

# Workforce Development - Advanced Manufacturing

Developing skilled  
technicians to  
secure future  
productivity and  
growth



# Foreword



**Paul Butler**

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**A** highly skilled workforce has been instrumental in enabling the growth of the automotive sector in the North-East. Workforce development continues to be a key priority for NEAA members, so we were delighted to support a project, commissioned by Sunderland City Council in 2018, to identify actions which could help secure the supply of skills our sector would need to enable future growth and productivity. The project engaged our members, and identified six priority areas. These are:

- Increasing the supply of capable entry level operators – through actions to increase supply and improve employability.
- Resourcing and training more skilled technicians – by increasing the apprentice pipeline and attracting experienced technicians.
- Establishing a pipeline of manufacturing engineers – building the capability to realise the opportunities afforded by new technology, automation, and digitalisation.
- Strengthening supervisory capability and succession – by leveraging best-practice development programmes across the sector.
- Building advanced engineering & technology capability - to enable the growth of advanced technology businesses in the region.
- Attracting the best candidates at all levels – through inspirational STEM education outreach, and providing a more inclusive and compelling employment offer.

In response to these findings, the NEAA board has prioritised a number of follow-up actions. Resourcing and training sufficient skilled technicians to meet the needs of the advanced manufacturing sector moving forward is clearly a key issue for our members, and one that becomes even more important as new technologies and industrial digitalisation transform our manufacturing facilities.

We have therefore undertaken further work to identify how to address this challenge, and this report outlines how we could approach this. I would like to thank all our members who have provided insight and helped shape the report. I sincerely hope it informs actions which ensure that our advanced manufacturing businesses in the north-east continue to attract and retain the workforce they need to be globally competitive.

A stylized, handwritten signature in black ink, consisting of several loops and a long horizontal stroke extending to the right.

**Paul  
May 2019**

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# Executive Summary

**N**issan, and their local supply chain, have enabled the North East of England to develop world-class capability in advanced manufacturing and operational excellence. The transformation of the automotive sector and advanced manufacturing due to rapidly emerging new technologies and industrial digitalisation provides both an opportunity and a risk for the sector in the region.

## Opportunity and Risk

**T**he opportunity is reflected in the ambition of the Strategic Economic Plan (SEP)<sup>6</sup> for the region, which sees advanced manufacturing as a key source of "more and better jobs". The commitment to this ambition is evidenced by the development of the new International Advanced Manufacturing Park (IAMP) on the boundary of Sunderland and South Tyneside which seeks to create 7,000 new jobs, and will have an advanced engineering centre at the heart of it (Centre of Excellence for Sustainable Advanced Manufacturing - CESAM).

The region will be competing in a global marketplace for new investment, and this presents risk as well as opportunity. It will need to maintain world-class levels of performance and productivity, and convince new investors that it has the capability to realise profitable growth. Failure to do this will leave the region vulnerable, as products and technology change at rapid pace. Providing a strong supply of skilled people will be key in addressing this risk, and a robust pipeline of highly-skilled technicians and engineers is imperative.

## The Challenge

**T**his report considers the systemic issues which are contributing to the current and future shortage of skilled technicians in the north-east. It looks at the UK policy context, and how it might be falling short of driving the outcomes required by the SEP and UK Industrial Strategy.

We consider the inherent challenges of developing advanced technical capability - it typically takes longer, costs more, and is more equipment intensive. We look at some of the practical issues that can make it difficult for employers and small businesses to provide the required level of technical training.

We assess the current situation in the North East, and describe the extent of the future short-fall of skilled technicians in the region. We highlight examples of good practice that address these challenges, and that could inform a North East response to them.

## The Way Forward

**A**ddressing this challenge will require a different approach, which we recommend will include several important changes.

**1** A more compelling advanced apprenticeship offer for both candidates and SMEs, which could be enabled through a centre of excellence for advanced technical training, which could:

- Provide a clear, inspirational and integrated learning pathway for candidates, which enables progress from school to employment, with a clear 'line of sight' of educational progression through to higher education and better employment and career opportunities.
- Develop high level technical skills in an advanced environment which is recognised as world-class.
- Collaborate with other leading advanced manufacturing training centres in the UK to leverage capability to develop curricula for skills required for new and emerging technologies.
- Provide full-service support on apprenticeship development and technical training for SMEs, enabling them to access highly qualified candidates.

**2** More flexibility at a regional level to target funding in support of apprentice development in those sectors prioritised in the Strategic Economic Plan. This should include financial assistance to SMEs in advanced manufacturing, where the cost to the employer is higher than in other sectors.

**3** A coordinated and focussed approach to sourcing the technicians that will be required by advanced manufacturing businesses in the North East in the near-term. This should avoid disruptive churn in other sectors in the region, and should provide support to those businesses required to retrain existing technicians.

**4** A focussed plan is needed with robust governance and effective alignment across broader stakeholders within the region. This will need strong leadership with the vision and tenacity to address systemic issues, manage change, and make a sustainable difference.

# Introduction

The North East of England has a strong engineering and manufacturing heritage. The arrival of Nissan in the 1980s, and the development of their local supply chain, established world-class automotive manufacturing capability and operational excellence in the region. This has been supported through a clear commitment to skills and workforce development. A strong “grow your own” development philosophy has been assisted by a network of local education and training providers. Migration into the region has consistently been low<sup>1</sup>, so it has been important to ensure a strong local supply of skills.

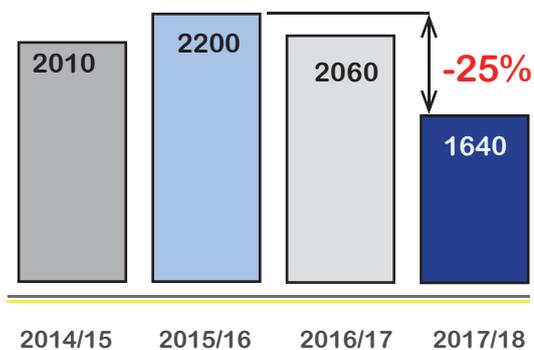
Developing advanced manufacturing continues to be a priority for the region, and is seen as a key source of “more and better jobs” in the Strategic Economic Plan (SEP) for the North East. A new International Advanced Manufacturing Park (IAMP) on the boundary of Sunderland and South Tyneside is aiming to create 7,000 new jobs in the period up to 2030.

Several factors are converging to challenge the ability to source the workforce required to realise this growth ambition, which include:

- An ageing workforce - there is a need to replace many highly skilled employees approaching the end of their career. Many of those recruited into the automotive sector in the mid-1980s are now leaving the workforce, and less young people are joining it<sup>1</sup>.
- A competitive local employment market - unemployment is low, and the automotive sector no longer provides the pay and benefit premium or employment security, that previously differentiated it for job-seekers
- New product technology, automation, and industrial digitalisation – rapidly changing work in advanced manufacturing is demanding new and higher level skills.

## A challenge for today and tomorrow

Figure 1. North East Advanced Apprentice starts in Engineering & Manufacturing.



Source: Department for Education: 2019<sup>2</sup>

All these factors contribute towards a risk that the sector may not be able to source the skilled technicians it needs to support growth and new investment. Mitigating this risk is made even more challenging by some additional factors specific to these roles.

