

Analysis of Engineering and Manufacturing Skills in the South East Midlands

January 2020



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Introduction

The [SEMLEP Local Industrial Strategy](#) highlights the importance of engineering and manufacturing and its need for continued investment and states that “The remarkable innovation, assets and expertise in the area – across engineering design, technical testing, motorsport, aerospace, advanced engineering, digital technologies, autonomous vehicles, robotics, additive manufacturing, electronics, agri-tech and food and drink – should be allowed to flourish, generating important multiplier effects for the rest of the local and wider economy.”

In addition, the ambition within the Oxford-Cambridge Arc is “To put employers at the heart of innovative skills provision”.

SEMLEP and its partners holds the desire to become a centre for excellence through “focus on the development of digital and STEM skills, including working with government and local partners to develop ambitions for the UK’s first STEM skills-focused university in Milton Keynes. This project will complement the new Institute of Technology at Bletchley, supported by up to £28m from the Department for Education, who will work closely with Milton Keynes College to deliver the project”.

For this to be achieved we will require a sustainable talent pipeline and people with the skills required by employers.

This report has been compiled using data analysis, surveys and with contributions from employers and aims to act as a prompt for wider discussion to define both current and short/medium-term engineering and manufacturing skills needs.

This report is to help inform stakeholders for training provision, investment and promote the development of partnerships in the South East Midlands and across the Oxford-Cambridge Arc.

Paul Thompson
Employer and Skills Manager
South East Midlands Local Enterprise Partnership

Executive Summary

The Demand for Occupations within Engineering and Manufacturing

- From the 2019 SEMLEP Business Survey employers find it hard to recruit:
 - Plant and Machine Operatives
 - Science, Engineering and Production Technicians
 - Design Occupations
 - Production Managers and Directors
 - Electrical and Electronic Trades
 - Metal Forming, Welding and Related Trades
 - Metal Machining, Fitting and Instrument Making
- From Labour Insight the highest number of job postings were for:
 - Maintenance Technician
 - Production Worker
 - Mechanical Engineer
 - Utilities Technician
 - Electrical Engineer
 - Quality Inspector / Technician
 - Manufacturing Machine Operator
 - Validation Engineer
 - CNC Operator
 - Industrial Engineer
 - Production Supervisor
 - Welder/Solderer
 - Product Development Engineer
 - Production Plant Manager
 - Engineering Manager
 - CAD Designer / Draughtsperson/Draughtsman
 - Test Technician
- The occupations that are growing in demand are:
 - Maintenance Technician
 - Production Worker
 - Electrical Engineer
 - Quality Inspector / Technician
 - Manufacturing Machine Operator
 - CNC Operator
 - Industrial Engineer
 - Production Supervisor
 - Welder/Solderer
 - CAD Designer / Draughtsperson/Draughtsman
 - Test Technician

The Demand for Skills

- From the 2019 SEMLEP Business Survey, employers find the following skills difficult to obtain:
 - Technical and practical skills
 - Job specific skills
 - Communication
 - General employability skills (core competencies, attitudes, behaviours)
 - Digital skills
 - Sales and marketing skills
- From the 2019 SEMLEP Business Survey, employers identify gaps in the existing workforce as:
 - Digital skills
 - Technical and Practical skills
 - Job specific skills
 - Sales and marketing skills
 - Managerial skills
- Labour Insight shows that the top core competences required are:
 - Communication Skills
 - Problem Solving
 - Teamwork / Collaboration
 - Detail-Orientated
 - Planning
 - Organisational Skills
 - Microsoft Excel
 - Leadership
 - Digital Literacy
 - Microsoft Office
- The top technical and vocational skills required are:
 - Mechanical Engineering
 - Computer Numerical Control (CNC)
 - Welding
 - Quality Assurance and Control
 - Customer Service
 - AutoCAD
 - Engineering Drawings
 - Packaging
 - Commissioning
 - Predictive / Preventative Maintenance
 - Mechanical Design
- The top digital skills required are:
 - AutoCAD
 - Microsoft Excel
 - Microsoft Office
 - SolidWorks
 - Microsoft Word
 - Computer Aided Draughting/Design
 - Enterprise Resource Planning (ERP)
 - SAP
 - Microsoft Powerpoint
 - CATIA
- Barriers to training are cited as lack of appropriate training or courses existing staff not seeking up-skilling, insufficient budget to provide training courses, staff not judged capable of progression and employers not being prepared/able to release staff during work hours
- In-house training and development, outsourcing training and development and working with independent training providers are preferred methods of training
- There are low rates of engagement with schools, colleges and universities (less than 3% of businesses)

Qualifications and Certification

- The job postings indicate a preference by employers for Level 6 (degree) and level 4 qualifications, with level 2 being requested primarily for maths and English.
- Mechanical engineers, electrical engineers, CAD designer / draughtsperson / draughtsman, production supervisors and plant managers are usually expected to have some previous experience of work.
- Current education provision is predominately in higher education (levels 5-7 54%), and further education (levels 0-4 31%), apprenticeships (15%) making up the remainder.
- From consultation with employers the traditional route to engineering degrees is still through the academic pathway via A-Levels.
- The qualification demands from employers would appear to have a similar profile to that of the learner pipeline except for:
 - Higher demand for level 2 – there is a need for GCSEs in English and Maths and an entry point for Advanced Apprenticeships
 - Higher demand for level 4, 20% of employers compared with 3% in the pipeline
 - Slightly lower demand for levels 5/6/7, 39% of employers versus 54% in the pipeline
- Comparisons with the overall learner/job postings rate would appear to indicate insufficient numbers of learners at levels 3, 4, 6 and an insufficient talent pipeline from secondary education.
- Little certification is specified in job postings, with 96% of job postings not requesting certification of any type.

Businesses

- The numbers of engineering and manufacturing businesses have grown from 4430 units in 2015 to 4645 in 2018, this has reduced slightly in 2019 to 4625.
- Local business unit numbers have grown in fabrication, utilities, food and drink manufacture, the manufacture of vehicle/transport, wood manufacture, manufacture of paper and basic metals.
- Business sizes are predominately Micro (0-9 employees) at 80% and this size of business has provided most of the growth in numbers. There has been a reduction in the number of small (10-49 employees) and large (250+) businesses.
- Manufacturing is a sector identified as having jobs most influenced by AI and automation, with an estimation of potentially 46% of jobs being impacted (approximately 43,000 in the SEMLEP area).
- From the regional employment figures and consultation with employers, the initial impact on occupations is on:
 - Food and drink process operatives
 - Packers, bottlers, canners and fillers
 - Laboratory technicians
 - Assemblers and routine operatives

- Skilled metal, electrical and electronic trades supervisors
- Occupations with salary averages within the SEMLEP area considerably lower than the national averages are:
 - Production managers and directors in manufacturing
 - Mechanical engineers
 - Biological scientists and biochemists
 - Research and development managers
 - Production and process engineers
 - Science, engineering & production technicians, not classified
 - Electrical engineers

Location

- The business locations are in Central Bedfordshire (16%), Milton Keynes (13%), Aylesbury Vale (11%), Northampton (10%), Luton (8%), Bedford (8%) and Daventry (7%). All others are distributed evenly across the other areas.
- The largest growth has been in Milton Keynes and Aylesbury Vale
- There has also been growth in Daventry, Corby, Bedford, Central Bedfordshire and Kettering
- Northampton and Wellingborough have seen a reduction in local business units

Recruitment Trends

- Most engineering and manufacturing skill related job postings within the SEMLEP area are based in:

• Milton Keynes	23%
• Northampton	16%
• North Northamptonshire	15% (Kettering, Corby, Wellingborough, Rushden)
• Luton	13%
• Bedford	11%
• Central Bedfordshire	9%
• Aylesbury Vale	7%
- Job postings for engineering and manufacturing related occupations have declined in the last 4 years at a slower rate than the overall vacancy demand. The proportion of the overall job postings has increased from 9% to 10% of the total.

