

Appendices

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Appendix 1

BRCB E&S Board Terms of Reference & Membership

**BELFAST REGION CITY DEAL
EMPLOYABILITY AND SKILLS BOARD**

Terms of Reference

1. BACKGROUND

The BRCD region, stretching from Mid and East Antrim to Newry, Mourne and Down, is a functional economic area based on the local authorities that comprise the Belfast Travel to Work Area. With a population of over 1 million residents, more than half of whom are under the age of 40, the BRCD region is young, ambitious and growing.

The Deal represents a new way of working between central and local government and regional partners and secures a bespoke package of investment from central government and BRCD partners to support the delivery of our shared vision. The BRCD partners comprise the six local authorities; 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 and Newry, Mourne and Down District Council, the region's two universities; Queen's University Belfast and Ulster University, and four of the region's further education colleges; Belfast Metropolitan College, Northern Regional College, Southern Regional College and the South Eastern Regional College. These partners have worked together intensely since 2017 to secure £1 billion of investment to support the delivery of a shared ambition to accelerate inclusive economic growth for the region and to deliver thousands of new and better jobs; with pathways and support in place to make them accessible to people from all communities.



Governance arrangements to manage the delivery of the BRCD, comprising an Executive Board supported by Pillar Boards, build upon the structures in place previously to enable the development of the deal.

Each pillar board is accountable to the Executive Board and is responsible for the ongoing implementation of the Deal.

2. ROLE OF THE EMPLOYABILITY AND SKILLS BOARD

The Employability & Skills Board will focus upon the job and skills requirements originating from the BRCD programme of investment and the sectors within which they operate. It will work closely with government partners to support delivery of NI strategies for employability and skills, championing for the interests of the BRCD in the new employability and skills eco-system.

The Board will act as the partnership for collaboration to drive improvements in employability prospects and increase skill levels in priority areas. It will achieve this by helping to coordinate investment in interventions that respond to need and take advantage of future opportunities for industry and residents across the region.

Responsibilities

Responsibilities will include but will not be limited to:

Advising the Executive Board on strategic direction in relation to tackling employability and skills priorities associated with the BRCD programme of investment;

- Challenging, championing, and building support for the continued development and delivery of the employability and skills proposition associated with the BRCD programme of investment.
- Overseeing the implementation of the BRCD employability and skills proposition by:
- Sharing data and labour market intelligence to ensure that the work programme is informed by all available data sets held by Board members;
- Analysing - and where appropriate commissioning - labour market intelligence and working with partners to identify labour market needs and gaps in provision relevant to the BRCD programme of investment;
- Developing and implementing annual action plans which reflect a shared agenda among partners and stakeholders and align to the employability and skills needs/opportunities arising from the city deal and associated industry needs;
- Supporting BRCD Investments to develop effective employability and skills plans as part of project delivery, including through delivery of social value approaches.
- Identifying and supporting the development and delivery of priority employability and skills projects, including opportunities for pilot projects to test efficiency of proposed interventions.

- Supporting a co-ordinated response to employability provision on a sub-regional basis and alignment in the interface between skills planning and employability provision related to BRCD priorities;
- Engaging with industry on the design and delivery of agreed employability and skills projects/programmes using existing structures where possible.
- Working collaboratively with BRCD partners to maximise inclusive growth benefits such as through the integration of social value in procurement processes and collaborative human resource interventions.
- Undertaking skills analysis and planning with partners, aligned with new structures established through the skills strategy, to inform and help develop skill pathways in priority areas; and
 - Informing, implementing and overseeing the agreed process of Evaluation and Assessment.
- Agreeing and implementing plans and processes for effective engagement with key partners and communicating the employability and skills opportunities created through the BRCD.
- Reporting to the Executive Board on progress.

3. RESPONSIBILITIES OF THE EMPLOYABILITY AND SKILLS BOARD CHAIR

The responsibilities of the Chair are:

- Reporting on behalf of the Board through to the BRCD Executive Board.
- Sets the agenda for each meeting.
- Ensures that agendas and supporting materials are delivered to members in advance of meetings.
- Makes the purpose of each meeting clear to members and explains the agenda at the beginning of each meeting.
- Clarifies and summarises what is happening throughout each meeting.
- Keeps the meeting moving by putting time limits on each agenda items and keeping all meetings to appropriate timings.
- Encourages broad participation from members in discussion by calling on different people.
- Ends each meeting with a summary of advice provided and assignments.
- Follows up with consistently absent members to determine if they wish to discontinue membership.
- Finds replacements for members who discontinue participation.
- Representing the BRCD where required on external forums/events/meetings championing for the interests of city deals.

4. RESPONSIBILITIES OF EMPLOYABILITY AND SKILLS BOARD MEMBERS (INCLUDING THE CHAIR)

The responsibilities of individual ESB members are to:

- Take a genuine interest in the BRCD Programme's outcomes and overall success.
- Understand the goals, objectives, and desired outcomes of the Programme.
- Champion the actions and priorities developed through the Board within their organisational structures ensuring organisational awareness and where required approval to align /commit resources is progressed.
- Seek and respond to opportunities to communicate positively about the E&S Programme.
- Prioritise attendance at meetings scheduled to ensure consistency of representation
- Ensure representatives nominated to attend in place of named representative are willing and able to attend meetings to represent their organisation, are properly briefed and are enabled to raise issues, agree positions update members as required
- Allocate appropriate and timely resources to support delivery of assigned actions agreed by the Board.
- Share relevant data and intelligence where available
- Actively participate in meetings through attendance, discussion, and review of minutes, papers and other ESB documents.
- Support open discussion and debate and encourage fellow members to participate and voice their insights.
- Participate in the agreed reporting and monitoring arrangements to detail how their organisation is contributing towards the E&S programme and associated activities.

5. MEMBERSHIP

The table below lists **the membership** of the Board

Organisation
Marie Therese McGivern (Chair)
Belfast Metropolitan College
South Eastern Regional College
Southern Regional College
Northern Regional College
Antrim & Newtownabbey Borough Council
Ards & North Down Borough Council
Belfast City Council

Lisburn & Castlereagh City Council
Mid & East Antrim Borough Council
Newry, Mourne & Down District Council
Queens University Belfast
Ulster University
Department for Communities*
Department for Economy*
Invest Northern Ireland*
UUEPC [□]

* The Northern Ireland City & Growth Deal Governance & Funding Arrangements document defines that Government Departments (including ALB's) will have advisor status with no voting right within city and growth deal governance structures. Advisors role will be to provide critical guidance and challenge connecting with regional strategies and helping to inform the priorities of the Board. [□] UUEPC Strategic Economic Advisory Support

Operation of the Board will be supported by the following representatives.

Organisation	Name
E&S Pillar Comms Forum Representative & Advisory Support	Lisa McCartney / Danielle Hart (Belfast Metropolitan College)
Programme Management Office	Damien Martin
	Ruth Rea
	Sandra Donnelly

6. FREQUENCY OF MEETINGS

The Employability and Skills Board will meet every other month, usually in the last week of the month, where possible.

7. AGENDA, MINUTES, AND SUPPORTING MATERIALS

A notification and papers will be sent to members three working days in advance of an ESB meeting. This will include the following:

- Agenda for upcoming meeting.
- Minutes of previous meeting.
- A progress report for the project.
- Documents / information to be considered at the meeting.

Appendix 2

AM Task and Finish Group Terms of Reference

Advanced Manufacturing Sector Skills Assessment Task and Finish Group Terms of Reference

Background Information

Advanced Manufacturing in Northern Ireland – The Opportunity

Northern Ireland has a rich history in Manufacturing, and 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 has been highlighted by the Department for the Economy's 10X Vision as a key cluster which is pivotal to our economic growth. In this decade of innovation, 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. In this decade, our innovative sectors will be our engine of economic growth and we need to see these sectors take up a bigger share of our economy to redress the imbalance in our non-tradable (e.g., local service jobs) and tradable (e.g., innovative firms) sectors.¹ Across Northern Ireland a firm foundation exists from which the sector can continue to grow and innovate. With determination and a co-ordinated ecosystem of resources and support, Northern Ireland will become a globally renowned and competitive base for high value, niche and sustainable manufacturing.²

City and Growth Deals

Over the next few years, Northern Ireland will benefit from a package of investment from four city and growth deals: Belfast Region City Deal (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 significant deals will help create global centres of innovation excellence in key growth sectors. 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 with a variety of projects benefitting the sector such as:

- **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 to be

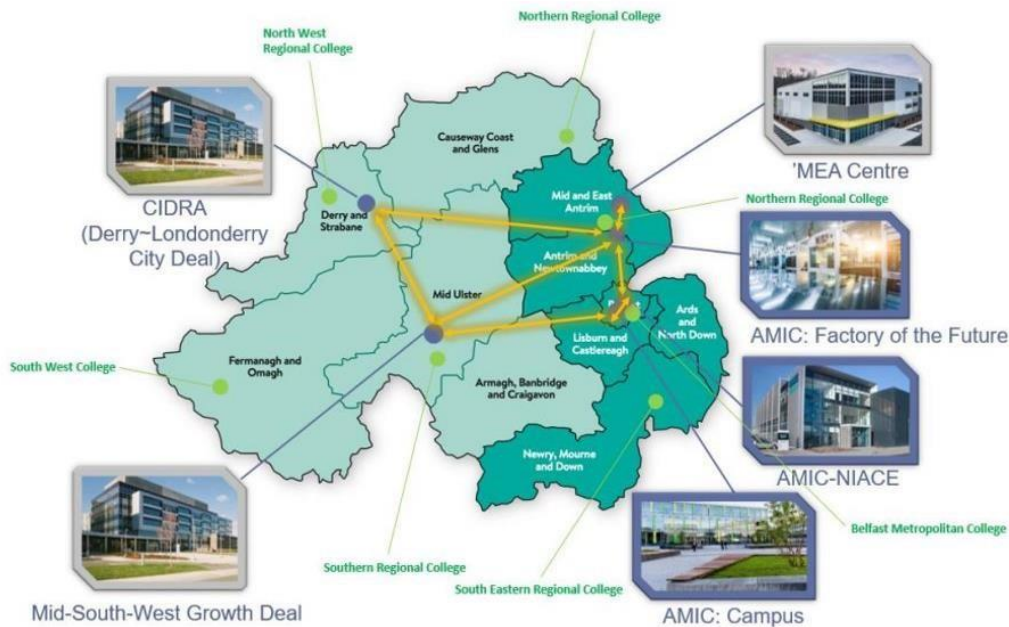
¹ OECD Skills Strategy Northern Ireland (United Kingdom) : Assessment and Recommendations.

² Making a Better Future, Maker's Alliance Strategy.

delivered as part of BRCD. This project aims to be transformative for the advanced manufacturing sector in the Belfast Region and Northern Ireland.

- **I4C @ St Patrick’s Barracks, Belfast Region City Deal:** A dedicated SME focused innovation centre at St Patrick’s Barracks led by Mid & East Antrim Borough Council.
- **Centre for Industrial Technologies and Automation (CIDRA), Derry-Londonderry and Strabane Region City Deal:** 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.

These City and Growth Deal projects will be one of the drivers of innovation in the Advanced Manufacturing Sector.



A Regional Approach

The Advanced Manufacturing Sector has a wide geographical spread. Northern Ireland has an Advanced Manufacturing focus in Belfast, Craigavon, Derry-Londonderry, Dungannon, North Down and Antrim. There are strongly developed sectoral clusters in Aerospace and Polymers and looser groups in several other subsectors. There is a good spread of jobs across all local government districts.



Local Government District	Advanced Manufacturing Employee Jobs	Manufacturing Total Employee Jobs	
Antrim And Newtownabbey	5,758	7,387	12.7%
Armagh, Banbridge And Craigavon	4,485	12,006	9.9%
Belfast	6,748	9,809	14.9%
Causeway Coast And Glens	1,849	3,956	4.1%
Derry And Strabane	3,242	5,711	7.1%
Fermanagh And Omagh	2,816	5,047	6.2%
Lisburn And Castlereagh	3,665	5,204	8.1%
Mid And East Antrim	4,684	8,198	10.3%
Mid Ulster	7,570	15,513	16.7%
Newry, Mourne And Down	3,258	7,659	7.2%
North Down And Ards	1,356	2,884	3.0%
Total	45,431	83,374	100%

Source: Business Register and Employment Survey, 2017

64.4%

Employability & Skills

Ensuring access to the scale of skilled workforce required be a critical determinant of the City and Growth Deals overall success, the success of the Advanced Manufacturing Sector, and indeed the 10X strategic vision and Northern Ireland Economy. An increase in capability and skills pipeline in this sector and greater collaboration between Further and Higher Education, Industry and Councils to develop the skills required will be necessary. This Skills Assessment will form the basis for the development and implementation of interventions as well as realignment of funding to support the vision for growth of this sector which is of significant importance to the Northern Ireland Economy.

Objectives of Group

The objective of this 'Skills Assessment' Task and Finish project is:

- (i) To understand the existing and future labour and skills challenges impacting upon the sector and associated implications as a result of city deal investments;
- (ii) To map the range and scale of existing provisions through currently operating in Northern Ireland, identifying gaps in provision This will be focused upon: Technology Roadmapping themes, Level 7&8 Specialist areas, Apprenticeships, Upskilling & Re-skilling, Talent Pipeline Development, Train the Trainer, Business Support, Collaboration with Industry & Tackling Perceptions.
- (iii) To identify the need for new interventions and/or scaling up existing provision to meet demand, principally aligned to areas of city deal investment.
- (iv) To identify solutions inside and outside of NI we can learn from/use eg. Work of HVMC in curriculum development and to consider options/interventions for consistent methodologies for forecasting going forward
- (v) To consider the most effective way for Queen's to deliver AMIC, what people and specialisms are needed for job roles created within the centre and from businesses engaging with the centre.

Critical Tasks

To better understand what the skills needs will be in this sector the key segments of work within this project will include:

- 1) An overview of the jobs likely to be created through the BRCD investment, including expected timescales;
- 2) An overview of current and expected future skills challenges impacting the sector. This is likely to draw from existing intelligence and emerge through direct engagement with businesses and representative bodies to develop our understanding; 3) To develop and understanding of:
 - (i) the spectrum of existing employability and skills provision targeting the development of advanced manufacturing skills;
 - (ii) a breakdown of the range and volume of current employability and skills provision (aligned to the sector).
- 4) To assess the potential of existing interventions to meet the needs of industry and future BRCD demand (based on 1 above)
- 5) To identify gaps in provision by volume and/or the scale of intervention (long list of actions) 6) To identify solutions outside of NI we can use/learn from.
- 7) To consider the need and mechanism for forecasting going forward.
- 8) To prioritise possible actions for intervention and provide recommendations for the consideration by the BRCD E&S Board (and wider City & Growth Deals where relevant) identifying proposed next steps to include development of project proposals, identification of funding opportunities (if relevant) etc.

Membership

The Task & Finish Group will harness the collective effort and expertise of BRCD partners, government departments and key stakeholders. In ensuring that the project aligns to the need of the sector, representatives from industry will be incorporated across the delivery of the project. The overall Task & Finish group will comprise of:

Representative Category	Organisation	Person
Council	Antrim & Newtownabbey Borough Council	Majella McAlister /Michael McKenna
	Mid & East Antrim	Karen Hastings
FE Colleges	SERC	Trevor Breadon
	NRC	Alan Reid
	SRC	Lindsay Bronte
	SWC	Alastair Booth
Universities	Queen's University Belfast	Dr. Charles McCartan
	AMIC Delivery Team	Ciaran Prunty
	Ulster University	Dr Eddie Archer
Industry	Centre for Competitiveness	William Ussher
	Manufacturing NI	Mary Meehan
	Makers Alliance	Mark Huddleston
Sectoral Partnerships	Creative Composites	James Hegarty
Invest NI	Invest NI	Caroline Arnott
City & Growth Deals	Mid South West Growth Deal	Claudine McGuigan
	Derry City & Strabane Deal	Justin Quinn

Members of the T & F group are required to:

- Prioritise attendance at meetings scheduled as required;
- Ensure nominated representatives attend meetings to create a consistency of engagement;
- Allocate resources to support the rapid development of assigned actions;
- Commit to engagement throughout the timeframe of the group recognising that due to the timescales involved short turnaround timeframes may be required;
- Share data and intelligence where available to support the delivery of the project;
- Commit to championing recommendations and proposals developed through their organisational structures ensuring organisational awareness and where required approval to proceed /commit resources is progressed.

