these technical developments are specialised, making it hard for companies to find workers with those skills and for the supply of those skills to keep pace. Much of the required skills are based on numeracy, which is required across all industries. Increasing the supply may not be able to adequately meet the demand of the Advanced Manufacturing and Engineering sector as expected considering the demand from elsewhere.
93. Employers in the Advanced Manufacturing sector are almost twice as likely to have a hard to fill vacancy as the economy as a whole, 9% compared to 5%. As a percentage of total vacancies the hard to fill vacancies make up 39% in the Advanced Manufacturing sector, 10% higher than the economy as a whole. Skills shortage vacancies are reported in 8% of employers in the Advanced Manufacturing sector compared to 4% in the economy as a whole. Skills shortage vacancies make up almost all of the hard to fill vacancies, accounting for 92% compared to 77% in the wider economy. The main reason for these vacancies is a lack of technical and job specific skills, 80% of Advanced Manufacturing employers with skills shortage vacancies report this reason compared to 63% in the economy as a whole.

Elekta

Turnover: £430m

Profile: A Swedish company founded in 1972 to make medical technologies that provide radiotherapy, radiosurgery, neurosurgery and related equipment. They have an office in Crawley and they employ 750 people in the UK.

³³ UK Commission for Employment and Skills – Sector Skills Insights: Advanced Manufacturing – 2012

94. There appears to be higher levels of skills deficiencies in the Manufacturing sector compared to the overall economy. 19% of Advanced Manufacturing companies reported having at least one employee with a skills gap, slightly higher than Manufacturing as a whole (18%) and the economy as a whole (15%)³⁴. The average number of employees within the sector with a skills gap is much higher, 10.3 employees per company on average have a skills gap. This compares with 7.7 employees in Manufacturing as a whole and 5.3 employees in the whole economy. The main reason for these skills gaps are that an employee's training is not yet complete or they are new to the role, both of which are higher than the economy as a whole. The main skills that employees are missing are technical and job related skills, 75% of Advanced Manufacturing employers responded that these skills are missing, compared to 60% in the wider economy.

Edwards Vacuums Limited

Turnover: £66.6m

Profile: With its global headquarters in Manor Royal, Crawley, and employing 4,200 people worldwide, Edwards Vacuums design and manufacture high quality vacuums and pumps and operates in over 30 countries.

95. Further evidence of skills mismatches is that on average the level of wages in Manufacturing are higher than the overall economy, this is even higher in the sub-sectors that are considered to fall within Advanced Manufacturing and Engineering. Wage levels also appear to increase with higher levels of qualifications, this is generally true for all industries but the effect appears to be stronger in manufacturing.

96. Despite the higher wages of well qualified workers the employer also gains a benefit from employees who have qualifications. UKCES³⁵ calculated that the Net Present Value of an apprenticeship at any level was highest in Construction and Engineering, and a paper by BIS³⁶ found that for engineering level 3 apprenticeships the time taken to recoup the cost is shorter than most other industries and that employers report added value to the organisation through improved labour retention and the in-flow and transferability of new skills. Graduates who started higher education in 1999 were more likely to be employed in a job requiring a degree, have relatively higher wages compared to the average, and be involved in high performance working practices³⁷.

97. There is evidence that Advanced Manufacturing companies are more likely to train employees in response to skills gaps. 73% of Advanced Manufacturing companies have increased training activity to address skills gaps, this is compared to 68% in both the wider Manufacturing sector and the economy as a whole³⁸. However, the

³⁴ UK Commission for Employment and Skills – Skills and performance challenges in the advanced manufacturing sector - 2015

³⁵ UK Commission for Employment and Skills: The Economic Value of Intermediate Education and Vocational Qualifications 2009

³⁶ Department for Business, Innovation, and Skills Research Paper: Employer Investment in Apprenticeships and Workplace Learning 2012

³⁷ Purcell et al. Class of '99, study of the early labour market experience of recent graduates 2005

³⁸ UK Commission for Employment and Skills – Skills and performance challenges in the advanced manufacturing sector - 2015

amount of training appears to be lower than the wider economy, the average number of days spent training per trainee is 4.8 days in the Advanced Manufacturing sector, whereas in the whole economy it is 6.7. Research by McKinsey suggests that better management can result in more sales per employee, sales growth, market share growth, and increase in capital market valuation³⁹.

98. UK Manufacturing companies do appear to train more than EU Manufacturing companies, 88% of companies had provided training compared to 54% in the EU. Employers in Manufacturing are also less likely to have annual reviews on employees, less likely to have employees training towards a qualification of any kind, and less likely to offer any sort of training. Many employers see training leading to increased wage demands or to poaching of talent by rivals⁴⁰.

