

May 2024



Advanced Manufacturing Skills Assessment

Northern Ireland City and Growth Deals

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Acknowledgements

The Advanced Manufacturing Task and Finish Group emerged following the identification of a need to understand whether the skills needs emerging from City & Growth Deal Activity could be met by the current labour market. The approach, originally designed by the BRCD as the most advanced deal, was later extended to cover all four city and growth deals across Northern Ireland.

The Terms of Reference and proposed membership of the Task & Finish Group were approved by the Cross-Deal Skills Group. The Group's Task was to understand existing and future labour and skills challenges impacting upon the sector and associated implications as a result of city deal investments, map the range and scale of existing provisions, identify the need for new interventions and/or scaling up existing provision, identify solutions inside and outside of NI to learn from and consider options/interventions for consistent methodologies for forecasting (full details of the methodology deployed are contained in Section 1).

The following organisations participated in the Group and contributed to this report:

Group	Representation
Councils	Antrim and Newtownabbey Borough Council Mid and East Antrim Borough Council
Further Education Colleges	South East Regional College Northern Regional College Southern Regional College South West College
Universities	Queen's University Belfast Ulster University
Industry Reps / Public Bodies	Centre for Competitiveness Manufacturing NI Makers Alliance Advanced Manufacturing and Engineering Sectoral Partnership Invest NI
City & Growth Deals	Mid South West Growth Deal Derry and Strabane Growth Deal
AMIC	AMIC Delivery Team

The Group engaged widely and extensively across relevant areas of expertise through industry and education and with our government partners. In addition, much of our research was supplemented by a process of employer engagement and we would like to thank all of the contributing organisations.

Special thanks goes to Sam Turner, AMIC CEO who Chaired the Task and Finish Group and facilitated the work and discussions of the group, as well as bringing significant insight into skills and innovation and the role innovation centres can play in supporting skills and workforce development.

Executive Summary - Advanced Manufacturing Skills Assessment

Purpose of Research Activity

To identify gaps in skills provision and to make recommendations to help ensure that an appropriately qualified workforce can be put in place to meet the anticipated development and growth of the Advanced Manufacturing Sector in Northern Ireland expected to result from the programme of investment through City and Growth Deals in the sector.

The work to achieve this included:

- An overview of current and expected future skills challenges impacting the sector and associated implications as a result of city deal investments (drawing from existing intelligence and direct engagement with businesses and representative bodies)
- A profile of:
 - the spectrum of existing employability and skills provision targeting the development of advanced manufacturing skills
 - a breakdown of the range and volume of current employability and skills provision (aligned to the sector)
 - an assessment of the potential of existing interventions to meet the needs of industry now and in the future
 - gaps in provision by volume and/or the scale of intervention
- Identification of the need for new interventions and/or scaling up existing provision to meet demand, principally aligned to areas of city deal investment;
- Consideration of solutions inside and outside of NI we can use/learn from;
- Recommendations regarding potential approaches to addressing gaps in provision and other challenges in the sector based on emerging findings;

Priority Considerations

In the course of this work, the key areas of focus reflecting the current policy priorities of City & Growth Deals, to align with regional strategic priorities included:

- **Skills for Growth:** Considering how skills programmes and employment opportunities can be aligned with the advanced manufacturing sector helping to unearth potential for new apprenticeship pathways, and the development of mid-tier and higher-level skills.
- **Inclusive growth (Skills for Inclusion):** Exploring opportunities to address skills imbalances and improve access to employment opportunities across the region through socially inclusive progression pathways and maximise inclusion and diversity.
- **Digitalisation and the impact of technology:** Increasing the adoption of digital technology within the Advanced Manufacturing sector and considering the resulting implication on skills needs. As well as the general digital skills needs of employees in almost every sector there will be specific needs aligned to occupations within the advanced manufacturing sector that need to be considered if future demand is to be met. Areas of focus for skills development will be Industry 4.0 technologies such as automation and robotics, and digital technologies including modelling and design for manufacture.
- **Supporting Innovation:** Supporting the drive for increased innovation capability to help achieve world-leading advantage in the advanced manufacturing sector.

- **Sustainability and Net Zero Sustainability:** Considering the rising importance of sustainability and the drive to Net Zero and its impact for skills development.

The Potential

Northern Ireland has a rich history in Manufacturing, it continues to be a key sector.

Northern Ireland has a higher concentration of manufacturing businesses than the UK.

Across Northern Ireland, manufacturing accounts for 11% of employment and over 15% of GVA and the sector drives innovation and exports and provides skilled and well-paid jobs, which has a significant multiplier effect throughout the economy.

*“Advanced manufacturing and innovation are two of the key areas within my Department’s 10X Economic Vision which aim to deliver an economy which is ten times more innovative, more inclusive and more sustainable for the benefit of everyone.” **Economy Minister Gordon Lyons***

Northern Ireland is home to over 5,000 manufacturing companies supporting 120,000 jobs. As a sector, manufacturing delivers around £10.6 billion per annum to the local economy, including exports of around £6 billion of products and services to international markets. It is a significant sector in the Northern Ireland Economy and advanced manufacturing companies in Northern Ireland are already leading the drive for innovation with the sector recognised by the Department for the Economy as one of five clusters ready to adopt enabling technologies. Across Northern Ireland a firm foundation already exists from which the sector can continue to grow and innovate.

Invest NI recognises that **Northern Ireland has a vibrant and highly sophisticated advanced manufacturing and engineering sector, citing that in** recent years, employment in the Northern Ireland manufacturing sector has grown more than four times faster than the rest of the UK. Manufacturing accounts for 11% of employment and over 15% of GVA, making it a key sector in the Northern Ireland economy. Companies operating in the sector are diverse with a range of experience and there are a number of areas of developing global competitive strength. The sector is dominated by smaller employers with a high proportion of NI’s manufacturers (93%) employing less than 50 people. The region is home to both indigenous and international companies engaged across a range of activities from R&D, new product development to manufacturing. A key success factor for the sector in the future will be a continued focus on research and development to drive innovation, further strengthening the sector’s global position as cutting edge and globally competitive.

The sector is currently supported by a number of research centres of excellence undertaking industrially relevant research and channelling university expertise into the development of sophisticated products and processes to assist the growth of companies in our advanced manufacturing and engineering sector including Northern Ireland Advanced Composites & Engineering Centre, Northern Ireland Technology Centre, Centre for Competitiveness and the Polymer Processing Research Centre. The planned City and Growth Deal investments totalling over £150m over the next ten years provide a platform for generational change in the manufacturing infrastructure, adding value to the environment by bringing together industrially relevant research and the business community to significantly expedite the rate of growth and innovation within the sector. By creating

global centres of innovation excellence, they will provide opportunities for businesses, located both in and outside Northern Ireland, improving the interface between world-leading academia and research and provide access to breakthrough technologies, helping to drive innovation in processes and products development.

The new Centres will include:

- **Advanced Manufacturing Innovation Centre (AMIC)**
- **Centre for Industrial Digitalisation Robotics & Automation (CIDRA)**
- **i4C Innovation and Cleantech Centre**
- **Agri-Tech Centre**
- **Digital Twin**
- **An Engineering & Skills Innovation Centre as part of the Mid South West Growth Deal.**
- **RAPIC**

These projects have been promoted by our local authorities, the education sector partners and endorsed by NI and UK governments. This network will be the foundation of translating innovation to the wider economy, connecting businesses at all levels to new ideas and technologies and bringing to life the benefits for our people of a highly productive economy. They aim to build upon the strengths and unique characteristics of the region, through targeted innovation interventions and address barriers to economic growth across the region. These City and Growth Deal projects will be one of the drivers of innovation in the advanced manufacturing Sector and fundamental to the success of these Centres driving the sector forward is a skills eco-system to support Industry needs.

The planned City and Growth Deals investments with an advanced manufacturing focus have a good regional spread, reflecting the wide geographical spread of jobs in the sector across all local government districts.

Responding to Challenges

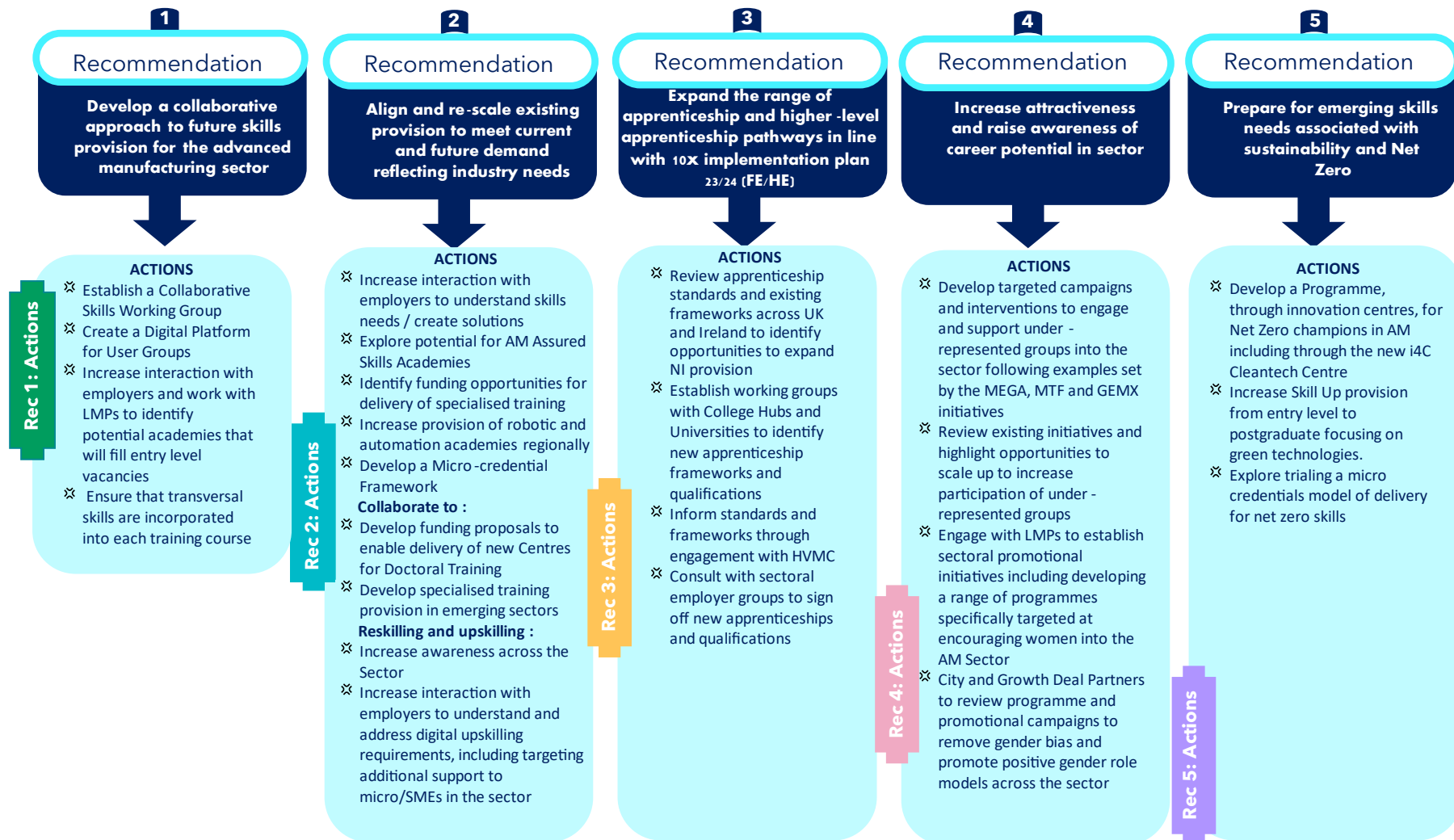
The Advanced Manufacturing Sector is a key area of growth in Northern Ireland and the City and Growth Deals in the Region should act as a catalyst to innovation and scaling up of organisations leading to continued growth. **This cannot happen without a significant investment in people and skills.** However, the sector faces significant challenges which need to be addressed:

- Throughout the programme of research and stakeholder engagement which underpinned the development of the 10X Skills Strategy, there was a clear and consistent message that our 'skills system' is fractured and fragmented. Different institutions govern and deliver different elements and there is an absence of a consistent overall vision for what we expect our skills system to deliver. Addressing this, and the inefficiencies it causes, will require a refreshed approach to how we view and govern the system.¹
- Future skills are changing rapidly, industry needs support to forecast and plan. Traditional businesses within this sector are struggling to understand and equip themselves with the right skills and capabilities to take advantage of disruption within this sector. As innovation continues to drive changing skills needs, a mechanism is needed to integrate skills forecasting ensuring new skills provision can be introduced at an appropriate time. There is currently an absence of regional skills forecasting for the sector, involving a joining up of key stakeholders in this area.
- Rapid changes and innovations in the sector, such as digital technologies, data and automation will require continuous learning and upskilling to remain competitive and relevant in the global market.

¹ Skills Strategy for Northern Ireland Skills for a 10X Economy

- The difficulty of attracting and retaining talent in the sector, especially among young people and women, who may have negative perceptions or lack of awareness of the opportunities and benefits of working in advanced manufacturing. This requires more effective promotion and engagement of the sector with schools, colleges, universities and communities to showcase the diversity and potential of careers in advanced manufacturing.
- The existing apprenticeship offering is dated with regard to both the curriculum and the apprenticeship frameworks (standards) and does not meet the emerging demands of employers in response to the evolving opportunities afforded by technology and the move to more advanced manufacturing. There is a need to develop new training curriculum and content to underpin the ambition of the advanced manufacturing sector, this content must align with the development of new apprenticeship frameworks at Level 3 and also feed on into Higher Level Apprenticeships.
- There is a gap between the skills demand and supply in the sector, which may result from mismatches between the qualifications and competencies of the existing and potential workforce and the requirements and expectations of the employers. This requires more collaboration and alignment between the education and training providers and the industry to ensure that the skills provision meets the current and future needs of the sector.
- Skills provision for sustainability and reaching net zero in advanced manufacturing is a complex and multifaceted challenge. Designing and implementing effective programmes to support skills development, reskilling and upskilling of workers, especially in emerging and critical technologies for net zero, such as hydrogen, carbon capture and storage, circular economy and renewable energy will need to be addressed if we are to meet net zero targets.

Findings from this research highlights that skills clearly lie at the heart of the success of the vision of Northern Ireland as a leader in advanced manufacturing and the sector is already facing a significant skills challenge. This report gives greater context behind the issues raised and the following diagram summarises the recommendations, actions and interventions which may go some way to address them.



Section 1: The Advanced Manufacturing Skills Assessment

Advanced Manufacturing Skills Assessment - Background

Over the next few years, Northern Ireland (NI) will benefit from a package of investment from four City and Growth Deals: Belfast Region City Deal² (BRCD), Derry-Londonderry and Strabane Region City Deal (D&SCD), Mid-South West Growth Deal (MSWGD) and Causeway Coast and Glens Growth Deal (CC&GGD).

These City and Growth Deals will improve the interface between world-leading academia and research and provide access to breakthrough technologies, helping to drive innovation in processes and product development and providing opportunities for businesses both inside and outside Northern Ireland.

NI is a global leader in Advanced Manufacturing and as such it is one of the five priority sectors identified through the 10X Decade of Innovation³. Manufacturing is predicted to be one of the top ten growth sectors up to 2028⁴ - leading to an estimated 10,000 jobs across manufacturing (under the high growth scenario) - with potential for an additional 1,500 workers per annum⁵ in Advanced Manufacturing, Materials and Engineering by that date.

Advanced Manufacturing is associated with the use of innovative or cutting-edge technologies and methodologies. A diverse range of companies spanning aerospace, automotive, construction, materials handling, electronics, energy, water and consumer products operate within the sector. Specific areas within which local companies are developing competitive strength globally include; plastics and polymers, composites design and manufacturing, precision manufacturing, off-site/modular construction solutions, amongst others.

The sector is home to both indigenous and international companies engaged across a range of activities from R&D, new product development to manufacturing and is supported by a number of existing world class research centres of excellence including:

- Northern Ireland Advanced Composites & Engineering Centre (NIACE)
- Northern Ireland Technology Centre (NITC)
- Centre for Competitiveness (QUB Belfast)
- Polymer Processing Research Centre (QUB Belfast)⁶

Continued focus on research and development to drive innovation will further strengthen the sector's cutting-edge position but also needs to be aligned with efforts to create a vibrant talent pipeline with skills shortages regularly being highlighted as a major constraint on sector growth. The 10X Delivery Plan 2023/24 raises the importance of making the most of our skilled and talented people to support innovation and ensuring that we have the right pipeline of skilled individuals to support specific needs of innovating companies.

² The Partnership comprises Antrim and Newtownabbey Borough Council, Ards and North Down Borough Council, Belfast City Council, Lisburn and Castlereagh City Council, Mid and East Antrim Borough Council, Newry Mourne and Down District Council, Queen's University Belfast, Ulster University, Belfast Metropolitan College, Northern Regional College, South Eastern Regional College and Southern Regional College

³ 10X Economy - an economic vision for a decade of innovation | Department for the Economy (economy-ni.gov.uk)

⁴ [Skills Barometer 2021 update | Department for the Economy \(economy-ni.gov.uk\)](#)

⁵ <https://protect-eu.mimecast.com/s/KBvbCl7pBTOByOZH4TH?domain=investni.com>

⁶ NIACE, NITC and PPRC are being amalgamated into AMIC

In recent years Northern Ireland's diverse advanced manufacturing and engineering sector has grown almost three times faster than the rest of the UK⁷ leading to a higher concentration of manufacturing businesses here than in the UK as a whole and improving our economic competitiveness. Across the region it accounts for 11% of employment and more than 15% of GVA⁸. More specifically, within the BRCD region, it comprises almost 8%⁹ of all employment (46,400 jobs), making it a key sector in the local economy.