Conclusions

- There is an insufficient number of young people considering engineering and manufacturing as career option
- There is insufficient relevant education provision at level 4
- The development of technical and practical skills needs to be addressed both through vocational and academic pathways
- Core competencies, attitudes and behaviours need to be developed and applied pre 16
- Relevant digital skills need to be developed and applied pre 16
- Engineering and manufacturing employer engagement with educators needs to increase
- Business skills in marketing, sales and management need to be developed through programmes/courses that are easily visible and accessible
- Businesses need to adopt all pathways for recruitment including apprenticeships and T-Levels
- Businesses need to challenge themselves over diversity within engineering and manufacturing

Actions

As part of the delivery of the SEMLEP Local Industrial Strategy and the wider Oxford-Cambridge Arc activity, we aim to stimulate and inform actions to develop a talent Pipeline;

Pre 16 Education through Careers and Enterprise Company Activity

- Prescribe and/or encourage the development of relevant, inspirational activity for use in schools, both primary and secondary phases of education, to inspire a talent pipeline into STEM occupations for young people and parents/carers
- Work with the STEM Ambassadors to ensure common messaging about the labour market, employer needs and opportunities within the area
- Promote employer engagement with partners through #GrowingTalent and Give an Hour, a single focal point for all activity
- Seek the applied use of technology within schools aimed at developing and applying core competencies, digital and STEM skills more akin to a working environment through CPD of teachers
- Encourage and promote all pathways into engineering and manufacturing
- Apply focus on increasing diversity of the talent pipeline in to engineering and manufacturing for gender, ethnicity and disability

Further and Higher Education Partners

- Promote the development of closer working relationships between engineering and manufacturing businesses, further and higher education establishments
- Support education stakeholders with increasing understanding of engineering, manufacturing and digital needs for current and future technologies to ensure provision exists at the right levels and is accessible to employers and individuals
- Promote new facilities and pathways in local further education establishments to businesses
- Provide support for future institutions such as MK:U and the Institute of Technology at Bletchley Park with strong links to businesses
- Promote increased provision and access to support for the development of sales, marketing and managerial skills
- Seek support for technical and practical skill conversion courses for people from academic pathways coming into apprenticeships, further or higher education

Adult Education Budget Holders and Independent Training Providers

- Help inform adult learning budget holders in terms of pathways and employer requirements for core competencies, attitudes, behaviours, digital literacy, technical and practical skills, up-skilling and re-skilling for entry into engineering and manufacturing. This includes the promotion of lifelong learning.
- Support innovative methods of delivery and accessibility for the development of skills in individuals including the use of Ed-Tech

Businesses through the SEMLEP Growth Hub and Network Partners

- Promote reviews of recruitment pathways in SME;
 - Tackling unconscious bias regarding qualification levels, gender, ethnic background and disability
 - The use of apprenticeships, T-Levels and relationships with educators
- Encourage retention of the workforce in SME through investment in training, up-skilling and re-skilling
- Promotion of provision to support skills development and business growth

Engineering and Manufacturing Definition for this Report

For the purposes of this report we have focused on engineering and manufacturing occupations as opposed to sectors.

Most engineering and manufacturing occupations are in the high-performance technology and advanced manufacturing sectors however there is a significant number within logistics, health, retail, education and construction.

The construction sector was addressed in our report with the [CITB Construction skills gap analysis for the South East Midlands area, August 2018](#). Actions as a result of this report are ongoing through partners details for which are available through contacting SEMLEP at paul.thompson@semlep.com.

It is acknowledged that there will be overlaps in some sub sectors such metal fabrication, welding, electrical maintenance and installation, etc.

The DfE include “Transportation Operations and Maintenance” within “Engineering and Manufacturing Technologies”. This element does not form part of this analysis.

Some qualifications not deemed relevant included within “Manufacturing Technologies” have also been excluded from the analysis, for example “Cake Decoration” and “Wired Sugar Flowers”. These occupations make up a very small proportion of the total number, such that their exclusion does not influence the final conclusions.

SEMLEP - Business Survey 2019 Data

From the SEMLEP Business Survey in December 2019, over 1,600 businesses were asked to identify challenges and opportunities for skills.

In summary the responses to relevant questions regarding those that responded to having 'hard-to-fill vacancies' (18% of those surveyed) were:

Which specific occupations have you found it hard to fill?

- Plant and Machine Operatives – 11%
- Science, Engineering and Production Technicians – 11%
- Design Occupations – 5%
- Production Managers and Directors – 4%
- Electrical and Electronic Trades – 4%
- Metal Forming, Welding and Related Trades – 3%
- Metal Machining, Fitting and Instrument Making – 3%

Have you found any skills difficult to obtain when recruiting staff in the last 12 months?

- Technical and practical skills – 20%
- Job specific skills – 18%
- Communication – 8%
- General employability skills – 7%
- Digital skills – 6%
- Sales and marketing skills – 6%

Do you have gaps in your existing workforce?

- Digital skills – 5%
- Technical and Practical skills – 5%
- Job specific skills – 4%
- Sales and marketing skills – 4%
- Managerial skills – 4%

Why do you think there are skills gaps amongst your existing workforce?

- Lack of appropriate training or courses – 25%
- Existing staff not seeking up-skilling – 18%
- Insufficient budget to provide training courses – 12%
- Staff not judged not capable of progression – 7%
- Not prepared/able to release staff during work hours – 6%

Which digital skills have you found difficult to obtain?

- Digital marketing (including social media) – 31%
- Digital design – 19%
- Programming/coding – 16%
- Computer-Aided Design (CAD) – 15%
- Microsoft Office (Excel, Word, PowerPoint) – 11%
- Other – 30%

What actions have you taken to increase skills?

- Offering in-house training and development – 19%
- Outsourcing training and development/working with independent training providers – 10%
- Not doing anything – 6%
- Engaging with colleges – 3%
- Investing in apprenticeships – 3%
- Engaging with schools – 2%
- Engaging with universities – 1%
- No skills gaps – 66%

Summary:

- Engineering related technical and practical and job specific skills are difficult to obtain when recruiting as reflected in the vacancy occupation types being difficult to fill
- Up-skilling of digital, job specific, technical and practical and skills are identified as skills gaps for the existing workforce
- Sales, marketing and managerial skills within the existing workforce require focus
- Digital skills required relate to marketing, design, programming and digital literacy (Microsoft Office - Excel, Word, PowerPoint)
- Barriers to training are include lack of appropriate training or courses existing staff not seeking up-skilling, insufficient budget to provide training courses, staff not judged not capable of progression and employers not being prepared/able to release staff during work hours
- In-house training and development and outsourcing training and development/working with independent training providers are preferred methods of training
- There are low rates of engagement with schools, colleges and universities across all sectors.

SEMLEP Area Engineering and Manufacturing Occupations

Occupations Most in Demand

From Labour Insight Jobs (Burning Glass Technologies), engineering and manufacturing occupations in greatest demand for 1/8/18 to 31/7/19 from 36,000 job postings were:

Engineering and Manufacturing Occupation	Vacancies
Maintenance Technician	1703
Production Worker	1548
Mechanical Engineer	1538
Utilities Technician	1428
Electrical Engineer	1022
Quality Inspector / Technician	789
Manufacturing Machine Operator	721
Validation Engineer	700
CNC Operator	691
Industrial Engineer	687
Production Supervisor	669
Welder / Solderer	634
Product Development Engineer	589
Production Plant Manager	563
Engineering Manager	531
CAD Designer / Draughtsperson/Draughtsman	472
Test Technician	359

The table below shows that most of these occupations are growing in demand compared with employer demand data starting from 2015:

Growth	
Stable	
Reduction but significant need	

Engineering and Manufacturing Occupation	Growth
Production Worker	
CNC Operator	
Quality Inspector / Technician	
Maintenance Technician	
Test Technician	
Production Supervisor	
Manufacturing Machine Operator	
Industrial Engineer	

Welder / Solderer	
CAD Designer / Draughtsperson/Draughtsman	
Electrical Engineer	
Production Plant Manager	
Utilities Technician	
Mechanical Engineer	
Validation Engineer	
Engineering Manager	
Product Development Engineer	

The predominant sectors calling for these occupations are:

Engineering and Manufacturing Occupation	Predominant Sectors with Vacancies
Maintenance Technician	Logistics, Retail, Health, Education
Production Worker	Manufacture, Food Production
Mechanical Engineer	Design, Manufacture, Systems
Utilities Technician	Defence, Utilities, Air Conditioning, Manufacturing
Electrical Engineer	Manufacturing, IT, Design
Quality Inspector / Technician	Manufacturing, Retail, Utilities
Manufacturing Machine Operator	Manufacturing
Validation Engineer	Manufacture, Transport
CNC Operator	Manufacturing
Industrial Engineer	Design, Manufacture
Production Supervisor	Manufacturing
Welder / Solderer	Manufacturing, Construction
Product Development Engineer	Design, Manufacture
Production Plant Manager	Manufacturing
Engineering Manager	Manufacture, Food Retail
CAD Designer / Draughtsperson/Draughtsman	Design, Construction
Test Technician	Manufacture, Food Production

Engineering and Manufacturing Occupations and Skills

From Labour Insight Jobs (Burning Glass Technologies), details of the skill sets requested by employers for each occupation can be found in Appendix 1.

Skill demands by business area/focus.