Frequency of Meetings & Timescale

The proposed operating timeframe for the proposed working group is 20 weeks from the commencement and initial meeting on 14 September 2022 with a written report to be drafted in January 2023.

Appendix 3

AM Task and Finish Group Terms of Reference

NI City and Growth Deal Advanced Manufacturing Activity

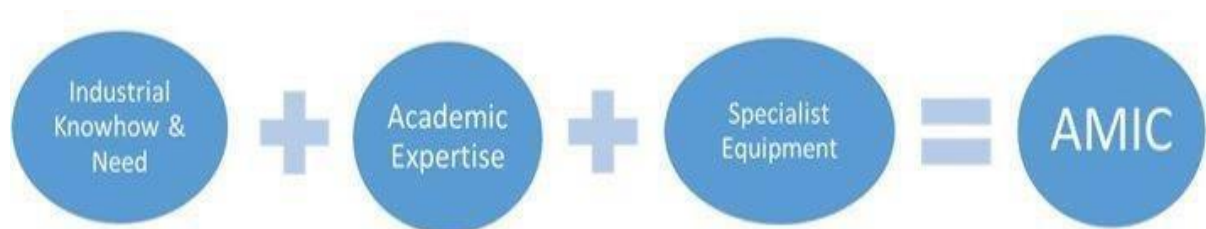
BRCB - Advanced Manufacturing Innovation Sector (AMIC)

A £98m Advanced Manufacturing Innovation Centre (AMIC) project, led by Queen's University Belfast, in partnership with Ulster University and Antrim and Newtownabbey Borough Council, will provide fresh capabilities for the NI Advanced Composites and Engineering Centre (NIACE) and create a 10,500m 'Factory of the Future' at Global Point in Newtownabbey, giving advanced manufacturing and engineering businesses access to the very latest technology, specialist equipment and expertise. The 'Factory of the Future' will be AMIC's flagship facility and will become Northern Ireland's national centre for advanced manufacturing, significantly accelerating levels of innovation and collaboration between industry and researchers.

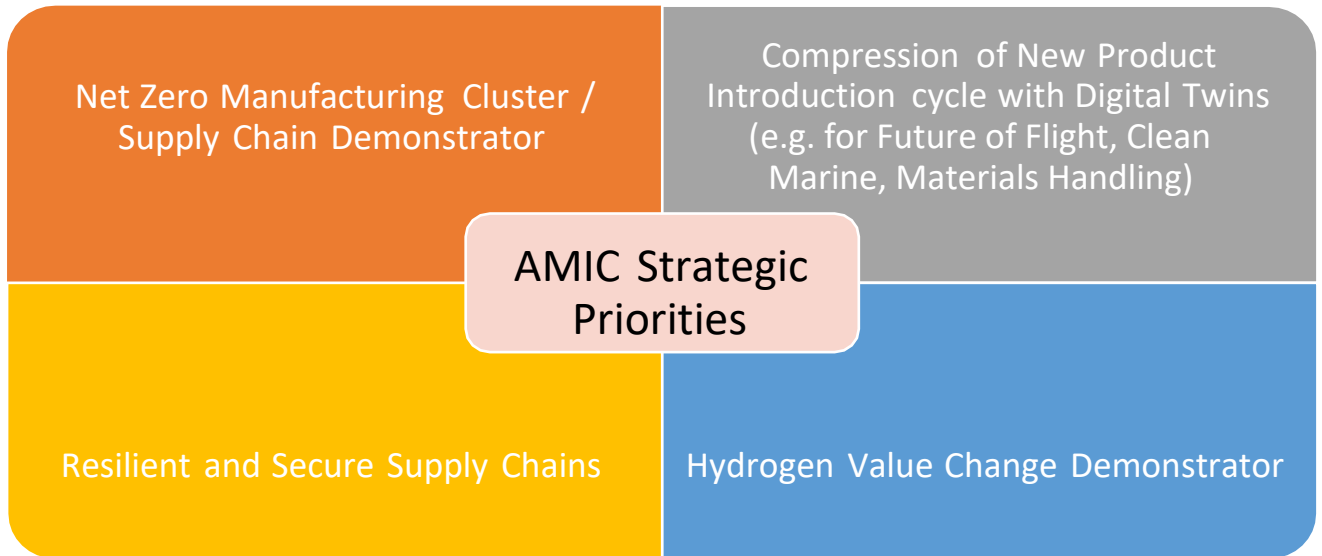
AMIC is an industry led, open access manufacturing & engineering innovation centre with state-of-the-art facilities and an expert engineering team, underpinned by academic excellence. It aims to provide direct value for Northern Ireland manufacturers demonstrating scale solutions for UK, Ireland and beyond. AMIC's capabilities and strategic priorities have been informed by strengths of existing groups (NITC, PPRC, NIACE), academic excellence in QUB & UU and Northern Ireland industry capability and needs.

AMIC will:

- Be the springboard for manufacturing innovation in Northern Ireland.
- Provide industry with access to the very latest manufacturing technology and Industry 4.0 smart automation, supported by experienced, professional engineers.
- Accelerate new technologies through the innovation phase by:
 - Solving real-world industrial challenges through R&D
 - Enabling NI companies to access global markets



AMIC strategic priorities



AMIC has identified the following priority markets and sectors:

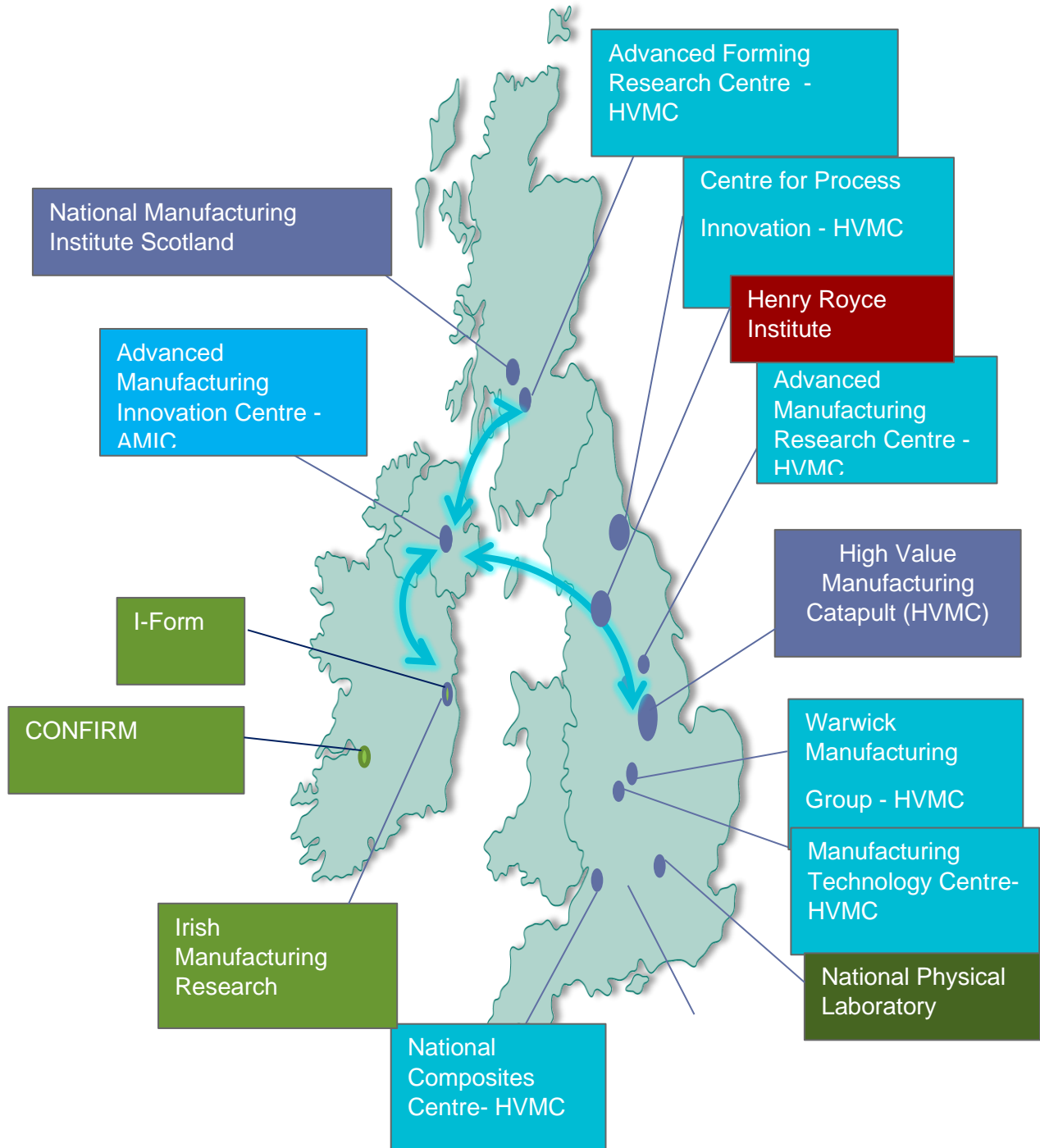
- **Aerospace, Defense and Space** sector with 130 companies and £1.9bn turnover in NI
- **Materials Handling** sector that represents 100+ companies with £1.7bn turnover, almost all exports
- **Polymers and Composites** sector that 70+ companies (overlapping with ADS)
- **Transport (including Marine) sector** that includes the £63.4m Belfast Maritime (Artemis)
- Strength in Places, and Wrightbus (£11.2m for new Hydrogen tech for buses)
- **Photonics sector** (part of a £66m Strength in Places award) is a national niche USP, a Nano- Manufacturing Corridor is formed in NI
- **Advanced Construction with two major companies and strong SME base**
- **Agri-tech, Food and Drink** significant sector in NI, NITC has strong links with CAFRE
- **Cleantech-** nascent sector including hydrogen generation, transport use cases, biomass, sustainable materials

AMIC will place Northern Ireland in an Advanced R&D and Investment Network.

A **Centre for Industrial Digitalisation, Robotics and Automation (CIDRA)** will be established as part of the Derry City and Strabane District Council (DCSDC) City Deal. The Centre will be based in the Derry City region.

The total indicative capital budget for CIDRA is £25 million, (inclusive of optimism bias and VAT). The budget also includes specialist equipment of £8.0 million (inclusive of VAT, pre-optimism bias). CIDRA will be an industrial support facility focussed on research, development and demonstration of the integration of five key technologies which are crucial for future industrialisation, innovation and manufacturing activity, as the sector progresses towards Industry 4.0. The technologies in question are: **Artificial Intelligence, Digitalisation, Robotics, Automation and the Industrial Internet of Things (IIoT)**.

AMIC will place Northern Ireland in an Advanced R&D and Investment Network:



CIDRA will offer the following services:

- A source of advanced expertise in the five core technologies and their integration in an industrial manufacturing context, for the benefit of N.I industry;
- A template model factory demonstrating agile manufacturing and “digital twins”, integrating artificial intelligence, IIoT, robotics, automation, and digital communications into industrial manufacturing processes;
- A facility to allow industry to see, evaluate and gain hands-on experience in terms of what digital technologies can do for their company so that they can understand better how to adopt the new technologies in their own context (a Digital Transformation Demonstrator);
- A facility for evaluation of designs, rapid implementation and testing of prototypes;
- A facility for continuous professional development and skills upgrading for the existing workforce, who will need to adapt to new Industry 4.0 methods with relevant accreditation;
- A testbed for research and development in industrial digitalisation, robotics and automation for manufacturing;
- A Centre that complements the Intelligent System Research Centre (ISRC) and the Cognitive Analytics Research Laboratory (CARL) (both at Ulster University, Magee campus) addressing innovation challenges with the option for industry to be part of the delivery, thus accelerating new skills gained through accredited professional development.
- A hub from which University-Industry partnerships can be grown, nurtured and developed.
- Public Engagement – regular seminars and workshops to bring the general public into the debate about Industry 4.0, the impact of robotics and automation and the need for a calm, non- sensational but genuine, evidence-based discussion regarding the societal impacts of these new technologies.

CIDRA will offer the following to NI Manufacturing?

- A source of **advanced expertise in the five core technologies** in an industrial and commercial context for the benefit of N.I industry
- A **template model factory demonstrating agile manufacturing**, integrating artificial intelligence, IIoT, robotics, automation, and digital communications into industrial manufacturing process.
- A facility to allow industry, to see, evaluate and gain hands-on experience in terms of what **digital technologies** can do for their company (a **Digital Transformation Demonstrator**)
- A facility for **evaluation** of designs, rapid implementation and testing of prototypes.
- A facility for continuous professional development and **skills upgrading** for the existing workforce.
- A **testbed** for research and development in industrial digitalisation, robotics and automation for manufacturing and commerce.
- A Centre that builds upon the extensive expertise in artificial intelligence, **machine learning and robotics** in the Centre of Excellence in Intelligent Systems at UU Magee campus (the Intelligent System Research Centre)

- Addresses **innovation challenges** with the option for industry to be part of the delivery, thus accelerating new skills gained through accredited professional development.
- A **regional hub** from where University-Industry partnerships can be grown.
- A location for ongoing technological developments in partnership with **industry and commerce** – not just manufacturing industry.

Digital Manufacturing Demonstrator and Industry 4.0 demonstrator factory

A core component of CIDRA will be the Digital Manufacturing Demonstrator and Industry 4.0 demonstrator factory. This will focus on the integration and utilisation of:

- **Cyber-physical systems** – digital twin-based design, simulation, virtual production, optimisation, actual production, automated feedback loops from product performance to cyber space design for continuous improvement.
- **Robotics and automation** – ensuring consistency and efficiencies, improved productivity and competitiveness.
- **Additive manufacture** – for accelerated production of mass and customised products at scale, on-demand printing of a range of materials, high and low volume production.
- **Digitalisation and AI** – integrated supply chain, integrated data analytics, traceability data and analysis, manufacturing system visibility.
- **IoT** – sensing everything, feeding into manufacturing efficiencies, and feedback loop analysis.