However, the relative size of companies operating in the sector is significant and smaller SMEs tend to benefit from opportunities as part of the sub-contracted supply chain in the sector. With the vast majority being micro businesses their ability to avail of (or understand the scope of) existing skills solutions is limited. Emerging interventions developed through AMIC and other partners, will therefore consider how best to target these small companies to help them fully understand the skills offer and the opportunities and potential for innovation that this could bring to their organisations. Many of these SMEs are crucial to the supply chain for a range of sectors including new technologies like green hydrogen and it will be even more important as we strive to reach net zero targets that the sector can work with supply chain partner to implement new approaches to carbon accounting.

Northern Ireland already benefits from a rich manufacturing and engineering tradition which will be further bolstered by the city deal investments in the sector. However, it is expected that advanced manufacturing will be one of the sectors most impacted by automation and Industry 4.0, Emerging technologies will not only impact how businesses operate, but will also dictate future skills needs. The implications of the move to meet the challenges for Industry 4.0 immediately presents increased risks for an aging workforce unable to adapt to these new technologies and this issue is core to the priorities called out in the 10X Skills Strategy which aims to create a strong digital spine for growth of the regional economy.

In order to remain globally competitive, industry recognises the need to get in front of this by preparing now for the skills needs of the future. Increasingly jobs in advanced manufacturing will require mid and higher-level skills, yet research shows that three in ten workforces already lack technical skills and more than a fifth consider themselves to be deficient in advanced technology skills including machine learning¹⁰.

Ensuring access to the scale of skilled workforce required will be a critical determinant of the success of both the Advanced Manufacturing sector and of City and Growth Deal investments more generally. It will also impact the success of the 10X strategic vision for the economy.

Greater collaboration between Further and Higher Education, Industry and Councils to develop the skills required will be necessary if the region is to strengthen the capability and skills pipeline in this sector. There will be a need for skills progression pathways that align to industry need. Addressing the skills opportunities, gaps and needs for the sector in order to fully benefit from the opportunity these investments can bring, is the primary focus of this report.

⁷ [Skills Barometer 2021 update | Department for the Economy \(economy-ni.gov.uk\)](#)

⁸ <https://protect-eu.mimecast.com/s/KBvbCl7pBTOByOZH4TH?domain=investni.com>

⁹ Belfast City Region Skills Barometer, January 2019

¹⁰ www.barclayscorporate.com/content/dam/barclayscorporate-com/documents/insights/industry-expertise/a-new-image-for-manufacturing.pdf

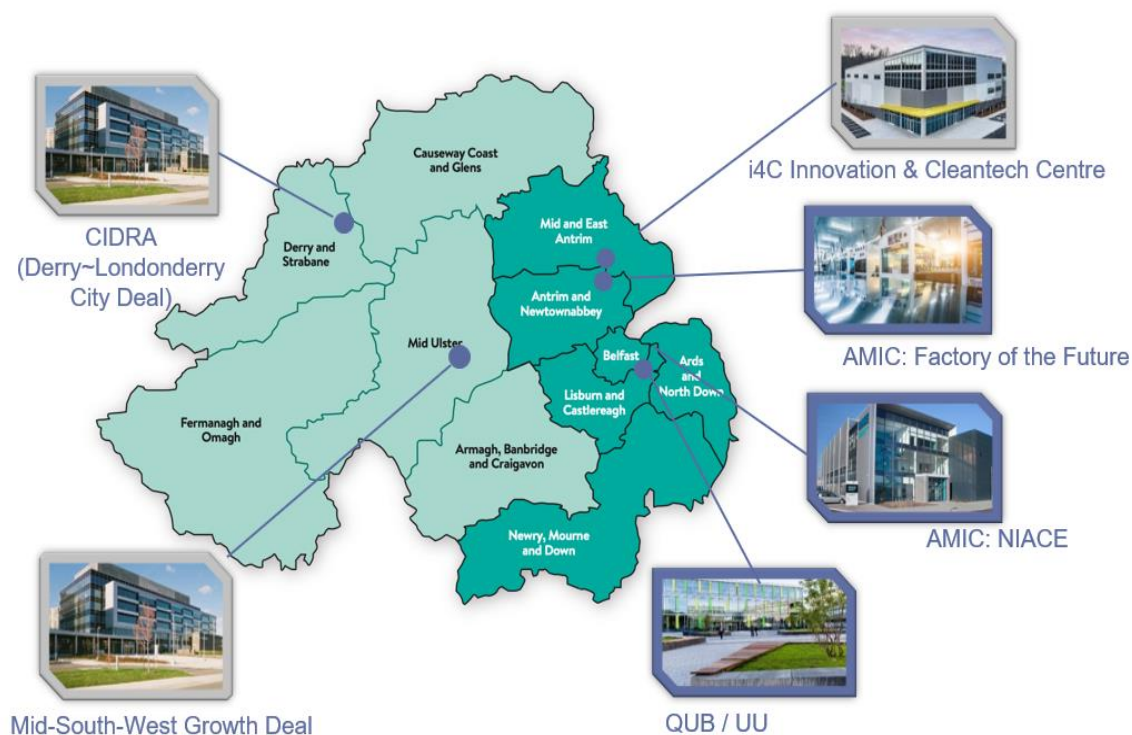
Advanced Manufacturing Skills Assessment - City and Growth Deals

The advanced manufacturing sector is currently supported by a number of research centres of excellence undertaking industrially relevant research and channeling university expertise into the development of sophisticated products and processes to assist the growth of companies in our advanced manufacturing and engineering sector including:

- Northern Ireland Advanced Composites & Engineering Centre
- Northern Ireland Technology Centre
- Centre for Competitiveness
- Polymer Processing Research Centre.

The planned City and Growth Deal investments totaling over £150m over the next ten years¹¹ provide a platform for generational change in the manufacturing infrastructure, adding value to the environment by bringing together industrially relevant research and the business community to significantly expedite the rate of growth and innovation within the sector. By creating global centres of innovation excellence, they will provide opportunities for businesses, located both in and outside Northern Ireland, improving the interface between world-leading academia and research and provide access to breakthrough technologies, helping to drive innovation in processes and products development.

Advanced Manufacturing features strongly across the deals through a range of planned projects:



¹¹ In addition, the NI Executive has committed funding of circa £100m through the NI Complementary Fund. Under the first tranche of this funding Mid and East Antrim and QUB/UU were awarded funding to develop a collaboration with local industry aimed at accelerating the growth of the hydrogen economy in NI. This project involves energy/hydrogen skills training that would build on the hydrogen training academy.

Advanced Manufacturing and Innovation Centre (AMIC), Belfast Region City Deal

A Centre to support advanced manufacturing led by Queen's University. The establishment of the Advanced Manufacturing and Innovation Centre (AMIC) is an ambitious project which aims to be transformative for the advanced manufacturing sector both within the Belfast Region and across Northern Ireland more generally.

Digital Twin, Belfast Region City Deal

Digital Catapult is leading on proposals for a Digital Twin Centre in Northern Ireland to provide common, shared physical and digital infrastructure to support the development of digital twins, elements of which include common data architecture, tools, models, software, systems and hardware.

i4C Innovation and Cleantech Centre, Ballymena, Belfast Region City Deal

A dedicated SME focused innovation centre at St Patrick's Barracks i4C is led by Mid & East Antrim Borough Council. Scheduled to open in 2027, and representing an investment of £24m, the i4C Innovation and Cleantech Centre will provide a range of accommodation and supports enabling SME innovation across all sectors in the sub-region.

Centre for Industrial Digitalisation and Automation (CIDRA), Derry-Londonderry and Strabane Region City Deal

An Innovation Centre focusing on robotics and automation led by Ulster University.

Engineering & Skills Innovation Centre, Mid-South West Growth Deal

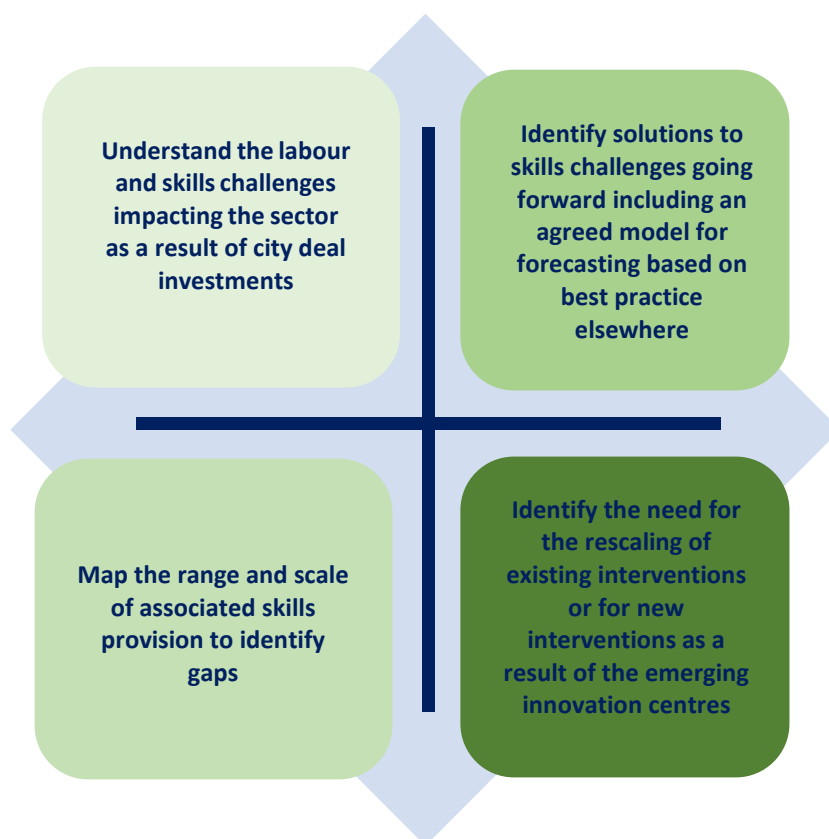
State-of-the-art engineering and advanced manufacturing facility focused on innovation, industrial digitalisation and higher-level technical skills.

Advanced Manufacturing Skills Assessment - Objectives

To better understand the potential skills opportunities and challenges facing the Belfast Region City Deal in delivering their capital investment projects, the BRCD's Employability and Skills Board¹² approved the establishment of an *Advanced Manufacturing Task and Finish Group*¹³ in September 2022 to fully explore this issue.

Following consultation with government partners, and agreement on the benefit of a more collective approach to skills assessments across the region, it was agreed that the Group's remit should extend beyond the BRCD, to encompass other projects likely to face skills needs associated with the advanced manufacturing sector, within each of Northern Ireland's city deals¹⁴ (Appendix 1).

The overall objectives of this project were to:

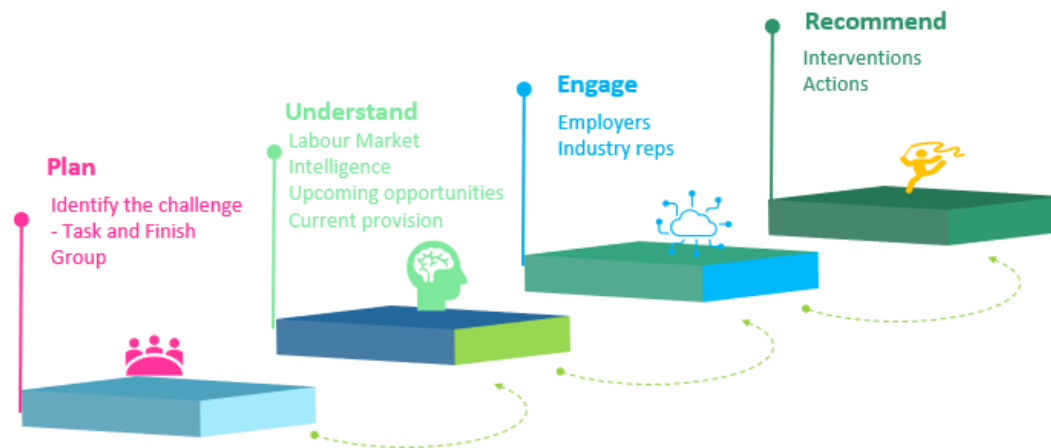


¹² See Appendix 1 for membership and Terms of Reference

¹³ See Appendix 2 for membership and Terms of Reference

¹⁴ See Appendix 3 for details of the relevant City Deal projects

Advanced Manufacturing Skills Assessment – Methodology



The methodology adopted included:

- A review of the most recent literature about the current status of advanced manufacturing and expected future trends in NI.
- An analysis of data from City and Growth Deal projects to obtain a sense of the scale and scope of planned activity and likely job (and skill) requirements.
- An analysis of data and qualitative information to assess labour market trends in respect of the advanced manufacturing sector.
- Engagement with universities, colleges and local councils, as well as sectoral representative bodies, to assess the scope and scale of current skills provision across NI.
- A series of one-to-one interviews¹⁵ with large and small Employers representing different industry sectors across Northern Ireland which helped us to:
 - Understand employers' experiences as they operate within the current labour market environment.
 - Verify whether research findings continue to be relevant to the current economic and labour environment employers experience.
 - Gain insight and feedback on the current employability and skills system.
 - Seek input into expected skills need now and into the future.
- An assessment of the above evidence to reach an informed conclusion about the extent to which current provision will be able to meet future needs
- Engagement with providers to understand how any identified gaps or shortfalls in provision might be addressed
- Identification of recommendations for consideration by the City and Growth Deal employability and skills boards and the Cross-Deal Skills Group

This project is intended to identify gaps in current skills provision impacting the sector and explore the potential to realign existing resources to better meet emerging demands.

The findings emerging through this work have informed a series of recommendations which are outlined in Section 7.

¹⁵ Refer to Appendices 4 and 9

Section 2: Advanced Manufacturing Skills Assessment - Policy Context

Advanced Manufacturing in Northern Ireland - Strategic Direction

To shape the work of this group and the emerging recommendations, it is important to understand the influence current policy environment has or may have on the availability of skills over and beyond the lifespan of city deal projects.

The Northern Ireland Skills Barometer 2021¹⁶, as a key source of economic intelligence locally, has helped to frame this report in the context of the current and future economic landscape and labour market environment.

Similarly, the OECD Skills Strategy¹⁷ notes the significant progress Northern Ireland has made in strengthening its skills system as well as its economic and social performance (and recognises a number of further strategies which have contributed towards the region's skills focus and direction¹⁸). However significant challenges remain.

The UK's Government Office for Science¹⁹ sets out how manufacturing in the wider UK global manufacturing eco-system is entering a critical period and will be faced with changes in a number of areas. Looking forward to 2050, the report identified the *"increasing dependence on highly skilled workers"* as one of the characteristics which will have significant implications.

Maker's Alliance²⁰ has also identified *"Skills and Labour Growth through increasing the capability of our people, leadership development and the creation of a pipeline of talent to fuel expansion"* as one of the six drivers for the development of a high performing, yet sustainable manufacturing sector.

The OECD report set the context for the future economic positioning of the region as articulated through DfE's 10X Vision and the accompanying skills strategy, Skills for a 10X Economy²¹ which presents a strategic framework for the development of the Northern Ireland skills system to 2030. The three strategic goals and corresponding policy commitments and enablers it sets out to address the skills imbalances in the local economy – aiming to improve social inclusion and well-being across society - offer a useful framework by which to guide this research.

The recommendations emerging through this project will align with and support the Strategy's policy objectives, which include commitments to:

- Boost our Innovation potential, driving global competitiveness in our key strategic clusters
- Provide better jobs for more people and develop a robust skills base, supporting our businesses to deliver on their competitive potential
- Open up educational pathways, empowering everyone in our society to reach their potential

¹⁶ <https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Skills-Barometer-2021-Summary-Report.pdf>

¹⁷ [OECD Skills Strategy Northern Ireland \(United Kingdom\) : Assessment and Recommendations | OECD iLibrary \(oecd-ilibrary.org\)](#)

¹⁸ Refer to Appendix 6

¹⁹ In *The Future of Manufacturing: A new era of opportunity and challenge for the UK*- new 'Build Back Better: Our Plan for Growth' Build Back Better: our plan for growth - GOV.UK (www.gov.uk)

²⁰ [Makers Alliance - A Strategic Plan for Manufacturing in Northern Ireland August 2022](#)

²¹ Skills Strategy for a 10X Economy <https://www.economy-ni.gov.uk/publications/skills-10X-economy-skills-strategy-northern-ireland>

As a small, advanced economy, the future prosperity of Northern Ireland will rely heavily on its ability to identify and invest in the sectors where it is already, and can continue to be, globally competitive²². The development of specific specialist skills, through globally recognised research institutions which will work collaboratively with Northern Ireland-based businesses to drive global competitiveness will be key to economic success. Manufacturing is amongst the sectors with the greatest annual gross demand for labour capable of significantly contributing to the lifeblood of the local economy.

As a recognised global leader in the sector, it is no surprise that DfE's 10X Economic Vision identified advanced manufacturing as one of five 'priority clusters' with the potential to drive the forward the local economy through better, higher paid jobs and improving productivity. These priority clusters have the potential to generate increased innovation and higher levels of competitiveness while improving the opportunity for businesses to diversify into new markets. The 10X Strategy considers that by coming together and forming 'clusters' in the economy, their impact can be maximised, increasing the region's potential to be world class with global leadership capabilities.,

The Department for the Economy's medium-term economic recovery plan 'Rebuilding a Stronger Economy' also identified advanced manufacturing as one of four sectors that will be key to rebuilding Northern Ireland's economy and its importance and potential with regard to:

- Plastics and polymers
- Composites design and manufacturing
- Precision manufacturing and specialist joinery and fit-out.