³⁹ UK Commission's Employers Skills Survey 2011

⁴⁰ Ibid

ANNEX

LOCAL SUPPORT ORGANISATIONS

University of Brighton

- The Sir Harry Ricardo Laboratories are one of the largest UK research teams dedicated to internal combustion engines, the development of laser-based measurement techniques, fundamental modelling and computational simulation. It is regarded as one of the foremost centres for automotive engine research in Europe. The group's international esteem is demonstrated by its breadth of collaboration with over 40 academic institutions and industrial partners across the world.
- This research is set to be expanded when the Advanced Engineering Centre opens on the university's Moulscombe campus. It will generate 30-35 additional research posts, 15 academic/technical engineering posts, 60 engineering graduates per year, and 3,600sqm employment space that will be made available to local companies that will have access to state of the art Manufacturing facilities and expertise as well as training and support.
- In addition there will be a Central Research Laboratory in the re-developed Preston Barracks in Brighton that will focus on supporting new hi-tech and design-led Manufacturing start-up companies and entrepreneurs.
- The Vetronics Research Centre (VRC) is the only Academic Centre of Excellence in the UK conducting research and training in the subject area of Vetronics (Vehicle Electronics), sponsored by the UK Ministry of Defence (MOD) and supported by Defence Science Technology Laboratory and Defence Equipment and Support.
- Started in 2004, the VRC has acquired funding primarily to conduct innovative research in the field of Vetronics for Land Systems on behalf of the UK (MOD). Its purpose is to research future technologies and methodologies and disseminate the information to the government, academic, and defence industry in the UK.
- The VRC has also conducted research in the field of Avionics and Commercial Automotive, and has helped defence industry companies to develop demonstrators and test beds for future military vehicle designs, offering expertise in the latest Vetronics technologies.
- The School of Pharmacy and Biomedical Science works alongside the Brighton and Sussex Medical School developing regenerative medicine treatments, with recent success in achieving a £200K research grant. It has specific expertise in disease processes, biomedical materials and nanoscience/nanotechnology.
- The Brighton and Sussex Medical School is a collaborative venture between the University of Brighton and the University of Sussex which supports a range of research, including the development of advanced biomaterials for use in

regenerative medicine, and is involved in the production of innovative treatments and furthering pharmacological understanding of drug interactions.

- The Green Growth Platform is also part of the University of Brighton. They provide support to businesses in the low carbon and environmental technology sectors across Sussex. They offer package of business support, events, innovation and training delivered by a team of industry experts, business advisors and leading academics.

University of Sussex

- The Dynamics, Control and Vehicle Research Group is internationally known for its work in automotive research in dynamics and control, along with work on vehicle efficiency through drag reduction, weight minimisation, and improved energy conversion.
- The Sensor Technology Research Centre is a world leading centre focusing on electric and magnetic sensor technologies and their applications. Activities include the fundamentals of sensor operation, mobile communications and networks, modelling of measurement scenarios and application specific projects.
- The Thermo-fluid Mechanics Research Centre is a dedicated research laboratory specialising in both fundamental and applied research in thermofluids. Our expertise in the areas of aerodynamics and heat transfer is generally applied to research in gas turbine technology. There is a particular emphasis on gas turbine internal air systems, gas-path aerodynamics & component heat transfer and modelling of flow and combustion.
- The university also actively researches in the areas of informatics and data systems, management of data systems and biomedical diagnostics, development of video analytic software and robotics. SPRU – the Science Policy Research Unit examines issues raised by scientific and technological change. They pursue ways to achieve excellence, efficiency and competitiveness in the use of science and technology by firms engaged in knowledge exchange and innovation management; by industries and regional authorities seeking to understand technological trajectories and the clustering of companies; and governments seeking to nurture competences and capabilities.
- **Marine South East** – is a local support organisation that aims to support the strategic growth of the marine sector through consultancy projects, collaborations, European partnerships and strategic projects. They offer support on issues such as; Offshore and Marine Energy; Maritime Resource Efficiency; Ports and Marine Operations; Skills and Workforce Development; Maritime Cluster Collaborations; Marine Business Collaborations.
- **The Big Bang Fair South East** – is an annual fair that is aimed at school children as a way of encouraging them into engineering and science careers.

7,000 students from across the region attend and visit interactive displays and workshops run by local and international science and engineering companies.

- **STEMfest** – is linked to the Big Bang Fair and similarly aims to inspire young people to take up careers in STEM roles. It offers a series of interactive shows, workshops and demonstrations that take place in schools and colleges, in STEM Clubs and at a major public events. There are STEMfests in Crawley, and along the Coast.
- **University Technical College Newhaven** – is a new education provider with a focus on marine and environmental engineering for 14-18 year olds. Education will focus on STEM and computing subjects at GCSE and A-level.
- **Chambers of Commerce and Sussex Manufacturing Forum** – the Sussex Surrey, Brighton and Hove, and Croydon Chambers of Commerce provide local businesses with advice and support and networking events. The Sussex Manufacturing Forum runs quarterly for local businesses to attend events and network with other local businesses.
- **Business Navigators** – the Business Navigator Growth Hub is a free sign posting service that helps businesses in the Coast to Capital region identify the type of support they require and where to find it. It is open to any type of business in the region.