- Skilled technicians are already scarce in the region, and across the UK.
- There are insufficient advanced apprentices in training to meet the near-term requirements of the sector. The numbers of engineering & manufacturing advanced apprentice starts is declining in the North East, whilst remaining flat across the UK (Figure 1).
- Advanced apprenticeship programmes in engineering in the North East typically take 4-5 years to complete, so there will be a delay before any increase in apprentice numbers impact the availability of skilled technicians.
- Falling net-migration in to the UK is impacting the ability to attract skilled employees from outside the region. There will also be strong pull for these skills from outside the region, further re-enforced by some significant infrastructure projects, such as HS2.

In this report we explore the underlying issues contributing to this situation and recommend actions that could be taken. These provide a systemic response to ensuring a sustainable supply of skilled technicians which will be needed to support productivity and growth in advanced manufacturing.

# Our Approach

The findings in this report have been informed by a broad range of stakeholders and subject matter experts. North East Automotive Alliance members have provided considerable input on their workforce requirements and practices, including those relating to skilled technicians and advanced apprenticeships. Several approaches have been used to collect information and data, and validate findings from multiple perspectives. Findings have been reviewed against best practice and contextualised within the broader UK policy framework. The current practices have been reviewed to assess whether they adequately support the future requirements of the sector and the North East Strategic Economic Plan.

## Identifying and validating key themes



Structured interviews were initially conducted with employers. This included a diverse mix of businesses including Nissan and tier 1 and tier 2 suppliers, as well as advanced technology businesses in the region. Interviews were also conducted with universities, colleges and independent training providers to incorporate insight from the education and training supply-chain.

We facilitated discussions with various stakeholder groups using a storyboard of materials. These were used to 'play back' and test the key findings at different stages of analysis, and provide opportunity to gather more stakeholder insight. Through this ongoing process our findings were further developed and validated.

## Gaining deeper insight – skilled technicians



NEAA member businesses were surveyed to gather more detailed feedback on their practices and perspectives relating to the recruitment and training of skilled technicians and advanced apprentices. Responses were received from around one-third of the industrial businesses polled. Collectively these 33 businesses employ over 14,000 employees in the region. Further discussions were held to explore specific challenges and issues raised in the survey feedback.

## Considering the policy and systemic context



Government education and business policy provides the context that informs the decisions that businesses and training providers make regarding the training of skilled technicians and advanced apprenticeships. They also shape the decisions made by potential candidates, and the outcomes that are delivered. Our findings and recommendations are positioned within this context, and consider the systemic impact of recent policy changes. We also considered different policy approaches being taken by devolved administrations and practice in other countries.

## Learning from best practice case studies



Best practice in the resourcing and training of skilled technicians and advanced apprentices was explored through site visits and consultation with subject matter experts. This included employers in automotive and other advanced manufacturing sectors, and education and training providers both within and outside the region. We identified examples of innovative practice and highlight these in the report.



# || The Challenge

**S**killed technicians play a critical role in optimising the performance and productivity of our manufacturing facilities. Their capability is key to realising the opportunities provided by new technologies and industrial digitalisation. They are employed in roles such as Maintenance or Die Technicians, Machinists, and Welders, and have typically qualified by completing Level 3 Advanced Apprenticeship programmes over a 4-5 year period\*. On many programmes, the apprentices achieve educational qualifications equivalent to Level 4, and in some instances Level 5. Those in engineering, quality, technical and management positions across the sector have often progressed from these roles, and apprenticeship programmes have been used to provide an ongoing succession pipeline.

## Forecasting demand

**T**raditionally, many large employers recruited and trained large numbers of technical apprentices. Not all would necessarily secure permanent employment with that business on completion of their apprenticeship, but those that didn't would typically secure employment in skilled technician roles with other local employers. Technical apprenticeship participation in the UK halved between 1979 and 1995<sup>3</sup>, and the practice of large employers "over-training" declined. Several policy changes since the mid-1990s<sup>4</sup> have changed the scope and participation in apprenticeships, but these have not helped align the demand and supply of skilled technicians.

In 2015 the UK Automotive Council<sup>5</sup> undertook a comprehensive skills survey, which sought feedback from employers on critical roles that they were finding difficult to source and which were impacting on their operational performance. In the North East the role of maintenance technician was deemed both the most "critical now" role and the most important "future ongoing" requirement.

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\*See Appendix Two for a full description of Education Levels for England Wales and N. Ireland

## An ageing UK workforce

**T**he demand for these skills is also being driven by the age-profile of the manufacturing workforce. One large employer reported that they expected more than half of their current skilled technicians to retire in the near future. The number of advanced apprentices being trained in the sector are insufficient to replace the numbers leaving it. This, and the preference of employers to retain a mix of experience among the skilled workforce, is generating churn in the market for experienced skilled technicians. 78% of NEAA members surveyed have recruited skilled technicians externally in the last 2 years. The impact of this churn is often greatest for SMEs and Tier 2 suppliers who may not be able to compete with the pay, benefits, and shift premium offered by larger businesses.

## A shortfall of at least 400 technicians in the next 5 years

**T**he ambition to grow advanced manufacturing in the region, in line with the SEP and through initiatives such as IAMP, creates further demand for these skills. We estimate that the combined effect of the retirement profile and IAMP could result in employers in the manufacturing cluster around Washington facing a shortfall of 400 skilled technicians over the next 5 years. This estimate takes into account the number of advanced apprentices currently being trained, which is forecast at less than 100 new starts per year in the automotive sector in this area. We assume the demand for technicians will continue, driven by skills required to support increasing automation, industrial digitalisation and emerging technologies.

## A containment plan is needed

**A**lthough increasing participation in advanced apprenticeships will be key to establishing a sustainable pipeline of these skills, it will not address the near-term supply challenge due to the 5 year lag between an apprentice starting training and achieving the required level of competence in a substantive role. Some form of containment action will be needed to resource and retrain existing technicians. Many employers are already doing this, and the NEAA members who hired new technicians in the last 2 years reported that 60% of new hires needed more than four weeks training, with half of these needing more than twelve weeks.

# The Opportunity and Risk

The case for growth in advanced manufacturing is outlined in the UK Industrial Strategy and the Strategic Economic Plan (SEP) for the north-east. Manufacturing accounts for 15.3% of the GVA<sup>6</sup> in the region, and will need to maintain the capability and skills required to realise the opportunities of digitalisation and new technologies and successfully compete for new investment. The advanced apprenticeship pipeline is critically important in providing the technical skills, and long-term capability, needed to realise these growth opportunities in established and emerging sectors.

## Emerging Technology requires new skills

Advanced manufacturing is changing at an unprecedented pace. Some established capabilities will become obsolete or transition due to new technology and powertrain electrification. New skills will be required to be competitive in shifting global markets.