A Flexible and Reconfigurable Production Environment

Experience has shown that talking about the potential of AI and robotics is insufficient. Industrialists need to see and feel real demonstrations of real product manufacturing. Accordingly, it is envisaged that the Digital Manufacturing Demonstrator (DMD) facility will have the following characteristics:

- **Real product design and manufacture:** The DMD will not be a limited, static exhibition display. Instead, utilising the digital twin and additive manufacturing approach, the DMD will manufacture real products, enabling companies to see a complete working model factory, from design in the cyberspace digital twin, through virtual products to real products, to validation and feedback, displaying insight into utilisation of AI, IIoT and robotics in each case.
- **Flexibility and Adaptability:** The facilities and equipment of the DMD will be chosen for maximum flexibility in design and manufacturing. The specific products to be fabricated at any point in time will be selected based on industrial interest (See “*How will the Facility be Used?*” section below).
- **Sense and Measure Everything using IIoT:** every aspect of the facility will be sensorised, enabling utilisation of tools such as Siemens Mindsphere or equivalent to illustrate how data leads to extraction of intelligence, which leads to better designs, enhanced productivity, smooth supply chains and continuous improvement. The facility will use 5G wireless technology for ease of sensor placement and data communication at sufficient bandwidth.
- **Use of Robotics:** The DMD will be designed so that in addition to the additive manufacturing, high specification industrial robotics are exploited in product

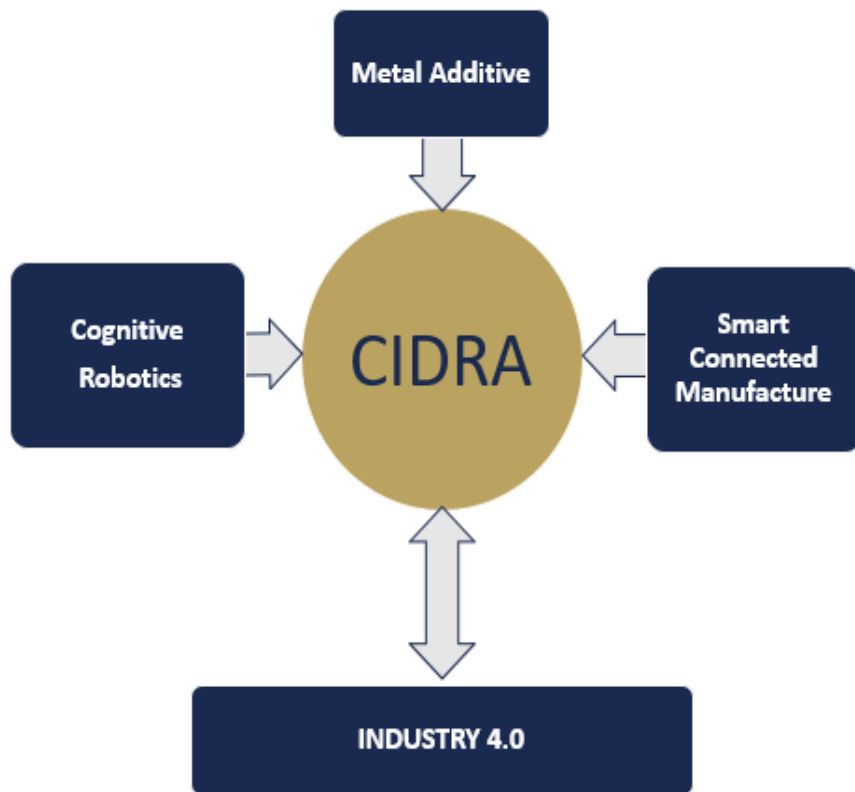
manufacturing, materials and product transportation, automation of packaging etc. A range of industrial robots will be made available offering opportunities for understanding and assessing the advantages, opportunities and limitations of current robotics in a manufacturing environment. AGVs, cobots and dedicated production robot tools will be utilised. The opportunity to gain experience in robot programming will also be provided for participants.

- **AI in Manufacturing:** Underpinning all operations of the DMD will be AI and Data Science. The DMD will extract real data from the design and production processes and will enable designers and engineers to get real experience in data analytics tools, experimenting with real facilities to observe the effects of the insights gained from the data analytics processes. Core manufacturing intelligence, closed loop analytics and process visibility will be demonstrated.
- **Collaboration:** a facility where teamworking is demonstrated in an effective manner, using state of the art teamworking/collaboration tools (e.g., Siemens TeamCenter). Integrating “model” suppliers and logistics for realistic “whole factory” modelling and anomaly detection.
- **Cybersecurity:** a wraparound cyber security envelope, allowing companies to see how to protect their IP while being committed to the opportunities offered by an integrated supply chain, design and production environment.
- Demonstrations of potential “**Factory of the Future**” technologies for discrete manufacturing.
- **Industry 4.0 Preparedness Assessment:** utilising Industry 4.0 check-up tools such as FESTO’s Industry 4.0 Quick Check.

How will the Facility be used?

It is envisaged that there will be five types of participants in the facility:

- **Day Visitors** – company staff and general public who come to have a short tour and get a basic understanding of the potential of Industry 4.0 and these technologies.
- **Industrial and Commercial Company staff on Secondment** – who come to work at the facility for several months at a time, experimenting with the equipment, developing and trying out prototype production, gaining expertise in one or more of the critical topics – robotics, AI, IIoT, additive manufacturing etc.
- **Researchers** – engaged in advancing the science and technology of industrial manufacturing, robotics and automation at a time of unprecedented opportunities.
- **Company Staff for Upskilling** – the facility will be of enormous value in providing short intensive practical upskilling opportunities, away from a real production line.
- **Students** – on university and FE courses, who are provided with the opportunities to run experiments and gain experience on real industrial equipment.



Involvement of Industrial Partners

The active and energetic involvement of industrial partners is crucial to the success and relevance of CIDRA. We consider the facility to be an industry-university ecology, where both industrialist and academics feel equally at home and mutually contribute.

In this context we envisage at least five types of industrial and commercial partners, as follows:

- Cognitive Analytics Research Lab (CARL)
- The Smart Manufacturing Data Hub
- I4C
- HYTECH NI
- Digital Twin Centre
-

Current Position

Currently the CIDRA project has been approved by DfE to proceed from Strategic Outline Case (SOC) level to Outline Business Case level and Heads of Terms have been signed.

The new Cognitive Analytics Research Lab (CARL) will deliver world-class cognitive analytics research capability, attracting significant local and international industry engagement as well as Foreign Direct Investment to the region.

Ulster has a long and proud history of expertise in Data Analytics both in terms of machine learning algorithms and the application of analytical techniques across a diverse range of domains. There are over 60 academic staff contributing to such research across all subject areas

of the university. Recent investments include: £11m in the Centre for Stratified Medicine; £5m in Functional Brain Mapping facility; €4.5m in MIDAS (Meaningful Integration of Data, Analytics and Services); £1m in Capital Markets Collaboration; and in December 2016 €8.6m funding for the Centre for Precision Medicine – using data to improve Clinical Decision Making and Patient Safety.

CARL will consolidate this expertise into one centre and grow over the next 5 years to become a 200 person world-leading centre of excellence in Cognitive Analytics attracting international experts in the global research community to achieve world-leading research. This unique new centre will align Ulster University’s research capability in computing and intelligent systems together with our stratified medicine and our proposed Graduate Entry Medical School creating the opportunity to develop a distinct research capability which has global impact.

CARL is unique in that it is conceived and built from the ground up through collaborative consultation with our industry and civic stakeholders with a strong focus on economic and societal impact. The key focus for the centre will be application of research in Cognitive Analytics in a number of domain areas including (but not limited to):

- Health
- Financial Technology
- Advanced Manufacturing
- Media
- Energy
- Civic Society and Public Policy

The Smart Manufacturing Data Hub

In 2022, the UK government and industry announced the establishment of the **Smart Manufacturing Data Hub (SMDH)** as part of the £300 million **Made Smarter Innovation Challenge**. The SMDH is designed to support small and medium-sized manufacturers to become more competitive by harnessing the power of data. Digital solutions, expert guidance, and funding will be available to companies through the hub, allowing them to explore and evaluate their processes, make operational savings, de-risk investments, and become more digital savvy. It is hoped that increased adoption of digital technologies can improve productivity¹.

The SMDH is led by Ulster University and backed by £50 million of government funds and business co-investment. Nearly 10,000 manufacturers are expected to benefit from the hub and 13,000 jobs will be supported, helping to boost economic growth and level-up regions across the UK. The hub will be supported by £20 million from the UK government-backed Made Smarter Innovation Programme, along with £30 million of business co-investment

i4C

“The i4C Innovation Centre will act as a hub for micro and small manufacturing business innovation activity providing the stimulus and environment for ideation and prototyping whilst also acting as a springboard for both the development of a Cleantech hub for Northern Ireland and for attracting FDI opportunities into Ballymena, NI’s largest regional town.”

Key strategic objectives of i4C include:

- To address the low levels of innovation amongst SMEs and promote investment in innovation and uptake of programmes such as Knowledge Transfer Partnerships (KTP's) in key areas of advanced manufacturing and the broader field of cleantech.
- To create the infrastructure to ensure that Ballymena and the MEA area has an innovation- focused quality accommodation offering for new and FDI expansion.
- To position Mid and East Antrim as the key hydrogen manufacturing and support hub for NI to support local companies including the owners of Wrightbus in their plans for NI3.
- To build upon the interest from FDI companies seeking to establish Cleantech and hydrogen economy-based businesses in Ballymena, i.e., CPH2, with its plan for 100 jobs and development of a local supply base.
- To provide an exemplar of an industry 'makerspace' promoting and supporting innovation and knowledge transfer and commercialisation activity.
- To increase collaboration supported by industry and academic partners within MTF, NRC, AMIC, CASE and through the unique Michelin Fund offering.
- To contribute significantly to the regeneration and place-making vision of the brownfield St Patrick's Barracks site and the wider town centre by acting as a flagship enabler.
- To create inclusive employment opportunities for all; and
- To create an integrated, enterprising environment to act as a catalyst for wider economic regeneration in MEA, BRCD and NI

i4C Collaboration and Partnership Approach

The i4C Innovation Centre concept has been developed and refined from the SOC stage through an extensive process of stakeholder engagement, involving consultation by MEABC with companies and stakeholders within the MTF, NRC, AMIC, QUB, CASE, Maker space champions, DfE (NI) Energy Division, Invest NI, Wrightbus, Michelin Loan Fund, amongst others. The consultation has involved discussion with potential i4C operators such as Catalyst and Oxford Innovation and organisations in the innovation space such as HALO Urban Regeneration Ltd in Kilmarnock and STEAM house in Birmingham that are currently developing similar schemes set to open in mid to late 2021.

This engagement has confirmed that there is a need for the i4C project and the significant opportunities that it offers. Council as the sponsor for i4C will continue to work alongside key partners (and appointed i4C centre delivery partners) to deliver services to tenants and the wider MEA community through continued collaboration and joint working. The i4C proposal will fill this void through the development of a new Innovation and Cleantech centre to provide an accommodation base and a platform for enhanced SME supports around open innovation and commercialisation activity and particularly activity around the acceleration and adoption of clean technologies (cleantech). For instance, it is planned to establish a fully equipped innovation laboratory (iLAB) at i4C with dedicated staff to assist SMEs with their innovation activity and skills training.

i4C: Key Aims and Objectives

- To become a launch pad for innovation and commercialisation activity particularly for SMEs operating in the Cleantech sector and around the emerging hydrogen economy.
- To build upon the complimentary investment being made by MEABC in the hydrogen economy via its Hydrogen Training Academy that would transfer over to the iLAB at i4C.
- To attract new FDI to Ballymena, both FDI that is new to NI, as well as regional satellite operations of externally owned firms established in Belfast, Dublin or elsewhere with growth plans linked to MEA's industrial strengths and/or attracted to the quality offering and working environment that the i4C would provide.
- To work alongside key industry partners via the local Manufacturing Task Force (MTF), to ensure high level of ownership and sharing of best practice across firms of all sizes and all parts of the supply chain.
- The iLAB component of i4C aims to create a unique environment where companies can develop prototypes, demonstrate scale-up, and experiment with new processes, materials and smart technologies, before moving production to their own facilities. At the iLAB, companies can get access to specialist skills and training supports as well as supports from competency centre partners such as the Centre for Advanced Sustainable Energy (CASE), Advanced Manufacturing Innovation Centre (AMIC) and the Further Education (FE) college sector.

The BRCD programme partners acknowledge that supporting major regeneration projects will help to transform the economic potential of key towns across the region. In this regard, the i4C can contribute significantly to 'transformational' impact not only in terms of job creation and economic growth opportunities but also in the regeneration, place making and community confidence impacts arising from the i4C investment at the St Patrick Barracks site and any wider investment in a future town centre innovation district.

Linked to the i4C is the ambition to create a Smart and Sustainable Innovation District at Saint Patrick's and its wider environs and where i4C will form a key resource hub for all sectors using digital and clean technology. The design team for the i4C building and Smart technologies have recognised that the Covid-19 pandemic will impact on future building designs. Technologies such as smart sensors and ventilation will form key elements of smart control within the building environment of the future and within i4C.

i4C at Saint Patrick's: Expected Outputs

- The project aims to deliver the following key impacts: Increase in investment in product and process innovation, and knowledge transfer.
- Increase capability in advanced manufacturing with a focus on agile innovation.
- A focal point for the Hydrogen Hub in NI, working alongside the Joe Bamford group and
- local universities.
- A new Cleantech hub in NI for industrial led innovation linked to climate change.
- Attraction of new FDI or regional satellite operations to Ballymena.
- Build upon the strengths and success of MEA's MTF collaboration.
- Increased co-operation with partners MTF, NRC, AMIC and CASE.
- Create higher skilled and better paid jobs in key sectors across all levels of education.

- Support regional growth within the AMME and clean growth sectors.
- Net additional jobs from the i4C Innovation Centre and iLAB: supporting businesses and beneficiaries of the Cleantech training suite that includes the hydrogen training facility.
- Construction related spend is estimated to create or sustain employment.
- Increased annual GVA; and
- A key added value spin-off from i4C is that it will serve as the hub for the creation of a smart and sustainable ‘innovation district’ in the heart of Ballymena radiating from Saint Patrick’s and adding significant value to the economic regeneration of a brown field site.

HYTECH NI

£15m capital funding for a hydrogen technology accelerator has been awarded for a series of hydrogen testbeds under the NI Complementary Fund (2022-25). Under this proposal Council and QUB are progressing a joint Outline Business Case for a programme of activity to commence and largely complete before the i4C and AMIC projects are complete. The Council ambition is that the accelerator will include a substantial footprint in Ballymena and align with the i4C, iLAB and AMIC offerings such as:

- Creating opportunities for continued investment and collaboration in the cleantech sector from 2023/24 until the scheduled opening of the i4C Innovation & Cleantech Centre in Ballymena in mid-2027.
- Enhancing the core engineering design, manufacturing, prototyping, verification and digital capabilities of AMIC through a focus on new hydrogen technologies / innovation.

The accelerator also aims to:

- Deliver Research and Innovation Excellence within Queens University Belfast / Ulster University in support of an active Commercialisation pipeline bridging the gap between technical capability and industry demand and
- Position Ballymena as Northern Ireland’s premier hydrogen town and place Mid & East Antrim at the forefront of new hydrogen economy through the development of three thematic hydrogen testbeds of scale related to use of hydrogen for heating, transportation and skills training.

Design Smarter Digital Twin Centre

Digital Catapult has led on the development for proposals for a Digital Twin Centre in Northern Ireland supported by £36m of public sector funding, c.£2m of revenue generation from commercial R&D **and c.£16m private sector co-investment** from four founding industry partners (Artemis Technologies, NATS, Spirit AeroSystems and Thales UK) who have been involved in the co-design of the Digital Twin Centre. The centre would be the first of potentially several complementary Design Smarter: Digital Twin Centres across the UK for complex product design and high value manufacturing.

The Centre will 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. The centre will initially focus in sectors

including maritime, aerospace and defence but have the capability and plans to explore other sectors. Digital Catapult plans for the Digital Twin Centre are intended to support the diffusion of Digital Twin research, development and innovation projects regionally and nationally. It will support the longer-term sustainability of industry in Northern Ireland.

It is recognised that the project still has further work to do in order to maximise integration with other Centres of Excellence (within BRCD and other Government investments) and in relation to inclusive growth and skills. It is important that Digital Catapult continue to develop these elements of its project between OBC and FBC stage.

Appendix 4

Advanced Manufacturing Employability Survey Questionnaire

Advanced Manufacturing Employability Survey Questionnaire

Please complete this Survey to help inform a Northern Ireland regional Skills Assessment for Advanced Manufacturing to support the anticipated growth expected in the sector as a result of the investment in a number of significant City & Growth deal projects aligned with advanced manufacturing.

We are also carrying out 1-1 interviews with Industry, if you would prefer to provide your feedback by way of interview or would like the Survey in a different format, please contact Jenny McAuley at J.McAuley@qub.ac.uk.

Background information

Advanced Manufacturing has been highlighted by the Department for the Economy's 10X Vision as a key cluster which is pivotal to our economic growth and the sector is recognised by the Department for the Economy as one of five clusters ready to adopt enabling technologies. Northern Ireland will benefit from a package of investment from four city and growth deals and with a strong focus on advanced manufacturing the following projects will help Northern Ireland become a globally renowned and competitive base for high value, niche and sustainable manufacturing.