Engineering

Skill Groups	Job Postings
Drafting and Engineering Design	2,566
Mechanical Engineering	1,648
Electrical and Computer Engineering	618
Engineering Management	486
Engineering Practices	479
Electronic Hardware	383
Process Engineering	322
Engineering Software	199
Civil and Architectural Engineering	190
Robotics	174
Automation Engineering	154
Circuitry	121
Simulation	104
Automotive Technologies	93
Industrial Engineering	72

Maintenance, Repair, and Installation

Skill Groups	Job Postings
Equipment Repair and Maintenance	1,851
Basic Electrical Systems	808
Electrical and Mechanical Labour	418
Hand Tools	385
HVAC	360
Vehicle Repair and Maintenance	307
Plumbing	243
Schematic Diagrams	148
Power Tools	118
Painting	98
Appliance Repair and Maintenance	55
Equipment Operation	46

Customer and Client Support

Basic Customer Service	1,064
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Manufacturing and Production

Skill Groups	Job Postings
Computer-Aided Manufacturing	1,222
Machine Tools	1,184
Welding	930
Manufacturing Standards	702
Manufacturing Processes	674
Product Development	466
Lean Manufacturing	440
Machinery	419
Brazing and Soldering	152
Product Inspection	125
Metal Fabrication	122

Overall the top 10 core competencies requested are:

Skill	Job Postings	Growth Nationally
Communication Skills	2,434	Growing
Problem Solving	1,231	Stable
Teamwork / Collaboration	1,173	Growing
Detail-Orientated	1,102	N/A
Planning	1,052	Stable
Organisational Skills	876	N/A
Microsoft Excel	663	Growing
Leadership	638	Stable
Digital Literacy	608	Stable
Microsoft Office	575	Stable

The top 10 technical and vocational skills requested are:

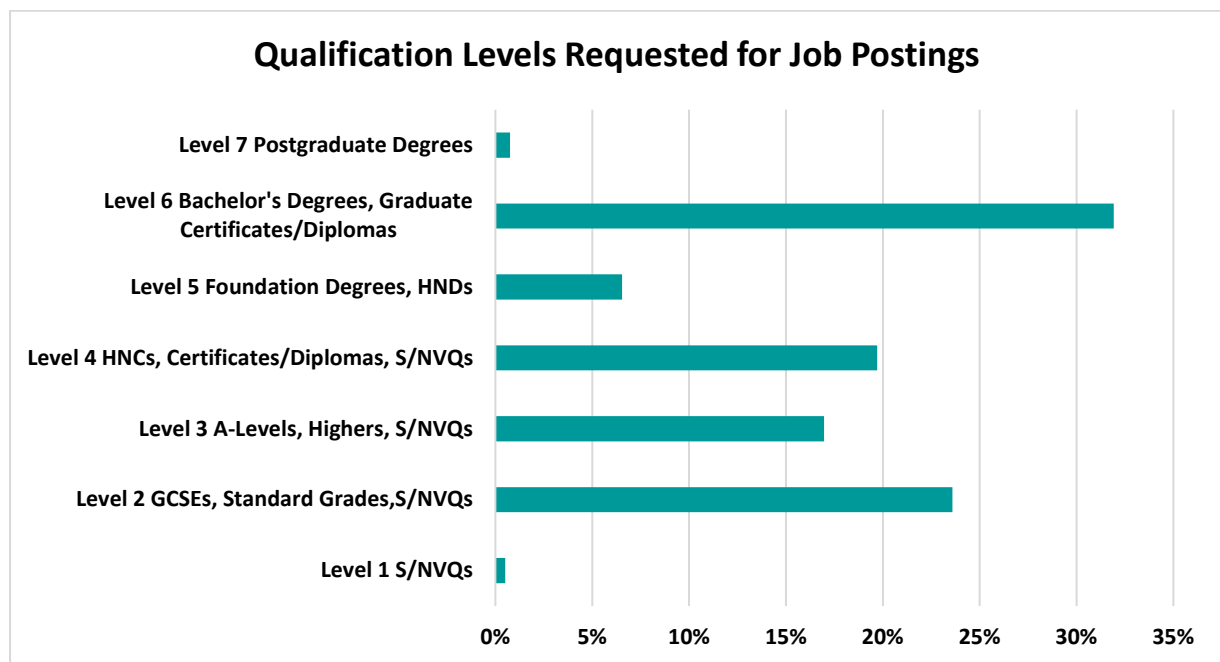
Skill	Job Postings	Growth Nationally
Mechanical Engineering	1,476	Stable
Computer Numerical Control (CNC)	1,017	Growing
Welding	910	Stable
Quality Assurance and Control	844	Growing
Customer Service	835	Growing
AutoCAD	799	Stable
Engineering Drawings	777	Growing
Packaging	762	Growing
Commissioning	756	Stable
Predictive / Preventative Maintenance	750	Growing
Mechanical Design	725	Stable

The top 10 digital skills requested are:

Skill	Job Postings	Growth Nationally
AutoCAD	799	Stable
Microsoft Excel	663	Growing
Microsoft Office	575	Stable
SolidWorks	454	Stable
Microsoft Word	228	Stable
Computer Aided Draughting/Design (CAD)	212	N/A
Enterprise Resource Planning (ERP)	190	Stable
SAP	185	Growing
Microsoft Powerpoint	161	Stable
CATIA	133	Growing

Engineering and Manufacturing Occupations and Qualifications

Demand for qualifications is broad from level 2 to level 6.

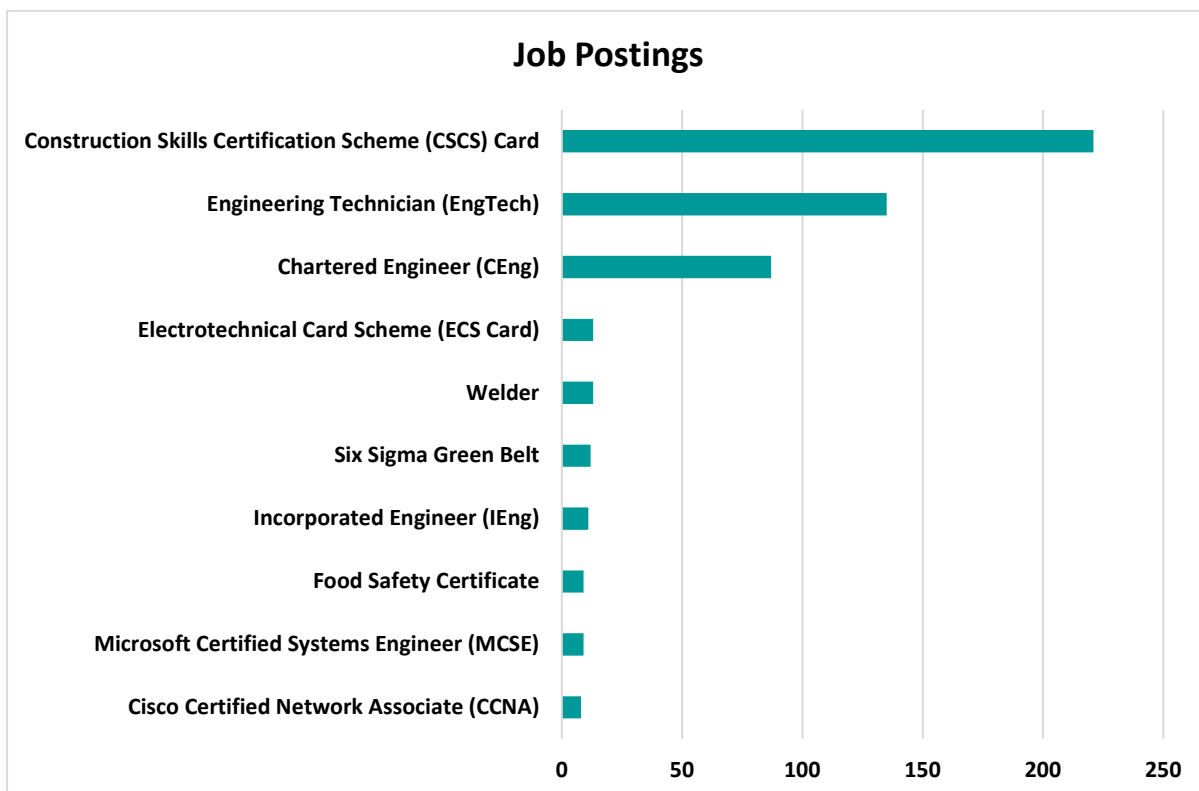


From 2016 to the end of September 2019, there has been a reduction at Level 2 and 5.

There is a significant demand for level 4 and level 6.

Education level	2016	2017	2018	Sept 2019 Last 12 Months
Level 1 S/NVQs	1%	1%	1%	1%
Level 2 GCSEs, Standard Grades, S/NVQs	34%	37%	32%	24%
Level 3 A-Levels, Highers, S/NVQs	5%	7%	6%	17%
Level 4 HNCs, Certificates/Diplomas, S/NVQs	22%	20%	24%	20%
Level 5 Foundation Degrees, HNDs	20%	18%	18%	7%
Level 6 Bachelor's Degrees, Graduate Certificates/Diplomas	18%	16%	20%	32%
Level 7 Postgraduate Degrees	1%	0%	1%	1%

Little certification is specified in job postings, with 96% of job postings not requesting certification of any type. The main certification is CSCS for use in construction.