NATIONAL SUPPORT ORGANISATIONS

- **The High Value Manufacturing Catapult (HVM)** - is the catalyst for the future growth and success of Manufacturing in the UK. It is a strategic initiative that aims to revitalise the Manufacturing industry. The Catapult provides UK business with a gateway to access the best Manufacturing talent and facilities in the country. It is also a two-way communication channel to the heart of government and a valuable conduit for funding from both the public and private sectors for projects and initiatives with due merit.
- **The Advanced Manufacturing Research Centre** - with Boeing is dedicated to working with Manufacturing businesses, from global aerospace giants to local SMEs. Businesses can work with us on a one-off project, or join us as a member for long-term collaboration. Backed by the Technology Strategy Board the centre can tap into a national network of Manufacturing research excellence – if a particular technology falls outside their areas of expertise, they can call on Catapult partners for the support a business needs.
- **The Advanced Forming Research Centre** - is part of the UK High Value Manufacturing Catapult. It assembles key elements of Manufacturing R&D into a framework which supports the delivery of strategy. The foundation of AFRC is our ability to provide Manufacturing R&D services in a robust and standardised manner.
- **The Centre for Process Innovation** - is a UK-based technology innovation centre and part of the High Value Manufacturing Catapult. They use applied knowledge in science and engineering combined with state of the art facilities

to enable our clients to develop, prove, prototype and scale up the next generation of products and processes.

- **The Manufacturing Technology Centre** - focuses on providing Manufacturing system solutions in an agile environment in partnership with industry, academia and other institutions. The facility provides an environment for the development and demonstration of new technologies on an industrial scale offering flexibility to their members and their research partners.
- **The National Composites Centre** - will bring together dynamic companies and enterprising academics to develop new technologies for the design and rapid manufacture of high-quality composite products. The combination of academic and business strengths will speed progress from laboratory to design to factory and into products. Its key objectives are:
 - Provide Manufacturing facilities at an industrial scale and rapid Manufacturing processes capable of building prototypes to validate design concepts
 - Be the hub of the UK's effort to develop and implement rapid composite Manufacturing technologies and systems.
 - Lead the co-ordination of a strengthened network of regional centres of composites excellence
 - Provide direction and focus for fundamental research and collaborative links with UK universities
 - Help to develop and co-ordinate training to support the skills base necessary for applying advanced and specialist composite technologies
- **Semta** – The Science, Engineering, Manufacturing and Technologies Alliance - is a not-for-profit organisation responsible for engineering skills for the future of the UK's most advanced sectors. Led by employers, their job is to transform the skills and productivity of the people in the engineering and advanced Manufacturing technologies sectors.
- **Innovate UK** – is part of the Department for Business, Innovation, and Skills, and is aimed at providing funding and support for businesses engaged in innovative activity such as; carrying out a feasibility studies; creating a new product or service, through research and development; work with other businesses or research organisations on collaborative projects. It has some focus on specific industries that link to the Advanced Manufacturing and Engineering sector; Emerging and Enabling Technologies; Energy; High Value Manufacturing; Resource Efficiency; Transport.
- **UKTI** – provides tailored support and advice packages to all type of businesses who are interested in exporting their products and growing their business overseas.
- **The Enterprise Europe Network** – helps small and medium sized businesses in all industries exploit business opportunities in the European Union and

further afield. Member organisations providing support include including chambers of commerce and industry, technology centres, universities and development agencies.

- **Patent Box and R&D Tax Credits** – are two schemes aimed at incentivising innovative activity. The Patent Box enables companies to apply a lower rate of Corporation Tax to profits earned from its patented inventions. R&D tax credits provide relief on corporation tax on qualifying research and development costs.
- **Engineering UK** – works in partnership with the engineering sector to improve the perception of the sector within society, and particularly young people, and to build career programmes around engineering. They run the Big Bang event that attracts almost 70,000 students to experience the types of activities are available in the engineering sector.

LOCATION QUOTIENTS

99. Location quotient is a method of measuring the relative concentration of an industry in one location compared to another. A LQ score of over 1.0 suggests there are sector strengths in that region. For example the Coast to Capital LQ would be compared to the national concentrations and an Area Partnership LQ would be compared to the Coast to Capital concentration.

100. For this paper the Coast to Capital regional level formula looks like this:

$$\frac{(\text{Coast to Capital Total Employees} / \text{Coast to Capital AME Employees})}{(\text{UK Total Employees} / \text{UK AME Employees})} = LQ$$