- Advanced Manufacturing and Innovation Centre (AMIC), Belfast Region City Deal: A Centre to support advanced manufacturing led by Queen's University.
- I4C @ St Patrick's Barracks, Belfast Region City Deal: A dedicated SME focused innovation centre at St Patrick's Barracks led by Mid & East Antrim Borough Council.
- Centre for Industrial Technologies and Automation (CIDRA), Derry-Londonderry and Strabane Region City Deal: 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.

Ensuring access to the scale of skilled workforce required be a critical determinant of the City and Growth Deals overall success, and the growth of the Advanced Manufacturing Sector. A Task & Finish Group has been set up to carry out a Skills Assessment for advanced manufacturing in the region which will form the basis for the development and implementation of interventions as well as realignment of funding to support the vision for growth of this sector. Industry needs are a fundamental part of the in-depth research and your feedback will help us identify the gaps and collaborate on practical solutions.

Main Areas for Discussion

1.0	Current Skills Talent:
Additional Questions	<ol style="list-style-type: none"> 1. What are main skills challenges currently impacting your organisation 2. Recruitment of staff into the organisation i.e. are there key occupational roles the organisation is finding it difficult to recruit for? 3. Existing workforce - are there specific skills you feel are lacking within your current workforce? 4. How does your organisation currently support the development of workforce skills? 5. What is your organisational approach to training and development – structured/ad hoc/continuous?

	<p>6. Are there any challenges or pressures that impact your company's capacity to invest in skills development?</p> <p>7. Supply chain - are there specific skills you feel are lacking within your current supply chain?</p>
2.0	Future Skills Needs:
	<p>What skills needs do you expect your organisation to require that you believe are currently lacking?</p> <p>1) Are you able to access skills provision in this area?</p> <p>2) What developments in the industry eg technological developments and Industry 4.0 are leading to requirements for changing skills?</p> <p>3) What workforce challenges are you currently/do you anticipate facing? eg. aging workforce, gender imbalances, increasing need for diversity etc</p> <p>4) What additional skills development would benefit your workforce? Eg softer skills, communication, innovative mindset, problem-solving.</p>
3.0	Digital Skills:
	<p>1) Technology is impacting all industries. What are the skills implications of digital technology for your business?</p> <p>2) Do you believe these are currently being supported?</p> <p>3) Do you believe there is a digital skills gap within your organisation? If yes how is this currently being addressed?</p> <p>4) Is there any specific support you think could be provided to develop these skills e.g. more general, mainstream provision across the sector?</p> <p>5) Which areas of digital skills development are needed in your organisation and to what extent are they being met?</p> <ul style="list-style-type: none"> • Basic – e.g. Excel, Word, Office 365, ECDL • Digital – learning computer packages to do an existing job e.g. Sage, BIM, CAD, Power BI • Software –traditional software e.g. Java, SQL, .Net • Cloud – advanced cloud based applications including AI, Fuzzy Logic e.g. Amazon Web Services, Azure.
4.0	Sustainability Skills:
	<p>1) The sustainability agenda and the drive towards net carbon zero will have significant implications across all sectors. At this stage, what is your understanding about the skills needs of your organisation and/or supply chain as a result of the sustainability/net carbon zero agenda?</p> <p>2) Is there a sustainability skills gap within your organisation? If yes how is this currently being addressed?</p> <p>3) Is there any specific support you think could be provided to develop these skills e.g. more general, mainstream provision across the sector?</p>
5.0	Supply of Future Talent and Sector Attractiveness:
	<p>1) Sectoral attractiveness has been identified as a key challenge in our research to date. Do you believe there are issues around the appeal of</p>

	<p>the Sector that reduces the number of people choosing to enter the sector?</p> <ol style="list-style-type: none"> 2) What are the key issues/barriers affecting <i>young people's</i> entry into the sector? 3) Are existing efforts to promote the sector (e.g. via careers service) sufficient? 4) What role can employers play - are they sufficiently engaged? 5) What is your organisation doing to engage young people? 6) What is your organisation doing to promote STEM and the sector in your local area?
6.0	Apprenticeships
	<ol style="list-style-type: none"> 1) Apprenticeships offer a key mechanism to support the skills and talent into and within the sector, to what extent to apprenticeships play a role in your pipeline of employees? 2) Does your company offer apprenticeships and if so in what? 3) Do you find the current apprenticeship measures easy to engage with? Are there any barriers? 4) Would you consider engaging more with apprenticeships? 5) Are there any gaps in the current apprenticeship offering? 6) Would your organisation be interested in developing an apprenticeship in a specific area?
7.0	Diversity:
	<ol style="list-style-type: none"> 1) Labour market statistics suggest that the advanced manufacturing sector has challenges around diversity (in particular gender diversity) which could help to plug some of the labour and skills gaps. 2) How has your organisation tried to encourage/support diversity? 3) What more do you believe could be done to encourage underrepresented client groups (such as women) to enter the sector?

8.0	Engagement with the current E&S system:
	<ol style="list-style-type: none"> 1) There are a range of organisations across Northern Ireland operating in the employability and skills arena. What are your views on the support currently offered to employers? 2) What organisations/interventions do you currently engage with – what works and what doesn't? 3) Is it currently easy to access information on employability & skills/workforce development support? 4) What would make it easier for you as an employer to engage? 5) What funding do you get to help employability & skills delivery? 6) Are there specific gaps in provision you would like to highlight?
9.0	Innovation
	<ol style="list-style-type: none"> 1) What is your organisation currently doing to engage with innovation activities? 2) What is the appetite to engage in future innovation activities.
10.0	Areas of Focus
	<ol style="list-style-type: none"> 1) What are your organisation's future plans for integration or automation and robotics and what support measures would be helpful in this area?
11.0	Positive Initiatives
	<p>Do you have any examples of positive initiatives taken by your company or any other company in respect of any of the areas included within this interview?</p> <p>E.g. programmes to promote diversity / encourage non-traditional groups to become involved in advanced manufacturing.</p>
12.0	Do you feel that SMEs are currently well supported and what support would be helpful?
13.0	What role do you think AMIC and other City & Growth Deal innovation projects/centres can play in Employability & Skills support/development?

Finally: Are you content for our report to use unattributed quotes to support some of the points raised in this discussion?

Thank you for your time & input

Appendix 5

Current HE Skills Provision in NI

Current higher education skills provision in NI

This Appendix provides an overview of the existing higher level skills provision in Northern Ireland to help us understand the extent to which the current system is addressing the needs of employers within the sector. The information below reflects our understanding at a moment in time and will be subject to change.

Queen's University Belfast

Queen's University Belfast offer a range of undergraduate and postgraduate study options. At undergraduate level, courses 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.

Queen's University Belfast Provision Level 6+

Intervention	Purpose	Website
Mechanical Engineering BEng including sandwich.	This is a 3 (or 4 if sandwich) year full-time, level 6 course. Aerospace Engineering is at the cutting edge of technology, understanding and applying scientific principles to the design, development and service of some of the most technologically advanced engineering products in the world. Aerospace engineers will be pivotal in addressing the future challenges of the aerospace industry related to the environment and sustainability. With the ability to succeed in diverse and challenging situations, aerospace engineers are versatile, opening up a wide range of career opportunities, and graduates can be found in leading private and public sector companies worldwide	Website.
Product Design Engineering BEng including sandwich.	This is a 3 (or 4 if sandwich) year full-time, level 6 course. The main objective of this engineering degree is to produce graduates with a broad and balanced set of skills and attributes required for the design and manufacture of innovative, optimised and sustainable technical products for the 21st century. This course develops the technical, personal, interpersonal and professional skills necessary to do that. It is a variant of the Mechanical Engineering degree, which focuses on design process methodology, materials, manufacturing and analysis.	Website.
Mechanical Engineering MEng including sandwich.	This is a 4 (or 5 if sandwich) year full-time, level 7 integrated masters course. Mechanical engineers apply skills and knowledge in maths, science and software to design and manufacture innovative, efficient and reliable technology at an optimised cost. Mechanical engineers are at the forefront of sustainable solutions for a better world in the 21st century and are involved in the design, manufacture and recyclability of most products. This course develops the technical, personal, interpersonal and professional skills necessary in mechanical engineering.	Website.

Aerospace Engineering MEng including sandwich.	<p>This is a 4 (or 5 if sandwich) year full-time, level 7 integrated masters course. Aerospace Engineering is at the cutting edge of technology, understanding and applying scientific principles to the design, development and service of some of the most technologically advanced engineering products in the world. Aerospace engineers will be pivotal in addressing the future challenges of the aerospace industry related to the environment and sustainability. With the ability to succeed in diverse and challenging situations, aerospace engineers are versatile, opening up a wide range of career opportunities, and graduates can be found in leading private and public sector companies worldwide.</p>	Website.
Product Design Engineering MEng including sandwich	<p>This is a 4 (or 5 if sandwich) year full-time, level 7 integrated masters course. The main objective of this engineering degree is to produce graduates with a broad and balanced set of skills and attributes required for the design and manufacture of innovative, optimised and sustainable technical products for the 21st century. This course develops the technical, personal, interpersonal and professional skills necessary to do that. It is a variant of the Mechanical Engineering degree, which focuses on design process methodology, materials, manufacturing and analysis.</p>	Website.
Mechanical Engineering PGCert	<p>This is a Post Graduate Certificate. Students enrol on a part-time (1 years) basis. Students typically complete one or two modules per semester, completing a total of three modules over the academic year. The programme aims to augment the undergraduate education of those who have completed it, through a combination of advanced scientific knowledge, interpersonal and practical capabilities, with a specific focus on tackling industrially relevant engineering challenges. The curriculum will improve employability by developing the postgraduate skills required for a successful transition to industry or a research role in academia.</p>	Website.
Engineering Management PGCert	<p>This is a Post Graduate Certificate. Students enrol on a part-time (1 years) basis. Students typically complete one or two modules per semester, completing a total of three modules over the academic year. The programme aims to augment the undergraduate education of those who have completed it, with a specific focus on the development of engineering commercial and management skills. The curriculum will improve employability by developing the postgraduate skills required for a successful transition to industry.</p>	Website.
Mechanical Engineering With Management PGCert	<p>Places on this course are funded by the Department for the Economy's Skill UP, the flexible skills fund. This is a part-time two semester postgraduate certificate course designed to provide suitably qualified professionals with a good understanding of energy systems and policy, energy economics and management, the environment and energy efficiency, as well as renewable and sustainable generation needed for the decarbonisation revolution over the next thirty years. Those completing the programme will acquire the key technical and</p>	Website.

	<p>economic skills to actively contribute to the design, implementation and management of the net zero transition. This course will be of particular interest to those already in employment and working in the field of sustainable energy and engineering in general, as part of ongoing professional training as well as leading to the widening of new job opportunities for graduates in other professions who need to upskill and diversify into environmental sustainability. The course is also suitable for professionals who have considerable professional experience in business, industry, or enterprise, and policy making and wish to become leaders in energy systems, environmental sustainability and decarbonisation.</p>	
<p>Mechanical Engineering with Management PGDip</p>	<p>This is a Post Graduate Diploma. Students may enrol on a full-time (1 year) or part-time (2 years) basis. Part-time students typically complete one or two modules per semester. Full-time students typically complete three modules per semester. The Diploma is awarded to students who successfully complete all six taught modules (120 CATS points). However, exit qualifications are also available: students may exit with a Postgraduate Certificate by successfully completing 60 CATS points from taught modules.</p> <p>The diploma aims to augment the undergraduate education of those who have completed it, through a combination of advanced scientific knowledge, interpersonal and research capabilities. with a specific focus on the development of engineering commercial and management skills. The curriculum will improve employability by developing the postgraduate skills required for a successful transition to industry or a research role in academia.</p>	<p><u>Website.</u></p>
<p>Mechanical Engineering with Management (and Industrial Internship) MSc</p>	<p>Students enrol on a full-time (1 year) or part-time (2 years) basis (not including an additional year for the internship). Part-time students typically complete one or two modules per semester. Full-time students typically complete three modules per semester.</p> <p>The MSc is awarded to students who successfully complete six taught modules (120 CATS points) and a research project (60 CATS points). Exit qualifications are available: students may exit with a Postgraduate Diploma by successfully completing 120 CATS points from taught modules or a Postgraduate Certificate by successfully completing 60 CATS points from taught modules.</p>	<p><u>Website.</u></p>

Ulster University

A range of engineering course options are available at Ulster University. The School of Engineering offers a broad range of engineering courses at undergraduate and postgraduate level. 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 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 Masters 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 workforce.

Ulster University Level 6

Intervention	Purpose	Website
Biomedical Engineering BEng (Hons)	Biomedical Engineering combines biology and engineering, applying engineering principles and materials to medicine and healthcare. 4 year undergraduate programme with compulsory placement year.	<u>Website</u>
Biomedical Engineering MEng (Hons)	Biomedical Engineering combines biology and engineering, applying engineering principles and materials to medicine and healthcare. 5 year undergraduate programme with compulsory placement year and masters award.	<u>Website</u>
Electronic Engineering BEng (Hons)	4 year undergraduate programme with compulsory placement year Electronic engineering graduates are highly employable and can find work in areas such as electronics, automotive, IT, telecoms, manufacturing, utilities and construction. The university has worked closely with employers to develop this BEng Hons course to prepare students for a wide range of industrial electronic roles. Using a connected programme of study which allows you to build on the knowledge gained in each semester, this degree will prepare you to become a well-rounded engineer equipped for a wide range of roles within industry.	<u>Website</u>
Electronic Engineering MEng (Hons)	5 year undergraduate programme with compulsory placement year and masters award. Electronic engineering graduates are highly employable and can find work in areas such as electronics, automotive, IT, telecoms, manufacturing, utilities and construction. The university has worked closely with employers to develop this BEng Hons course to prepare students for a wide range of industrial electronic roles. Using a connected programme of study which allows you to build on the knowledge gained in each semester, this degree will prepare you to become a well-rounded engineer equipped for a wide range of roles within industry.	<u>Website</u>
Electrical and Electronic Engineering BEng (Hons)	The BEng Hons Electrical and Electronic Engineering degree will prepare you to become a professional electrical engineer, working on electrical products and systems, from research and design to installation. It will be your job to deal with the	<u>Website</u>

	<p>input of power to electrical systems, as well as with data acquisition and gathering.</p> <p>You will be qualified to work in many areas, including power generation and control, transportation, IT, manufacturing, construction and telecommunications.</p> <p>Most electrical engineers work with large-scale electrical systems, such as using electricity to transmit energy, however a wide range of technologies are being developed, from household appliances and installing lighting within buildings, to power stations and satellite communications.</p> <p>The course has a built-in year of work experience, where students work in industry during their third year, making it a highly practical degree with highly trained graduates.</p>	
Electronic Engineering with Enterprise Development BEng (Hons)	TBC	<u>Website</u>
Engineering Management BEng (Hons)	<p>The BEng Hons Engineering Management is a four-year, professionally accredited engineering course that is designed to equip you with a very valuable blend of engineering and management skills.</p> <p>Engineering Management graduates play a key role in design and manufacture where the challenges include the development of more efficient and effective manufacturing systems and processes, the creation of innovative products, global sustainability and the building of new business models to support high-value manufacturing.</p> <p>This course has been developed to satisfy industry demand for professional engineers who possess business and management skills combined with engineering expertise.</p>	<u>Website</u>
Engineering Management MEng (Hons)	MEng Hons Engineering Management is a five-year, fully CEng accredited, engineering course that is designed to equip students with a valuable blend of engineering and business skills. The course delivers on a wide range of subjects that explore topics such as engineering technology and materials, manufacturing systems and processes, new product design and mechanical engineering, as well as studies in business and management.	<u>Website</u>
Mechanical Engineering BEng (Hons)	<p>Mechanical engineers create, design and manufacture all kinds of products and processes across a wide range of industries. From automotive to medical devices, aerospace to renewable energy, or materials processing to mobile phones, mechanical engineers are involved at all stages of the product life cycle.</p> <p>4 year undergraduate programme with compulsory placement year</p>	<u>Website</u>