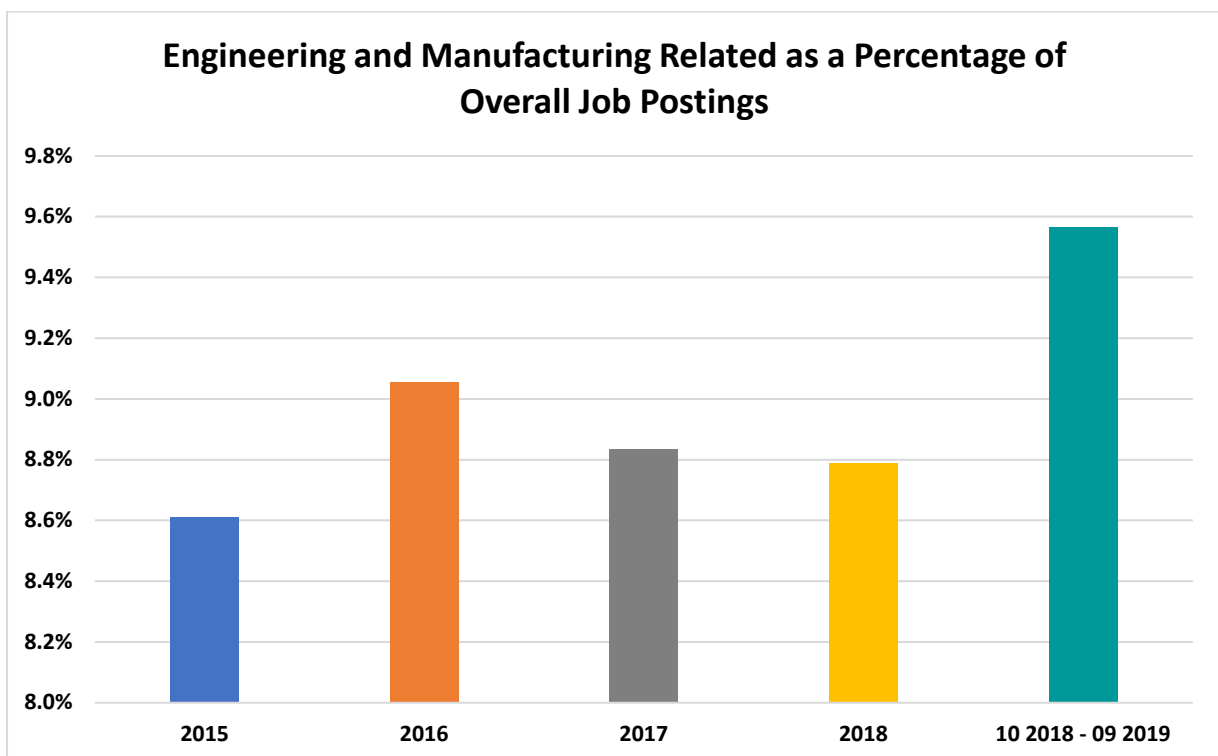
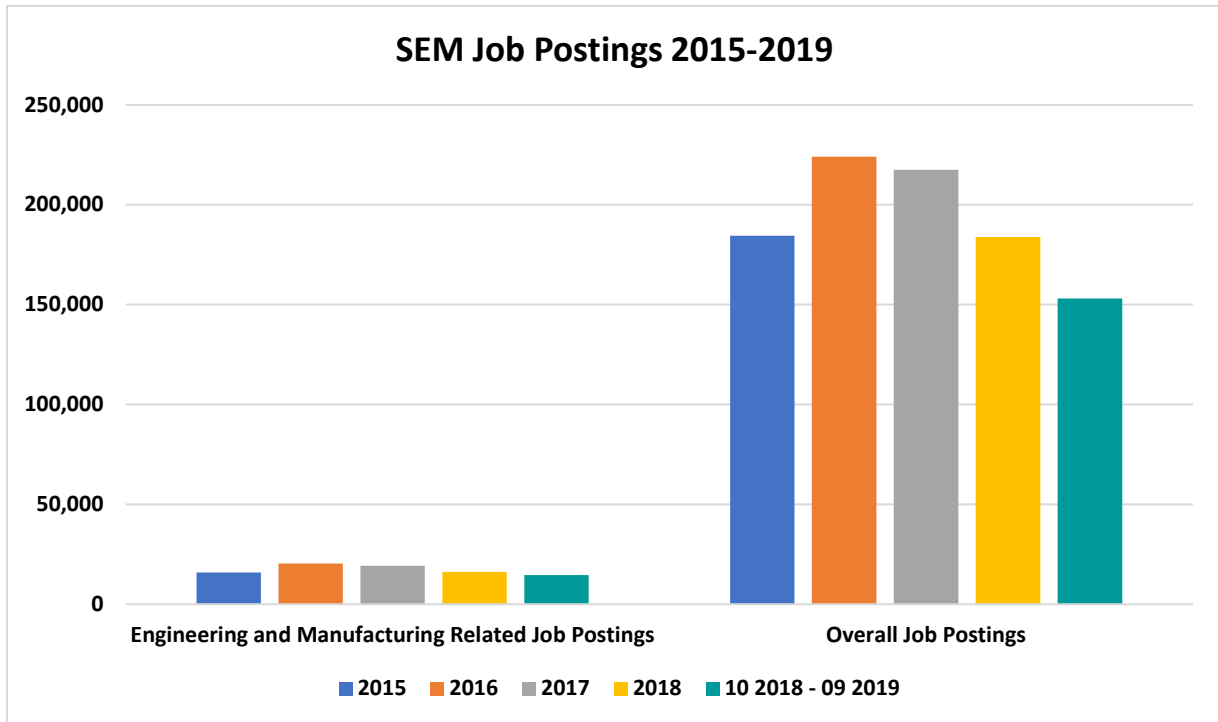


From Labour Insight Jobs (Burning Glass Technologies), details of the qualification levels requested by employers for each occupation are listed below:

Engineering and Manufacturing Occupation	Typical Qualification Level Request
Maintenance Technician	2/3
Production Worker	2/3
Mechanical Engineer	4/5/6
Utilities Technician	2/3/4
Electrical Engineer	4/5/6
Quality Inspector / Technician	4/5/6
Manufacturing Machine Operator	6
Validation Engineer	6
CNC Operator	2
Industrial Engineer	4/5/6
Production Supervisor	3/4/5/6
Welder / Solderer	2/3
Product Development Engineer	6
Production Plant Manager	4/5/6
Engineering Manager	6
CAD Designer / Draughtsperson/Draughtsman	4/5/6
Test Technician	3/4