Focus on Sustainability and Net Zero

The Climate Change Act (Northern Ireland) 2022, commits the region to net zero greenhouse gas (GHG) emissions by 2050 and DfE's Energy Strategy²³ sets out a pathway to 2030 that will mobilise the skills, technologies and behaviours needed to take us towards our vision for 2050. It discusses the substantial and underpinning role of skills in delivering on this commitment. Meanwhile the vision for a 10X economy recognises low and zero carbon technologies as a key opportunity for Northern Ireland. The Department's recent '*Energy Strategy for Northern Ireland – Consultation on Policy Options*²⁴' highlights the strong advanced materials and engineering sector already present in Northern Ireland, which offers an opportunity to be at the forefront of innovation in global efforts to tackle climate change. However, if the region aims is to reap the benefits of greener ways of working and living across our society new skills will be required at all levels. The DfE 10X Delivery Plan 2023/24 specifically highlighted the importance that in City and Growth Deals the Net zero and the wider sustainability agenda will be considered in the development of project proposals and taken forward through a cross deal working group.

Focus on STEM

The Northern Ireland Skills Strategy references a particular need to drive increased participation in 'narrow STEM' subjects which have particular economic relevance in Northern Ireland as they offer some of the best opportunities for individuals to develop rewarding, well-paid careers. As the qualifications expected to offer the most significant employment opportunities in the decades ahead, it will be especially important to improve the participation rates of women in this area as recent statistical evidence demonstrates a persistent gender imbalance in numbers of females studying STEM subjects and participation in advanced manufacturing workforce.

²² DfE/Landfall Strategy Group (2019). The Strategic Integration of Skills and Innovation in Northern Ireland: An International Small Economy Perspective

²³ Energy Strategy Path to Net Zero Energy > <https://www.economy-ni.gov.uk/publications/energy-strategy-path-net-zero-energy>

²⁴ <https://www.economy-ni.gov.uk/consultations/consultation-policy-options-new-energy-strategy-northern-ireland>

Embracing new technologies

Many reports and strategies have highlighted the challenges facing industry as the sector progresses towards Industry 4.0. The Made Smarter Industrial Digitalisation Review²⁵ sets out the issues facing the UK with regard to productivity and competitiveness and proposes solutions in terms of the adoption of Industry 4.0 and skills development. The UK government's Industrial Strategy²⁶ is also clear on the challenges and opportunities facing industry and society in general in the face of rapid advances in AI, robotics and digitalisation.

The European Commission's industrial strategy policy, Investing in a Smart, Innovative and Sustainable Industry²⁷ - A renewed EU Industrial Policy Strategy; Economy 2030 and launched in September 2017, addresses similar challenges, as does the draft Industrial Strategy for Northern Ireland²⁸ and the Northern Ireland Draft Programme for Government 2016. Also relevant, is the 2016 Matrix Digital ICT Report in Northern Ireland²⁹. Crucially, much of Northern Ireland industry is ill-prepared for these challenges and is actively seeking technological support to deliver greater productivity and efficiencies. A number of 'enabling technologies' which are the foundation of our future growth have also been identified by Northern Ireland's Department of Education (DE)³⁰.

Lifelong learning

Creating a culture of lifelong learning is crucial to ensuring that individuals actively participate in adult learning after leaving the compulsory education system. *Skills for a 10X Economy* identifies the need to 'create a culture of lifelong learning' in Northern Ireland setting an initial goal to match the UK average participation of 25% of working age adults by 2030. Participation in 2021 remained at 17%, a figure which has shown little change since 2016³¹. As our economy transforms, individuals of all ages will need to engage in education and training to ensure their skills and qualifications maintain pace with change. Apprenticeships are critical to the delivery of the Department's 10X Economic Vision, and the introduction of All Age Apprenticeships in September 2023 aimed to provide opportunities for more people to embark on a career of their choice. The ambition to create an additional 1,700 apprenticeship opportunities per year for those aged 25 and above signified an opening of careers options to people of all ages, supporting inclusion and a culture of lifelong learning.

Leadership and Management

A number of studies also point to Northern Ireland's challenges in respect of leadership and management capabilities - including evidence of weak adoption and low-quality management practices (e.g., employee performance measurement)³². Various rounds of the World Management Survey show that the average quality of management in Northern Ireland's businesses is among the lowest among European countries³³. Management and leadership skills are currently in short supply in the labour market, with 49% of employers indicating that these skills are difficult to find³⁴. This

²⁵ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/655570/20171027_MadeSmarter_FINAL_DIGITAL.pdf

²⁶ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664572/industrial-strategy-white-paper-print-ready-version.pdf

²⁷ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2017:479:FIN>; <https://www.economy-ni.gov.uk/sites/default/files/consultations/economy/industrial-strategy-ni-consultation-document.pdf>

²⁸ <https://www.economy-ni.gov.uk/sites/default/files/consultations/economy/industrial-strategy-ni-consultation-document.pdf>

²⁹ <https://matrixni.org/wp-content/uploads/2016/03/2016-Matrix-Digital-ICT-Report.pdf>

³⁰ These include cybersecurity, software engineering and AI, robotics, virtual production, advanced composites, food supply chain/safety, digital transactions/ID authentication and zero carbon tech, transport, energy and agrifood.

³¹ OECD Skills Strategy for Northern Ireland (United Kingdom) Assessment and Recommendations <https://www.oecd-ilibrary.org/sites/1857c8af-en/index.html?itemId=/content/publication/1857c8af-en>

³² McKinsey and Company, 2009[24]; Department for Education, 2017[14]

³³ Centre for Economic Performance, 2015[39]; Bloom and Reenen, 2010[40].

³⁴ Department for Education, 2017

trend is expected to deepen, given an expected increase in demand for managerial occupations into the future³⁵. A respondent to this Advanced Manufacturing Skills Assessment’s Employer Engagement Survey suggested that what is required is ‘*A strategy that sets out the vision to strengthen leadership and management and a specific focus on Advanced Manufacturing as a key Cluster with complex needs would be helpful.*’

Supporting Innovation

Innovation is a key pillar of City and Growth Deal activity. DfE’s vision, as articulated in the Skills Strategy states that; “*we want to see the diffusion of innovation across our economy, driving positive change in all our businesses and in our productivity performance.*” The NI Executive’s Innovation Strategy³⁶ contains some 60 actions across four key knowledge themes to support innovation into the future.

Collaborative Working

The research and stakeholder engagement that underpinned the subsequent Skills Strategy, highlighted the absence of an overall shared vision for what Northern Ireland’s skills system needs to deliver and identified a recurring view that the existing ‘skills system’ is fractured and fragmented. Addressing this, and the inefficiencies it causes, will require a refreshed approach. Clustering has been identified by DfE in 10X as a vehicle for developing global leadership capabilities throughout Northern Ireland’s economy as key as the creation of strategic clusters is widely acknowledged as an important driver of competitiveness in economies around the world. 10X also identifies Advanced Manufacturing as a priority cluster.³⁷

The 7 priority sectors are -

- Agri-Tech
- Life and Health Sciences
- Advanced Manufacturing, Materials and Engineering
- Fintech / Financial Services
- Software
- Screen Industries
- Low Carbon (including Green Hydrogen)

Employability & Skills - City and Growth Deal Priorities

Employability and skills are pivotal to delivery of the region’s four emerging City and Growth Deals. It forms one of the four investment pillars of the Belfast Region City Deal which is at the most advanced stage of delivery. The BRCD focuses its efforts on addressing skills for inclusion, skills for growth and skills for a digital future. Together with what is known about the direction of travel of key strategic policies in Northern Ireland, the focus of the City and Growth Deals helps to frame emerging skills needs, and in particular this skills assessment, in the wider social and economic context.

³⁵ Ulster University Economic Policy Centre, 2019

³⁶ <https://www.economy-ni.gov.uk/publications/northern-ireland-innovation-strategy>

³⁷ [10X Economy - an economic vision for a decade of innovation | Department for the Economy \(economy-ni.gov.uk\)](#)

Section 3: The Advanced Manufacturing Landscape in Northern Ireland

Overview

Northern Ireland has a world-class reputation in advanced manufacturing. The sector is vibrant and highly sophisticated, with a key role to play in rebuilding the economy after the pandemic. From the concept and design stage of manufacturing, through to the production and distribution of innovative products globally, the industry - made up of around 5,000 indigenous and international companies - is both diverse and global³⁸.

Advanced Manufacturing Materials and Engineering (AMME) is typically regarded as manufacturing that is capital and knowledge intensive, uses a high level of technology, includes elements of service provision and relies on specialist skills³⁹. It is often linked to 'Industry 4.0' and as a result advanced manufacturers often have higher levels of digital readiness⁴⁰ as they are more likely to use embedded technologies and techniques such as statistical methods to improve quality, enabling them to continuously improve their production processes.

Organisations working in the sector are engaged in the full range of activities from Research and Development (R&D) to new product development. From bulk materials handling and processing equipment, large diesel generator sets and crushing and screening equipment; the supply of components and products to producers of cars and vehicles; manufacturing, production and development of medical devices and semi-conductor manufacturing; developing high quality and innovative products for some of the world's leading airline companies - employees working in advanced manufacturing in Northern Ireland are at the forefront of cutting-edge technology.

Employment Trends

Northern Ireland's advanced manufacturing sector is comprised predominantly of small to medium sized entities - with only 1% of all organisations defined as large (more than 250 employees). However, the total number of jobs in the manufacturing sector in 2021 was 86,707 representing around 11% of all jobs in the region⁴¹, making it the second largest industry after the service sector. The 46,000 advanced manufacturing employee jobs⁴² in Northern Ireland are well dispersed geographically, with the Mid-Ulster area employing the highest proportion (16.7% in 2017), closely followed by Belfast (14.9%) and Antrim & Newtownabbey (12.7%). More than three quarters of advanced manufacturing companies (76%) are micro sized – i.e. comprising 9 employees or fewer – while just 1% employs more than 250 employees.

In recent years, employment in the Northern Ireland manufacturing sector has grown more than four times faster than the rest of the UK, accounting for more than 15% of Gross Value Added (GVA), making it of proportionately greater significance to the Northern Ireland economy than is the case in the rest of the UK. The sector is both locally and globally competitive, delivering higher paying jobs, a highly

³⁸ Sub-sectors of Advanced Manufacturing in NI include: Aerospace, defence, security & space, automotive, consumer products, water, materials handling, construction products, composites & polymers, Agri-engineering, electronics, green growth & renewable energy and highly specialised individuals.

³⁹ Renewing industrial regions. Advanced manufacturing and industrial policy in Britain (2021).

⁴⁰ For example, as defined in BSI PAS1040 (2019)

⁴¹ [BRES-2021-Publication_1.pdf \(nisra.gov.uk\)](#)

⁴² <https://www.economy-ni.gov.uk/news/minister-highlights-importance-northern-irelands-advanced-manufacturing-sector>

skilled workforce and contributing to a more regionally balanced economy⁴³. However, access to the volume of relevant qualified workers at the right time will be a key determinant of the sector's ability to innovate and grow. The Skills Barometer predicts that the net labour requirement in Northern Ireland from education and migration up to 2030 will be 28,700 and within this, advanced manufacturing will be one of the sectors with the greatest annual gross demand for labour⁴⁴.

The manufacturing sector is already struggling to meet the needs of expansion as well as natural wastage. The sector is expected to require around 1,500 new workers every year, with opportunities across all skills levels and work which includes R&D, new product development and manufacturing.⁴⁵ This extends to professional, scientific and technical roles and is particularly acute across level 4, 5 and 6 qualifications (Foundation Degree, Higher-Level Apprenticeship, HNC, HND, Degree or Degree Apprenticeship).

However, the impact of the pandemic and post-Brexit limitations on the availability of labour have caused further production bottlenecks for manufacturers seeking to recover lost ground and take advantage of opportunities for growth. Although 70% of companies surveyed through this skills assessment indicated plans to grow, labour market shortages, further compounded by general skills shortages, are likely to pose a significant risk to these ambitions. Almost three quarters (69%) of Northern Ireland businesses believe there is a skills shortage in their organisation - the highest of any region of the UK (67% in England, 60% in Wales, 63% in Scotland). More than half (59%) of Northern Ireland businesses say Covid-19 has made it harder to hire candidates with the right skills while Brexit uncertainty has made a third (32%) not hire for vacant roles⁴⁶.

A more detailed analysis of demand and supply in the labour force is included in Appendix 7 with a broad overview of emerging trends included in the next section.

Demand Side Trends

Future Skills Demand

The annual average gross demand for workers in Northern Ireland is expected to be 84,000 over the coming decade, around two-thirds of which are expected to be filled by those within the existing labour market (i.e., 'job to job' moves or from the unemployed or economically inactive) and the remaining 28,000 by education leavers or those entering from migration⁴⁷. The most 'in demand' occupations are expected to be science and technology professionals (2,500).

Priority Clusters

DfE 10X has identified 7 priority clusters in areas where the emergence of significant capability and capacity demonstrated the potential to drive the economy forward. These include:

- Agri-Tech
- Life and Health Sciences
- Advanced Manufacturing, Materials and Engineering
- Fintech / Financial Services
- Software

⁴³ A more detailed breakdown of the general manufacturing trends in Northern Ireland is included for reference in Appendix 8.

⁴⁴ NI Skills Barometer

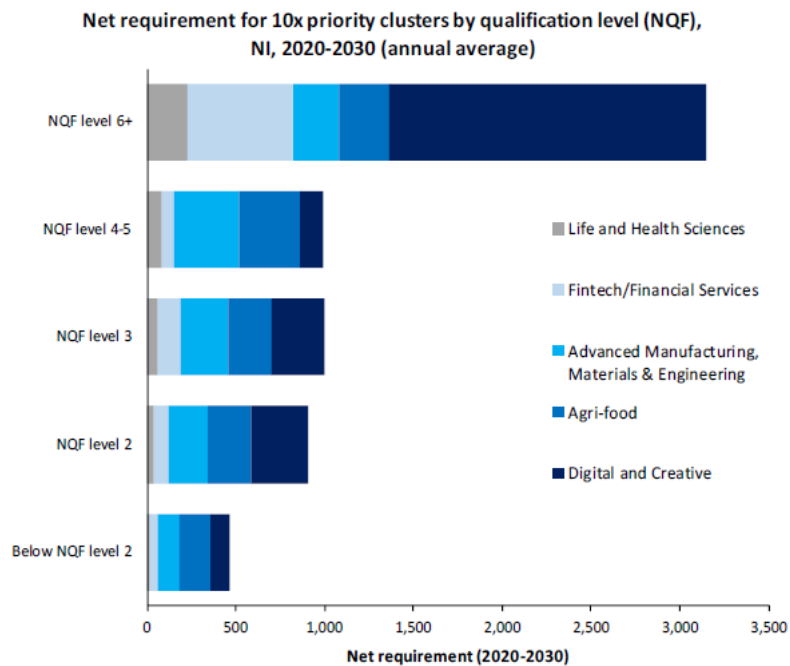
⁴⁵ <https://www.economy-ni.gov.uk/news/minister-highlights-importance-northern-irelands-advanced-manufacturing-sector>

⁴⁶ https://www.base-uk.org/sites/default/files/news/The_Open_University_Business_Barometer_Report__2021.pdf

⁴⁷ NI Skills Barometer 2021

- Screen Industries
- Low Carbon (including Green Hydrogen)

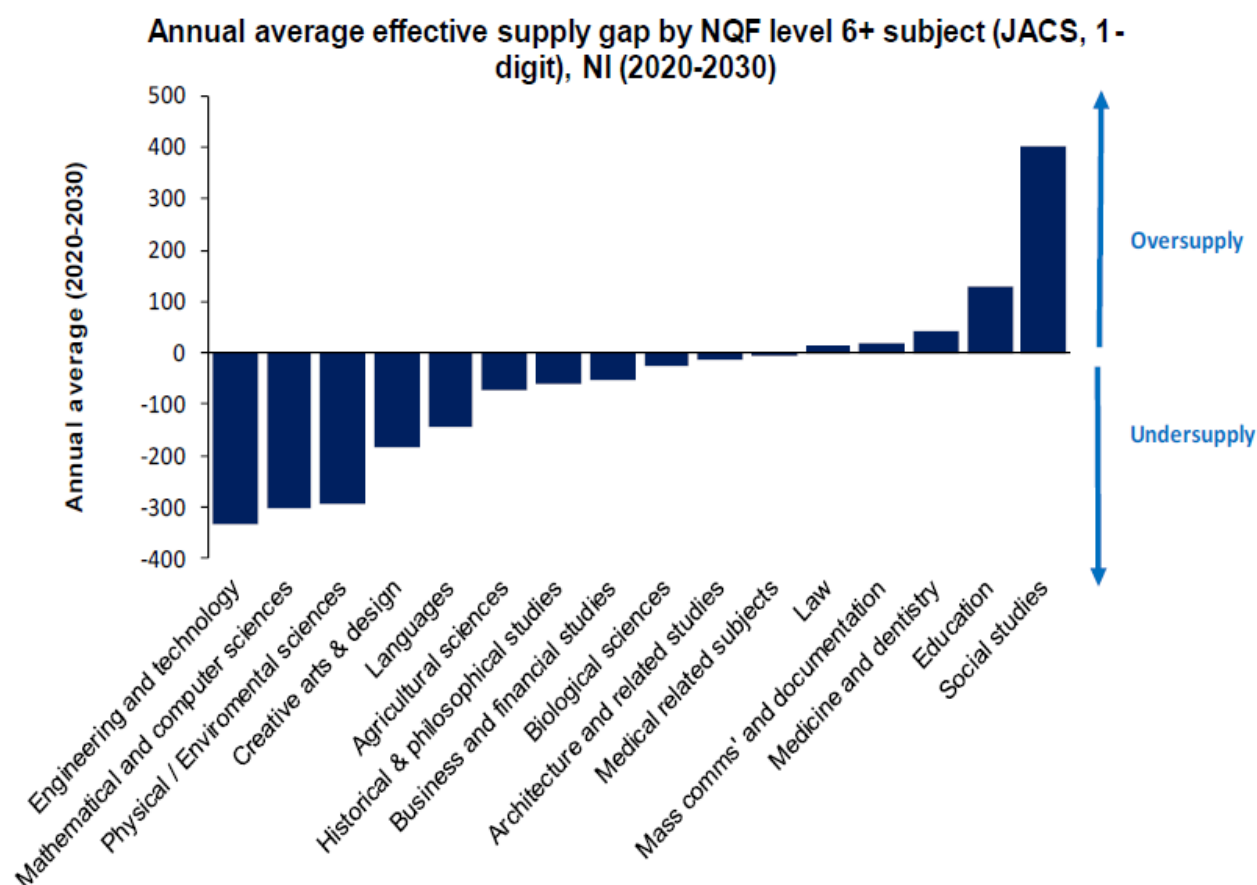
Employment within the identified 10X priority clusters⁴⁸ is predicted to account for 73,000 jobs over the next decade, with advanced manufacturing expected to contribute significantly to this number (see diagram below). As a result, science and technology professionals will be in significant demand. An expected undersupply at NQF level 3 and above - particularly in engineering and technology, maths and computer science and physical and environmental sciences - is anticipated.