Figure 2. Emerging Technologies that support Electrification in Automotive

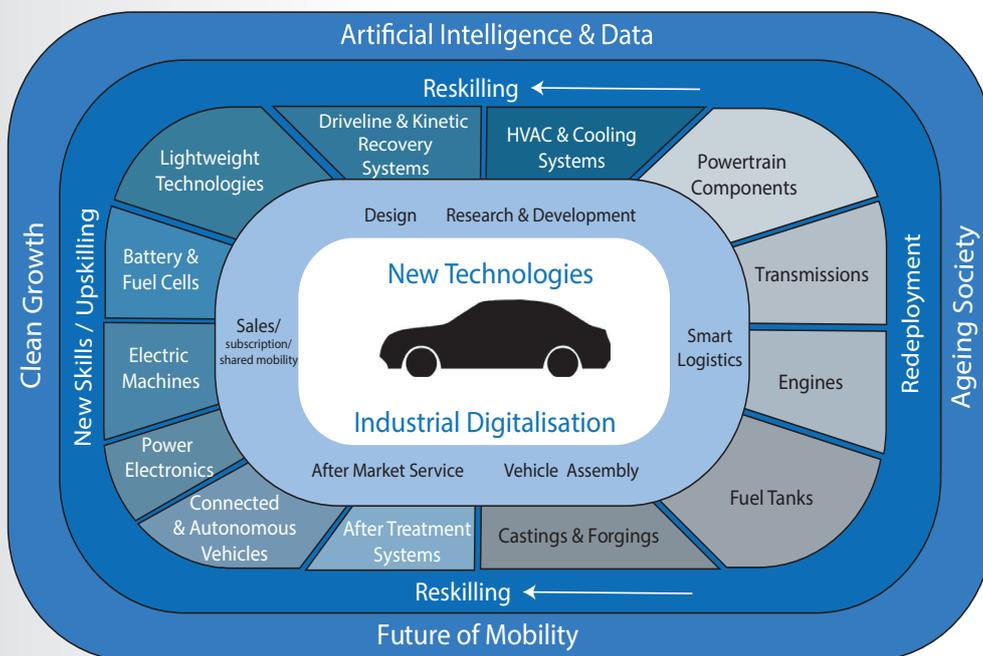


Figure 2 provides a high level illustration of the impact of new technologies for the automotive sector. The technologies associated with the internal combustion engine are described on the right, whereas the emerging new technologies & electrification of vehicles are described on the left. The capabilities in the middle, may support hybrid or be repurposed. The changes to capability will drive a corresponding requirement for redeployment, reskilling or new skills across the sector.

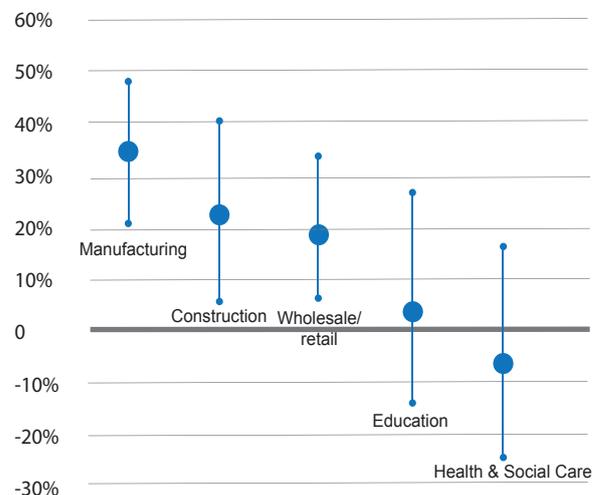
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## Improving skills provides a return on investment

Skilled technicians are well paid and contribute to the local economy. Across the UK, median pay within 3 years of completing an advanced apprenticeship in manufacturing and engineering is typically a third higher than for those who have completed a Level 2 in manufacturing and engineering<sup>7</sup>. Figure 3. shows that the percentage hourly wage premium associated with the higher level qualification compares favourably with other sectors.

Investment in technical skills provides long-term returns to both the individual and the purchasing power of the broader local economy. Many achieve higher level qualifications as part of their apprenticeships, and will continue to progress to degree level. Technical training and education will provide transferrable skills, a range of employment opportunities, and often career progression.

Figure 3. Level 3 apprentices hourly wage premium over employees educated to Level 2 by sector (2015/17)



Source: SMF analysis of Labour Force Survey (2015/17)<sup>19</sup>  
Error bars at 95% confidence interval. Where the bars overlap 0, the variation is not statistically different.

# Key Findings

Developing engineering and manufacturing technician skills requires a high level of commitment and investment – it typically takes longer, costs more, and is equipment-intensive.

## Wages, training duration & uncertainty impact demand

Providing advanced technical training requires a very high level of commitment from employers and providers. An advanced level apprenticeship in Engineering & Manufacturing Technologies (E&MT) takes, on average, around two years longer<sup>8</sup> to complete than other advanced apprenticeships. This means that employers need to fund apprentice wages for a longer period than in other sectors. Importantly for SMEs, the duration of the 4-5 year apprenticeships also adds to the uncertainty and risk associated with committing to apprentice training. Some state that it is difficult in smaller business to accurately forecast requirements that far in advance, and there is also a risk that apprentices may not complete their training. More than 20% of apprentices on Level 3 E&MT programmes in the North East failed to complete their apprenticeship in 2017/18<sup>10</sup>. As most small businesses offering apprenticeships will only employ one apprentice at a time, non-completion represents a significant risk to them getting a return on their investment in wages and training<sup>9</sup>. Although experienced skilled technicians are in short supply, it would appear that some SMEs consider experienced technician recruitment to be more cost and time-effective, and less risk, than training an apprentice.

For larger employers, a combination of cost and capacity to train and mentor apprentices results in them being reluctant to employ more than they require. This precludes them from over-training to supplement the apprentice pipeline for the broader sector.

## An investment burden & risk to providers

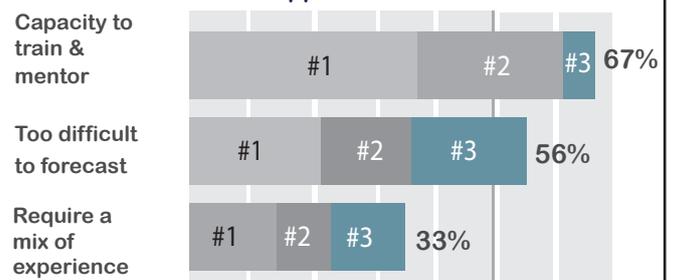
Technical training requires providers to make a significant capital investment in facilities and equipment. This will continue to be important as the adoption of new product technology and automation changes the workplace. Currently there are a number of competitive providers in the local area and no clear sector consensus on the most capable provider. The apprenticeship levy has contributed to further disruption, and a number of employers have changed providers. These market dynamics contribute to risk, and potential inefficiency, of capital investment for providers.

## Higher training costs

The impact of the apprenticeship levy is covered in more detail elsewhere in this report, but levy-paying employers will need to assign a higher proportion of their levy towards the training costs of any advanced E&MT apprentices they employ. The amount of levy that is required to fund the training costs of advanced E&MT apprenticeships is capped at £26,000 or £27,000 dependent on standard. Those employing apprentices in non-technical sectors can make their levy go further, and they get a quicker return on their investment. Funding is also limited to that training needed to develop the skills, knowledge, and behaviours identified as role requirements in the relevant apprenticeship standard. Best practice providers are seeking to equip apprentices with skills associated with new technologies. They are going significantly beyond the current standard and incurring additional costs which are unfunded. Moving forward, standards will need to be sufficiently agile to incorporate emerging industry requirements in a timely manner.