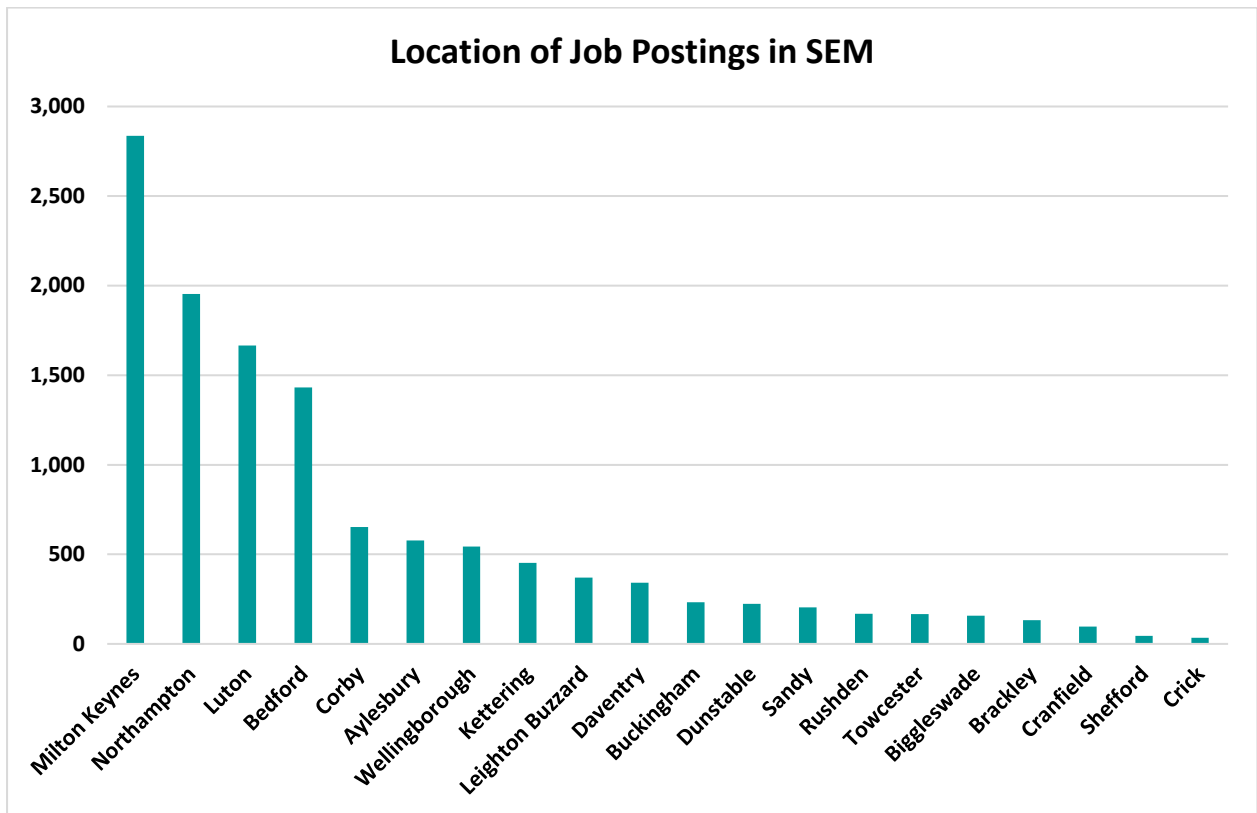
Recruitment Trends 2015-19

Job postings for engineering and manufacturing related occupations have declined in the last 4 years at a slower rate than the overall vacancy demand. The proportion of the overall job postings has increased from 9% to 10% of the total.



The Location of Demand

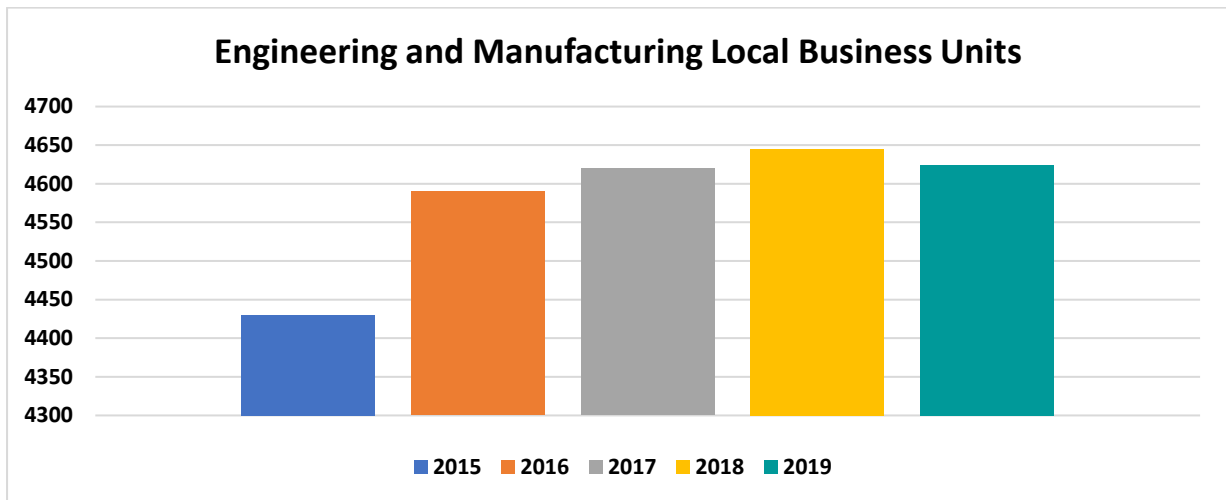
There are clusters of businesses seeking people with engineering and manufacturing skills.



Most engineering and manufacturing skill related job postings within the SEMLEP area are based in:

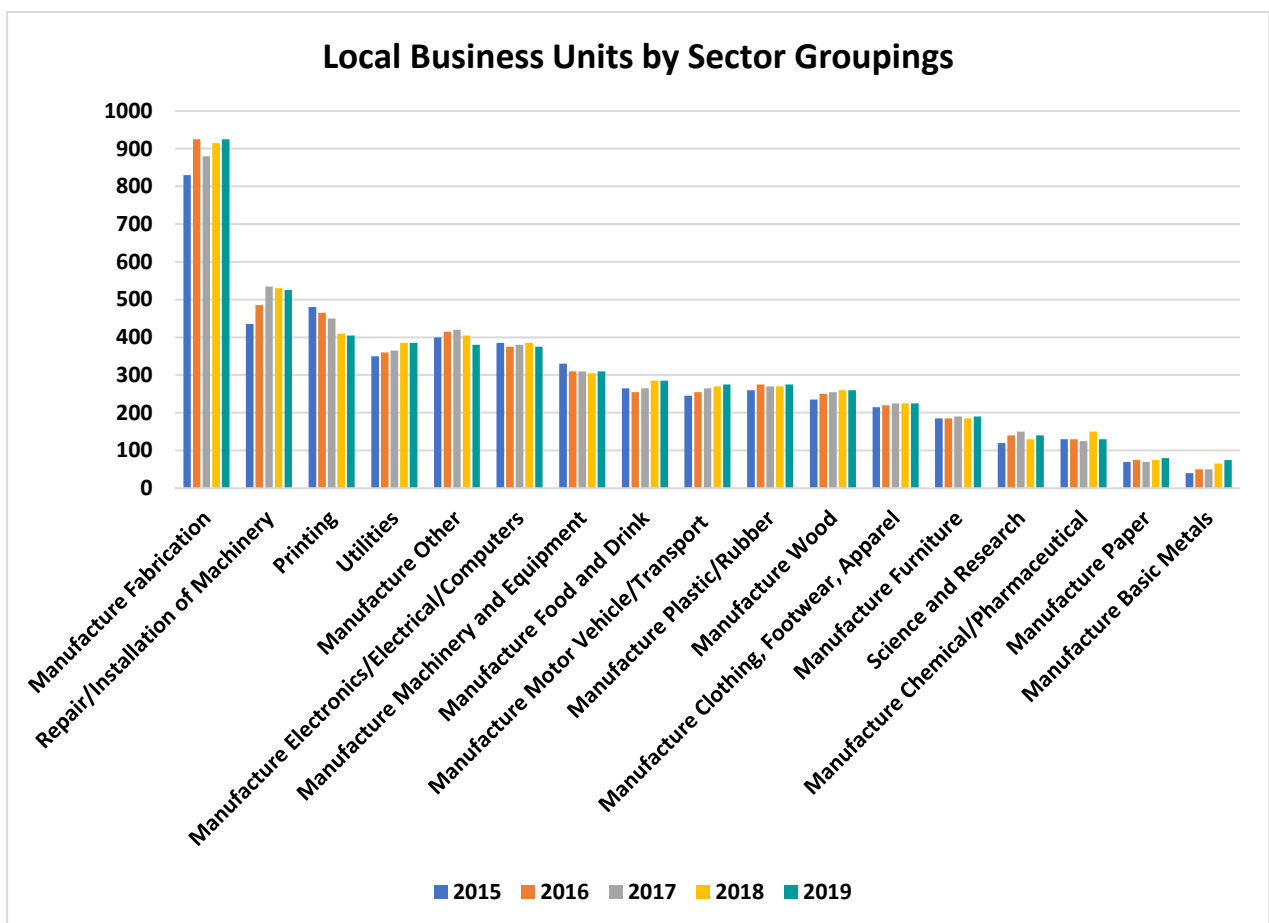
- Milton Keynes 23%
- Northampton 16%
- North Northamptonshire 15% (Kettering, Corby, Wellingborough, Rushden)
- Luton 13%
- Bedford 11%
- Central Bedfordshire 9%
- Aylesbury Vale 7%

Engineering and Manufacturing Business Growth Area



The numbers of engineering and manufacturing businesses have grown from 4430 units in 2015 to 4645 in 2018, this has reduced slightly in 2019 to 4625. This accounts for just over 5% of the local business units.

Local business unit numbers have grown in fabrication, utilities, food and drink manufacture, the manufacture of vehicle/transport, wood manufacture, manufacture of paper and basic metals.