Source: UUEPC

⁴⁸ NI Skills Barometer 2021

Increased demand for higher-level qualifications



Understanding the Supply Gap⁴⁹

Almost two-fifths (37%) of labour demand over the coming decade is expected to require NQF level 6+ qualification while only 8% of demand is expected at NQF level 2 or below, a drop from 16% in the first iteration of the NI Skills Barometer for the 2015-2025 period. This decreased demand for lower skills has coincided with a rapid increase in educational attainment.

With lower-level jobs at greater risk of automation, this demand for higher level skills could be further accentuated. The anticipated undersupply at level 6+ is most marked in engineering, technology, mathematical and computer science related subjects.

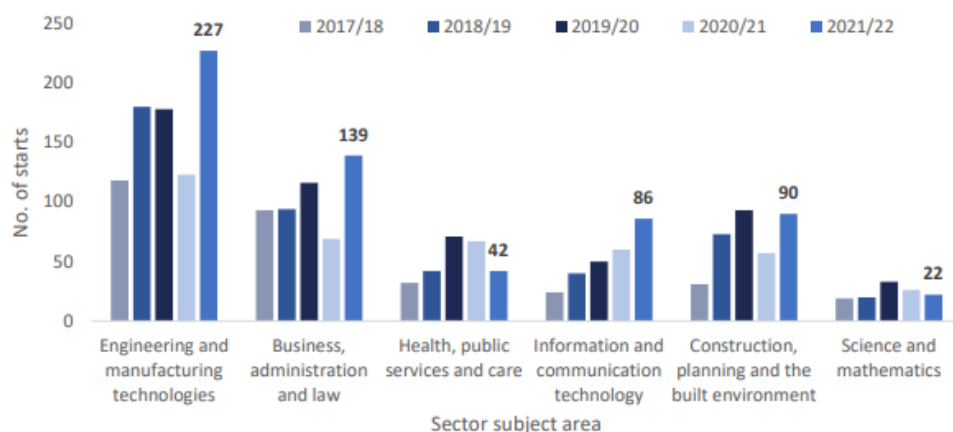
Demand for mid-level qualifications

Engineering and manufacturing technologies at NQF levels 4-5 are among the most in demand subjects over the coming decade. However, there is a limited supply of education leavers at this level throughout the NI education system. New subject provision at NQF Level 4-5 has the potential to improve this position and this can only be delivered by FE Colleges working with university partners

⁴⁹ The supply/demand (im) balance or “supply gap” represents the net requirement of individuals from education and migration (demand) *minus* qualifiers from education institutions entering the labour market at a level on par with their qualifications (supply) i.e. demand net supply. The information is based on an annual average over the 10-year period 2020-2030 under the high growth scenario. For example, if education related subjects is over supplied by +130, that represents an average annual oversupply of 130 per annum within that subject group over the 10-year period 2020-2030. Similarly, if mathematics and computer science graduates are undersupplied by-300 graduates, that represents an average annual undersupply of 300 graduates within that subject group over the next decade. This concept is referred to as the average annual supply gap.

and employers to develop the Level 4/5 qualifications usually in the form of Foundation Degrees with articulation pathways into Degrees. The table below illustrates the increasing demand for Higher Level Apprenticeships in the engineering and manufacturing.⁵⁰

Figure 2.7: HLA starts by the six most popular sector subject areas, 2017/18 to 2021/22



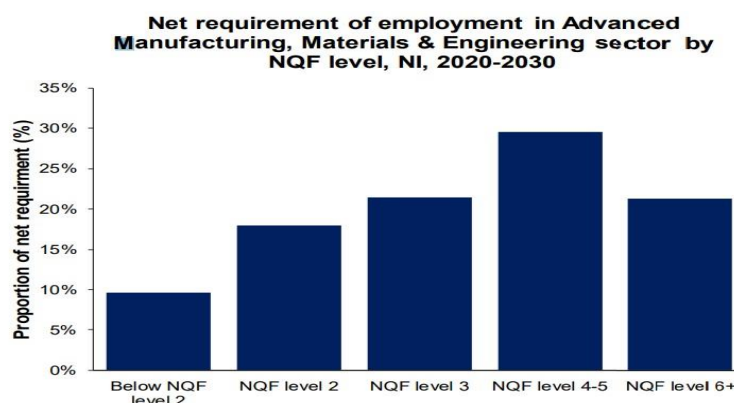
Source: FE LMS, CAFRE administration system

Manufacturing and degree level qualifiers

The manufacturing sector is one of the top four employers of degree level qualifiers. The sector employs more degree level qualifiers (23,000) than the ICT sector (16,000) and roughly the same as the professional services sector (24,000). However, manufacturing has reduced its share of lower qualification levels more than any other sector, reflecting the need for fewer, but more highly qualified, workers.

The sector⁵¹ is also expected to grow in the period to 2030 with demand peaking at levels 4-5.

Level6+	20%
Levels 4-5	30%
Level 3	20%
Level 2	17%
Below Level 2	less than 10%



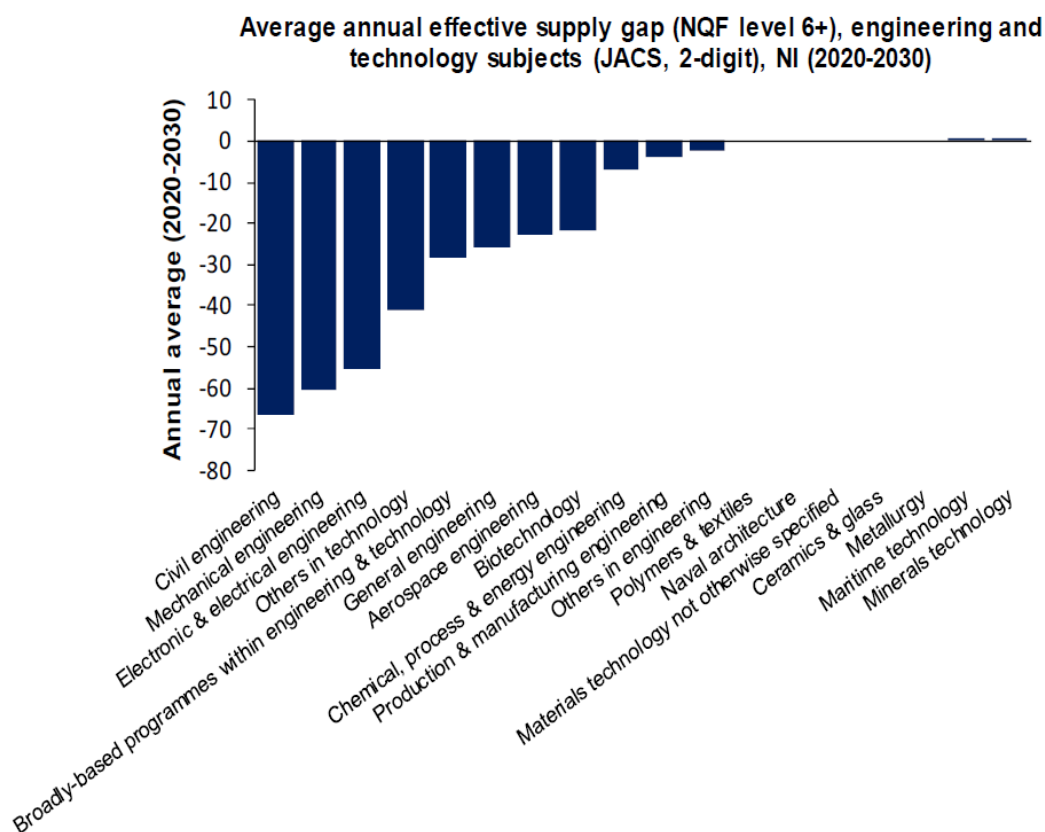
⁵⁰ <https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Higher-Level-Apprenticeships-at-NI-FE-colleges-and-CAFRE-academic-years-2017-18-to-2021-22.pdf>

⁵¹ NI Skills Barometer 2021

Supply Side Trends

Undersupply of STEM qualifiers

The Skills Barometer reveals a significant undersupply of skills in computer science and engineering subjects. While the number of computer science qualifiers has increased over the past five years, the increase is not sufficiently high to have filled the skills gap highlighted in earlier reports. Over the same period, the number of engineering qualifiers has marginally decreased, exacerbating previously identified undersupply within this subject area.

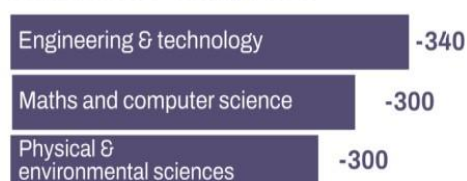


Although Northern Ireland has a higher proportion of broad STEM qualifiers compared to the UK (50% against 41%), this is largely driven by a higher proportion of health-related graduates. The proportion of narrow STEM⁵² graduates is similar across both NI and the UK. However, the absolute number of qualifiers in NI suggests low qualifier numbers in some STEM subjects. The most undersupplied STEM related subjects at NQF levels 6+, include Engineering and Technology, Mathematics & Computer Science and Physical/Environmental Sciences. This is consistent with the findings in previous iterations of the Skills Barometer.

(Im)balance



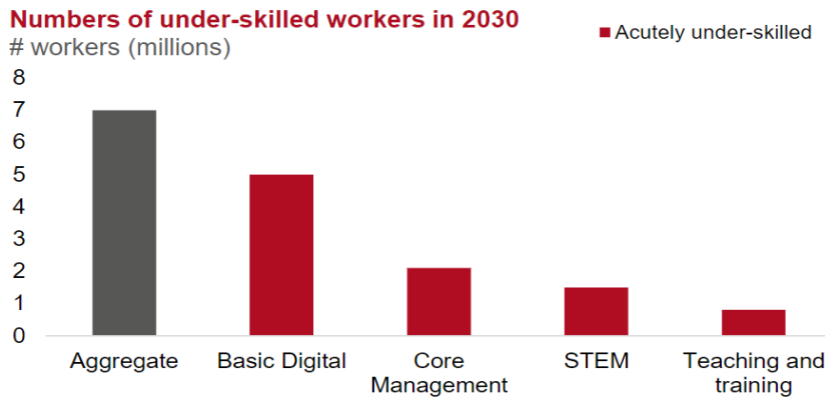
Graduate subjects



⁵² Narrow STEM is a subset of Broad STEM and includes the following subject areas: Biological and sports sciences; Psychology; Physical sciences; Mathematical sciences; Engineering and technology; Computing; and Geographical and environmental studies (natural sciences)

The UK Skills Mismatch in 2030 Industrial Strategy⁵³ highlights underkilled workers in basic digital and STEM. Significantly, there is also a general undersupply in teaching and training. This is important as “more and better jobs” emerge as a result of the 10X vision driving up wages there will need to be enough teachers and trainers to support the pipeline of talent into the required areas – which will include subjects associated with advanced manufacturing.

Figure 1: Estimated under-skilling in the workforce in 2030¹



Brain Drain

Evidence suggests that Northern Ireland already faces a significant challenge in terms of the pool of qualified labour. The ‘brain drain’ where young people move to other regions for their further and higher education, deciding not to return after completing their studies, poses a particular problem. In addition, the Maximum Aggregate Student Number (MASN) which places a cap on the number of local students at Northern Ireland’s universities is another factor that acts as an economic handbrake as it also forces local talent to pursue their studies elsewhere. Higher wages in the Republic of Ireland, in other areas of the UK and further afield are also driving people away from the region.

Economic Inactivity

High and sustained levels of economic inactivity reflect a long-term structural weakness within the Northern Ireland economy which has had the highest working age economic inactivity rate of any UK region in 92 of the past 100 quarters, posing a major obstacle to inclusive economic growth.

Net inflows of people from unemployment and economic inactivity into employment are required to boost the size of the available labour supply. However, severe qualification mismatches between those in work and those out of work create barriers in matching the unemployed and inactive to available roles. Although fewer than one in five (16%) of the economically inactive population indicate that they would like to work, this still represents 51,000 people who would be willing to work if there was a suitable opportunity.

⁵³ [Microsoft Word - UK Skills Mismatch 2030 - Research paper \(industrialstrategy.gov.uk\)](https://www.industrialstrategy.gov.uk/~/media/Industrial-Strategy-Council/2020/04/microsoft-word-uk-skills-mismatch-2030-research-paper)

Opportunities and Challenges

The focus on innovation in advanced manufacturing through DfE's 10X Strategy and the City and Growth Deal investment projects provide significant potential for the 2,200 companies in the sector. Expenditure on research and development in Northern Ireland remains comparatively low compared to the region's gross domestic product (GDP) (1.5% vs. 1.7% in the UK and 2.3% across OECD countries, in 2016, OECD Skills Strategy NI). The region's advanced manufacturing companies are embracing a new era of innovation and growth with ambitious plans to grow the sector in Northern Ireland. At the same time, ongoing challenges and opportunities associated with Covid-19 and Brexit have forced changes and new ways of working. Many organisations have innovated and changed their processes and business models while some companies are bringing their manufacturing production and sourcing back to Northern Ireland.

Examples of some of the innovative development and activity planned for the sector include:

- **Smart-nano**⁵⁴ - Queen's University researchers, in partnership with Seagate Technologies, are working to deliver the next generation of nano-photonic devices in an initiative that is driving significant inward investment to Northern Ireland. The partnership has led to the creation of the Smart Nano NI Consortium which has been awarded over £60m to develop new technology for medical devices, communication and data storage.
- **Food Processing**⁵⁵ - Following a workshop in May 2022 recommendation emerging in a Digital Roadmap for Advanced Manufacturing in Agri-food included the need for a focus on skills development and knowledge transfer. The College of Agriculture, Food and Rural Enterprise (CAFRE), in partnership with the Northern Ireland Technology Centre (NITC) at Queen's University Belfast, held an event on Industry 4.0 Food Factory of the Future to highlight how the principles of advanced manufacturing can benefit food processing businesses.⁵⁰
- **Airplane components** - Automation engineers from the Northern Ireland Technology Centre at Queen's have been working with Moyola Precision Engineering on a project to ensure the safety of components on airplane wings, which has resulted in significant time savings for the company. The partnership is taking place under SCENIC, a £9m collaborative research and development project, between the Northern Ireland Technology Centre and a consortium of aerospace companies in the region, part funded by Invest Northern Ireland. Project SCENIC will give Northern Ireland a strategic advantage and ensure that the region is at the forefront of expertise for titanium and hard metal machining within the global aerospace sector.

Building on these types of growth opportunities, the planned City and Growth Deal projects are also likely to be among the key drivers of innovation in the sector in the years ahead. The planned global centres of innovation excellence will provide opportunities for businesses, inside and outside Northern Ireland, to improve the interface between world-leading academia and research. They will also provide access to breakthrough technologies that help to drive innovation in processes and product development and develop the infrastructure and test environments that will allow the next generation of products to be tested and trialed. This City and Growth Deal activity will help Northern Ireland companies to continue to compete on a global scale and remain competitive and less vulnerable to international competition.

From an initial review of the planned City and Growth Deal business cases at a more advanced stage, we can see that the projects will only further add to the anticipated sectoral growth over the next ten

⁵⁴ <https://www.qub.ac.uk/Research/case-studies/seagate-nano-photonic-devices.html>

⁵⁵ <https://www.daera-ni.gov.uk/news/industry-40-food-factory-future-event-cafre>

years.

At the highest level (operational) jobs expected include:

- 13,000 jobs supported through the Smart Manufacturing Data Hub
- 3,785 jobs over ten years at CIDRA
- 126.5 direct permanent and 310 indirect / induced jobs through the i4C plans
- 1,537 direct, indirect and induced jobs at all levels through AMIC
- Additional jobs can also be expected through Digital Twin (BRCD) (currently in development) and projects emerging from Mid-South West's growth deal.

Together, City and Growth Deals, the UK Government's 'levelling up' agenda, the new UK R&D Roadmap and the partnership MoUs signed with Catapult Centres and other Research Technology Organisations (RTOs), are creating a unique opportunity to improve the region's global position in advanced manufacturing capabilities, attracting funding, securing our prosperity and safeguarding our future. However, a collaborative and strategic approach will be needed to support industry and address the scale of innovation and growth expected in the sector. There will also be a need to educate and support businesses – in a sector dominated by smaller employers which are less likely to invest in innovation activities or skills development – if the region is to capitalise on this potential and develop the skills required.

Section 4: Current Skills Provision

This section of the report provides an overview of the existing skills provision in Northern Ireland in the advanced manufacturing sector and outlines the extent to which the current system is addressing the needs of employers. The information below is subject to change. Full details of the current provision is contained in Appendix 5, this section summarises the provision available.