Mechanical Engineering MEng (Hons)	<p>Mechanical engineers create, design and manufacture all kinds of products and processes across a wide range of industries. From automotive to medical devices, aerospace to renewable energy, or materials processing to mobile phones, mechanical engineers are involved at all stages of the product life cycle.</p> <p>5 year undergraduate course with compulsory placement year and masters award</p>	<u>Website</u>
Mechanical Engineering with Enterprise Development Neng (Hons)	<p>The BEng Hons Mechanical Engineering with Enterprise Development will prepare you to become a professional engineer, working on electronic products and systems, from research and design to installation and sales. Your job may be to take an idea from conception to final product.</p> <p>You will be qualified to work in many areas, including power generation and control, transportation, IT, manufacturing, construction and telecommunications.</p> <p>Most engineers work with large-scale systems, such as using electricity to transmit energy or controlling automation in the home. You will learn a wide range of technologies, from household appliances and installing lighting within buildings, to power stations and satellite communications.</p> <p>The course has a built-in year of work experience, where students work in industry during their third year, making it a highly practical degree with highly trained graduates.</p>	<u>Website</u>
Mechatronic Engineering BEng (Hons)	<p>Mechatronics unites the principles of mechanics, electronics, and computing to develop simpler, more economical and reliable systems.</p> <p>This BEng Hons course has been designed with employers to prepare students for a wide range of industrial electronic and mechanical roles.</p> <p>4 year undergraduate programme with compulsory placement year.</p>	<u>Website</u>
Mechanical and Manufacturing Engineering BEng (Hons)	<p>There is no product that exists in the world that has not been engineered – from the smallest computer chips using nanotechnology to the biggest structures, such as bridges and the world’s tallest buildings. All engineering comes down to one thing and that is the need to solve a problem – how can I make it better? How can I make it more useful? Mechanical and Manufacturing engineering concentrates on the design and manufacture of machines, from the smallest parts to large systems, covering industries as diverse as automotive, aerospace and medical. So if you have ever wondered how you can make an F1 racing car go faster or how we can design and build the next generation of space exploration, then mechanical and manufacturing engineering is for you.</p>	<u>Website</u>
Renewable Energy Engineering BEng (Hons)	<p>This 4 year BEng Hons course prepares students for work within the emerging renewable energy industry and will allow you to make a difference in the world. Graduates will join a body of engineers with the vision and skills necessary to design and manufacture engineering systems and machines</p>	<u>Website</u>

	<p>for the renewables industry. You will learn how to think innovatively and turn your ideas into useable technology.</p> <p>Graduates with this mix of mechanical design, electronics, power systems and renewable energy engineering experience have many career opportunities available to them in this emerging sector. The course has a built-in year of work experience, where students work in industry during their third year, making it a highly practical degree.</p> <p>So whether you want to engineer the next generation of renewable power systems or drive change and create 'green cities' then this degree will give you the knowledge and skills to do so.</p>	
<p>Mechatronic Engineering MEng (Hons)</p>	<p>Mechatronics unites the principles of mechanics, electronics, and computing to develop simpler, more economical and reliable systems.</p> <p>This MEng Hons course has been designed with employers to prepare students for a wide range of industrial electronic and mechanical roles. Expanding upon the knowledge gained in the first four years (3 in study, 1 in industry), this course comprises of specialist subjects in the fifth year. Allowing students to extend their knowledge in an area of interest , or an area which will provide further career opportunities.</p>	<p><u>Website</u></p>
<p>Technology with Design BSc (Hons)</p>	<p>This four-year honours degree course provides the opportunity to study technology in the context of design for the marketplace. It provides the skills, technical know-how and market awareness needed to apply creativity to the pursuit of innovation.</p> <p>4 year undergraduate programme with compulsory placement year</p>	<p><u>Website</u></p>
<p>Advanced Composites and Polymers PGDip/MSc</p>	<p>The course draws upon the internationally recognised research within the school in areas such as 3D woven preforms (for use in the aerospace and other transportation sectors), polymer processing, nanocomposites and technical textiles. During the MSc you will be embedded in a research group as part of your dissertation. The team which delivers the course also has a wealth of industrial experience built from collaborations with key companies including Rolls Royce, Bombardier and Airbus. The course also attracts part time students from the local polymer processing sector.</p>	<p><u>Website</u></p>
<p>Biomedical Engineering PGDip/MSc</p>	<p>This course is a suitable preparation for employment in the medical device, pharma and biotechnology sectors and as preparation for PhD studies or research positions. The course draws upon the internationally recognised research with the school in areas such as Tissue Engineering, Bioceramics, Medical Electrodes and Drug Delivery. The course team also has a wealth of industrial experience and several medical device spin out companies have been established by the school.</p>	<p><u>Website</u></p>

<p>Manufacturing Management PGDip/MSc</p>	<p>The programme has been designed to provide postgraduate education and training in Manufacturing Management. The course includes modules in topics such as Computer Aided Engineering, Quality and Manufacturing Systems.</p> <p>A significant proportion of the students on the course come from local engineering companies and study in a part-time mode. Both the MSc and PgDIP versions of the course are also suitable for engineering or science graduates wishing to up skill in order to improve their employment prospects.</p>	<p><u>Website</u></p>
<p>Mechanical Engineering MSc</p>	<p>Driven by the School's industrial work and research, this programme has been designed in response to demand from industry to deliver the skills required to develop new technologies and meet the engineering challenges of the future.</p> <p>The programme draws upon the heritage of Mechanical Engineering in the region and internationally recognised research within the school in areas such as Aerospace Composites, Polymers, Advanced Metal Forming and Nanotechnology. Such research within the school has led to several successful spinout companies and collaboration with a broad range of industrial sectors such as aerospace, automotive, materials handling, marine and energy. Staff teaching on the course have a wealth of industrial experience working with a wide range of companies.</p>	<p><u>Website</u></p>

The Open University

The Open University offers the following courses via distance learning:

- Undergraduate Foundation Degree in Engineering
- Top-up Bachelor of Engineering (BEng) (Hons)
- Bachelor of Engineering (BEng) (Hons)
- Master of Engineering (MEng)
- BSc (Honours) Computing with Electronic Engineering
- BA/BSc (Hons) Design and Innovation
- BSc (Hons) Computing & IT and a Second Subject – can be combined with Design or Business as a Second Subject
- BSc (Hons) Combined STEM degree Postgraduate
- MSc in Engineering
- MSc in Technology Management
- MSc in Systems Thinking in Practice
- MSc in Environmental Management
- MBA (Technology Management)

Postgraduate Provision

Intervention	Delivered by	Purpose	Further Information and comments
Aerospace Engineering PhD.	<u>QUB</u>	A PhD programme runs for 3-4 years full-time or 6-8 years part-time and is dedicated to translating research innovation into real world industrial and societal benefit. Many PhD graduates have moved into academic and research roles in Higher Education while others go on to play leading roles in industry or become entrepreneurs. Research undertaken by PhD students in the School of Mechanical & Aerospace Engineering forms a critical part of its research portfolio. Within this environment PhD students research within the broad topics of design, materials, manufacturing, and energy.	<u>Website.</u>
Mechanical Engineering PhD.	<u>QUB</u>	A PhD programme runs for 3-4 years full-time or 6-8 years part-time and is dedicated to translating research innovation into real world industrial and societal benefit. Many PhD graduates have moved into academic and research roles in Higher Education while others go on to play leading roles in industry or become entrepreneurs. Research undertaken by PhD students in the School of Mechanical & Aerospace Engineering forms a critical part of its research portfolio. Within this environment PhD students research within the broad topics of design, materials, manufacturing, and energy.	<u>Website.</u>
PhD Programmes	<u>Ulster University</u>	University funded, Industry funded and Self funded PhD programmes delivered at UU. Areas of study include Biomedical Engineering, Composites and Polymers, Mechanical Engineering, Nanotechnology, Plasmas etc.	<u>Website</u>

Appendix 6

Strategies Informing NI Skills Priorities

Strategies Informing NI Skills Priorities

- *Strategies for Further and Higher Education: Further Education Means Success: The Northern Ireland Strategy for Further Education* in 2016 (Department for Employment and Learning, 2016[33]) *Graduating to Success: A Higher Education Strategy for Northern Ireland* in 2012 which centred on themes such as **economic development, accessibility and curriculum delivery**.
- Strategies for vocational education: *Securing our Success: The Northern Ireland Strategy on Apprenticeships* in 2014 and *Generating our Success – the Northern Ireland Strategy for Youth Training* in 2015. Tangible results from these strategies included the introduction of Higher- Level Apprenticeships at Qualification Level 4+ (Department for Employment and Learning, 2014[34]). 18
- The strategy for career guidance which was overhauled in 2016 *with Preparing for Success 2015-2020: A Strategy for Careers Education and Guidance*. This provided future direction of careers education and guidance and set out the vision, aims, policy commitments and key actions to ensure delivery (Department for Employment and Learning; Department of Education, 2016[36]).
- Northern Ireland’s overarching strategy for government, *The Draft Programme for Government Framework: 2016-21* (Northern Ireland Executive, 2016[37]), proposed a number of skills-related economic indicators such as increasing innovation, increasing the proportion of people working in good jobs, and reducing educational inequality.
- The agreement between the UK and Irish Governments *New Decade, New Approach* (UK Government, 2020[38]) includes a commitment to invest strategically to ensure that Northern Ireland has the right mix of skills for a thriving economy, as well as an enhanced approach to careers advice, curriculum, training and apprenticeships to enhance employability and support economic growth.
- Northern Ireland’s industrial strategy, *Economy 2030: A Consultation on an Industrial Strategy for Northern Ireland* (Department for the Economy, 2017[39]) included a **vision for Northern Ireland “to be a globally competitive economy that works for everyone”**. The strategy includes enhancing education, skills and employability as one of the five core pillars for growth, with proposals consisting of reforms to careers advice, strengthening collaboration across industry and government, and delivering new models of youth training.

Appendix 7

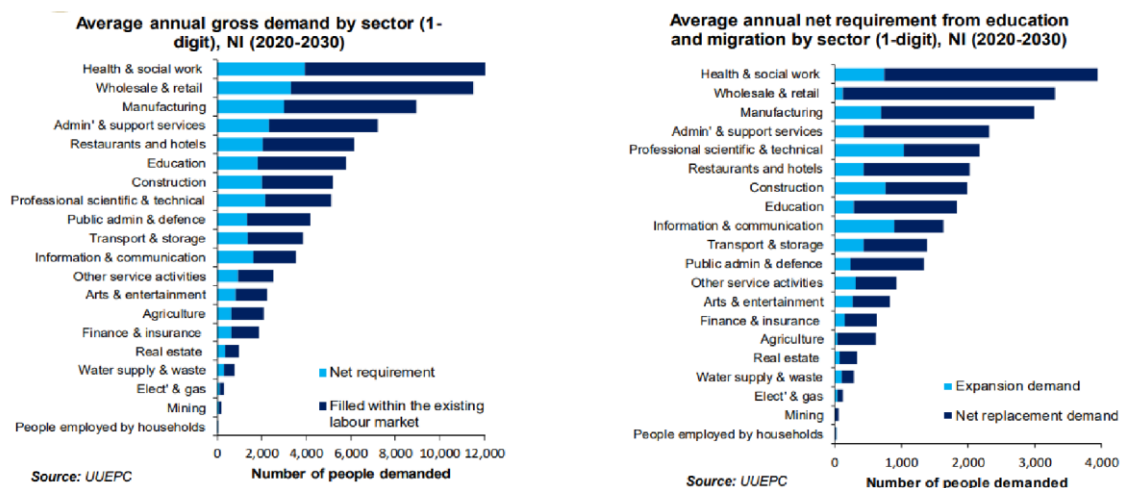
Labour Market Trends

Labour Market Trends

In Northern Ireland, the annual average gross demand is expected to be 84.7k over the coming decade. Around two-thirds will be filled by those within the existing labour market (i.e., job to job moves or the unemployed or economically inactive). This leaves the remaining 28.7k (34%) to be filled by education leavers or those entering from migration.³

Overall, the health and social care sector accounts for the largest proportion of net requirement (14%) followed by wholesale and retail (12%) and manufacturing (10%).

Demand by Sector and Annual Net Requirement from Education and Migration⁴

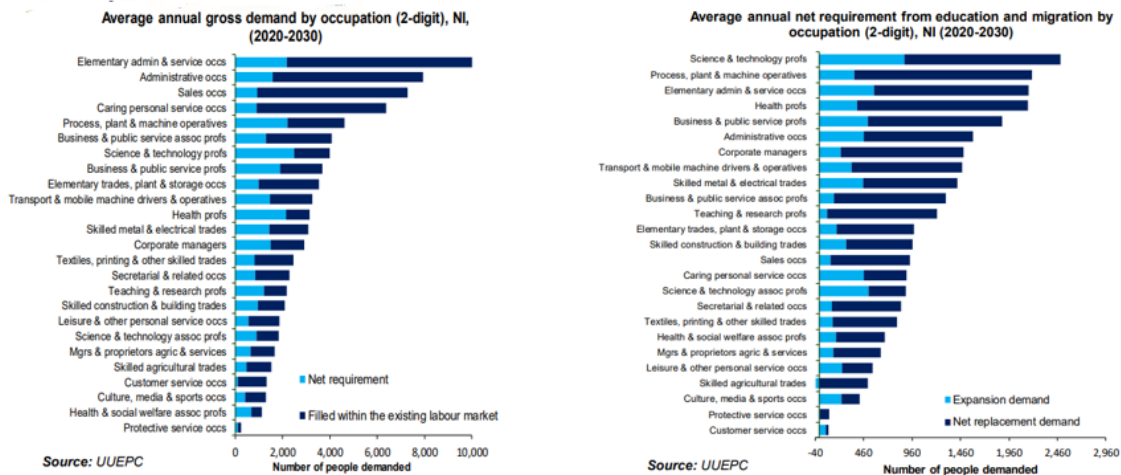


The composition of labour demand by occupation is driven by the occupation mix within sectors. The most in demand occupation is science and technology professionals (2.5k)

³ NI Skills Barometer 2021

⁴ Extracted from NI Skills Barometer Infographics <https://www.economy-ni.gov.uk/publications/northernireland-skills-barometer-2021-update>

Demand by Occupation and Net Requirement by Occupation⁵

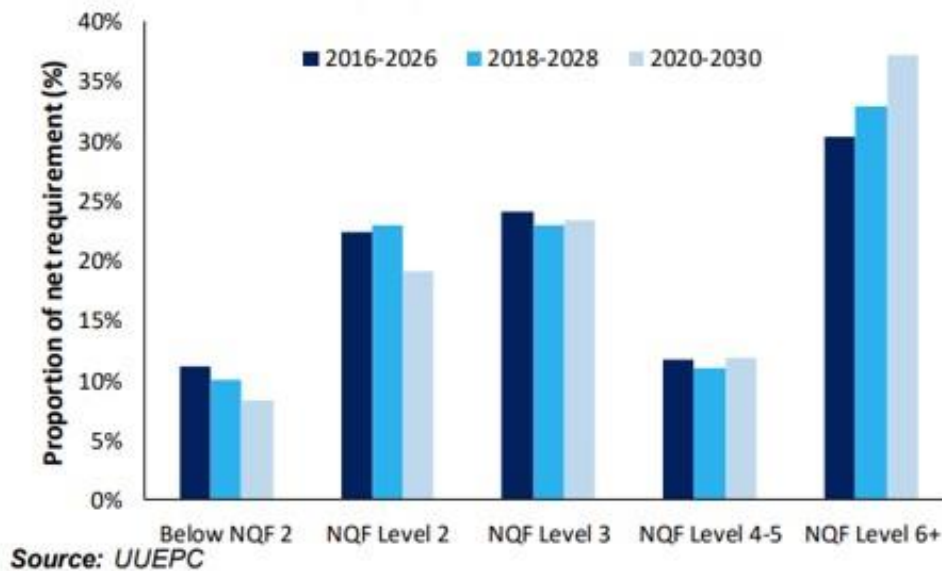


Increased demand for higher-level qualifications

Almost two-fifths (37%) of labour demand over the coming decade is expected to require NQF level 6+ qualification (i.e., undergraduate degree, masters, PhD).