The proportion of business types in engineering and manufacturing are:

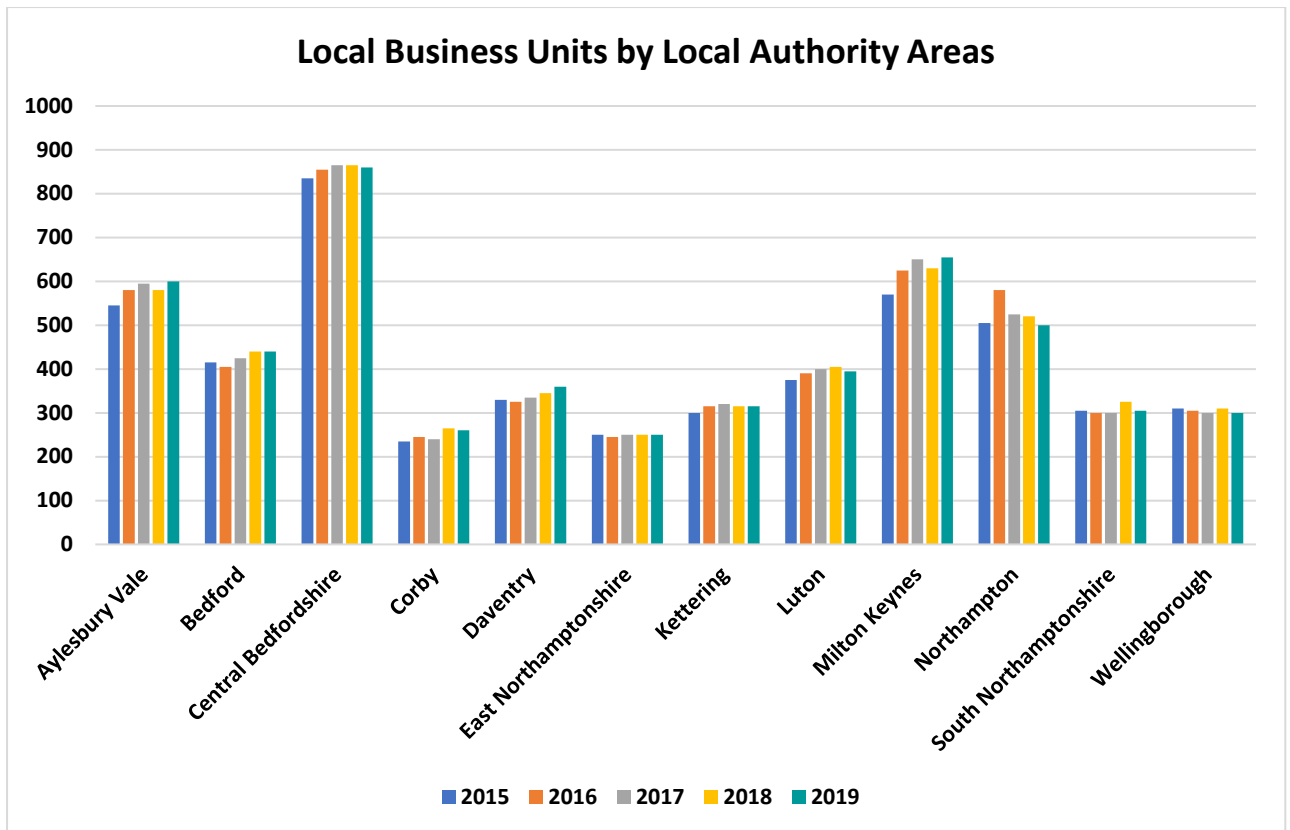
Sector Grouping	Proportion
Manufacture Fabrication	20%
Repair/Installation of Machinery	11%
Printing	9%
Utilities	8%
Manufacture Other	8%
Manufacture Electronics/Electrical/Computers	8%
Manufacture Machinery and Equipment	7%
Manufacture Food and Drink	6%
Manufacture Motor Vehicle/Transport	6%
Manufacture Plastic/Rubber	6%
Manufacture Wood	6%
Manufacture Clothing, Footwear, Apparel	5%
Manufacture Furniture	4%
Science and Research	3%
Manufacture Chemical/Pharmaceutical	3%
Manufacture Paper	2%
Manufacture Basic Metals	2%

The largest group is fabrication, and in 2019 this comprised:

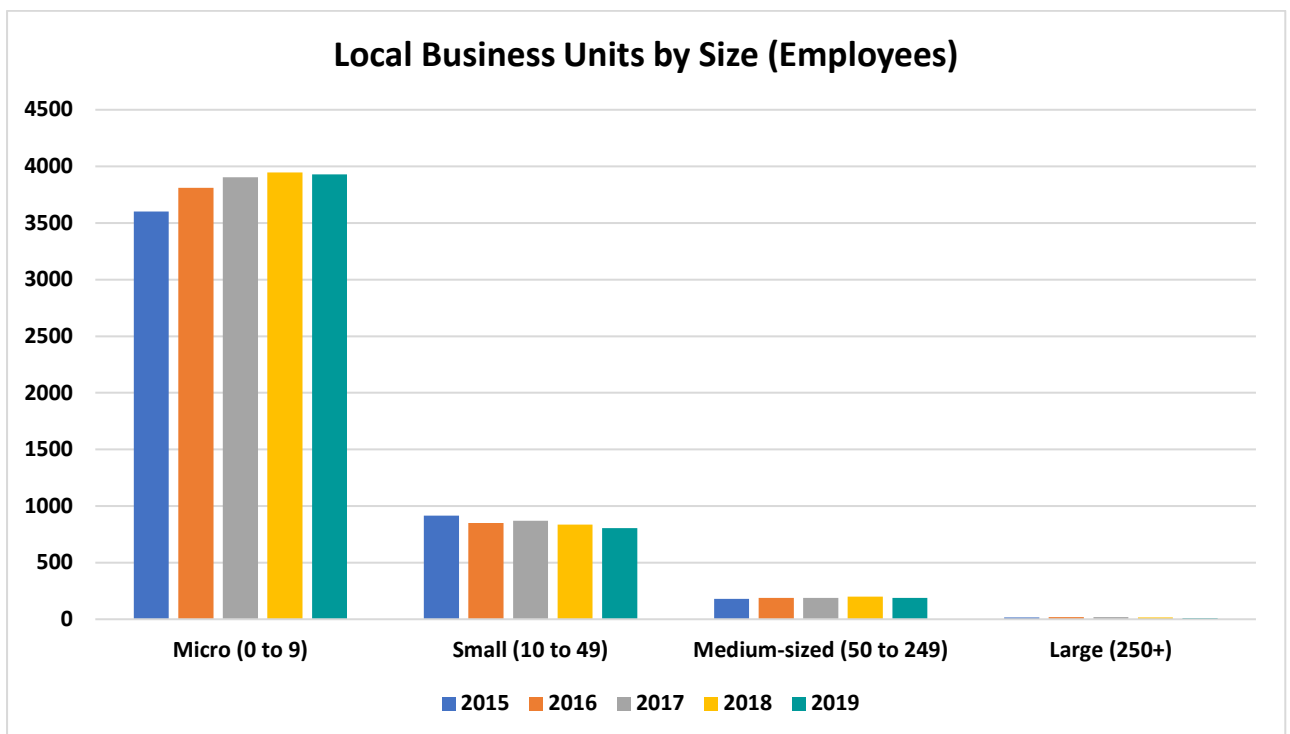
Manufacture Fabrication	Number
Machining	560
Manufacture of other fabricated metal products not classified	110
Manufacture of metal structures and parts of structures	95
Treatment and coating of metals	45
Manufacture of tools	35
Manufacture of doors and windows of metal	25
Forging, pressing, stamping & roll-forming of metal; powder metallurgy	10
Manufacture of locks and hinges	10
Manufacture of light metal packaging	5
Manufacture of wire products, chain and springs	5
Manufacture of fasteners and screw machine products	5

The business locations are in Central Bedfordshire (16%), Milton Keynes (13%), Aylesbury Vale (11%), Northampton (10%), Luton (8%), Bedford (8%) and Daventry (7%). All others are distributed evenly across the other areas.

The largest growth has been in Milton Keynes and Aylesbury Vale. There has also been growth in Daventry, Corby, Bedford, Central Bedfordshire and Kettering. Northampton and Wellingborough have seen a reduction in local business units.



Business sizes are predominately Micro (0-9 employees) at 80% and this size of business has provided most of the growth in numbers. There has been a reduction in the number of small (10-49 employees) and large (250+) businesses.



Regional Employment Growth in Engineering and Manufacturing

Data from the East of England and East Midlands (Standard Occupation Codes) shows increases in employment of a number of occupations.