Overview

The current and future needs of the advanced manufacturing sector were considered as part of a BRCD report exploring potential apprenticeship opportunities created by key City and Growth Deal activity, which also cast light on the increasing skills challenge facing the advanced manufacturing sector more generally. The demographic profile of the sector reveals an aging workforce with over 32% of those in plan, process and machine operatives jobs over 50 years old⁵⁶. Skills trends suggest that the older population is more likely to have developed their skills ‘on the job’ and less likely to have formal qualifications. However, the demand for skills over the next ten years is expected to show a reduction in lower-level skills with increasing levels of demand for mid and higher skills. This coupled with increasing demand for mid and higher-level skills driven by technological advancement is creating a challenge as to how the industry can access the talent it will need going forward.

Skills Pathways

Skills pathways will need to take account of opportunities to attract new highly skilled first-time entrants well as opportunities to upskill existing employees and reskill those both within and outside the sector. A number of providers across Northern Ireland offer advanced manufacturing skills provision at levels 1-6. The region’s two universities – Queen’s University Belfast and Ulster University - collaborate on Foundation Degrees and offer both undergraduate and postgraduate courses. The Open University also provides higher education courses. At the same time, the six regional FE colleges⁵⁷ across Northern Ireland offer a range of courses from levels 1-6 in this field.

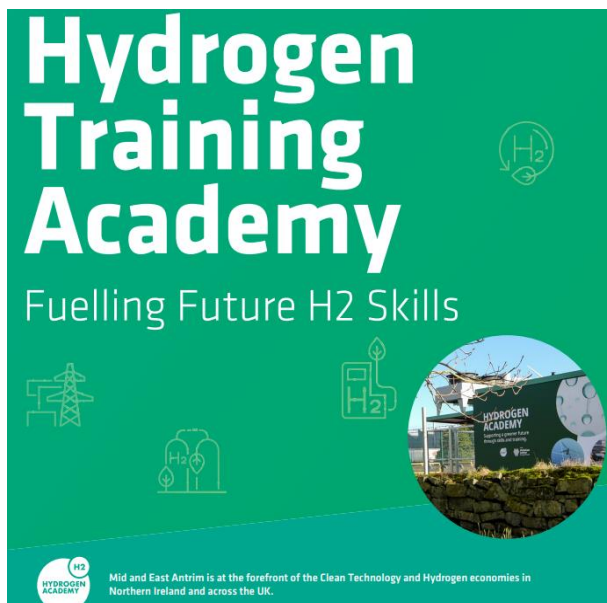
South West College, as host of the regional Engineering and Advanced Manufacturing Hub⁵⁸, collaborates with the other five colleges to provide a high quality, current, responsive provision and service for learners, employers and other key stakeholders throughout Northern Ireland. The further education sector reviews its curriculum delivery regularly to ensure the sector is aligned with the region’s economic needs.

While the remit of the Hubs is to lead the development of new curriculum opportunities in conjunction with the other colleges, there have been a number of instances where colleges have identified and developed programmes of study outside of the Hub structure, e.g., the development of qualifications for a local or niche purpose or for specialist provision such as the pilot Hydrogen Training Academy in Mid and East Antrim includes FE delivery partners Belfast Met, NRC, QUB and UU.

⁵⁶ Belfast City Region Skills Barometer, January 2019

⁵⁷ South East Regional College, Southern Regional College, North West Regional College, Belfast Metropolitan College, Northern Regional College and South West College

⁵⁸ This emerged as an action from Project One of the [Further Education Means Success Strategy](#), published in 2016 by the Department for the Economy (DfE) focusing on ‘Curriculum Content and Delivery’ across the Further Education (FE) sector. A key aspect of strategy was the designation, development and implementation of Curriculum Hubs (Hubs) in each of the six colleges of FE in Northern Ireland (NI).



A CONTINUOUS LEARNING PATHWAY



This has also included engagement in work to consider new areas - such as railway and print and packaging - resulting in innovative apprenticeship pathways being developed for employers. It will be important that innovation in curriculum development is allowed to continue to meet specific needs, in a controlled and monitored manner.

We reviewed the full pathway of skill level as reflected in the diagram below:

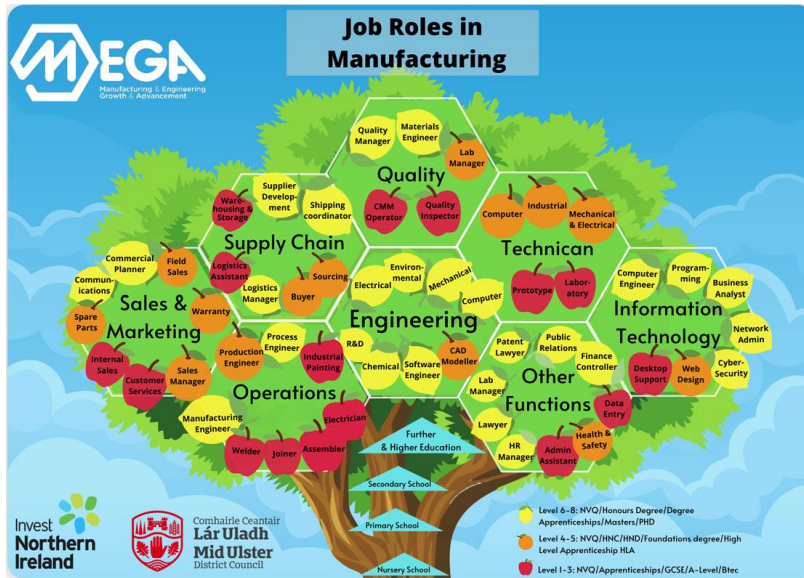


Career Advice

A range of initiatives organised by the Department for the Economy⁵⁹ and by industry bodies such as Manufacturing NI promote careers in this (and other) sectors. Local Councils support communities with careers services and provide signposting to careers resources. Examples of proactive measures relating to the manufacturing industry include Mid Ulster’s Investment in MEGA⁶⁰. MEGA (Supported by INVEST NI and Mid-Ulster Council) MEGA is an industry-led collaborative network in Mid-Ulster working together towards a common goal. Its mission is to promote the manufacturing and engineering sector as a source of high-value, long-term employment and to create transformational career opportunities that deliver skills for life. MEGA’s core function is to act on behalf of industry to address the skills deficit and attract people into Advanced Manufacturing & Engineering. An example of MEGA’s showcasing of careers is shown below.

⁵⁹ The Department for the Economy Careers Service, Educational Career Advisory Support

⁶⁰ An Industry led collaborative network (see Case Study below), Mid and East Antrim Borough Council have a Manufacturing Task Force industry-led collaboration aimed at ensuring that Mid and East Antrim has a prosperous future as the home of world class, innovative advanced manufacturing, the group organised a Science Summer School in 2022 which aimed to encourage curiosity, inspire the next generation of local talent and future workforce and raise the importance of Science, Technology, Engineering, Arts and Maths (STEAM) activities with young people and their parents.



Mid and East Antrim Borough Council have a [Manufacturing Task Force](#) industry-led collaboration aimed at ensuring that Mid and East Antrim has a prosperous future as the home of world class, innovative advanced manufacturing. The MTF has been established since 2018 and actively engaged in promoting and developing career opportunities in the sector. Invest NI has supported various Collaborative Growth Networks in the sub region via the MTF umbrella, the most recent being the award-winning Hydrogen Skills Training Academy delivered over 2022/23.

GEMX is an industry led collaborative network of innovative companies and educational institutes in the North West of Ireland. It “exists to bring education, industry and leadership together, so we can nurture a vibrant, thriving engineering and manufacturing community.”



Home > Education

Working With Education

We're passionate about supporting young people on their journey into industry – developing the skills and resilience it takes to get their foot in the door, and prepare them for a successful and exciting engineering career with a salary to match.



GEMX Support For Education

Entry and Mid-Level Provision (1-5 NQF)

Further Education College Course provision - Advanced Manufacturing			Mode of Attendance	SERC	SRC	NWRC	NRC	BMET	SWC
Level 1	FE	Certificate in Engineering	FT		✓			✓	✓
		Electrical & Mechanical Engineering	FT				✓		
	Training	City & Guilds Welding	PT	✓	✓	✓			✓
		Certificate in Performing Engineering Operations	PT					✓	✓
Level 2	FE	Fabrication & Welding	FT			✓		✓	
		Electrical & Mechanical Engineering	FT			✓	✓		
		Engineering	FT		✓				✓
	Training	Fabrication & Welding	PT	✓	✓		✓	✓	✓
		Mechanical Engineering	PT	✓	✓		✓		
		Maintenance Engineering	PT		✓		✓		
		Electrical & Electronic Engineering	PT		✓		✓		
		Engineering	PT		✓		✓		✓
Level 3	FE	National Diploma/Extended Diploma Engineering	FT		✓	✓	✓	✓	✓
		National Diploma/Extended Diploma in Advanced Manufacturing	FT	✓	✓	✓	✓	✓	✓
		National Diploma/Extended Diploma Mechatronics	FT	✓					
		National Diploma/Extended Diploma in Advanced Electronics	FT	✓					
		Aeronautical Engineering	FT					✓	
		Manufacturing Engineering	FT			✓	✓	✓	✓
		Electrical & Electronic Engineering	FT				✓	✓	
Level 4	HE	Pearson BTEC HNC Engineering	PT	✓	✓	✓	✓		✓
		HNC Electrical & Electronic Engineering	PT			✓			
		Pearson BTEC HNC Engineering	FT					✓	
		HNC Aeronautical Engineering	FT					✓	
Level 5	HE	BTEC HND Engineering	FT	✓					
		HND Electrical & Electronic Engineering	FT	✓					
		Foundation Degree Manufacturing Engineering	FT						✓
		Foundation Degree Mechatronic Engineering	FT	✓	✓				✓
		Foundation Degree Mechanical Engineering	FT			✓		✓	
		Foundation Degree Electrical & Electronic Engineering	FT			✓	✓	✓	
		Foundation Degree Mechanical & Manufacturing Engineering	FT				✓	✓	

Higher Level Provision (6+ NQF)

Two of the region's 6 FE colleges offer a relevant degree/HLA in a related area on a combination of full and part time basis.

Further Education College Course provision - Advanced Manufacturing			Mode of Attendance	SERC	SRC	NWRC	NRC	BMET	SWC
Level 6	HE	BEng Hons Degree Engineering (Top Up)	PT/FT		✓				✓
	Higher Level Apprenticeships	BEng Hons Degree Engineering (Top Up)	PT		✓				✓

In addition, Queen's University Belfast offers a range of relevant undergraduate and postgraduate study options⁶¹. At undergraduate level, course options include Aerospace Engineering; Electrical & Electronic Engineering; Mechanical Engineering; Product Design Engineering; Software & Electronic Systems Engineering, etc.

At postgraduate level, course options include Electronics with Professional Internship; Engineering Management; Materials Science & Engineering; Mechanical Engineering with Management & Industrial Internship, etc. part-time and full-time options are available.

The School of Engineering at Ulster University also offers a broad range of engineering courses at undergraduate and postgraduate level⁵². At undergraduate level, bachelor and integrated masters programmes are offered in: Biomedical Engineering, Electronic Engineering, Engineering Management, Mechatronic Engineering (offered also as a part-time route) and Mechanical Engineering. A BSc Hons in Technology with Design – an innovative hybrid programme that straddles

⁶¹ Full tables of provision included in Appendix 5

the subject areas of technology and design, is also available - the technology aspects of the curriculum are delivered in the School of Engineering and the Design aspects are delivered in the Belfast School of Art.

At postgraduate level, MSc programmes include: Advanced Composites & Polymers, Biomedical Engineering, Mechanical Engineering and Manufacturing Management. Postgraduate programmes are offered full-time and part-time, with the part-time courses popular among employees at engineering firms who wish to provide opportunities for training and upskilling among their workforces. Connecting pathways where FE & HE can work together are also beginning to emerge.

Apprenticeships

Apprenticeships also support the delivery of skills and talent into and within the sector. The extent to which existing apprenticeship provision is aligned to the current and future needs of the advanced manufacturing sector was considered as part of a BRCD report exploring opportunities created by key City & Growth Deal projects. This report provides a comprehensive overview of apprenticeship provision across the sector.

Higher Level Apprenticeships (HLAs), which have had positive feedback from employers, are aimed at individuals who have completed A-Levels (or equivalent) and are designed to help those in work to develop higher skills ranging from level 4/5 to level 8. Current HLA options include Mechanical, Mechatronics, Automotive and Advanced Engineering, Sustainable Construction, Renewables and Sustainability and Automotive and Advanced Engineering. Higher-Level Apprenticeships, in particular, provide a flexible skills offer from the perspective of both industry and participant, and there is a strong case for provision to be enhanced. Emerging actions might include, for example:

- Supporting the development of Higher-Level Apprenticeships to help address the skills gap at Level 6+ in engineering and technology. Areas of potential focus include; Mechatronics, Advanced Manufacturing, Polymer Processing and Motorsport Engineering.
- Enabling apprenticeship frameworks to be supplemented through optional module delivery as a means of responding to changing skill needs.

It is recognized that the existing apprenticeship offering is dated with regard to both the curriculum and the apprenticeship frameworks (standards) and does not meet the emerging demands of employers in response to the evolving opportunities afforded by technology and the move to more advanced manufacturing. There is a need to develop new training curriculum and content to underpin the ambition of the advanced manufacturing sector, this content must align with the development of new apprenticeship frameworks at Level 3 and also feed on into Higher Level Apprenticeships. The new frameworks must be approved by Sectoral Employer Partnerships (SEP), SWC currently leads on the engagement for FE sector in conversations on engineering and advanced manufacturing through the Curriculum Hub in this area.

FE Apprenticeships Provision

Further Education College Course provision - Advanced Manufacturing			SERC	SRC	NWRC	NRC	BMET	SWC
Level 1	FE	Certificate in Engineering		✓			✓	✓
		Electrical & Mechanical Engineering				✓		
	Training	City & Guilds Welding	✓	✓	✓			✓
		Certificate in Performing Engineering Operations					✓	✓
Level 2	FE	Fabrication & Welding			✓		✓	
		Electrical & Mechanical Engineering			✓	✓		
		Engineering		✓				✓
	Training	Fabrication & Welding	✓	✓		✓	✓	✓
		Mechanical Engineering	✓	✓		✓		
		Maintenance Engineering		✓		✓		
		Electrical & Electronic Engineering		✓		✓		
		Engineering		✓		✓		✓
	Apprenti	Fabrication & Welding	✓	✓	✓	✓	✓	✓
		Mechanical Engineering	✓	✓	✓	✓		
		Maintenance Engineering		✓		✓		
		Electrical & Electronic Engineering		✓		✓		
		Engineering		✓		✓		✓
Level	FE	National Diploma/Extended Diploma Engineering		✓	✓	✓	✓	✓
		National Diploma/Extended Diploma in Advanced	✓	✓	✓	✓	✓	✓
		National Diploma/Extended Diploma Mechatronics	✓					
		National Diploma/Extended Diploma in Advanced	✓					
		Aeronautical Engineering					✓	
		Manufacturing Engineering			✓	✓	✓	✓
		Electrical & Electronic Engineering				✓	✓	
	Apprenti	Fabrication & Welding	✓	✓	✓	✓	✓	✓
		Technical Support	✓	✓		✓		✓
		Mechanical Manufacturing Engineering	✓	✓	✓	✓	✓	✓
		Maintenance Engineering	✓	✓	✓	✓		✓
		Mechanical Engineering	✓	✓	✓	✓		✓
		Engineering		✓		✓		✓
		Polymers	✓					
		Automotive Engineering				✓		
Technician Apprenticeship Level 3 (Level 2 en route)	✓					✓		
Level	HE	Pearson BTEC HNC Engineering	✓	✓	✓	✓		✓
		HNC Electrical & Electronic Engineering			✓			
		Pearson BTEC HNC Engineering					✓	
		HNC Aeronautical Engineering					✓	
	Higher	Advanced Technician Engineering (HNC)	✓	✓	✓	✓	✓	✓

Further Education College Course provision - Advanced Manufacturing			SERC	SRC	NWRC	NRC	BMET	SWC
Level	HE	BTEC HND Engineering	✓					
		HND Electrical & Electronic Engineering	✓					
		Foundation Degree Manufacturing Engineering						✓
		Foundation Degree Mechatronic Engineering	✓	✓				✓
		Foundation Degree Mechanical Engineering			✓		✓	
		Foundation Degree Electrical & Electronic Engineering			✓	✓	✓	
		Foundation Degree Mechanical & Manufacturing				✓		
	Higher	HND Electrical & Electronic Engineering					✓	
		Foundation Degree Mechatronic Engineering	✓	✓				✓
		Foundation Degree Electrical & Electronic Engineering			✓	✓		
		Foundation Degree Mechanical & Manufacturing			✓	✓		
		Foundation Degree Manufacturing Engineering						✓
		Advanced Manufacturing				✓		

Level	HE	BEng Hons Degree Engineering (Top Up)		✓				✓
	Higher	BEng Hons Degree Engineering (Top Up)		✓				✓

Additional Provision

Academies

Employment Academies also offer a new, innovative and bespoke approach to training and provide an opportunity to get people into employment (including those who are unemployed, underemployed, economically inactive, or wanting to reskill and change career) in the advanced manufacturing sector. They represent a good demand-led solution to skills shortages.

Responding to the notable need for initiatives in this space, Councils' Labour Market Partnership Plans are demonstrating a clear shift of resources towards academies to support jobs in the sector. However, such plans are subject to funding (as well as the individual preferences of each Council area) and cannot therefore be relied upon as a strategic or sustainable model.