## Feedback from NEAA members

Figure 4. Top three barriers to recruitment and training of Advanced Technical Apprentices for NEAA members



NEAA members were asked to rank the main reasons preventing them from recruiting more advanced apprentices.

- Two thirds cited the lack of internal resources to provide on the job support and mentoring.
- Over half were reluctant to recruit without being able to assure post-training employment opportunities.
- A third said they recruit qualified technicians to maintain an appropriate mix of experience.

## SME engagement in providing advanced apprenticeships is key to establishing a sustainable supply of skilled technicians to support growth - it won't just happen.

Currently only around 10% of SMEs<sup>9</sup> across all sectors are recruiting advanced apprentices. Increasing the level of participation in manufacturing and engineering SMEs will be key to ensuring there are sufficient skilled technicians in the region. The previous section outlined how the length, cost, and uncertainty associated with advanced apprenticeships can deter SMEs from providing them. Navigating the complexity associated with apprenticeship frameworks/standards, funding, and providers also present challenges. Recruitment and the administration of apprentices also requires an investment of time for an SME.

### 'Personal attachment' of SME business leader is important

A Department for Business Innovation & Skills research paper on Employer Influence on Apprenticeships (2014)<sup>11</sup> looked at the reasons why SMEs are motivated to offer apprenticeships. The identification of a business need was in most cases a prerequisite, often this would be due to anticipated skills needs due to growth or replacement. In some sectors the apprenticeship is also the means to gaining the qualification that provides a new recruit with the licence to practice in that sector. The report also cites the significance of "personal attachment and social responsibility", where business owners or leaders are themselves former apprentices, and are personally committed to upholding a tradition of apprentice development. Former apprentices in leadership roles can also serve as important role models, exemplifying career progression that can be achieved following an apprenticeship. It was evident that senior leaders in a number of NEAA member organisations were former apprentices, and strong advocates of apprenticeships, but some indicated they did not have the authority within their business to effectively sponsor apprentice development. A number of larger businesses referred to the lack of local authority and central internal company processes regarding headcount or hiring approval that influenced the level of apprentice recruitment locally.

### The *Mittelstand* in Germany

In Germany the *Mittelstand*, literally translated as middle-strata, refers to the population of SMEs who employ around 80% of the industrial workforce.

They contribute more than half of GDP<sup>12</sup> which is similar to that of SMEs in the UK. The *Mittelstand* is a dense network of small, usually family-owned companies, deeply rooted in their local communities, and dependent on highly-skilled workers who have often been with the business a long time. Many of these businesses will be owned and led by people who have undertaken apprenticeships, and consider it their responsibility, and important to the reputation of their business, to provide apprenticeship training. This is further strengthened by the formal role of the *Meister* who has organisational responsibility for apprentice training. These individuals will have attained the highest level of vocational qualification. In Germany, 43% of businesses with 10-49 employees train apprentices, and this increases to two-thirds of those employing 50-249 employees<sup>12</sup>.

The accountability for technical training is also formalised in some Japanese businesses. At Nissan the Global Training Centre (GTC) includes a group of skilled technical staff, based in the North East, who are dedicated to supporting ongoing skills development globally.

### Leveraging the North East *Mittelstand*

SMEs will engage in apprenticeship training and there are examples of this in the North East. Ford Engineering, for instance, have an outstanding track record of investing in apprentice training and development, and have provided sponsorship to broader training programmes for young people in the region with Gateshead College.

Outside of the region, the AMRC Training Centre at Sheffield, the Toyota Academy at Derby and the MTC Training Centre at Ansty have all successfully engaged SMEs. The opportunity to benefit from high quality training in purpose-built facilities has proved attractive. The association with the AMRC and MTC has also enabled some to access additional financial assistance. At the AMRC Training Centre, Close Brothers, a merchant bank, part-subsidises apprentice wages for 20 SMEs for the first two years of the programme. Lloyds Bank provides sponsorship at the MTC, and initially subsidised some of the first year wage costs of apprentices hired without sponsoring employers. They have also off-set the contribution to training costs that non-levy payers are required to make.

## National policy and funding for apprentices is not aligning with regional strategic priorities

### What is an apprenticeship these days?

Policy developments over the last 25 years have progressively changed the outcomes being delivered through apprenticeships. Higher level technical vocational training to qualify people for craft or skilled roles is no longer the primary focus of apprenticeships, and advanced apprenticeships in E&MT only represented 6.5% of all apprentice starts in England in 2017/18<sup>2</sup>.

This broader scope for apprenticeships, and the introduction of the apprenticeship levy in 2017, is changing the way businesses use them. Higher Apprenticeships (Level 4+) have increased from 3% of all starts in 2014/15 to 13% in 2017/18, and funding is increasingly being directed towards the Continuous Professional Development of existing employees. 40% of people starting apprenticeships in 2017/18 had been with their employer for more than a year, and 41% were aged over 25<sup>2</sup>.

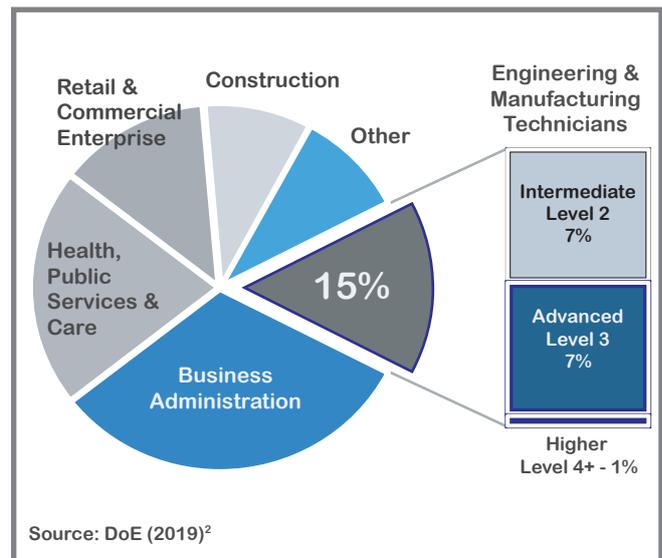
### The apprenticeship levy needs to enable technical apprentices

The apprenticeship levy was introduced with the stated objective of creating an additional 3 million apprentices by 2020. The desired increase hasn't yet materialised, and apprentice starts in 2017/18 are 25% down on 2014/15<sup>2</sup>. Up to January 2019, only 15% of apprenticeship levy funds had been used by levy-paying employers<sup>20</sup>. The number of advanced apprenticeship starts in E&MT across England has held-up and is broadly unchanged over this period. A detailed assessment of the apprenticeship levy goes beyond the scope of this report, but as levy-payers accounted for 48% of all apprentice starts in 2017/18, we should note some of the implications it has which relate to the provision of advanced apprenticeships in E&MT.

The method for levy distribution means that it funds apprentice training within the sectors that make up the existing employment profile of the region. It doesn't ordinarily enable funding to be realigned from sectors with a large employment base, to other sectors which might provide more opportunity for growth or higher-value jobs. In the North East, for instance, most apprentice training is in subjects such as Business Administration and Health, Public Service & Care, and there is no real ability to reallocate funding to sectors, such as advanced manufacturing, which are prioritised in the SEP. This inflexibility particularly impacts those regions most in need of rebalancing the skills in their economy between different sectors.