Employment Type	Number	Growth vs 2016
1121 Production managers and directors in manufacturing	58,200	5700
5223 Metal working production and maintenance fitters	45,600	15800
8111 Food, drink and tobacco process operatives	41,400	-400
9134 Packers, bottlers, canners and fillers	33,000	-4000
5231 Vehicle technicians, mechanics and electricians	30,900	3900
3113 Engineering technicians	20,200	6500
9139 Elementary process plant occupations n.e.c.	15,400	3300
3111 Laboratory technicians	15,200	-3400
3422 Product, clothing and related designers	15,100	2300
2122 Mechanical engineers	14,900	1900
2112 Biological scientists and biochemists	14,500	-9200
5215 Welding trades	14,200	1200
2126 Design and development engineers	13,900	1500
2150 Research and development managers	12,300	4900
8125 Metal working machine operatives	11,900	1000
2127 Production and process engineers	11,500	3300
8133 Routine inspectors and testers	11,000	2400
5221 Metal machining setters and setter-operators	10,600	1500
3119 Science, engineering and production technicians n.e.c.	9,900	4700
2119 Natural and social science professionals n.e.c.	8,800	1800
8139 Assemblers and routine operatives n.e.c.	8,400	-19800
3115 Quality assurance technicians	7,800	700
8137 Sewing machinists	7,700	200
3112 Electrical and electronics technicians	7,600	1100
2123 Electrical engineers	7,500	700
8131 Assemblers (electrical and electronic products)	6,900	700
8132 Assemblers (vehicles and metal goods)	6,200	3100
5250 Skilled metal, electrical and electronic trades supervisors	6,200	-1500
8116 Plastics process operatives	5,900	700
5224 Precision instrument makers and repairers	5,800	-1200
3116 Planning, process and production technicians	5,400	1400
5422 Printers	5,400	-3900
5235 Aircraft maintenance and related trades	5,200	200

Identified as one the 'Grand Challenges' by government, the adoption of AI, automated systems and technology is already and will continue to impact on occupations, productivity and types of employment in sectors. Within engineering

and manufacturing this includes the increased use of automation, robotics and mechatronics.

Manufacturing is a sector identified by PwC as having jobs most influenced by AI and automation, with an estimation of potentially 46% of jobs being impacted (approximately 43,000 in the SEMLEP area). It should be noted that these calculations do not consider the level of automation already having been applied, especially in new facilities.

Roles perceived at being at high and medium risk are:

Occupation	Risk of Automation
Quality assurance technicians	High Risk
Planning, process and production technicians	High Risk
Print finishing and binding workers	High Risk
Plastics process operatives	High Risk
Paper and wood machine operatives	High Risk
Routine inspectors and testers	High Risk
Sewing machinists	High Risk
Assemblers and routine operatives not classified	High Risk
Laboratory technicians	Medium Risk
Electrical and electronics technicians	Medium Risk
Science, engineering and production technicians not classified	Medium Risk
Sheet metal workers	Medium Risk
Metal machining setters and setter-operators	Medium Risk
Metal working production and maintenance fitters	Medium Risk
Precision instrument makers and repairers	Medium Risk
Air-conditioning and refrigeration engineers	Medium Risk
Printers	Medium Risk
Food, drink and tobacco process operatives	Medium Risk
Chemical and related process operatives	Medium Risk
Metal working machine operatives	Medium Risk
Assemblers (electrical and electronic products)	Medium Risk
Assemblers (vehicles and metal goods)	Medium Risk
Weighers, graders and sorters	Medium Risk
Packers, bottlers, canners and fillers	Medium Risk
Elementary process plant occupations not classified	Medium Risk

From the regional employment figures and consultation with employers, the initial impact on occupations is on:

- Food, drink and tobacco process operatives
- Packers, bottlers, canners and fillers
- Laboratory technicians
- Assemblers and routine operatives not classified
- Skilled metal, electrical and electronic trades supervisors (deemed Low Risk)

Salaries for Occupations

From Labour Insight and reviewing the last 12 months of job postings, salary levels for engineering and manufacturing occupations are mixed against national averages for the high-volume (top 25) occupations.

Occupation Title	Local Mean Advertised Salary	ONS, 2017 Mean Salary (UK-wide)	Above or Below National Salary
Production managers and directors in manufacturing	£38,940	£55,643	Below
Metal working production and maintenance fitters	£31,948	£31,348	Above
Food, drink and tobacco process operatives	£22,959	£19,370	Above
Packers, bottlers, canners and fillers	£29,522	£17,871	Above
Vehicle technicians, mechanics and electricians	£30,306	£26,972	Above
Engineering technicians	£34,268	£35,295	Below
Elementary process plant occupations n.e.c.	£22,800	£20,614	Above
Laboratory technicians	£25,412	£21,610	Above
Product, clothing and related designers	£41,031	£30,497	Above
Mechanical engineers	£36,834	£45,323	Below
Biological scientists and biochemists	£31,605	£38,465	Below
Welding trades	£26,469	£26,319	Above
Design and development engineers	£43,564	£41,193	Above
Research and development managers	£43,068	£50,440	Below
Metal working machine operatives	£26,332	£22,957	Above
Production and process engineers	£33,529	£40,933	Below
Routine inspectors and testers	£27,532	£24,740	Above
Metal machining setters and setter-operators	£29,669	£27,692	Above
Science, engineering & production technicians n.e.c.	£22,724	£27,478	Below
Natural and social science professionals n.e.c.	£38,059	£39,672	Below
Assemblers and routine operatives n.e.c.	£25,291	£22,139	Above
Quality assurance technicians	£27,868	£26,985	Above
Sewing machinists	£27,661	£15,301	Above
Electrical and electronics technicians	£31,768	£31,761	Above
Electrical engineers	£39,960	£47,826	Below

Occupations with averages considerably lower than the national averages are:

- Production managers and directors in manufacturing
- Mechanical engineers
- Biological scientists and biochemists
- Research and development managers
- Production and process engineers
- Science, engineering & production technicians, not classified
- Electrical engineers

Talent Pipeline – Engineering and Manufacturing Education Provision in the SEMLEP Area

Data from the ESFA DataCube and HESA shows 5,800 learners of all ages participated in qualifications relating to engineering and manufacturing in 2017/18.

The top occupations for 10/2018 – 09/2019 relating to engineering and manufacturing, accounting for 14,600 job postings, together with the qualification levels requested by employers were:

Occupation	Qualification Levels Requested by Employers				
	2	3	4	5	6
Maintenance Technician	37%	41%	11%	3%	5%
Production Worker	56%	8%	8%	6%	18%
Mechanical Engineer	17%	12%	26%	14%	32%
Utilities Technician	30%	30%	29%	2%	9%
Electrical Engineer	16%	18%	26%	4%	37%
Quality Inspector / Technician	21%	9%	17%	5%	48%
Manufacturing Machine Operator	30%	14%	2%	0%	54%
Validation Engineer	3%	6%	32%	10%	49%
CNC Operator	83%	6%	4%	0%	6%
Industrial Engineer	25%	7%	18%	4%	45%
Production Supervisor	38%	12%	14%	4%	32%
Welder / Solderer	58%	28%	0%	0%	15%
Product Development Engineer	2%	3%	17%	13%	64%
Production Plant Manager	11%	3%	18%	6%	61%
Engineering Manager	4%	9%	19%	12%	56%
CAD Designer / Draughtsperson/Draughtsman	21%	1%	39%	5%	34%
Test Technician	41%	29%	23%	0%	8%

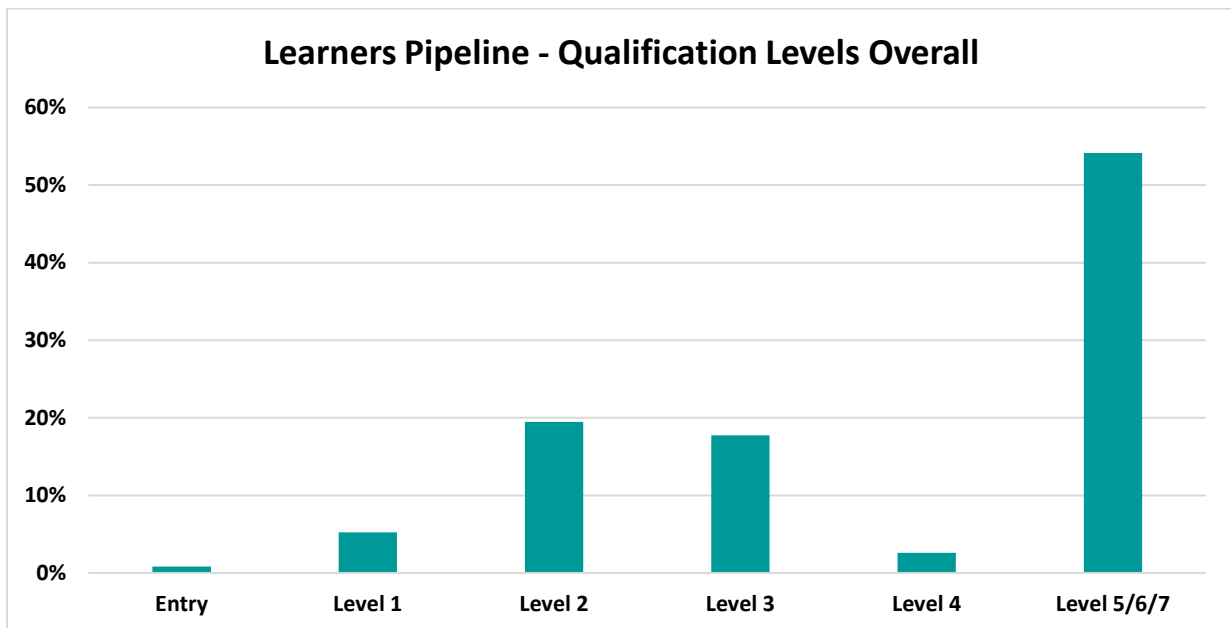
Key

30-100% of job postings
20-29% of job postings
10-19% of job postings

The job postings indicate a preference by employers for Level 6 (degree) and level 4 qualifications, with level 2 being requested primarily for maths and English.