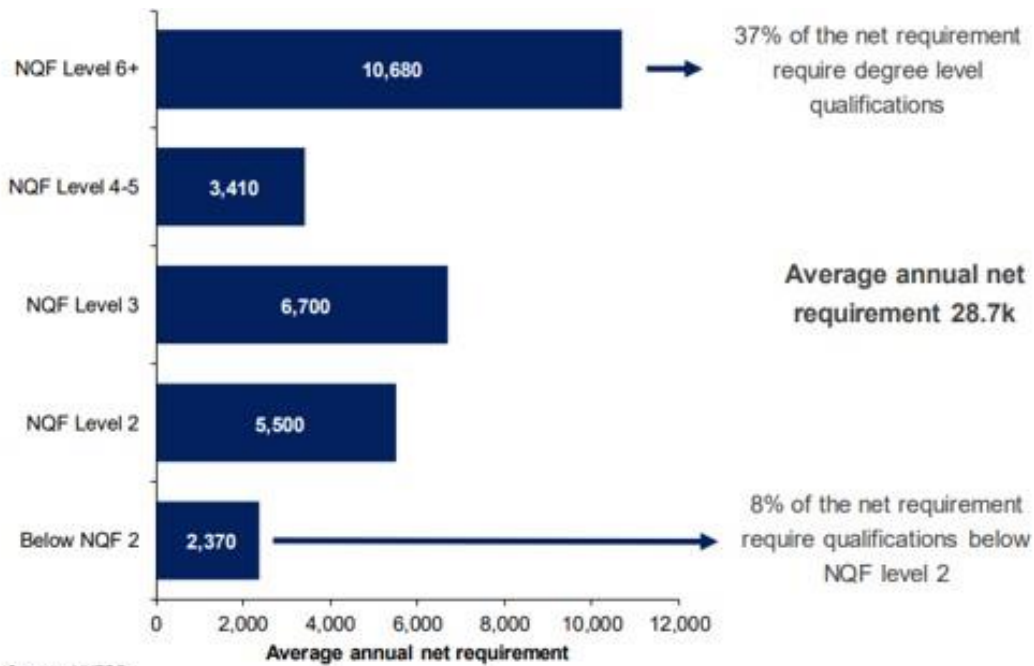
Only 8% of the net requirement are demanded at NQF level 2 and below. This figure has fallen from 16% in the first iteration of the NI Skills Barometer (2015-2025) and has coincided with a rapid increase in education attainment amongst education leavers. With lower-level jobs more at risk of automation, this demand for higher level skills could be accentuated further.

Annual average net requirement by qualification level (NQF), by NI Skills Barometer Iteration⁴



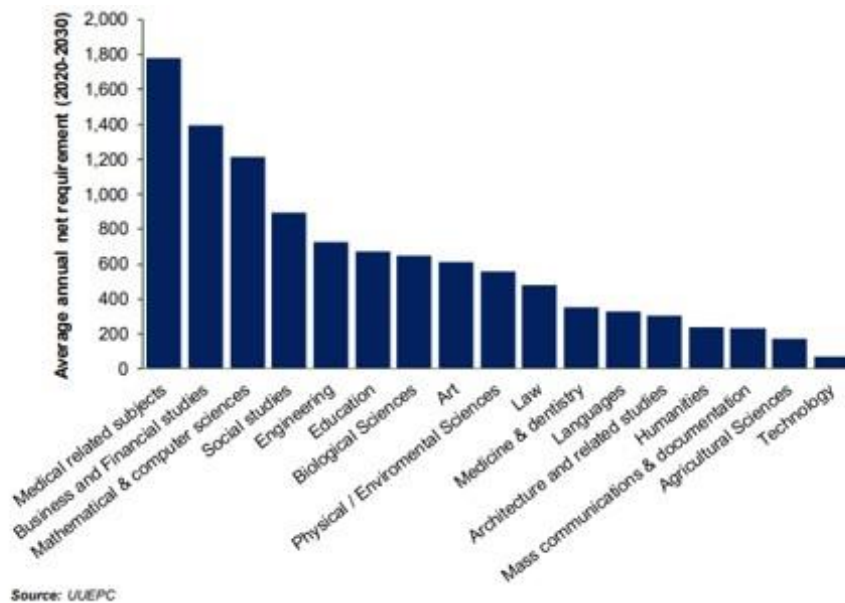
⁵ Extracted from NI Skills Barometer <https://www.economy-ni.gov.uk/publications/northern-ireland-skillsbarometer-2021-update>

Annual Average Net Requirement by Qualification Level (NQF), 2020-2030⁶



Higher-level Qualifications

Average Annual Net Requirement for NQF Level 6+ by Subject (JACS, 1-digit), 2020-2030⁶



The most in demand subject category is medical related subjects (1.8k) followed by business and financial studies (1.4k) and mathematics and computer science (1.2k). These top three subjects

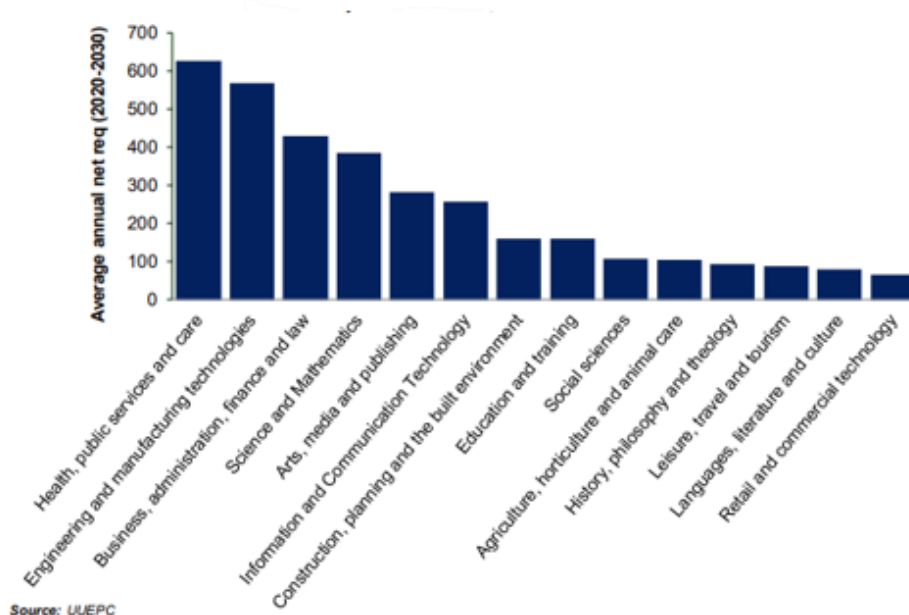
⁶ Extracted from NI Skills Barometer <https://www.economy-ni.gov.uk/publications/northern-ireland-skillsbarometer-2021-update>

account for over two-fifths (41%) of the NQF level 6+ net requirement. Engineering is also high a demand of with 700k.

Demand for Mid-Level Qualifications

At NQF level 4-5 the most in demand subject over the coming decade is health public services and care (0.6k) followed by engineering and manufacturing technologies (0.6k). Overall, there is a limited supply of education leavers at this level from the NI education system. The subject profile of demand could adjust rapidly in response to new subject provision at NQF Level 4-5.

Average annual net requirement for NQF level 4-5 by subject (SSA, 1-digit), 2020-2030⁷



Supply side

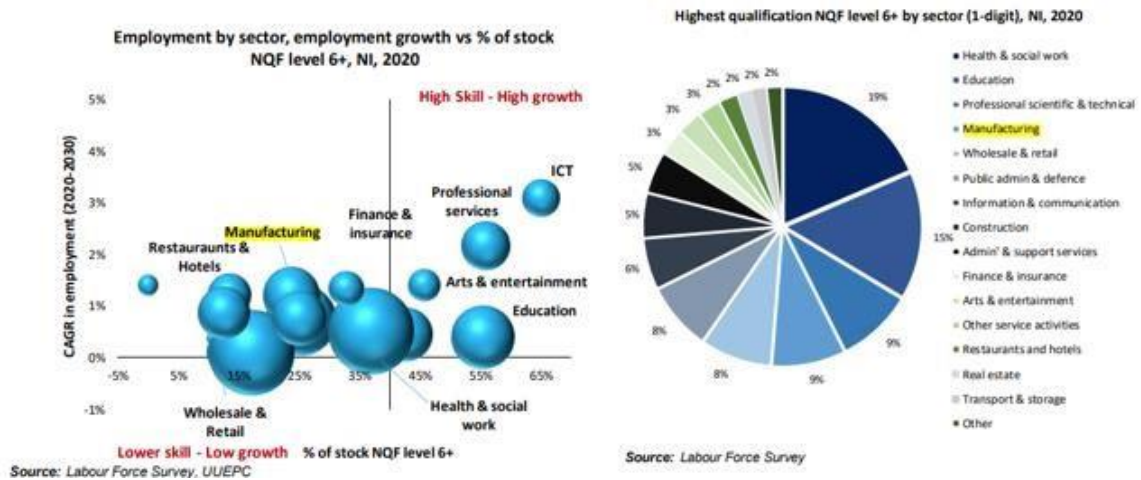
Higher-level skills

There has been a long-term shift in the stock of skills over the past two decades. The proportion of people in employment with at least an undergraduate degree (NQF level 6+) has more than doubled from 16% in 2003 to 38% in 2021. Whereas the stock of low-level qualifications (below NQF level 2) has halved from 30% to 15% over the same period. This has been driven by the generational effect of older workers with lower levels of qualifications exiting the workforce and replaced with younger workers with higher levels of qualifications. The over 50's represent half (49%) of people in employment with a qualification below NQF level 2 and only 23% of people with an NQF level 6+ qualification. This highlights the long-term improvement in education attainment over time that has created a large qualifications gap between generations.

Manufacturing and degree level qualifiers

The manufacturing sector has a low proportion of overall degree level qualifiers (25%) but is one of the top four employers of degree level qualifiers. To put this in context, the manufacturing sector employs more degree level qualifiers (23k) than the ICT sector (16k) and roughly the same as the professional services sector (24k).

Employment Growth by Sector and Stock of NQF Level 6+ Qualifiers by Sector, NI 2020⁷



Manufacturing has reduced its share of lower qualification levels more than any other sector. This reflects a shift towards advanced manufacturing which requires fewer, but higher qualified, workers.

STEM & Subject Areas

The NI Skill Barometer highlights 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 of a sufficient quantum 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 in this subject area.

The absolute number of qualifiers in NI suggests low qualifier numbers in some STEM subjects, overall NI has a higher proportion (50%) of broad STEM qualifiers compared to the UK (41%). However, this is largely driven by a higher proportion of health-related graduates. The proportion of narrow STEM⁸ graduates in NI and the UK is similar at 23% and 24% respectively. The proportion of narrow STEM qualifiers from NI HEI's was 23% in 2019/20. There are also skills gaps in sector specific subject areas. The STEM related subjects are the most undersupplied at NQF levels 6+, particularly Engineering & Technology, Mathematics & Computer Science and Physical/Environmental Sciences. This is consistent with the findings in previous NI Skills Barometer iterations. The trend reflects the growth in the ICT, professional services and advanced manufacturing sectors in the high growth scenario driving demand for qualifications in computer science and engineering subjects. This is also evident when analysing supply gaps using more granular subject classifications. The largest supply gaps are recorded in computer science, physics and chemistry.

⁷ Labour Force Survey, UUEPC

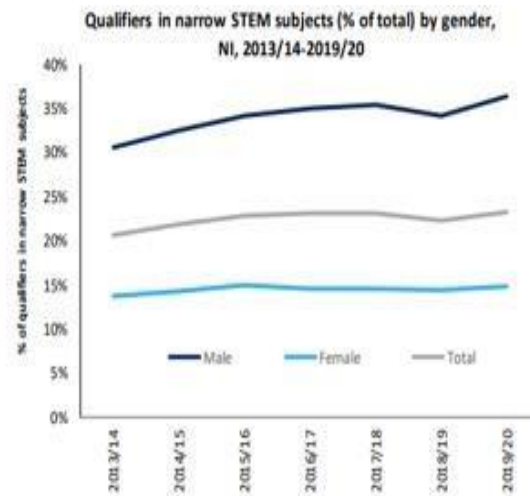
⁸ Narrow STEM is a subset of Broad STEM and includes the following subject areas: Biological and sports sciences; Psychology; Physical sciences; Mathematical sciences; Engineering and technology; Computing; and Geographical and environmental studies (natural sciences).

Percentage of Qualifiers from NI HEI's in Narrow STEM subject areas by gender, 2013/14-2019/20⁹

Qualifiers in narrow STEM subjects (% of total), by gender, NI, 2019/20

Narrow STEM	Male	Female	Total
Biological and sport sciences	5%	3%	4%
Psychology	1%	4%	3%
Physical sciences	2%	1%	2%
Mathematical sciences	1%	1%	1%
Engineering and technology	12%	2%	6%
Computing	13%	3%	7%
Geographical and environmental studies (natural sciences)	2%	1%	1%
Narrow STEM	36%	15%	23%

Source: NISRA, HESA



Source: NISRA, HESA

Supply-side – Wider Labour Market Considerations

Economic Inactivity

To boost the size of the available labour supply there must be net inflows of people from unemployment and economic inactivity into employment. Severe qualification mismatches between those in work and those out of work create barriers in matching the unemployed and inactive with suitable roles.

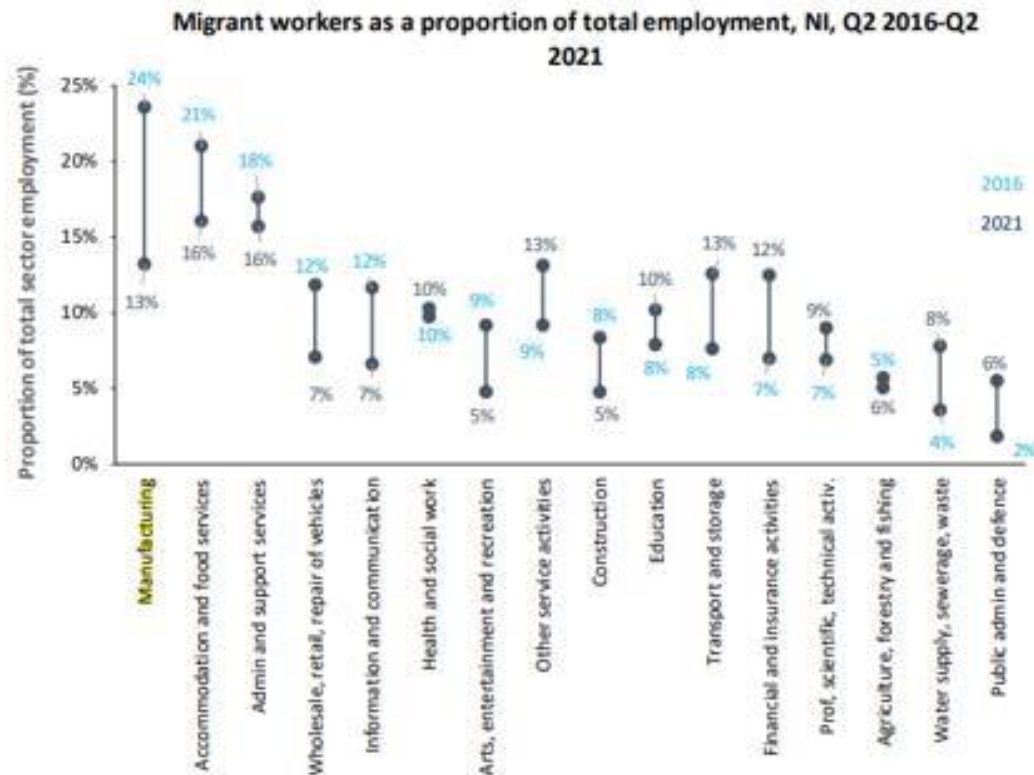
NI has had the highest working age economic inactivity rate of any UK region in 92 of the past 100 quarters highlighting that high rates of economic inactivity have been a long-term structural weakness of the NI economy, and a key contributor to holding back inclusive economic growth. Less than one in five (16%) of the economically inactive want a job, but this still represents 51k people who would be willing to work if there was a suitable opportunity.