In the North East last year only 15% of apprentice starts were in E&MT, and only 8% were at advanced level or above.

Figure 5. North East Apprentice Starts 2017/18



The levy places more choice and purchasing influence with employers, however this does mean that the education offer and the outcomes delivered in the North East will largely depend on separate decision-making processes made across hundreds of levy-paying employers. There is no ability at a regional level to ensure that those decisions are collectively supporting the development of long-term capability aligned to the strategic economic plan for the region. The current distribution of the Adult Education Budget is not directly aligned with regional priorities, although the Combined Authorities in England will have more discretion over this moving forward.

Following the introduction of the levy, SMEs are required to make a contribution to training costs which they did not previously make. This was originally capped at 10%, but has reduced to 5% for new apprentice starts, from April 2019. This may be impacting SME participation in apprenticeship programmes. Some providers have indicated that they have been unable to respond to demand from SMEs, because they have been unable to access incremental funding required from the Education and Skills Funding Agency. There is provision for levy payers to transfer a proportion of their unused levy to other businesses, but take-up remains low.

## Other regions are aligning financial support with their strategic priorities

The devolved administrations have assumed some budget and powers relating to apprenticeships that provide flexibility. The extent of this differs between the devolved national administrations and the combined authorities in England, but all are making some level of intervention to provide financial support to businesses with a view to achieving outcomes in line with regional priorities. In most regions this includes supporting SMEs, and in some it includes targeting priority sectors or higher level qualifications.

Following devolution to the North of Tyne there will be two combined authorities in the region who can provide financial assistance to align apprentice training to their strategic priorities. Additionally, these authorities will have devolved accountability for the Adult Education Budget. This means that SMEs in different parts of the North East will be able to access different levels of support. It may also potentially present challenges for some providers as combined authorities may prioritise in-region education and training suppliers.

Figure 6. Examples of interventions by devolved administrations to influence apprenticeship outcomes.

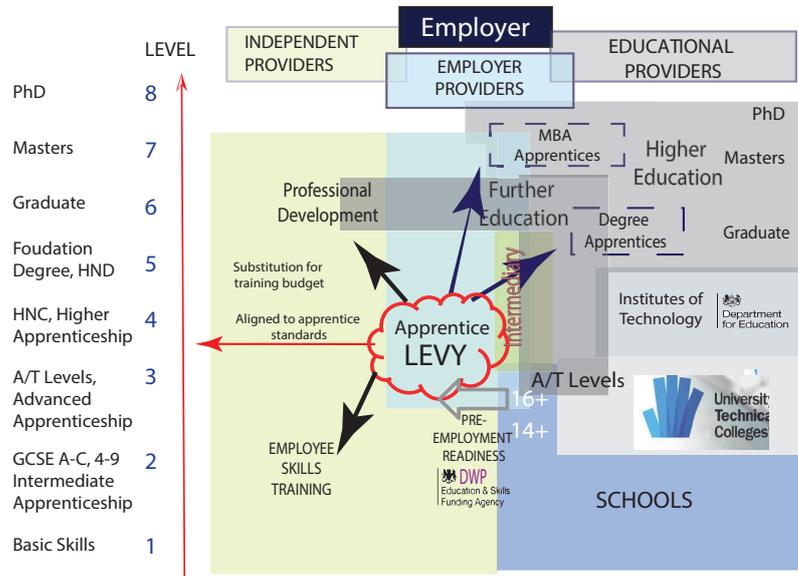
	Target Areas	Approach
<b>Wales<sup>13</sup></b>	<ul style="list-style-type: none"> <li>• SMEs</li> <li>• Priority Sectors</li> <li>• Level 3+ apprenticeships</li> <li>• Young people</li> </ul>	Three Regional Skills Partnerships determine priority sectors for region, and prioritise training funding. Targeting increase in Level 3+ apprentices in priority sectors. Additional financial support for SMEs hiring apprentices for first time (up to £3,500 per learner).
<b>Scotland<sup>14</sup></b>	<ul style="list-style-type: none"> <li>• Young people into employment/ apprenticeships</li> </ul>	Apprentice training fully funded for age 16-19. Various grants for employers providing employment/ apprenticeships to people under-29. Examples include Scotland's Employer Recruitment Incentive (up to £4k) & Glasgow Guarantee (50% wage subsidy for first 12 months or 24 months for a 4 year programme).
<b>Tees Valley<sup>15</sup></b>	<ul style="list-style-type: none"> <li>• SMEs in priority sectors or recruiting apprentices for first time</li> <li>• Age 19+</li> </ul>	Use of devolved Apprenticeship Grant for Employers to provide financial support to SMEs. More financial support for higher level apprenticeships in 9 priority sectors, including Advanced Manufacturing. £2,000 grant per learner for Level 3 plus further £2,000 if progress to Level 4 (up to max 3 learners pa).
<b>Greater Manchester<sup>16</sup></b>	<ul style="list-style-type: none"> <li>• SMEs who haven't recently hired apprentices</li> </ul>	Use of devolved Apprenticeship Grant for Employers and other funding to establish £4m SME Apprenticeship Support Package to offer grants of up to £3000 to non-levy paying SMEs who haven't hired apprentices in last 2 years.

# A complex education and training supply chain needs to adapt to meet future advanced manufacturing requirements

## A competitive and complex market

In recent years there has been ongoing change to the education system in the UK impacting 14+ year olds. The North East is characterised by a large and complex legacy network of education of training providers. There is a high density of universities, further education colleges, and independent providers, and more than 100 organisations providing apprenticeship training. The scope of services offered by these providers has evolved over time, as changes to education policy, funding arrangements, qualification levels, and performance measures have been introduced.

Figure 7: A fragmented and complex education and training supply chain



Collectively they have redefined the market segments for providers. The broader scope of apprenticeships and the introduction of the apprenticeship levy has created even more overlap and competition between providers. Importantly, it has also shifted the purchasing power to the employer, who is becoming increasingly demanding. Some providers don't consider it viable to invest time and resource in trying to engage a distributed SME population, and SMEs often feel disconnected from the system. It is also apparent that the operational and financial context in which providers operate is challenging, sometimes compromised further by the servicing of debt, resulting from investment programmes. The Area Review commissioned in 2016/17 by the Department for Education, envisaged more collaboration on curriculum between local colleges but did not propose significant structural change. There has been some recent merger activity between colleges.