Short Courses

DfE, with funding from the Northern Ireland Office and the Department of Finance, supports free short courses, delivered by the local further and higher education providers through the flexible skills programme Skill Up.⁶² This offers up to 7,000 free places - comprising opportunities from entry to postgraduate levels - focusing on skills identified by industry and linked to priority economic sectors, including advanced manufacturing. Most courses are delivered online and provide an opportunity to re-skill and upskill into areas where job growth is expected to be high.

Queen's University has also developed an Access Engineering programme in partnership with SERC, primarily to provide a route to higher education for those who have been away from education for an extended period (2 years minimum). The University Access Diploma in Computing and Engineering Sciences (CES) will provide a pathway to further study or employment in a range of disciplines associated with the Faculty of Engineering and Physical Sciences including Electronic Engineering, Civil Engineering, Maths, Physics, Mechanical and Aerospace Engineering, Software Engineering and Computer Science.

Leadership for productivity

Frontline managers in Northern Ireland's manufacturing sector now have access to a new programme sponsored by DfE, with support from the Queen's University Bright Minds initiative, and The Centre for Competitiveness, to help boost the sector's productivity. The Programme has been designed to support DfE's economic strategy and contribute to the sustainable growth of the Northern Ireland manufacturing sector. Nineteen local company representatives⁶³ have already availed of the opportunity afforded through this Programme.

On the Job Training

Manufacturing jobs also offer a wide variety of entry level positions. Most companies offer on-site training appropriate for those looking for a change from their day-to-day career (reskilling).

Industry Perception

There are some fantastic opportunities in the advanced manufacturing sector and organisations in Northern Ireland are working on exciting products in global markets, yet a negative perception of the

⁶² <https://www.nidirect.gov.uk/skillup>

⁶³ From companies including Dale Farm, Denroy, Encirc, Interface, Moyola Engineering and Ryobi

industry remains. People often view jobs in the industry as “dirty” and “hard” and parents often influence their children into more traditional career routes. This is compounded by reduced numbers of schoolchildren studying STEM subjects and not enough practical hands-on activity in schools. For those who have left school, there are also negative perceptions of the industry including a perceived requirement to work shifts with inflexible shift patterns. There is a significant need to focus resources on elevating the profile of the industry and reshape careers advice from an early age to shine the spotlight on the significant career opportunities. MEGA, MTF and GEMX continue to be successful in this area and this example could be replicated across the region.

There is an opportunity to capitalise on the commitment of organisations in the sector to engage with young people and others in the community who are economically inactive or could potentially change career path into the sector by establishing an Employer-led approach to sector profiling and stimulating pathways. Designed and delivered by the sector offer this would present a clear opportunity to refresh the messaging aligned to the career pathways in the modern advanced manufacturing sector. This would require a co-ordinated approach, whilst organisations in the sector are very active but this can lead to a bombardment of information and lack of engagement. One respondent to the Employer Survey stated: *“A lot of work needs to be done with the careers teachers/universities/colleges. We offered all the careers teachers within NI a site visit and an overview, around 100 people were invited but only 15 people accepted. Those who attended were blown away and couldn’t believe the range of careers.”* Co-ordination of effort would help strengthen the message and engagement and provide an equality of information and guidance across the NI region as current measures can depend on the geographical location of active organisations and the efforts of the local Council.

The new Innovation Centres could play a central role in helping to co-ordinate interventions to stimulate careers pathways, for example, the facilities at AMIC Factory of the future could be used for careers events, competitions, open nights, information sessions etc. with a number of organisations involved. This could also help smaller organisations get involved as they often have limited resources to engage directly in careers/sector profiling activities. The i4C centre will give access to SMEs to utilise specialised equipment alongside experts and this too could be used to raise the sector profile from a careers perspective.

An ideal solution would be for all stakeholders to be able to access the information needed in one place. For example, employers could access toolkits for helping to profile their activity, information about coordinated activities to get involved in, a tool for uploading stories/case studies and company information. Careers Advisors could access information, resources to help give up-to-date careers advice and find out about events etc., Students and talent could access careers advice, details of events, tours, open days, work experience opportunities. A technology solution could integrate a jobs widget and a social media feed. As one employer stated in the Employer Survey: *“It would be great if there was one place to go to find out information. Knowing what is available would be helpful.”*

Section 5: Fulfilling Advanced Manufacturing Demand

Ensuring access to the scale of skilled workforce required across the timescale of the City and Growth Deals will be a critical determinant of their overall success and their ability to drive both productivity and inclusive growth.

The net requirement for new employees in the manufacturing industry is already anticipated to be 1,500 per year and City and Growth Deal activity will only add to those projections. Although many projects remain at a relatively early stage of development, we do have some indicative data of anticipated job numbers relating to advanced manufacturing (as outlined on page 22) which show the potential demand within the sector. However, as illustrated in some of the earlier labour force supply data, employers across the sector, are already grappling with skills shortages. Employers in Northern Ireland are already facing a skills gap, with more than three quarters, (83%) reporting a shortage⁶⁴. This represents a significant year-on-year increase, with just over two thirds (69%) having indicated a skills gap one year earlier.

In fact, the AMME⁶⁵ report identified skills as the biggest weakness and potential barrier to growth, with constraints impacting all aspects of the sector. With manufacturing anticipated to be one of the top ten growth sectors in the period 2020-2030 (borne out by the employers we surveyed through this research, of whom 70% have plans to grow) - the anticipated City and Growth Deal activity described in this report will only further bolster that growth. More specific evidence about where the gaps and shortages lie, and therefore where skills interventions could most usefully focus, emerged through the employer engagement carried out as part of this work. Employers identified a wide range of shortages.⁶⁶ These appear to be corroborated by the results from the Technology Road mapping exercise⁶⁷ which offers a useful overview into the emerging skills needs facing the sector.

⁶⁴ The Open University's Business Barometer report (2022) was published in partnership with the British Chambers of Commerce and surveyed 144 key employers across Northern Ireland.

⁶⁵ <https://matrixni.org/wp-content/uploads/2016/11/AMME-Report.pdf>

⁶⁶ These included: Project Managers, Robotics, Hardware/Software, Software Engineers, Welders, Fabrication, Spray Painters, (Robotic), Supervisors, Design Engineers, Mechatronics, Systems Analyst, Cybersecurity Experts, Robotic Welders, Assembly Operatives, Spray Painters (Manual), Electromechanical skilled tradespeople, Sustainability Engineers, Programming, Systems Development, Coding, Operators, Production, Trained maintenance, Tradespersons, Quality Engineers, Semi-conductor and photonics, Data Scientists, Digital Transformation, CNC Operators, Planning, Skilled Electricians, People with high-level technical knowledge.

⁶⁷ A Strategic Technology Roadmap was launched in October 2022 by Queen's University following a detailed consultation on technology and skills needs for the next decade with over 100 leaders in advanced manufacturing on behalf of the Belfast Region City Deal-funded Advanced Manufacturing Innovation Centre (AMIC).

Skills to deliver City and Growth Deal activity.

From what we already know is planned through City and Growth Deal activity, the following areas of focus for skills development are beginning to emerge:

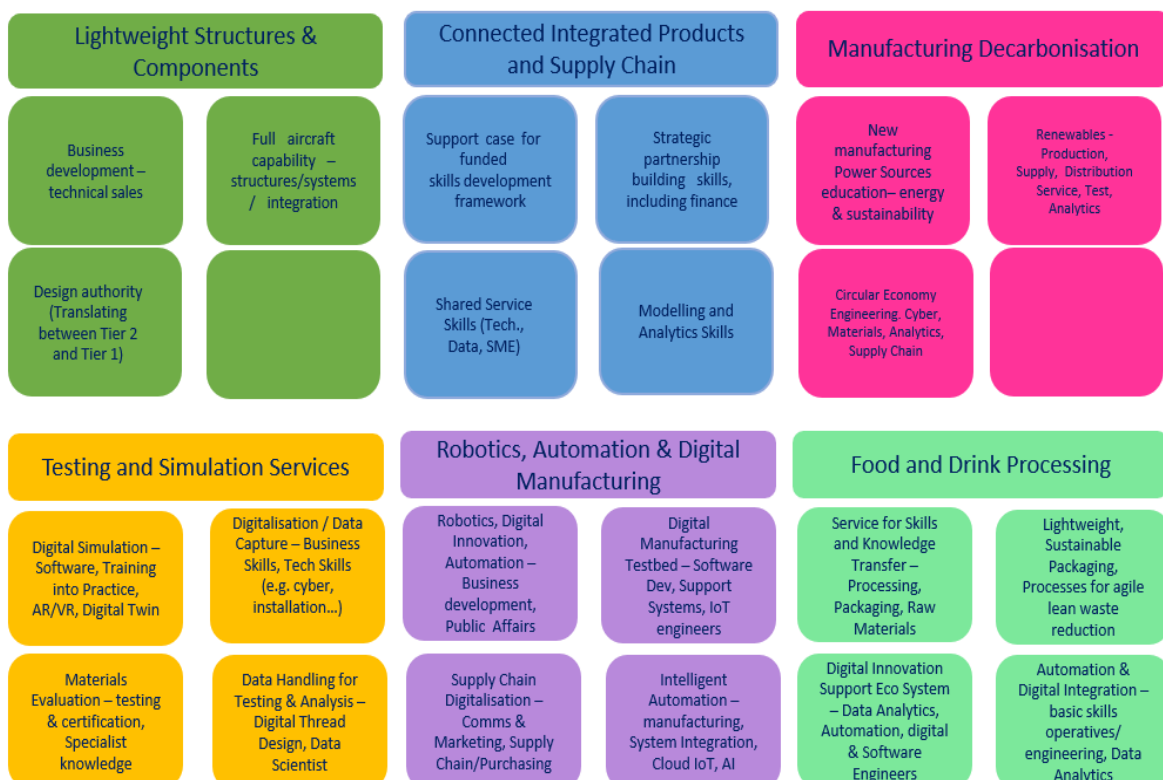
Emerging Areas of Focus connected to City & Growth Deal Activities:



Innovation Centres of Excellence

The City and Growth Deals centres of excellence will be best placed to understand the more detailed skills requirements in the above areas. They will be able to support industry in understanding emerging technological advancements - providing an environment for shared learning which will mitigate the risks associated with initial investment costs. Partners and experts from the University of Cambridge's Institute for Manufacturing and Queen's University developed a Strategic Technology Roadmap for Northern Ireland which identified key priorities to improve Northern Ireland's distinctive strengths in advanced manufacturing (summarised in the diagram below) and outlines how it can support the region's large, world-class companies as well as its SMEs.

Technology Road Mapping – advanced manufacturing



The findings from this (and other) Technology Road Mapping exercises can help to inform course and skills provision and be used to identify priority areas for upskilling and reskilling initiatives.

The National Skills Network⁶⁸ also summarised the anticipated skills needed for Industry 4.0, which align well with the technologies identified by DfE's 10X ambition. This included skills to support:

- Data Analysis and Visualisation
- Cybersecurity
- Artificial Intelligence and Machine Learning
- Cloud Computing
- Digital Twin Technology

The more general skills gaps identified by AMME companies (reflecting wider economic trends) included:

- Marketing and Sales
- Commercial Exploitation
- Leadership and Management
- Transversal (soft) skills

Effective forecasting and knowledge diffusion would help with the establishment of a coherent skills pathway and preparation for an adequate supply of specialist trainers; another skills related gap facing the sector.

Addressing Skills Shortages

To avoid the economic costs associated with skills shortages, the NI Skills Barometer suggests that skills needs should be planned based upon an ambitious economic outlook. Under such a high growth scenario, the Northern Ireland economy is forecast to grow from 902,000 jobs to 975,000 across the 2020-30 period - typified by rapid growth in sectors that demand for higher level skills such as professional services, ICT and advanced manufacturing.

Specialist Skills - Emerging and New Technologies

As illustrated in the previous section the emerging areas of capability associated with City and Growth Deal opportunities include:

- Smart Design
- Sustainable Composites & Polymers
- Smart Nano, Net Zero (cleantech/hydrogen)
- Additive Manufacturing
- Digitalisation of manufacturing processes.

Notably, much of this aligns with the skills needs identified through the Road mapping exercise for the sector, as summarised below. At the same time, AMME⁶⁹ companies identified skills as the greatest potential barrier for growth. Skills constraints at every level reached the top of AMME business threats and continue to do so.

Feedback from our engagement survey also indicated concerns with a number of particular roles in

⁶⁸ <https://www.nationalskillsnetwork.in>

⁶⁹ <https://matrixni.org/wp-content/uploads/2016/11/AMME-Report.pdf>

the sector (outlined in Appendix 9). Roles associated with AMME that are expected to experience the most demand in 2020-2030 include:

- Science & technology professionals
- Science & technology associate professionals
- Skilled metal and electrical trades
- Process plant & machine operatives
- Transport & mobile machine drivers & operatives
- Textiles printing and other skilled trades
- Skilled construction and other building trades
- Elementary trades, plant & storage occupations

The Northern Ireland Executive also recognises that whilst there are job opportunities across all occupational areas, demand is higher in occupations which include Science, Technology, Engineering and Maths (STEM). It identifies advanced manufacturing and engineering as extremely important to the Northern Ireland economy and in particular highlights careers requiring:

- CAD skills
- CNC machine operatives
- Mechanical and electrical engineering skills including at technician level and
- Strategic marketing

Companies in the region need also support to help integrate robotics and automation. There is currently a lack of support to help accelerate the adoption of robotics and automation and there are very few automation companies in Northern Ireland. There is also a skills gap in this area and the initial investment for one company alone to invest in automation can be a barrier.

As specialist areas continue to emerge, access to specialist industrial training will be needed. Although there are areas where specialist training provision currently exists e.g., polymer training offered by the Northern Ireland Polymers Association (NIPA), there is a notable lack of a strategic approach to identify the key areas of capability emerging to inform curriculum development and training delivery.

Net Zero Skills

Although organisations can see the major opportunity that net zero represents many are still at the early stages of developing solutions. At present there is an undeveloped understanding of the theory behind Net Zero and no agreed approach to implementing strategies for sustainability. Challenges in the wider supply chain in understanding and ensuring compliance with emerging requirements will also need to be met by the sector.

Significant changes in the advanced manufacturing sector as a result of technological advances will mean that upskilling will be continuously needed across all roles. It will be important that the sector is well positioned and prepared to avail of any opportunities that may arise in relation to accessing finance for green investments or in developing and exporting new products and knowledge. As well as the significant benefits this will bring in terms of reductions in energy consumption and carbon emissions, it will also help make the sector a more attractive, innovative and sustainable one in which to work.

It is expected that upskilling for sustainability and meeting net zero requirements will be a permanent requirement across all roles.⁷⁰

Leadership and Management Skills

In many businesses leadership and management are considered the most important factors for increasing skills utilisation and workplace performance. Technological innovations, globalisation and demographic and climate change will all have a large impact on the types of jobs and workplaces of the future. Strong leadership and management will be needed to instill the skills required to benefit from these changes.

Supporting industry leaders and managers will be critically important to drive innovation and to secure commitment to skills development so that the sector is able to respond appropriately to anticipated growth.

Transversal and Digital Skills

In terms of broad, general engineering, AMME employers unanimously credit NI's Education system with producing able, competent and intelligent young graduates, of a higher calibre than other regions/countries; indeed, the quality of engineering graduates produced by Northern Ireland's two Universities is broadly valued and recognised.

However, numerous employer surveys have identified issues regarding the work readiness of recent recruits with employers citing challenges with the additional skills and experience required to deliver an employable graduate. A recent survey by the Chartered Management Institute found that 80% of UK employers believe that current graduates do not arrive fully equipped with the skills required to be work ready⁷¹. Thus, a proportion of qualifiers will require additional 'transversal' skills development before they are capable of securing employment at a level equivalent to their qualification.

The Northern Ireland Skills Barometer describes these as 'soft skills' and concludes the ten most in demand of these types of skills to be:

- Problem solving
- Enthusiasm for upskilling
- Flexibility and adaptability
- Leadership
- Critical Thinking
- Tech Savvy
- Communication
- Emotional Intelligence
- Creativity
- Innovation

⁷⁰ An early example of a response to the net zero skills requirement is the Hydrogen Skills Training Academy delivered by Mid and East Antrim Borough Council and partners. This academy has created a pathway to accredited training provision in areas such as fuel cells and the safe handling of hydrogen fuel. The Council is planning to procure an operating partner for the i4C Innovation and Cleantech Centre that will deliver a range of skills training in the cleantech and net zero.

⁷¹ [employability-skills-research_work-ready-graduates.pdf \(managers.org.uk\)](https://www.managers.org.uk/employability-skills-research/work-ready-graduates.pdf)

Complex skills needs in a changing environment

Ensuring the skills needs of the future are met is about more than simply understanding what the skills gaps are. It will also require other changes to the system and processes that support the skills offer. These include the following areas. A number of models of good practice in relation to the areas below are summarised at the end.

Collaboration

Training in key areas such as leadership and management, entrepreneurship education, emerging technology areas, digital, sustainability and net zero, and specialist areas could be more streamlined, coordinated, strategically planned and responsive to industry need.

However, to achieve these things, and to better understand the specific skills needs emerging there is a need for greater collaboration across the sector for which a cross-sectoral Collaborative Skills Working Group will be essential. This will involve more comprehensive and sustained contact with employers and industry and more collaboration with education and training providers to inform curriculum and course content. Co-ordination of effort would help strengthen the message and offer greater consistency across the region.

Funding

Given the absence of a specific funding allocation for employability and skills through City and Growth Deals, there is a clear need for action to identify and pursue all funding opportunities that could support the advanced manufacturing sector.

Improved flexibility in the skills offer

There is increasing demand for more flexible short course provision particularly in response to the anticipated rapid increase in upskilling and reskilling e.g., flexible skills provision to include short courses. This suggests the need for access to modular learning through establishment, for example, of a Micro-Credentials Framework.