⁹ Source NISRA & HESA

Migration

The pandemic has caused a significant reduction in international migration inflows. Over half of migrants working in NI are employed in the health, manufacturing, education and retail sectors.

Migrant Workers as a Proportion of Total Employment, NI, Q2 2016 and Q2 2021¹⁰

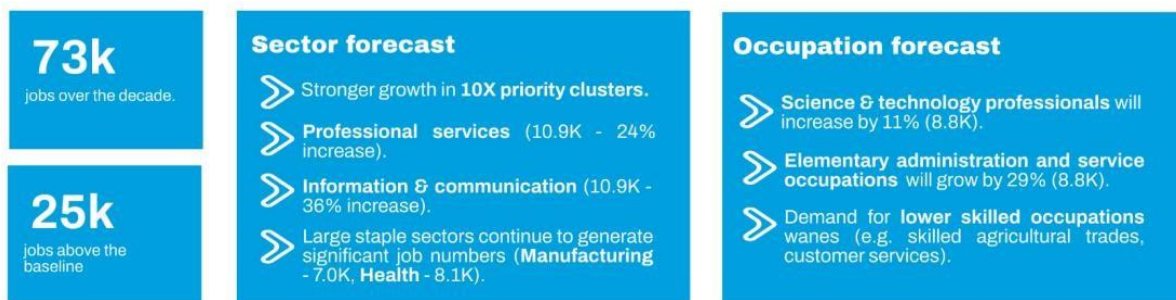


Source: ONS, LFS

10 X Priority Clusters and Advanced Manufacturing

10X priority clusters are expected to account for 73k jobs over the next decade, with advanced manufacturing expected to contribute significantly to this number. Science and technology professionals will be in significant demand as a result.

10X Priority Clusters¹¹



¹⁰ Source ONS/LFS

¹¹ Extracted from NI Skills Barometer 2021

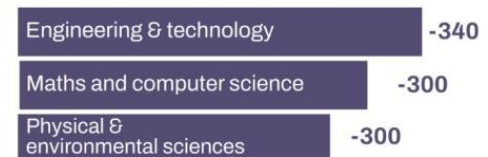
There is anticipated to be an undersupply at NQF level 3 and above and in particular in engineering and technology, maths and computer science and physical and environmental sciences.

10X Priority Clusters Undersupply

(Im)balance

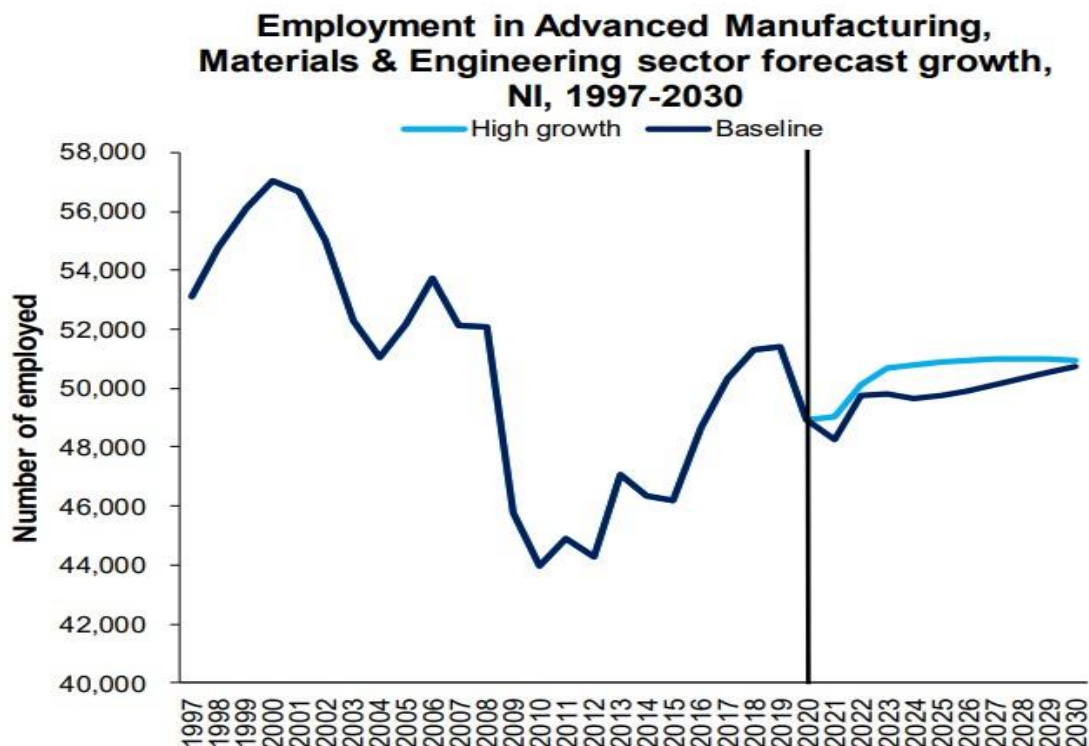


Graduate subjects



The Advanced Manufacturing and Engineering sector¹² is expected to grow in the period to 2030 and we can see that the requirement is at its highest at levels 4-5 (30%) with just over 20% requirement at level 6+ and level 3, around 17% at level 2 and less than 10% below level 2.

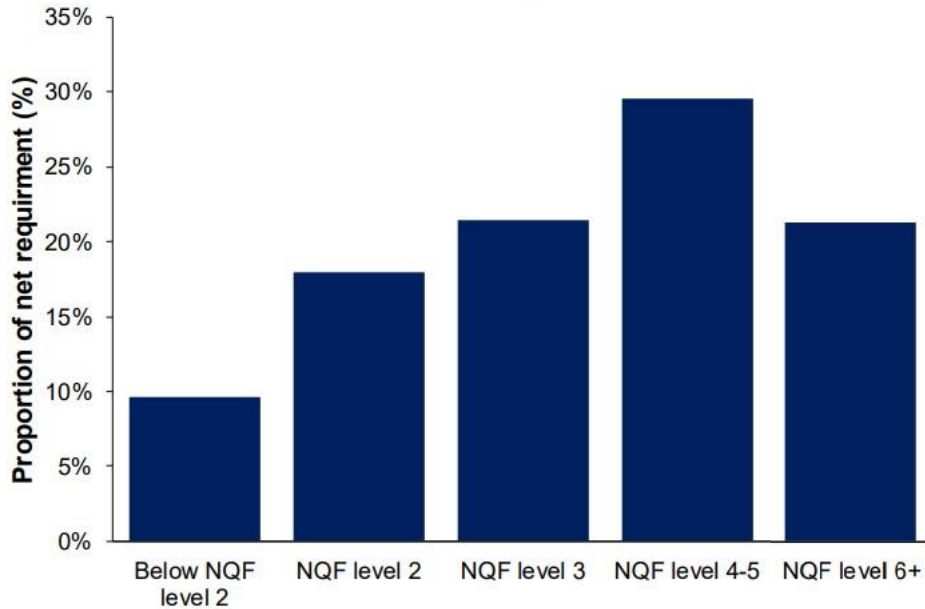
Employment in AMME Sector



¹² The Skills Barometer defines Advanced Manufacturing and Engineering as the following sectors (SIC, 2-digit): Manufacture of chemicals and chemical products; Manufacture of rubber and plastic products; Manufacture of other non-metallic mineral products; Manufacture of fabricated metal products, except machinery and equipment; Manufacture of computer, electronic and optical products; Manufacture of electrical equipment; Manufacture of machinery and equipment n.e.c.; Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment; and Other manufacturing.

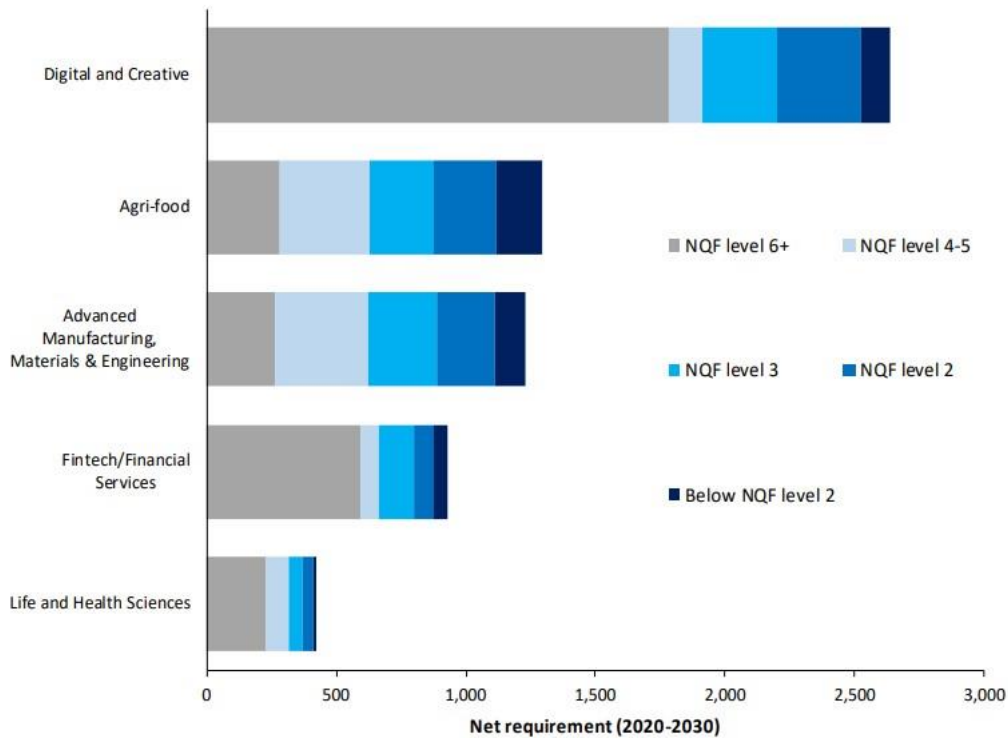
Net Requirement AMME Sector

Net requirement of employment in Advanced Manufacturing, Materials & Engineering sector by NQF level, NI, 2020-2030



Net Requirement for 10X Priority Clusters

Net requirement for 10x priority clusters by qualification level (NQF), NI, 2020-2030 (annual average)



Appendix 8

Advanced Manufacturing Trends

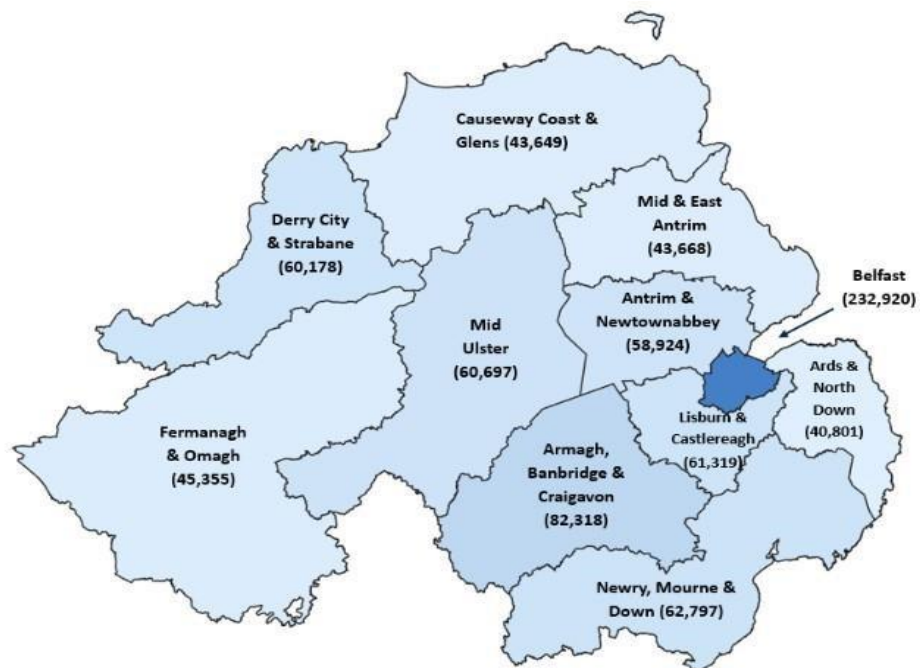
Advanced Manufacturing Trends

Percentage of employee jobs by Headline Industry, 2021¹³



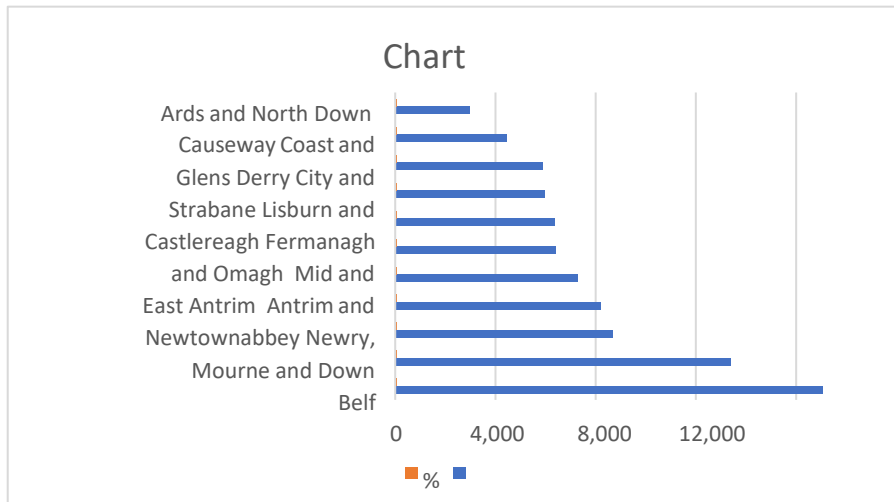
Whilst almost three in ten jobs in Northern Ireland are in Belfast City Council Area (29%), the area is home to just 10% of manufacturing jobs. Jobs are spread across all Council areas with the highest prevalence in Mid Ulster (17,006 or 19.5%) followed by Armagh City, Banbridge and Craigavon (13,389 or 15.5%). Ards and North Down have the lowest percentage of manufacturing jobs (2,973 or 3.5%) and the other Council Areas have an even spread ranging between 5-10% of total jobs.

Geographical spread of (all) jobs in Northern Ireland



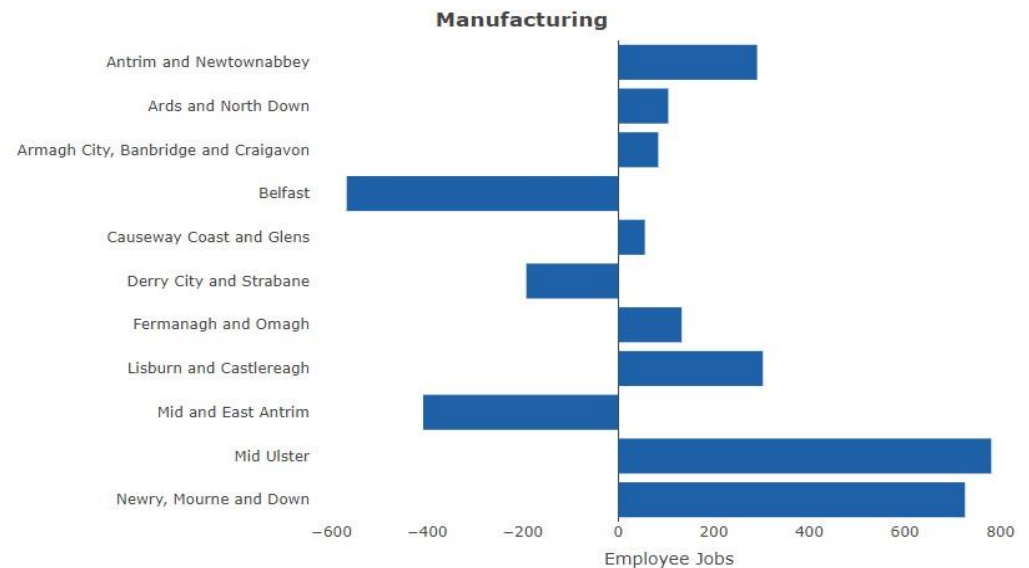
¹³ Figure extracted from Business Register and Employment Survey, 2021
<https://datavis.nisra.gov.uk/economy-andlabour-market/BRES-2021.html>

Total Manufacturing Jobs by Council Area 2021²



In 2021, Manufacturing jobs declined in Belfast (6.1% or 568), Derry City and Strabane (3.2% or 192) and Mid and East Antrim (6.0% or 408). Mid Ulster saw the largest increase in Manufacturing jobs over the year (4.8% or 781).