## STEM innovation is required

Maths attainment continues to be a barrier to participation in STEM education. It limits student choice and prevents progression to higher level qualifications and better career opportunities. University Technical Colleges (UTCs) have been established in the region to provide a more focussed STEM foundation, but they are viewed as competitors by some incumbent providers, who are keen to attract and retain the more able students to progress them to their sixth form. A new Institute of Technology (IoT) will be established in the region, which is intended to increase the number of learners with higher level technical skills, by providing an offer from Level 3 through to Level 6. IoTs provide an opportunity for a clearer and simpler STEM educational pathway, but as a new entrant to the market they will need strong leadership to establish themselves. To succeed and build the confidence of learners and those influencing their choices, they will need to be regarded as a complimentary offer, rather than a competitive one. Very few learners are actually progressing to Level 4 or 5 qualifications. Nationally, only 4% of the 2004/5 GCSE cohort had attained Level 4/5 as their highest qualification level by the age of 25, compared to 26% achieving Level 3 and 27% Level 6.<sup>21</sup> In comparison, in Germany level 4/5 makes up 20% of all higher education enrolments.<sup>22</sup>

## More focus is needed

This is a complex and dynamic education and training supply chain for employers to interact with, which has led to the success of independent providers in the region, who are viewed as credible partners by industry. Having several providers can help ensure there is a competitive offer for employers, and provide accessibility for learners across the region. However, it stretches the capability and resources required to deliver high-quality technical training, which is expensive to deliver relative to other areas. It is unrealistic to expect all 15 FE Colleges currently with a Level 3 Engineering offer to invest in the level of facilities and staff needed to meet the future needs of advanced manufacturing in the region. In contrast, the MTC Training Centre at Ansty leverages the equipment and expertise available through their co-located R&D activity, sponsored by leading universities, to enhance and differentiate their apprenticeship programme.

## A clear and compelling offer for learners is needed to improve participation

It is very difficult for the learner to navigate through this system to a technical vocational pathway, particularly if they have ambition to progress.

It is much more complex and dynamic than for those learners progressing through A-levels and into Higher Education. The currency of new providers such as UTCs and new qualifications such as T-levels are unproven, so involve a degree of risk for the learner. The perceived value of apprenticeships differs between key influencers of the choices being made. A survey of apprentices at the AMRC Training Centre indicated that most were neither encouraged or discouraged by their school to undertake an apprenticeship. Most reported that they had a family member who had experience of completing an apprenticeship, and around 90% said they were encouraged to do so by a family member.

It appears that a “personal attachment” for both employers and parents is an important factor. Diverse participation in STEM educational pathways continues to be a challenge. Female and BAME participation will require more focussed attention in support of efforts to increase the supply of technical apprentices.

### Best practice provides a clear *line of sight*

Some employers cut through the confusion. Nissan for instance advertise a pathway to a Level 5 foundation degree as part of their advanced apprenticeship offer, and will progress technicians to degree-level. Some Tier 1 suppliers will offer a Level 4 HNC, and sponsor some learners through to a degree. However, for most the pathway is less clear. International comparisons, including Singapore and the Netherlands, suggest that “Credible high-status pathways to HE ensure that vocational education is not seen as a dead-end option”<sup>18</sup>. The AMRC Training Centre at Sheffield, detailed in a case study on page 14, illustrates this well. The fact that the provider is a university with a global reputation for manufacturing research strengthens the proposition further, and helps engage SMEs by providing them with access to high quality candidates. Collaboration between providers could enable better prioritisation of capital expenditure between them, and enrich the overall technical curriculum by providing learners with access to broader learning opportunities through the facilities of collaborating providers.

Figure 8: Level of encouragement experienced by 16-18 year old to undertake a technical apprenticeship

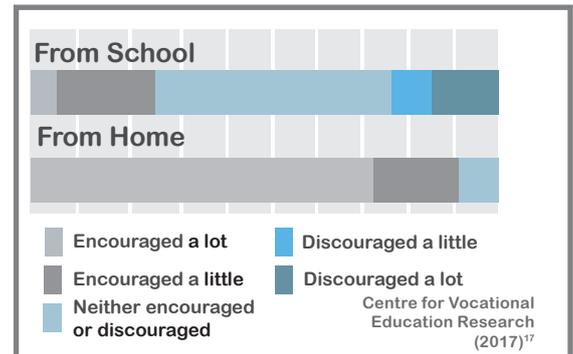
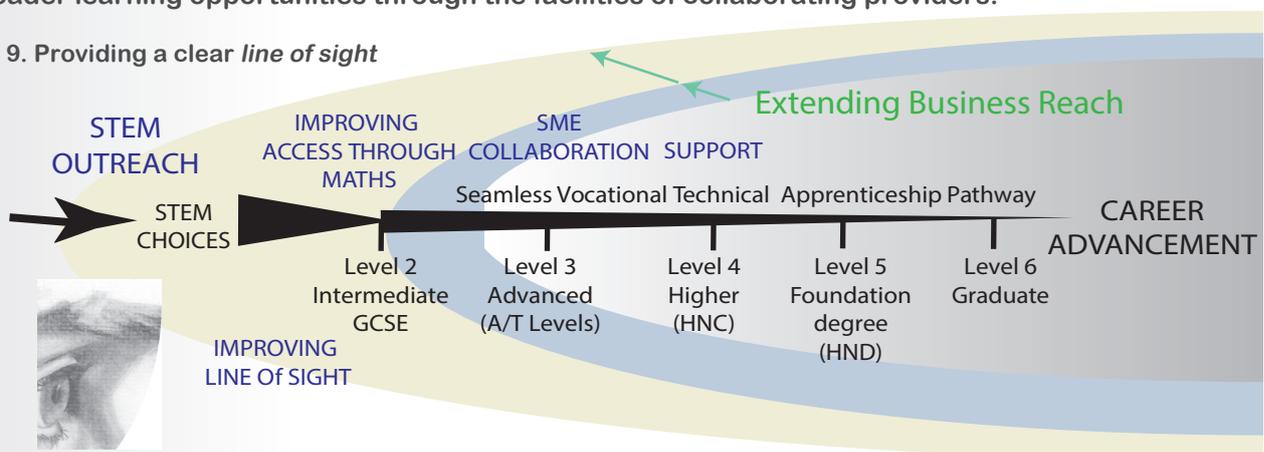


Figure 9. Providing a clear *line of sight*



In support of this report we have consulted with a number of leading UK advanced manufacturing businesses and education providers, which are recognised as best practice. Key learnings are provided below with two illustrative case studies.

- Providing young people with a perspective of a potential pathway through to higher education is important, and can mitigate potential concerns about limited career progression in SMEs.
- The importance of presenting technician roles and career paths as attractive to applicants and parents.
- A provider with an international reputation for excellence will strengthen the proposition for employers, candidates, and their parents, and reduce risk for SMEs. It can also more broadly strengthen the brand of advanced apprenticeships in the local area.
- Leveraging the scale and capability of a provider to efficiently provide a full-service to SMEs, from attraction through to mentoring and assessment, will be attractive to SMEs.
- Establishing an academy or training centre that is recognised for excellence can attract sponsorship and additional financial support for SMEs.
- Significant leadership is required to engage stakeholders to successfully deliver change.
- Vocational training that is co-located with R & D facilities benefits from access and exposure to emerging technologies that enhances curricula and learning opportunities.

## Case Study 1: Toyota UK Training Academy - Derby

### Background

Toyota UK have trained technical advanced apprentices in their Training Academy at Burnaston near Derby since the 1990s. In 2012 they identified capacity at the Academy to train apprentices in addition to their own intake, extended their offer to their local supply-chain and SMEs. Since then more than 30 local businesses have partnered with Toyota, and trained apprentices through the Academy. Toyota are also actively engaged in supporting local pre-apprenticeship STEM outreach by partnering with the Derby Manufacturing UTC and the JCB Academy. The Academy also provides module support to other providers, such as AMRC, on degree apprenticeships.