Mechanical engineers, electrical engineers, CAD designer / draughtsperson / draughtsman, production supervisors and plant managers are usually expected to have some previous experience of work.

Current education provision is predominately in higher education (levels 5-7, 54%), and further education (levels 0-4, 31%), apprenticeships (15%) making up the remainder.



From the graph there appears to be a deficit of level 3 provision. From consultation with employers, the traditional route to engineering degrees is still through the academic pathway via A-Levels, not included in this data.



The qualification demands from employers would appear to have a similar profile to that of the learner pipeline except for:

- Higher specified demand for level 2 – need for GCSEs in English and Maths and an entry point for Advanced Apprenticeships

- Higher demand for level 4, 20% of employers compared with 3% in the pipeline
- Slightly lower demand for levels 5/6/7, 39% of employers versus 54% in the pipeline

This is reflected in feedback from employers seeking to take recruits earlier through both demand and opportunities of using the apprenticeships and in some cases, driven by the apprenticeship levy.

The Institute for Apprenticeships (IfA) have produced Occupational Maps for a framework of 15 routes to skilled employment. The Occupational Maps were developed to articulate a common framework across all technical education including apprenticeships and college-based courses.

The Occupational Maps document all the skilled occupations that can be achieved through an apprenticeship or forthcoming T Level qualification. Occupations are grouped together to show linkages between them and possible routes for progression.

The Occupational Maps appear to be in line with employer needs with only some slight variations between recommended pathways and those currently being provided and requested by employers.

Occupation	Typical Employer Level Request	IfA Occupational Map
Maintenance Technician	2/3/4	3
Production Worker	2	2/3
Mechanical Engineer	4/5/6	6
Utilities Technician	2/3/4	3
Electrical Engineer	3/4/6	6
Quality Inspector / Technician	4/6	3/4
Manufacturing Machine Operator	2/3/6	2/3
Validation Engineer	4/5/6	4/6
CNC Operator	2	2
Industrial Engineer	4/6	6
Production Supervisor	2/3/4/6	4/5/6
Welder / Solderer	2/3	2/3
Product Development Engineer	4/5/6	4/5/6
Production Plant Manager	4/6	4/5/6
Engineering Manager	4/5/6	4/5/6
CAD Designer / Draughtsperson/Draughtsman	4/6	4/5
Test Technician	2/3/4	3/4

The Learner Pipeline

ESFA funded education provision for 2017/18 comprises:

Qualification Level	Further Education and Training	Apprenticeships	Higher Education
Entry	48		
1	304		
2	727	401	
3	569	458	
4	137	13	
5/6/7			3135

The total number of learners starting to job postings provides a ratio of 0.66 for all job occupation postings in the SEMLEP area.

The engineering and manufacturing learners to job postings the ratio is 0.40 within the SEMLEP area.

This would appear to indicate;

- Insufficient numbers of learners at levels 3, 4, 6
- An insufficient talent pipeline from secondary education

A full list of links to local further and higher education provision is listed in appendix 1.

Summary:

- More focus and relevant provision with employer engagement needs to be in place in pre age 16 schools to promote opportunities within engineering and manufacturing and the pathways and skills required by employers.
- Adoption of the new T-Levels by employers and educators as a viable pathway into engineering and manufacturing
- Investigate further the need for level 4: is it for internal training or an entry point?

National Picture – Engineering and Manufacturing

From the Institution of Engineering and Technology (IET) Skills and Demand in Industry Survey 2019:

- Engineering organisations generated £420bn of UK Gross Value Added
- Engineers make up 19% of the UK workforce
- Estimated annual shortfall of 59,000 new engineering graduates and technicians

The View of the Labour Market

- 31% of employers have expanded their engineering and technology (E&T) workforce in the last 3 years
- 60% state that recruiting is major barrier to achieving objectives
- 48% report difficulties in skills in the labour market
- Only 20% expect the supply of E&T skills into the industry to improve in the next 3-5 years
- 81% agree that businesses have a responsibility to support the transition from education and training into the workplace to get people with the right skills
- Large companies report issues with recruiting at a professional level, SME with technicians or skilled crafts
- Fewer internal skills gaps reported

Diversity

- Diversity remains an issue with only 11% of women in the E&T workforce
- Only 12% of businesses are taking actions to increase diversity in terms of ethnicity, LGBT+ status and disability
- 42% agree that their organisation could do more to recruit people from diverse backgrounds

Developing a Talent Pipeline

- 73% have problems with applicants with academic knowledge but are lacking workplace skills (up from 71% in 2017)
- Only 28% of employers are aware of the new T-Levels
- 59% state they have the capacity to offer work placements as part of the T-Levels, 43% state they intend to offer places
- 32% have engineering or technical apprentices in place
- 46% of companies without an apprentice said they were unlikely to take one on
- 66% of employers that do not employ an apprentice said that if they had capacity within the firm it would encourage them to create an apprenticeship
- 63% believed that having more motivated or better qualified young people applying would encourage them to create an apprenticeship
- 23% of apprenticeship levy payers have increased the number of E&T apprenticeships offered

Partnering Educators

- 57% of companies offer work experience to young people at school (up from 49% in 2017)
- 48% offer work experience to further education students
- 40% offer work experience to higher education students
- Only 26% work in partnership with colleges or universities to develop provision to match their needs
- Only 23% engage in schools
- Only 23% encourage staff to become STEM Ambassadors and participate in activities

Up-skilling and Re-Skilling

- 68% have arranged or funded training for E&T staff in the last 12 months (59% in previous survey)
- There have been increases in the training of operative, technicians and skilled craft staff, a reduction of professional staff
- 73% offer arrangements for older workers to help them stay with the company
- 53% of large companies are linked with universities to deliver training, compared with just 14% of businesses with less than 25 employees

Observations

The national picture compared with the SEMLEP area shows:

- There is a shortage of young people progressing through the talent pipeline towards engineering and manufacturing
- There is an opportunity through increasing diversity in the sectors for gender, ethnicity and disability
- There appears to be low levels of employer engagement with educators and young people in the SEMLEP area compared with national levels

Sources of Information

The research for Digital Skills in the SEMLEP area has been based on a range of data indicators and reports:

- SEMLEP Business Survey 2019
- Labour Insight Jobs (Burning Glass Technologies), Skills in Greatest Demand for 1/8/18 to 31/7/19
- Labour Insight Jobs (Burning Glass Technologies), Job Postings 2016 to August 2019
- Inter Departmental Business Register (IDBR) 2018
- Annual population survey – regional, ONS, Nomis, October 2019
- UK Business Counts - local units by industry and employment size band, ONS, Nomis, October 2019
- A Skills Mismatch Analysis of the Fifteen Technical Pathways, September 2017, Centre for Progressive Capitalism
- UK Economic Outlook, March 2017, PwC
- Institution of Engineering and Technology (IET) Skills and Demand in Industry Survey 2019
- Emsi, Focus on demand for STEM jobs and & skills in Britain, 2018
- DfE DataCube
- Higher Education Statistics Agency (HESA), Data and analysis, students

We would also like acknowledge the assistance of local employers and education partners in compiling this report.

Appendix 1 – SEMLEP Further and Higher Education Provision

Further Education

- Barnfield College <https://www.barnfield.ac.uk/courses-grid/>
- Bedford College <https://www.bedford.ac.uk/our-courses>
- Buckinghamshire College Group – Aylesbury Campus
<https://www.buckscollegegroup.ac.uk/our-courses/course-explorer>
- Central Bedfordshire <https://www.centralbeds.ac.uk/courses.html>
- Milton Keynes College <https://www.mkcollege.ac.uk/study-with-us/>
- Moulton College <https://www.moulton.ac.uk/our-courses>
- Northampton College <https://www.northamptoncollege.ac.uk/courses.html>
- Tresham College <https://www.tresham.ac.uk/courses-at-tresham/>

Higher Education

- University of Bedfordshire <https://www.beds.ac.uk/howtoapply/courses/>
- Buckinghamshire New University <https://bucks.ac.uk/our-courses>
- Cranfield University [search courses](#)
- University of Northampton <https://www.northampton.ac.uk/courses/>
- The Open University [search courses](#)

Independent Training Providers

- Nital Training and Development <https://www.nital.co.uk/>