Factory Floor Learning

There is also a need for more practical training and skills development. Hands-on experience of manufacturing and problem solving from an early age is of prime importance and access to factories and equipment would help with training and testing processes. A general scarcity of trainers in some specific areas will also need to be addressed.

Graduate Pathways

There is a strong interest in increasing provision of graduate pathways and in promoting higher level skills in areas associated with the road mapping themes (page 26). Pathways should be clearly mapped to show opportunities for progression and alternative routes.

Increased Existing Provision

There is strong support for the Apprenticeship model as a skills mechanism with evidence that new degree apprenticeships would be in demand. Within this there is a clear need to promote apprenticeships in the sector more among women and other under-represented groups. At the same time Employment Academies are a useful tool for entrants to the sector and could be extended to ensure a broader, more sustainable offer.

Training the Trainer

In order to properly supply all of the skills needs of the future, there will be a need to encourage those employed in the advanced manufacturing sector to consider delivering relevant, up to date training to new learners, and to facilitate those leaving the sector (through retirement, ill health) to become involved in training and to attract a properly qualified pool of future trainers.

Coordinated approach to forecasting and investment in facilities

Industry needs support to forecast and plan for rapidly changing future skills. There is currently an absence of regional skills forecasting for the sector. Whilst the sector continues to grow, its pace of growth has been slower than the region's average. Traditional businesses within the sector are struggling to understand and equip themselves with the right skills and capabilities to take advantage of disruption within this sector. As innovation continues to drive changing skills needs, a mechanism is needed to ensure new skills provision can be brought to market in a timely way.

Ongoing employer engagement will be required in order to reduce the skills gap in a way that properly reflects industry need and inform skills interventions across all levels and throughout the whole of the sector. At the same time there will be an opportunity to use this information to inform and influence curriculum development across the further and higher education sectors.

Improved Sectoral Appeal

Labour market shortages in specific areas suggest a need to broaden and improve the appeal of the sector to complement other efforts to address skills challenges. Competition for labour is expected to be a continuing issue across the labour market especially as skilled individuals from Northern Ireland are attracted elsewhere by higher wages and other incentives.

Improving image of the sector Sectoral: A negative and outdated perception of the industry persists. Relatively fewer students attracted to STEM subjects and a lack of practical hands-on careers experience is further compounded by parents and teachers who often direct children into more traditional career routes. Negative perceptions also extend to those out of education, with people often viewing the industry as 'hard' and inflexible. There is a need to reshape careers advice from an early age to make the case for the significant career opportunities within the sector while also focusing resources on elevating the profile of the industry more generally through an employer-led approach to sector profiling and stimulating pathways. Designed and delivered by the sector, this would present a clear opportunity to refresh the messaging about careers in the modern advanced manufacturing sector.

Expanding talent pool: Given expectations that restrictions in the labour market are likely to prevail for the next ten years, it will be vital that all stakeholders work together to maximise the participation of currently underrepresented groups. Minimising the risk of workforce shortages will depend largely on the ability of the sector to engage with non-traditional client groups. Tackling skills gaps will also be critical to driving forward a more inclusive workforce. A collective effort will be required to support economically inactive and long-term unemployed people into employment. It will be important that awareness and access to emerging opportunities in the sector are profiled more broadly - in particular to providers targeting specific client groups. Facilitating promotion of the opportunities emerging through City and Growth Deal projects would be a useful first step in developing a more coherent approach to promoting opportunities more generally⁷².

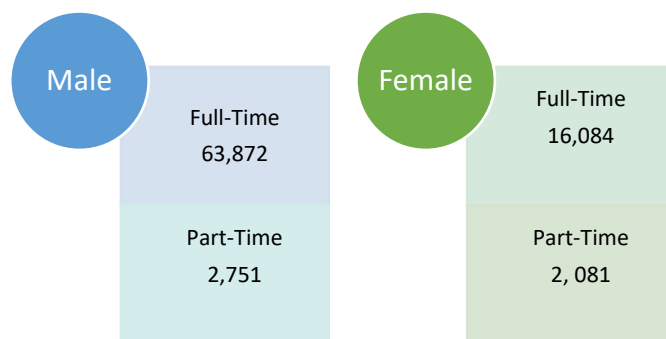
⁷² The new Innovation Centres could play a central role in helping to co-ordinate interventions to stimulate careers pathways, for example, the facilities at AMIC Factory of the future could be used for careers events, competitions, open nights, information sessions etc. This could also help smaller organisations, which often have limited resources, to engage directly in careers and sectoral profiling activities.

Tackling the Gender Gap

In 2018/19 of the 1,005 Northern Ireland domiciled students, Higher Education qualifications in Engineering and Technology, 790 (78.9%) were male and only 210 (21%) were female (HESA). A large gap exists between the proportion of male and female students studying narrow STEM subjects, at 36% and 15% respectively. The gap is particularly pronounced in engineering, technology and computer science subjects, where 25% of males study these subjects compared to just 5% of females. If the overall proportion of narrow STEM qualifiers is to be increased and the gender gap in the sector closed, then raising the proportion of females in these subject areas is crucial and there must be a concerted effort to attract females into the advanced manufacturing industry.

The gender disparity is reflected in similar numbers in the workplace where there gender disparity persists in manufacturing in Northern Ireland⁷³. In 2021 just over 20% of workers in Manufacturing in Northern Ireland were female.

Males and Females in Advanced Manufacturing Jobs 2021



A respondent to the employer survey stated: *“Getting females into the manufacturing side is improving but much too slowly.”* Given the required the increasing scale of demand for future employees across the manufacturing/advanced manufacturing sector it will be crucial for its success to address the gender imbalance.

Supporting an aging workforce

The manufacturing sector is facing an increasing skills challenge, the demographic profile of the sector highlights an aging workforce with over 32% of those in plan, process and machine operative jobs over 50 years old. Skills trends suggest the older population are less likely to have formal qualifications with their skills developed ‘on the job’. While NI’s education system is now producing more people with higher level qualifications than at any point in the past, it is important to remember that the labour market is comprised of people who have qualified from the education system over the previous 50 years. Whilst the introduction of All Age Apprenticeships in September 2023 aims to provide opportunities for more people aged over 25 to embark on a career of their choice, it will also be necessary to upskill and reskill many who are already in employment to ensure there is a sufficient skilled workforce to meet the requirements of growth in advanced manufacturing.

Improved Access to opportunities

As well as more jobs fairs to encourage entrants to the sector there is a strong case being made, through our employer engagement activity, for a digital solution to support the recruitment challenges. A Digital Platform or One Stop Shop would improve the information flow for all stakeholders by including details of job opportunities, career paths and supporting programmes.

⁷³ Total Manufacturing Jobs by Gender (Business Register and Employment Survey 2021)

Instilling a culture of lifelong learning – upskilling and reskilling at scale

The volume of reskilling and upskilling required is likely to be significant and will require a coordinated and joined up approach. With 80% of the 2030 workforce already in the workforce today, reskilling the existing workforce will be the major challenge between now and 2030⁷⁴. In a tight labour market, the ability to offer support to employees to upskill will be an important recruitment advantage, and there is currently a mismatch between skills and available opportunities. Northern Ireland already has the lowest proportion of any UK region of people in employment receiving job related education or training and has consistently recorded lower proportions of the workforce engaged in life-long learning over time. Given the technological advances, increased digitalisation and new and emerging capability areas anticipated through City and Growth Deals, all workers in the sector will need to be upskilled - and industry supported - to put in place a programme of lifelong learning that will meet the skills needs of the future. This will require steps to promote and embrace a new culture of lifelong learning and a model for upskilling that ensures specialist needs will be met into the future.

Models of good practice

In the course of this work, a number of initiatives were identified that could be learned from or aspects borrowed from:

Skillnet Ireland

Skillnet Ireland is a state-funded agency in Ireland that focuses on workforce development and upskilling. It operates as a national network of industry-led training and learning organisations, working to enhance the skills and capabilities of employees across various sectors. It collaborates with businesses, industry associations, and enterprise groups to identify the skills needs within specific sectors and develop targeted training programs to address those needs. Its primary goal is to support Irish enterprises in building a skilled workforce that can adapt to changing market demands and remain competitive.

Singapore “SkillsFuture” Initiative

Singapore has implemented a comprehensive approach to skills development known as the SkillsFuture" Initiative. The SkillsFuture initiative was launched in 2014 with the aim of helping Singaporeans develop skills throughout their lives, adapt to changing industry demands, and stay employable in a rapidly evolving economy.

Industry Transformation Maps (ITMs): The ITMs are industry-specific roadmaps that outline strategies for the transformation and growth of various sectors in Singapore. They identify key skills needed in each industry and provide insights into career pathways, training programs, and skills upgrading.

Advanced Manufacturing Technology Centre of Excellence Dundalk

The AMTCE supports people to reskill or upskill in the new emerging technologies used in Industry 4.0 or to enable people to develop new careers in advanced manufacturing through apprenticeships and traineeships. The purpose of the AMTCE is to provide training on state-of-the-art equipment and processes which will underpin the transition of Irish companies to Industry 4.0 based operations. The centre provides a dynamic catalogue of training courses which are tuned to the needs of industry and delivered by leading industry training practitioners. AMTCE has also developed a Robotics and Automation All-Ireland Apprenticeship which can be learned from and there is an opportunity for potential collaboration.

⁷⁴ UK skills Mismatch in 2030 Industrial Strategy Council.

The High Value Manufacturing Catapult

AMIC will help strengthen the relationship with the High Value Manufacturing Catapult – a network of research and Innovation Centres established by Innovate UK to transform UK Manufacturing. There are collaboration opportunities and there is much to learn from the Skills Initiatives of the Network: HVMC Centres offer Apprenticeships, Continuous Professional Development (CPD) courses and bespoke training to help build and maintain the high-level skills UK manufacturing needs.

Foresighting Reports

Foresighting future skills needs is a recommendation of the HVM Catapult's 'Manufacturing the Future Workforce' report proposing the Skills Value Chain approach to connect workforce development and skills with technology innovation. HVM Catapult has continued to develop a suite of processes and IT tools to facilitate and enable skills foresighting to take place. These tools and processes are also available under Open Government License.

Section 6: Conclusions

Northern Ireland has always had a rich history of manufacturing and the local advanced manufacturing sector has made a significant contribution to the growth of the NI economy. In 2021 the contribution of the sector to the economy was:

- 2,200 companies
- 46, 000 employees
- £3.2 billion to economy
- 8% of economic output

The importance of the sector to the transformation and reinvigoration of the economy post Covid and Brexit has been emphasised by the DFE 10X vision for a transformed economy where advanced manufacturing in NI is recognised as having the potential to become a globally leading sector. The NI Skills Barometer has also identified the potential growth of the sector within the NI Economy and the impact of this on the skills. The planned City and Growth Deal investments are designed to support and indeed help to deliver on this opportunity by bringing together R&D&I capability within universities and industry to drive improved productivity, create more and better jobs and respond to the challenges of net-zero.

In designing and developing these Centres it is essential that plans are in place that will provide the skills both to create this R&D&I capability within the centres and within industry but crucially, working with industry, government, FE & HE and local Councils, that the skills are developed and available across the wider SME community to operate transformed processes and deliver new, innovative products.

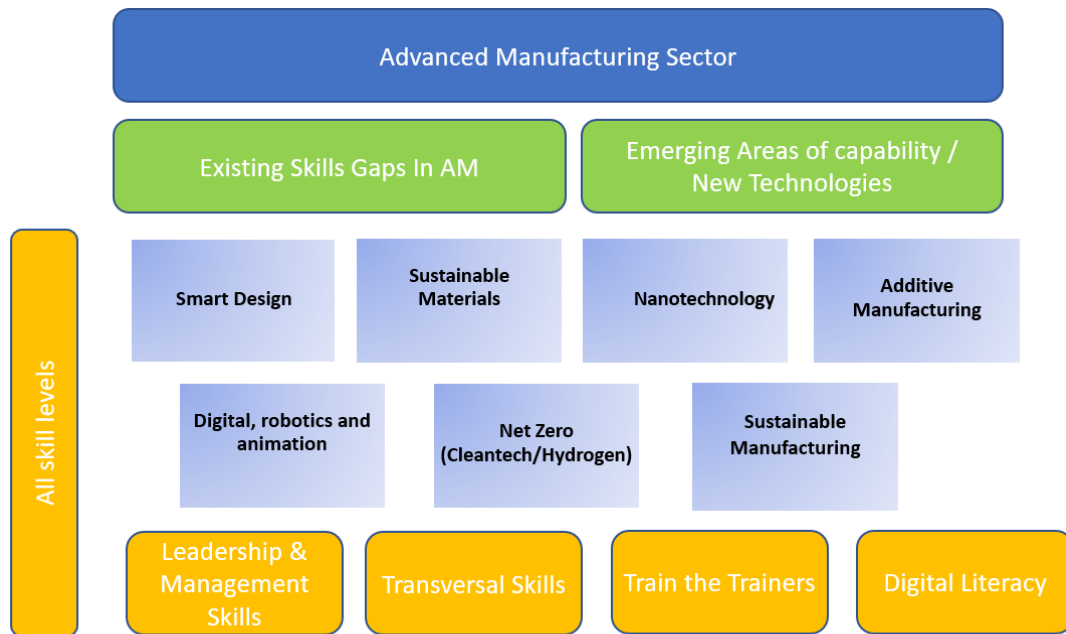
This skills assessment has therefore engaged with key stakeholders including employers, government and local education providers to understand the current skills provision and what will be required as a result of the new jobs to be created. At the heart of the recommendations, and aligned with the recommendations of the Skills Strategy, there is a real need to ensure collaboration across industry, HE and FE training providers and to align funding and skills delivery with the needs and opportunities of a critical, high value and growing sector. It is not enough to ensure that the future skills needed to make the sector succeed are in place. It will also be essential that opportunity to acquire these skills - and envision a viable, successful, career pathway - is available and accessible to a future pool of talent across society.

The task and finish group clearly identified that there is much to be positive about, despite the changing environment, with key components of the skills system in place and a Skills Strategy aligned with the 10X vision now being delivered. Queen's University Belfast and Ulster University are global leaders in research and development. The Engineering Hub led by FE Colleges is undertaking a critical role to review and update apprenticeship provision. Industry Associations such as NIPA and ADS support key clusters with skills initiatives such as the NIPA and SERC, Advanced Polymers Academy emerging to serve specialist skills needs. Invest NI continue to provide crucial industry support and Council-led Labour Market partnerships are bringing new, inclusive models to the table. New Innovation Centres will add to this support eco-system and provide significant network links such as AMIC connecting Northern Ireland with the High Value Manufacturing Catapult.

There are many areas where existing skills provision is meeting the needs of industry today and where provision can be upscaled or readily adapted given the levels of expertise already in existence. Apprenticeships, employment academies, work of manufacturing network organisations such as MEGA, MTF and GEMX to increase attractiveness of sector can be increased and replicated across the region to support new and emerging skills requirements. Though the lack of long-term funding

commitments for education and skills and the impact of this on delivery of long-term plan was a consistent concern.

The skills assessment revealed the following skills requirements reflecting the essentials for many of the jobs of the future, but in particular taking account of the dramatic impact of digitization and net-zero at all skill levels.



Ensuring the skills needs of the future are met is about more than simply understanding what the skills gaps are. It will also require other changes to the system and processes that support the skills offer. Additional challenges include:

- A Labour Market Shortage in the region and the sector including a high rate of economic inactivity making it difficult for industry to secure the people and skills they need to sustain their activity and plan for growth.
- A Skills Crisis exists due to a lack of basic skills among too many and this is compounded by huge changes due to emerging technologies, digitalization green growth, etc.
- Lifelong Learning: Northern Ireland has the lowest level of lifelong learning in the UK and low levels in comparison to other OECD countries. The Culture of Lifelong learning needs to change.

Following consultation across the task and finish group and engagement with industry a number of proposals were made and these have been grouped into the following recommendations.

Rec. 1	Develop a collaborative approach to future skills provision for the advanced manufacturing sector
Rec. 2	Align and re-scale existing provision to meet current and future demand reflecting industry needs
Rec. 3	Colleges and Universities work to expand the range of apprenticeship and higher level apprenticeship pathways in line with 10X implementation plan 23/24
Rec. 4	Increase attractiveness and raise awareness of career potential in sector
Rec. 5.	Prepare for emerging skills needs associated with sustainability and Net Zero

Section 7: Recommendations

Section 3 of this report has identified issues relating to both the demand and supply of the skilled workforce that will be required to meet the needs arising from City & Growth Deal investments.

This section identifies recommendations and supporting actions to help address these issues. Given the funding constraints in the NI economy and the absence of specific funding to deliver the Employability and Skills Pillars of City and Growth Deals, it will be important to support existing models of skills provision and identify opportunities for the upscaling of current skills training, whilst examining options for upskilling and reskilling opportunities to support business development and growth.

Beyond existing provision, this section also proposes interventions which could be developed to support future skills requirements in order to meet demand arising from the jobs created by the establishment of the City and Growth Deal Innovation Centres once operational.