### The Offer

Toyota have a 44 month advanced level 3 apprenticeship, with opportunity for some learners to achieve a level 4 HNC. The programme develops technicians for Mechatronics and Die Maintenance roles. Apprentices employed by external partners undertake an identical programme to the Toyota apprentices, and train alongside them. Toyota will support the recruitment process if needed, and leverage their expertise in apprentice development to support the partner organisation. The programme is delivered in partnership with Burton & South Derbyshire College. All apprentices are integrated into a single cohort, to avoid any perception of a two-tier system. The partners are typically SMEs based within 40 miles of Derby, and most are not levy payers. They value the quality of training and support they can access through a trusted world-class partner, and the relationship helps them recruit good candidates.

### Outcomes

- Over 150 apprentices have been trained for more than 30 SME partner organisations in the local area. They benefit from very high-quality training, and from the efficiency of leveraging the expertise and resources that Toyota provide.
- The approach is enabling an incremental supply of skilled technicians. Many of the SME partners were either not previously training apprentices, or had stopped recruiting them because they were finding it difficult to provide high quality training.

## Case Study 2: Sheffield Advanced Manufacturing Research Training Centre

### Background

The AMRC was established in 2001 as a collaboration between the University of Sheffield and Boeing. It is the anchor tenant of the Advanced Manufacturing park at Catcliffe, South Yorkshire, and has developed a world-class reputation for partnering with industry to develop technologies used in high-value manufacturing. The AMRC now has more than 100 industrial partners, and employs over 500 researchers and engineers. In 2013 a new AMRC Training Centre was opened.

### The Offer

The AMRC Training Centre offers apprenticeships in engineering that extend from Level 3 Advanced Apprenticeships through to degree and post-graduate apprenticeships. The Advanced Apprenticeship is typically a 3 year programme, and they are currently offered in Machining, Fabrication and Welding, Technical Support, and Mechatronics Maintenance. The Training Centre has an annual intake of around 250 apprentices, and provides training for more than 300 employers, most of which are SMEs. An apprenticeship delivered by a Russell Group university with a world-class reputation for advanced manufacturing, excellent facilities, and a pathway to higher education, provides a strong proposition for candidates. Employers are attracted by the supply of good candidates, the guarantee of high quality training and facilities, and a full-service which includes the Centre supporting recruitment, training and assessment. The offer is further enhanced by the support AMRC can help leverage from other partners. An example of this is the partnership with Close Brothers, a merchant bank, who part-subsidise the wage costs of apprentices with 20 SMEs during the first 2 years of the apprenticeship.

### Outcomes

- The pipeline of skilled technicians and apprentices in the region has increased significantly. The number of 16-18 year-old learners starting Advanced Apprenticeships in Engineering & Manufacturing Technologies in Rotherham is twice the national average.
- The AMRC Training centre provides a clear educational pathway for apprentices from Level 3 through to Level 7. A high proportion of learners are motivated to continue through this pathway.
- The AMRC has become the centre of excellence for engineering apprenticeships in the region, and is now training apprentices for employers in a 30-40 mile radius of the centre. Around 80% of employers are SMEs.
- New investors to the region such as Boeing, Rolls-Royce, & McLaren have confidence in the local pipeline of advanced manufacturing skills and capability.

## Best Practice demonstrates that a clear vision with strong leadership is required for a step change in technical skills training

A new approach which accelerates and sustains the development of advanced technical skills is required in the North East. It will need to provide a pipeline of capability, to allow the automotive sector to be competitive, both within the UK and globally. The 2019 Augar<sup>22</sup> review, commissioned by the Government, recommended that for the UK, “a more comprehensive solution to skills shortages will be required, encompassing all higher and further education institutions, and providing systematic sectoral and geographic coverage.”

This will involve significant change, since the systemic and legacy issues outlined in this report will need to be addressed. Policy and funding will present challenges and will require collaboration and innovative solutions. Different interests across the education and training sector, across local authority boundaries, and across different advanced manufacturing sectors, will need to be resolved and aligned. The perceptions of employers and learners will take time to change, and will require the education and training supply chain to better align to their needs. This is not simple and requires significant business leadership. It is evident that if left to the local market dynamics, the region will not be competitive with those areas that are adopting a more coherent strategic workforce plan underpinned by clear business demand and excellence in technical training.

New ways of enabling efficient delivery of high-quality programmes will be needed, together with more attention on foundation skills. Maths attainment, and development of foundation skills allow access to advanced apprenticeships and can accelerate the learning process. Programmes need to be focussed on the competency of each learner, rather than time-served. Some best-practice providers are already enabling completion of programmes, which go beyond the Standard requirements, within 3-4 years, and are effectively improving quality whilst reducing cost and uncertainty for employers. Furthermore, these approaches enable progression to higher education and better career and employment opportunities.

The examples of best-practice identified in this report highlight that these challenges can be addressed, and that bold action can enable sustained change and different outcomes. They also illustrate the importance of a clear vision, credible technical capability and facilities, and innovative approaches to funding and SME support. Strong leadership to establish alignment around the vision, sponsor the change process, and address challenges, has been critical to their success.

## Support will be needed for containment actions in the near term to attract and retrain skilled technicians from other sectors or regions.

The estimated short-fall of 400 skilled technicians in the Washington area alone in the next 5 years highlights that there is a need for a near-term containment action to resource and retrain existing skilled technicians, as it will take 5 years before any adjustment to advanced apprenticeship starts will have any impact on the availability of technicians.

Resourcing into these roles is challenging for several reasons:

- Skilled technicians are in demand across several sectors, and demand from one sector could just result in churn and skill-shortages in another.
- Attracting skilled people at this level into the region is challenging unless they are seeking redeployment or have some connection to the region.
- Migration from the EU has been a source of these skills previously, but Brexit and lower migration from the EU is likely to impact this supply moving forward and will result in competition for skills from other regions.

It is apparent that employers recognise that experienced candidates for skilled technician vacancies are likely to require additional training once they've been recruited. Of the NEAA members we surveyed, 60% indicated that new hires typically needed more than 4 weeks training, and 30% needed more than 12 weeks. There are established retraining and multi-skilling programmes in the region that typically take 3 months to complete for a skilled person from outside the sector. There are associated retraining and wage cost associated with this type of experienced hire, that typically do not attract financial support.

Any actions to attract experienced hires to the sector will require coordination to prevent unnecessary workforce churn within the region.

# Conclusion and Recommendations

Through this report we have outlined some significant issues which are impacting workforce development in the advanced manufacturing sector in the North East, and some particular systemic challenges which relate to the demand and supply of skilled technicians.

Addressing these challenges can unlock tremendous opportunity for the region to build on its strengths in advanced manufacturing. New product technologies, automation and digitalisation will transform the work that is done in our manufacturing facilities, and provide a platform for growth, productivity and better jobs. Skilled technicians have a key role to play in this, and best-practice illustrates that the pipeline for these skills can be improved, provided there is a more compelling local offer that works for employers and for candidates.

Addressing this challenge will need to form part of a broader and integrated response to securing the skills required to enable sustained productivity and growth across the sector. The demand and supply of skilled technicians does need urgent collective attention though. They are scarce skills already, and the length of training needed means there is no quick-fix.