Manufacturing Jobs Growth 2021



There are over 200 industry sections in with employees in the manufacturing sector in Northern Ireland. Details of the breakdown are included below.

With almost 25% in the manufacture of food products, around 9% in the Manufacture of fabricated metal products, except machinery and equipment and Manufacture of machinery and equipment and around 6% in the Manufacture of rubber and plastic products, the Manufacture of other transport equipment, the Manufacture of plastics products, and the Manufacture of other non-metallic mineral products.

Number of Employee Jobs, September 2021

Description	Total
Manufacturing Total	86,703

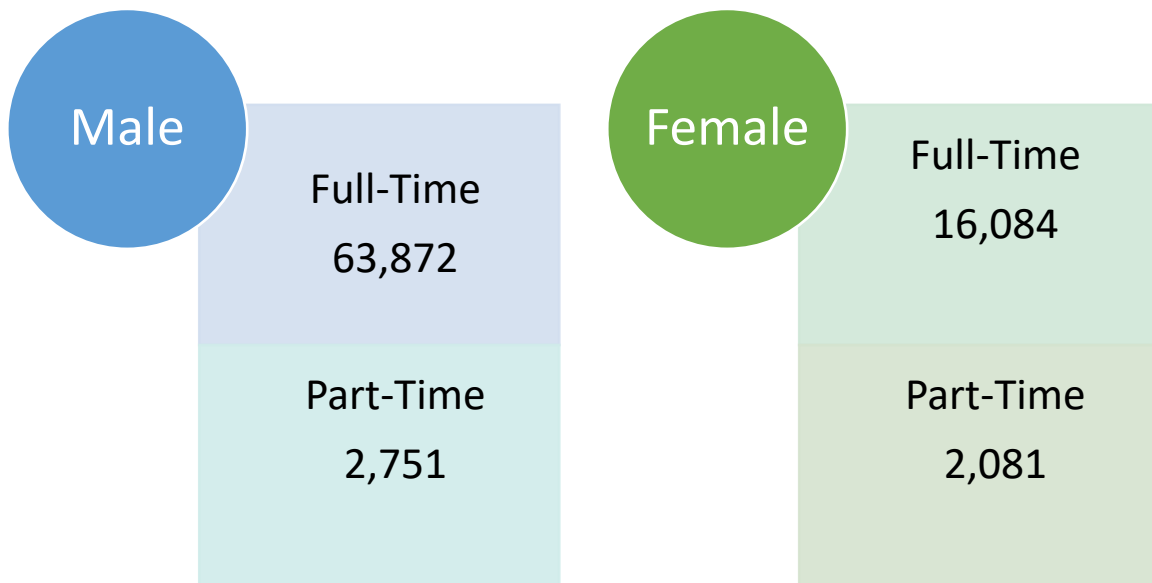
Of the 78,855 VAT and/or PAYE Registered Businesses operating in Northern Ireland Industry in 2022, 3,895 were categorised as having a broad industry grouping of manufacturing across 24 classes with 23% classed as Manufacture of fabricated metal products; except machinery and equipment, 15% classed as Repair and installation of machinery and equipment, 13% classed as Manufacturing of food products and around 9% classed as Manufacture of furniture and manufacture of wood and of products of wood and cork; except furniture; manufacture of articles of straw and plaiting materials.

Class	Businesses in NI
25 Manufacture of fabricated metal products; except machinery and equipment	920
33 Repair and installation of machinery and equipment	580
10 Manufacture of food products	510
31 Manufacture of furniture	350
16 Manufacture of wood and of products of wood and cork; except furniture; manufacture of articles of straw and plaiting materials	340
28 Manufacture of machinery and equipment n.e.c.	295
23 Manufacture of other non-metallic mineral products	235
22 Manufacture of rubber and plastic products	210
18 Printing and reproduction of recorded media	190
32 Other manufacturing	190
13 Manufacture of textiles	150
29 Manufacture of motor vehicles; trailers and semi-trailers	110
20 Manufacture of chemicals and chemical products	85
24 Manufacture of basic metals	85
26 Manufacture of computer; electronic and optical products	85
27 Manufacture of electrical equipment	85
11 Manufacture of beverages	70
30 Manufacture of other transport equipment	70
14 Manufacture of wearing apparel	60
17 Manufacture of paper and paper products	40
21 Manufacture of basic pharmaceutical products and pharmaceutical preparations	20
19 Manufacture of coke and refined petroleum products	5

There is still a big gender disparity in manufacturing in Northern Ireland¹⁴. Just over 20% of workers in Manufacturing in Northern Ireland are female.

¹⁴ Total Manufacturing Jobs by Gender (Business Register and Employment Survey 2021)

Males and Females in Advanced Manufacturing Jobs 2021



Out of 19 sectors, manufacturing is 14th in terms of the percentage of female workers. Transport and storage, Construction, Agriculture, forestry and fishing, Water supply, sewerage, waste management and remediation activities are the only sectors with a smaller percentage of females.

Gender Gap compared with other Industry Sectors

	Industry	Male	Female	Total	%age Female
1	Human health and social work activities	23,750	109,988	133,738	82.24
2	Education	16,742	57,413	74,155	77.42
3	Other service activities	5,550	8,818	14,368	61.37
4	Real estate activities	4,245	5,745	9,990	57.51
5	Accommodation and food service activities	22,287	28,028	50,315	55.71
6	Financial and insurance activities	8,919	10,889	19,808	54.97
7	Wholesale and retail trade; repair of motor vehicles and motor cycles	65,894	64,842	130,736	49.6
8	Public administration and defence: compulsory social security	25,663	25,160	50,823	49.51
9	Professional, scientific and technical activities	19,399	18,692	38,091	49.07
10	Arts, entertainment and recreation	7,764	6,861	14,625	46.91

11	Administrative and support service activities	31,263	23,191	54,454	42.59
12	Electricity, gas, steam and air conditioning supply	1,283	640	1,923	33.28
13	Information and communication	17,013	7,898	24,912	31.7
14	Manufacturing	66,623	20,081	86,703	23.16
15	Transport and storage	23,137	5,317	28,454	18.68
16	Construction	31,266	5,890	37,156	15.85
17	Agriculture, forestry and fishing	868	161	1,029	15.65
18	Water supply, sewerage, waste management and remediation activities	6,326	1,166	7,492	15.56
19	Mining and quarrying	1,755	271	2,026	13.38

Appendix 9

In-demand Roles

‘In-Demand’ Roles – feedback from Employers

From our Industry Survey, it is clear that many organisations are becoming much more active in investing in skills and people development.

Industry Perspective – Investment in Skills/Training Development

- People Investment in Skills and Engagement and Wellbeing Strategy
- Focus on onboarding and buddy system
- Skills matrix for development
- Performance Monitoring
- Skill matrices by department
- In-house training
- Six sigma training
- Training – leadership training
- Partnership with LinkedIn Learning
- Use a physical package called JUNK training is a success.
- Use Centre for Competitiveness for e.g., lean manufacturing
- Succession planning and looking at risks in the business.
- We offer very good development programmes.
- The importance of training and development for staff “Regarding skills, we invest in our people by training people from lower-level job roles. This has benefits that we can teach them what we require and also gives opportunities to those internally.”

Supporting the integration of Robotics and Automation

Companies in the region need support to help integrate of robotics and automation - most organisations are actively looking to increase automation, and it can be a good way to address skills gaps but the capital cost of investing in automation is a risk and can be a barrier. Organisations will ultimately need to digitise everything they do so they can do more with the same number of people, but this needs continued investment and upgrading. There is currently a lack of support/a hub of knowledge and excellence to help accelerate the adoption of robotics and automation and there are very few automation companies in Northern Ireland, the companies that do exist can take their pick of work. There is so little support around automation in Northern Ireland meaning organisations just can't get some work completed in the region. There is a skills gap in this area and the initial investment for one company alone to invest in automation can be a barrier.

Industry Perspective

- Most organisations are actively looking to increase automation.
- There are very few automation companies in Northern Ireland, the companies that do exist can take their pick of work. There is so little support around automation in Northern Ireland that need to go to England for support and often smaller scale projects – just can't get completed in NI.

Specialist Training Areas

As specialist areas emerge, access to specialist industrial training is needed, access to funding incentives and opportunities for collaborations would speed this process up. Specialist areas are emerging with a small but critical number of organisations in the region requiring provision of training. For example, there are currently areas where specialist training provision currently exists e.g., polymer training offered by NIPA, but these specialist areas can have a single point of failure (e.g., one provider) as there is currently a lack of a strategic approach to identifying the key areas of capability that are developing and which specialist areas require curriculum development, and training delivery.

Improving Sectoral Appeal

There remains an outdated perception of the manufacturing industry and a rising need for the sector to increase its attractiveness, making it a destination of choice for talent. Competition for labour expected to be a continuing issue across the labour market especially as skilled individuals from Northern Ireland are being enticed to the South of Ireland, the UK or other locations with higher wages and other incentives. Organisations are working hard to improve the appeal of advanced manufacturing sector, but there is an opportunity through the new City & Growth Deal Projects to co-ordinate the approach and help support a streamlined approach for profile the exciting developments.

Employer Perspective

Organisations are currently doing a lot to help with perception and attracting people into the industry:

- Visiting schools, career days, site visits, working with universities and colleges.
- Engaging with local young people in the community, working in the apprenticeship programme with SRC.
- Links with local schools and colleges.
- Annual Open House tours of manufacturing facility, target social media posts showcasing local manufacturing and automation, work experience, placement and graduate opportunities across the business.
- A dedicated skills and communities' strategy with enhanced focus in the community.
- Have a Stem Council on site.
- Go out into the schools, started with a Science Fair, post primary.

“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.”

Complex Training Needs in a Changing Environment

Training in key areas such as Leadership & Management, Entrepreneurship education, Emerging Technology Areas, Digital, Sustainability & Net Zero, and specialist areas could be more streamlined, coordinated, strategically planned and based on and responsive to industry need and changing the mindset of and supporting industry leaders and managers is critically important. Training can be rigid and is not always agile/responsive to need and flexible skills provision is needed i.e., short courses offering bite sized learning, micro-credentials etc. 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.

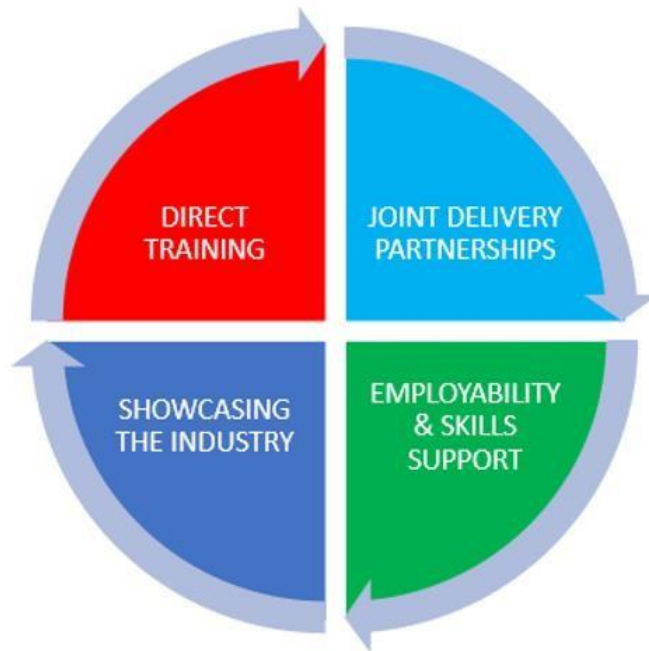
There is also a need for more practical training and skills development. Hands-on experience of manufacturing and problem solving from an early age is of prime importance. Crucially, the majority of children leave school without ever having built or constructed anything.⁸³ Industry find that getting time in a factory is difficult and disrupts business, access to factories and equipment would help with training and testing processes. There is also a scarcity of trainers in general and in some specific areas which must be addressed.

Appendix 10

Options for City & Growth Deal Centres in Supporting E&S

Options for City & Growth Deal Centres in Supporting E&S

Centres emerging from City & Growth Deal Investments offer a unique opportunity to have real impact through supporting employability and skills. By listening to industry voice, combining the knowledge and equipment and leveraging the partnerships through the City & Growth Deals, there is an opportunity to augment the existing support and deliver real solutions for now and the future to support industry across the region of Northern Ireland to innovate and grow. The following is a list of potential roles City & Growth deals could consider within the skills ecosystem:



Emerging Recommendations

Potential Role	Detail
Development and delivery of Training Modules aligned to areas of specialism within the sector	<ul style="list-style-type: none"> Fundamental Themes Emerging Specialist Areas Areas aligned with roadmapping, forecasting, industry demand and identified gaps.
Bespoke Tailored Training specific to areas of innovation developed through the Centre	<ul style="list-style-type: none"> Using building blocks from the training modules which can be configured. Can be combined with other providers. Potential for badging type system of recognition. Can be tailored further in some circumstances.
Learning Factory Projects	<ul style="list-style-type: none"> Individuals can join learning factory projects in the Factory of the Future. Structured delivery to cohorts. Groups from one organisation/ individuals from different organisations.
KTP Model	<ul style="list-style-type: none"> Looking at how the KTP model can be used/adapted to support innovation and <u>diffusion of information</u>.
Knowledge sharing and curriculum development	<ul style="list-style-type: none"> Acts as a sub-con to FE Colleges and Universities in areas of specialism, where <u>required</u>.

Upskilling/Reskilling	<ul style="list-style-type: none"> Identify needs and collaborate with providers to offer a ^{Page 68 of 69} menu of options. Learning Factory can be used for upskilling/reskilling eg in a certain technology.
Apprenticeships	<ul style="list-style-type: none"> Provide modules for apprenticeship programmes. Facilities used for delivery of Apprenticeship Programmes. New apprentice programmes delivered jointly with the colleges.
Executive Education/Support for Leadership	<ul style="list-style-type: none"> Partnering with providers eg the William J Clinton Leadership Institute to provide Executive/Leadership Training. Facilities used to train Leaders Opportunity to explore globally renowned leadership programme.
Value Chain/Train the Trainer	<ul style="list-style-type: none"> Role in developing STEM curriculum and shaping developing training for teachers, lecturers, technicians in company apprenticeships, FE colleges, schools and
Convening and Signposting	<ul style="list-style-type: none"> Plotting User Journeys to signpost industry to the right place for support based on the their needs at that time. Act as an easy access front door across NI.
Roadmaps and Skills Foresighting	<ul style="list-style-type: none"> Produce roadmaps to have a formal output in terms of skills foresighting. Connect with providers to carry out own foresighting and collaborations with Industry.
Business Strategy, Growth & Innovation Support	<ul style="list-style-type: none"> Prepare Value Proposition for different groups of stakeholders. How to access funding, workers, capital etc. Where to start with innovation.
Access to tools to help business growth	<ul style="list-style-type: none"> Provide tools to help companies understand their needs and also partner with others and signpost based on user journey.
Access to equipment and knowhow	<ul style="list-style-type: none"> Procure equipment which can be used for training. Options to use equipment/licences to test ideas. Open events to disseminate emerging solutions to industry.
Factory Tours/Open Days	For: <ul style="list-style-type: none"> Schools Careers Services Universities FE Colleges.
Profiling Work/People	Profiling: <ul style="list-style-type: none"> Research