The following high-level recommendations could be developed to supplement and maximise existing provision:

Recommendation 1 :	Develop a collaborative approach to future skills provision for the advanced manufacturing sector
Recommendation 2 :	Align and re-scale existing provision to meet current and future demand reflecting industry needs
Recommendation 3 :	Colleges and Universities work to expand the range of apprenticeship and higher level apprenticeship pathways in line with 10X implementation plan 23/24
Recommendation 4 :	Increase attractiveness and raise awareness of career potential in sector
Recommendation 5 :	Prepare for emerging skills needs associated with sustainability and Net Zero

Recommendation 1 Develop a collaborative approach to future skills provision for the advanced manufacturing sector

Issue	Existing Provision	Action	Stakeholders	
<p>There is a need for a collaborative approach to AM skills provision and to forecasting of current and future Skills needs.</p> <p>There is a lack of one stop shop to enable understanding of the skills pathways available in the Sector</p> <p>It is expected that Innovation Centres will be a key player in delivering a collaborative approach to skills provision and forecasting, working with government, industry and key stakeholders.</p>	<p>Sectoral advisory groups and industry forums</p> <p>The approach to forecasting is undertaken by a number of separate groups</p>	<p>Establish an Advanced Manufacturing Collaborative Skills Working Group⁷⁵</p> <p>Terms of Reference to include:</p> <ul style="list-style-type: none"> • Agree an approach to skills forecasting • Identify current and future skills needs • Inform and influence curriculum development across HE and FE • Consider options for funding to deliver • Develop a Digital Platform to act as an information source for user groups and agree how it will be managed⁷⁶ • Develop a Promotion and Engagement plan 	Innovation Centres	✓
			Employers	✓
			HE Sector	✓
			FE Sector	✓
			Councils /LMPs	✓
			Industry Reps	✓
			Government Partners	✓
			Invest NI	✓
<p>There is a need for new accessible pathways for entry level qualifiers in Advanced Manufacturing</p>	<p>M&EA Manufacturing Academy</p> <p>D&S Advanced Manufacturing Academy</p>	<p>Increase interaction with employers and work with LMPs to identify potential academies that will fill entry level vacancies</p> <p>Ensure that transversal skills are incorporated into each training course</p>	Innovation Centres	
			Employers	✓
			HE Sector	
			FE Sector	
			Councils /LMPs	✓
			Industry Reps	✓
			Government Partners	✓
			Invest NI	

⁷⁵ This could involve members of the Skills Assessment Task and Finish Group. A Collaborative Skills Working Group could be responsible for: Road mapping, Forecasting, Collective Intelligence, User Journeys, Toolkits, Equipment Register; Dashboard; Training Catalogue; Training Collaborations; educational/Pathway Gaps; Survey/Engagement; Course Development, identifying areas of capability/strength and responsible partners for: Forecasting & Road mapping, plans and methods of dissemination.

⁷⁶ (including a signposting tool and a catalogue of career pathways, training options, links to opportunities in the Sector)

Recommendation 2 Align and re-scale existing provision to meet current and future demand reflecting industry needs

Issue	Existing Provision	Action	Stakeholders
Need to prepare skills provision for NQF 4-5 qualifiers in Advanced Manufacturing	Foundation degrees	Increase interaction with employers to understand and address the demand of the Advanced Manufacturing Sector at levels 4-5	Innovation Centres
			Employers
	HE Sector		
	FE Sector		
	Councils /LMPs		
	Industry Reps		
	Government Partners		
Need to prepare for future demand for higher level (graduate) skills provision for Advanced Manufacturing	Higher Level Apprenticeships	Ensure that transversal skills are incorporated into each training course	Invest NI
			Innovation Centres
	Employers		
	HE Sector		
	FE Sector		
	Councils /LMPs		
	Industry Reps		
Government Partners			
Need to prepare for future demand for higher level (post-graduate) skills provision for Advanced Manufacturing	Broad range of degrees currently available through FE and HE institutions across NI	Explore potential for Assured Skills Academies to be adapted for Advanced Manufacturing to support AM employers with Graduate recruitment	Invest NI
			Innovation Centres
	Employers		
	HE Sector		
	FE Sector		
	Councils /LMPs		
	Industry Reps		
Government Partners			
Need to prepare for future demand for higher level (post-graduate) skills provision for Advanced Manufacturing	HLAs	Ensure that transversal skills are incorporated into each training course	Invest NI
			Innovation Centres
	Employers		
	HE Sector		
	FE Sector		
	Councils /LMPs		
	Industry Reps		
Government Partners			
Need to prepare for future demand for higher level (post-graduate) skills provision for Advanced Manufacturing	Assured Skills	Increase interaction with employers to understand and address the demands of the Advanced Manufacturing Sector at levels 7-8	Invest NI
			Innovation Centres
	Employers		
	HE Sector		
	FE Sector		
	Councils /LMPs		
	Industry Reps		
Government Partners			
Need to prepare for future demand for higher level (post-graduate) skills provision for Advanced Manufacturing	Broad range of post -graduate qualification currently available through FE and HE institutions across NI	Ensure that transversal skills are incorporated into each training course	Invest NI
			Innovation Centres
	Employers		
	HE Sector		
	FE Sector		
	Councils /LMPs		
	Industry Reps		
Government Partners			
Need to prepare for future demand for higher level (post-graduate) skills provision for Advanced Manufacturing	Knowledge Transfer Partnerships	Collaborate to develop funding proposals to enable delivery of new Centres for Doctoral Training⁷⁷	Invest NI
			Innovation Centres
	Employers		
	HE Sector		
	FE Sector		
	Councils /LMPs		
	Industry Reps		
Government Partners			

⁷⁷ These will act as future technology and skills pipelines, particularly in areas relating to the tech road mapping themes and other emerging areas of capability, achieving world-leading advantage for the NI advanced manufacturing sector.

Recommendation 2 Align and re-scale existing provision to meet current and future demand reflecting industry needs (continued)

Issue	Existing Provision	Action	Stakeholders	
<p>Lack of a consistent model for course development according to industry needs</p> <p>Lack of appropriate funding options identified</p>	<p>Training in specialist areas exists, particularly through organisations such as NIPA, NIACE (AMIC) and ADS but not coordinated or promoted</p>	<p>Identify funding opportunities to support delivery of specialised training.</p> <p>Collaborate to develop specialised training provision in emerging sectors⁷⁸</p> <p>(Collaborative Skills Working Group to progress both)</p>	Innovation Centres	✓
			Employers	
			HE Sector	✓
			FE Sector	✓
			Councils /LMPs	
			Industry Reps	✓
			Government Partners	
			Invest NI	
<p>The pace of change in robotics and automation is a challenge in the Advanced Manufacturing Sector</p>	<p>A Graduate Robotics Automation Academy was piloted with Deloitte in 2018 and delivered by Belfast Met</p>	<p>Increase provision of/Initiate robotic and automation academies⁷⁹ on a regional basis</p> <p>Develop new modules/courses in response to emerging themes in robotics and process automation</p>	Innovation Centres	✓
			Employers	
			HE Sector	✓
			FE Sector	✓
			Councils /LMPs	
			Industry Reps	✓
			Government Partners	
			Invest NI	

⁷⁸ E.g. High Value Design, Sustainable Composites & Polymers, Nano Technology, Additive Manufacturing. Need to ensure that this is aligned with the provision and capability offered by CIDRA.

⁷⁹ Connect in with group on Robotics and Automation 10X Robotics & Autonomous Systems Branch DfE (working towards innovative and competitive through Robotics and Autonomous Systems (RAS)).

Recommendation 2 Align and re-scale existing provision to meet current and future demand reflecting industry needs (continued)

Issue	Existing Provision	Action	Stakeholders	
Need for reskilling and upskilling provision at scale to keep pace with changing skills needs and shortages and to create opportunities for people entering or re-entering the sector	Innovate Us Skills Focus Skill Up QUB William J Clinton Leadership Institute Ulster Business School LMP Upskilling Programmes	<p>Increase interaction with employers to understand and address upskilling and reskilling requirements and awareness of reskilling and upskilling opportunities across the Sector</p> <p>Develop a Micro-credential Framework spanning FE & HE to enable bite sized and rapid upskilling of those within and/or seeking to re-skill to enter the sector - (HE and FE sectors, industry reps, employers)</p> <p>(Collaborative Skills Working Group to progress both)</p>	Innovation Centres	✓
			Employers	✓
			HE Sector	✓
			FE Sector	✓
			Councils /LMPs	✓
			Industry Reps	✓
			Government Partners	✓
			Invest NI	✓
Employers are struggling to keep pace with the skills needed to meet the increasing digitalisation of the sector	Innovate Us Skills Focus Skill Up QUB William J Clinton School of Leadership and Management Ulster Business School LMP Upskilling Programmes	<p>Increase interaction with employers to understand and address digital upskilling requirements⁸⁰, including targeting additional support to micro/SMEs in the sector</p> <p>(Collaborative Skills Working Group to progress)</p>	Innovation Centres	✓
			Employers	✓
			HE Sector	✓
			FE - BMET Digital Hub	✓
			Councils /LMPs	✓
			Industry Reps	✓
			Government Partners	✓
			Invest NI	✓

⁸⁰ Skills for Digital – (Content for Digital Curriculum design: Data processing / Analytics / IOT how to capture data and how to treat it; Process control; Process design; Modelling; Digital Twin; Process production/supply chain and; Measuring / understanding carbon footprint and how to measure

Recommendation 3

Colleges and Universities work to expand the range of apprenticeship and higher-level apprenticeship pathways in line with 10X implementation plan 2023/24

Issue	Existing Provision	Action	Stakeholders	
<p>Current apprenticeship and higher level apprenticeship provision is insufficient to meet the evolving advanced manufacturing requirements of future jobs as supported through City and Growth Deals</p>	<p>APPSNI HLAs</p>	<p>Review app standards and existing frameworks across UK and Ireland to identify opportunities to expand NI provision</p>	DfE Skills	✓
		<p>Establish working groups with College Hub and Universities to identify new APP framework and qualifications</p>	Employers	✓
			HE Sector	✓
			FE Sector	✓
			Belfast Met Digital Hub	✓
			Councils /LMPs	
			Industry Reps	✓
			Government Partners	
		<p>Consultations with sectoral employer groups to sign off new APPs and Qualifications</p>	Invest NI	✓

Recommendation 4 Increase attractiveness and raise awareness of career potential in the sector

Issue	Existing Provision	Action	Stakeholders	
<p>Labour market shortages are impacting the sector - with major shortages in specific areas suggesting a need to broaden and improve the appeal of the sector to complement efforts to address skills challenges</p> <p>More needs to be done to make the sector more socially inclusive, in particular to attract females.</p> <p>Increasing involvement of females in STEM study and careers is a significant strategic priority for our economy and society. (DfE)</p>	<p>Widening Access and Participation Units of Universities and FE Colleges</p> <p>Council / LMP Action Plans</p> <p>DfC – local Jobs and Benefits Offices</p> <p>DfE – Careers Advisory Service; Schools careers services</p>	<p>Develop targeted campaigns and interventions to engage and support under-represented groups into the sector following example set/engaging with the MEGA initiative</p> <p>Review existing initiatives and highlight opportunities to scale up to increase participation of under-represented groups)</p> <p>Engage with LMPs to establish sectoral promotional initiatives including developing a range of programmes specifically targeted at encouraging women into the AM Sector.⁸¹ (Collaborative Skills Working Group to progress above 3)</p> <p>City and Growth Deal Partners to review programme and promotional campaigns to remove gender bias and promote positive gender role models across the sector.</p>	Innovation Centres	✓
			Employers	✓
			HE Sector	✓
			FE Sector	✓
			Councils /LMPs	✓
			Industry Reps	✓
			Government Partners	✓
			Invest NI	✓

⁸¹ Apprenticeships; HLAs; Academies; Encouraging current female Manufacturing Apprentices to act as ambassadors/role models

Recommendation 5 Prepare for emerging skills needs associated with Sustainability and Net Zero

Issue	Existing Provision	Action	Stakeholders	
<p>There is an increasing and pressing need to develop sustainability and Net Zero Skills within the sector. Training provision is needed i.e. short courses offering bite sized learning, micro-credentials etc.</p> <p>There is an increasing demand for more flexible and short course provision, particularly in response to the need for rapid upskilling and reskilling in emerging areas. Training models must be more agile and responsive to industry needs.</p>	<p>Skill Up Programme 'green' short courses being delivered across FE and HE</p>	<p>Increase Skill Up provision - from entry level to postgraduate focusing on green technologies.</p> <p>Increase and expand programmes akin to the Hydrogen Training Academy delivered by M&EA</p> <p>Explore trialing a micro-credentials model of delivery for net zero skills</p> <p>Develop a programme through innovation centres for Net Zero Champions in Advanced Manufacturing.</p>	<p>Innovation Centres</p> <p>Employers</p> <p>HE Sector</p> <p>FE Sector</p> <p>Councils /LMPs</p> <p>Industry Reps</p> <p>Government Partners</p> <p>Invest NI</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>

Future Interventions and the Role of the City and Growth Deal Innovation Centres in Skills Development

City & Growth Deal innovation centres can play a significant role in informing the employability & skills requirements associated with Advanced Manufacturing. They are well placed to be ahead of the curve in terms of the skills implications of future innovations and it is essential that they are designed and developed to ensure that they share this knowledge and expertise to enable the diffusion of essential skills beyond large, innovation focused businesses across the sector. The centres will have state of the art facilities, technologies and capabilities, which can be used as resources for training to supplement existing skills providers and to support training the trainer. They will also provide an ideal environment to signal the future direction of manufacturing to the next generation of talent through schools' programmes, demonstrating the appeal of the sector, including its fundamental importance in tackling the net-zero challenge.

Appendix 10: Options for City & Growth Deal Projects to Support Employability & Skills provides a summary of some of the ways in which Innovation Centres/projects can support the Employability & Skills ambitions of the deals. Following the establishment of Innovation Centres there will be a requirement to build specific and targeted solutions to address continuing skills needs identified through this report. City & Growth Deal Innovation Centres will have a significant role in supporting industry but should do so in a way that complements, rather than duplicates, the existing support landscape.

Innovation Centres and Advanced Manufacturing related projects arising from City & Growth Deals will consider the analysis and recommendations outlined in the document and establish an action plan to build Employability and Skills into their Business Cases/Operational Plans.

As the most advanced on the Innovation Centre journey, AMIC will build out four capability areas to support research, innovation and knowledge transfer to industry. These areas have been tested through consultation with industry and informed by the AMIC Industry Board for the development of a robust business plan. AMIC aims to support the development of 300 Apprenticeships over the lifetime of the project and has therefore committed to playing a key role in collaborating with partners, as outlined in the recommendations above, to revising apprenticeship and HLA frameworks to ensure that they integrate new skills as a result of automation, digitalisation and net-zero/low-carbon. AMIC will put in place Skills Lead to co-ordinate its skills focused activity in collaboration with the various other offerings being delivered by partner organisations such as the i4C Innovation and Cleantech Centre and CIDRA.

This model could be replicated across the region in City & Growth Deal Innovation Centres currently in development and planned.

**LEARNING
FACTORY**

**DIRECT
TRAINING**

**TAILORED
TRAINING**

- Creating a facility within AMIC with aspects of an authentic production environment designed and used primarily for the purpose of learning.
- Modules and courses developed by AMIC and delivered to members and others.
- Training modules to be configured to meet companies needs.

**EXECUTIVE/
LEADERSHIP
EDUCATION**

**WORK WITH
DELIVERY
PARTNERS**

**CONVENING &
SIGNPOSTING**

**INDUSTRY
PROFILING**

- Partner with Providers eg William J Clinton Institute.
- World-class Leadership Programme.
- Knowledge-sharing, course development, provide modules.
- Apprenticeships
- Equipment use
- Signpost to help through User Journeys
- Factory Tours/Open Days
- Showcase Events
- Profiling People/Work

Strategic Support from Government

Strategic Actions beyond the scope of City & Growth Deal Partners and within the scope of government departments which should be considered to support the vision for success for the Advanced Manufacturing Sector in Northern Ireland include:

Suggested Action	Comment
Model for collaborative skills delivery – joint funding and co-creation with industry	Skillnet model in Ireland offers a potential model to learn from
A leadership strategy for Advanced Manufacturing and for Digital Innovation in Manufacturing	With a focus on skills and workforce development.
Development of a Net Zero Roadmap	With a focus on skills and workforce development.
Review of the Maximum Student Numbers Gap	To support more numbers in courses where there is an anticipated labour market shortage.
Development of an Occupational Shortage List for Northern Ireland	As is currently available in the UK and Scotland.
Grants to be made available for automation to drive productivity	For equipment and other investment for collaborations to help automate processes.
Shared intelligence on emerging skills areas/jobs roles	To ensure that the necessary talent pipeline exists and shared intelligence on wage benchmarking.

Suggested Action	Comment
Continued shared collateral to profile sector and job roles	E.g. Toolkits and Templates for Industry etc. to use
Funding support for sectoral profiling activities	Strategic funding for key growth sectors
Support significant geographical clusters/organisations in remote locations	e.g. strategy for cluster development and strategic planning of public transport arrangements

Glossary of Acronyms

AM	Advanced Manufacturing
AMME	Advanced Manufacturing, Materials and Engineering
AMIC	Advanced Manufacturing Innovation Centre
BCC	Belfast City Council
BRCD	Belfast Region City Deal
CIDRA	Centre for Industrial Technologies & Automation
CC&GCD	Causeway Coast and Glens City Deal
C&GD	City and Growth Deal
DoF	Department of Finance (NI)
DfE	Department for the Economy (NI)
DC&SCGD	Derry City-Londonderry and Strabane City Growth Deal
DE	Department of Education (DE)
EU	European Union
FE	Further Education
HE	Higher Education
I4C	Innovation and Cleantech Centre
INI	Invest Northern Ireland
LMP	Labour Market Partnership
M&EA	Mid and East Antrim Borough Council
MSWCGD	Mid-South West City and Growth Deal
NI	Northern Ireland
NIACE	Northern Ireland Advanced Composites & Engineering Centre
OECD	Organisation for Economic Cooperation and Development
QUB	Queen's University Belfast
RoI	Republic of Ireland
RTO	Research Technology Organisation
SERC	South Eastern Regional College
STEM	Science, Technology, Engineering and Maths
SRC	Southern Regional College
SME	Small and Medium Enterprise
UK	United Kingdom
UU	Ulster University