This is not a new issue, and it will need a step-change in approach. It will need a focussed plan, robust governance and effective alignment and collaboration across broader stakeholders within the region. It will need strong leadership with the vision and tenacity to address systemic issues and make a sustainable difference. Industry, local government, and education providers will need to align in support of a different model, if the region is serious about its ambition to secure future growth in advanced manufacturing.

Our primary recommendations are outlined below. We believe that establishing a centre of expertise for technical and apprentice training in the North East would provide an opportunity to better align the future needs of industry and young people, and play an important role in supporting the Strategic Economic Plan for the region.

**1** A more compelling advanced apprenticeship and technical training offer for both candidates and SMEs, which could be enabled through a centre of excellence for advanced technical training, which could:

- Provide a clear, inspirational and integrated learning pathway for candidates, which enables progress from school to employment, with a clear 'line of sight' of educational progression through to higher education and better employment and career opportunities.
- Develop high level technical skills in an advanced environment which is recognised as world-class, in order to provide industry with the skills it needs for now and the future.
- Collaborate with other leading advanced manufacturing training centres in the UK to leverage capability to develop and deliver curricula for skills required for new and emerging technologies.
- Provide full-service support on apprenticeship development and technical training for SMEs, enabling them to access highly qualified candidates.

**2** More flexibility at a regional level to target funding in support of apprentice development in those sectors prioritised in the Strategic Economic Plan. Businesses across the region should be able to access similar financial support, irrespective of whether they are within a Combined Authority or not. This is particularly important to SMEs in advanced manufacturing, where the cost to the employer is higher than in other sectors.

**3** A coordinated and focussed approach to sourcing the technicians that will be required in the North East in the near-term. This should avoid disruptive churn in other sectors in the region, and should provide support to those businesses required to retrain existing technicians.

**4** Leadership accountability for delivering these changes needs to be established. Effective governance will be needed to align stakeholders in the region in support of a cohesive workforce plan.

# Appendix One

The following organisations have contributed to this report, through survey responses, insights provided in structured interviews and through input provided in discussion and best practice sharing.

<p>Adient Seating UK Ltd Advanced Electric Machines Ltd. Airlane Pneumatics Ltd. AMRC - The University of Sheffield Arlington Automotive Ltd. Astute Machinery Consultants Ltd. Avid Technology Ltd. BorgWarner Inc Calsonic Kansei Ltd. Comau UK Ltd. D&amp;S Services Ltd. Dyer Engineering ElringKlinger GB Ltd. Faltec Europe Ltd. Ford Component Manufacturing Ltd. G.B. Belting Ltd. Gateshead College George Utz Ltd Gestamp (UK) Ltd. Gestamp Tallent Ltd. GT Group Ltd. Hyperdrive Innovation Ltd. Jaguar Land Rover Automotiove plc. Knorr-Bremse Rail Systems (UK) Ltd. Lear Corporation LKE (UK) Ltd. Manufacturing Technology Centre (MTC) Ltd.</p>	<p>Mi-King Ltd. NA College Ltd. New College Durham Nissan Motor Manufacturing (UK) Ltd. North East LEP. Norhumbria University. Novares Peterlee Ltd. Omron Electronics Ltd. Paragon Rapid Technologies Ltd. Peak Resource Ltd. Polymer Compounders Ltd. SETA Ltd. SEWS-E Ltd. SIC MARKING Ltd. Siemens plc. SNOP UK Ltd. South Tyneside Council. Sunderland College. Sunderland City Council. University of Sunderland. Tomlinson Hall &amp; Co. Ltd. Toyota Motor Manufacturing (UK) Ltd. TR Fastenings Ltd. Unipres (UK) Ltd. Vantec Europe Ltd. Zero Carbon Futures Ltd. ZF-TRW (TRW Systems Ltd.)</p>
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# Appendix Two

## EDUCATIONAL LEVELS

England, Wales & Northern Ireland

- Level 1** GCSE - grades 3, 2, 1 or grades D, E, F, G
- Level 2** CSE - grade 1, GCSE - grades 9, 8, 7, 6, 5, 4 or grades A\*, A, B, C, Intermediate apprenticeship, O level - grade A, B or C
- Level 3** A level/T Level, Advanced apprenticeship
- Level 4** Higher apprenticeship, higher national certificate (HNC)
- Level 5** Foundation degree, Higher national diploma (HND)
- Level 6** Degree apprenticeship, Degree
- Level 7** Master's degree
- Level 8** Doctorate

# Appendix Three

## Institutes of Technology

The Government announced the introduction of twelve new Institutes of Technology (IoT) in April 2019, to specialise in delivering quality higher level technical training (at Level 4 and 5) in STEM subjects:

IoT Lead	Other anchor partners	Sector specialisms
Barking & Dagenham College	Coventry University, Huawei, Saint Gobain	Construction and Infrastructure, Advanced Engineering, Creative, Digital and IT
Dudley College of Technology	University of Wolverhampton, Thomas Dudley Ltd, Fulcro COINS, The Dudley Group, NHS Foundation Trust	Advanced Manufacturing, Modern Construction Methodologies, Medical Engineering
HCUC	Brunel University, Heathrow, Fujitsu	Eng'g and Technology Sectors (digital, cyber security, IT)
Milton Keynes College	Cranfield University, Microsoft Ltd, KPMG, Evidence Talks, McAfee, VWFS	Cyber Security, Digital Sector, FinTech, IT
New College Durham	Newcastle University, Nissan Motor Company Ltd, ESH Group Ltd	Digital Advanced Manufacturing, Construction and the Built Environment
Queen Mary University of London	Newham College, Siemens, Port of London Authority, London and Regional Properties	Transport, Engineering, Infrastructure, Energy, Digital
Solihull College & University Centre	Aston University, Birmingham City University, Bosch Thermotechnology Ltd, Salts Healthcare	Manufacturing, Engineering
Swindon College	New College Swindon, University of Gloucester, Nationwide, Catalent Pharma Solutions, Excalibur Communications Ltd, Bath ASU	Advanced Engineering and High Value Manufacturing, Digital, IT and Creative Industries, Health and Life Sciences
University of Exeter	University of Plymouth, Bridgwater & Taunton College, City College Plymouth, Exeter College, Petroc, Truro & Penwith College, Babcock, Met Office, Oxygen House, TDK Lambda, Watson Marlow	Digital, Engineering, Manufacturing
University of Lincoln	Grimsby Institute of Further and Higher Education, North Lindsey College, Siemens, Bakkavor Ltd	Agri-Tech, Food Manufacturing, Engineering, Energy, Digital
Weston College of Further and Higher Education	Bath College, Gloucester College, Yeovil College, University of the West of England, Bristol, Airbus, GE Aviation, GKN Aerospace, JISC, National Composites Centre, North Somerset Council, Mayden Academy, Renishaw, St Monica Trust, Tech Op Solutions Ltd, Weston Area Health NHS Trust	Engineering (including Aviation), Hi-Tech Digital & Creative, Health & Social Care, High Value Manufacturing, Medical Technical
York College	University of Hull, ENERGIE Fabricom, Skipton Building Society, Seachill	Engineering/Manufacturing, Digital, Agri-tech

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The views, findings, conclusions and recommendations expressed in this report are strictly those of the authors.

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