

ADVANCED
MANUFACTURING
INNOVATION
CENTRE

STRATEGIC TECHNOLOGY ROADMAP



QUEEN'S
UNIVERSITY
BELFAST

BELFAST
REGION
CITY DEAL



Representing £98 million of investment through the Belfast Region City Deal, AMIC - Advanced Manufacturing Innovation Centre will be the springboard for manufacturing innovation in NI.

It will provide a specialised environment for advanced manufacturing, materials and engineering sectors to access the very latest manufacturing technology and Industry 4.0 smart automation, supported by experienced, professional engineers. AMIC builds on 50 years of sustained innovation and industry support through the Northern Ireland Technology Centre (NITC), the Polymers Processing Research Centre (PPRC) and NI Advanced Composites and Engineering (NIACE), and will consolidate and enhance these existing facilities.

A state-of-the-art Factory of the Future located at Global Point, Newtownabbey, will become a flagship facility for R&D that directly benefits society. As Northern Ireland's national centre for advanced manufacturing, the factory will support industry to develop innovative products, generating jobs and creating economic growth.

In Summer 2022, a detailed consultation was undertaken to develop a 10-year strategic technology roadmap, aligning the requirements of key stakeholders. The objectives were to:



Establish key trends and drivers, manufacturing developments and associated technologies and enablers



Identify areas for government and industry investment, particularly in AMIC as well as associated research priorities and business capability-building requirements

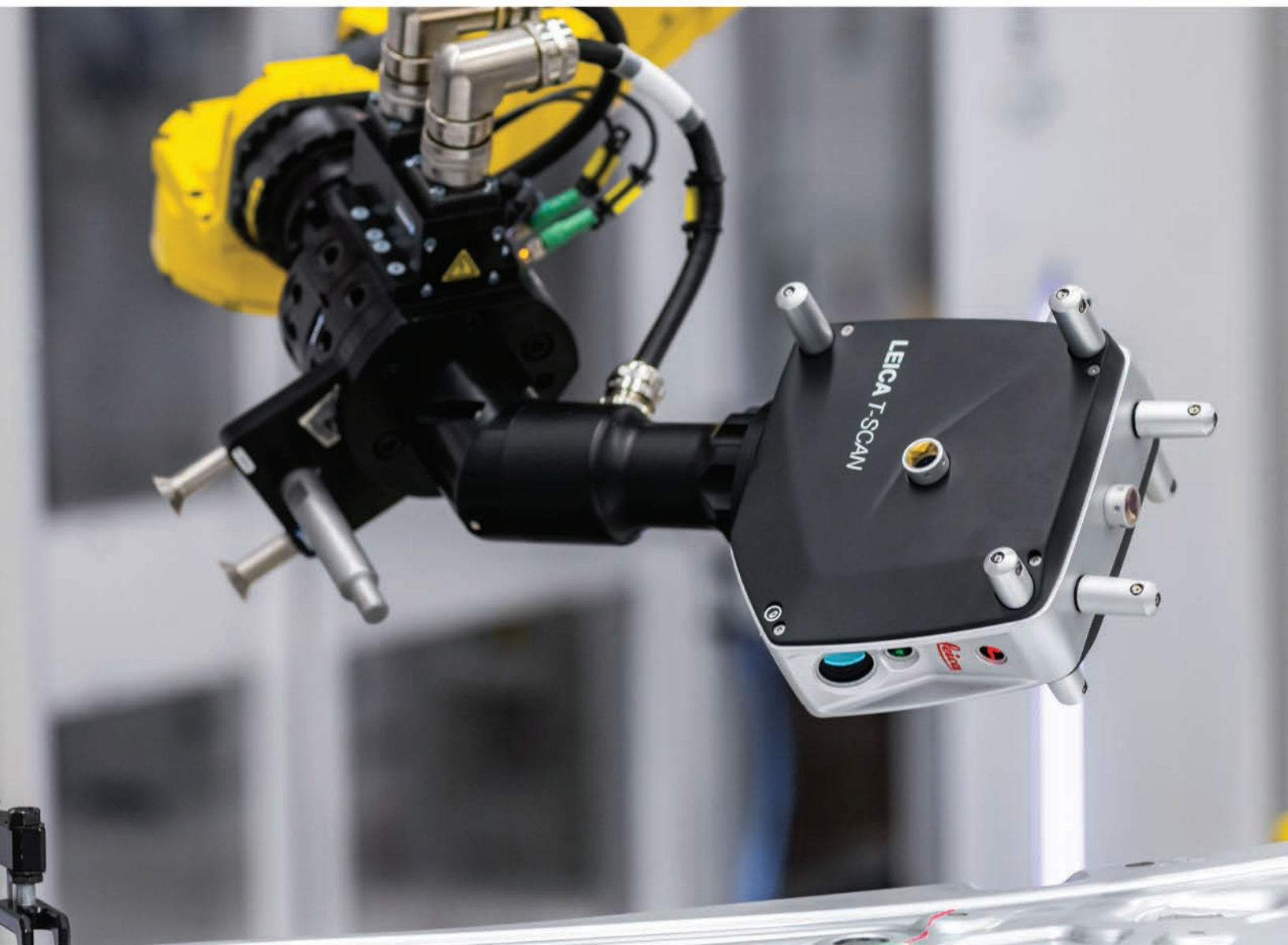


Provide input to regional skills development objectives and identify other emerging corporate capability-building needs which can be owned by industry and regularly reviewed

Key findings

Across the range of industries, Northern Ireland manufacturing, which is a significant part of the local economy, has a strong local competitive position, but a relatively weak global one. In general, across the sector, companies – aside from some well-known major and ‘niche’ players – hold a relatively poor knowledge of markets and competitors. The economy is dominated by a long ‘tail’ of small companies who presently have limited innovation capability and will, without considerable help and encouragement, struggle to take up new technologies and who risk falling prey to more agile international competitors.

AMIC has a potentially key role, (i) the development of new technologies in concert with major players, (ii) in supporting the wider and extensive network of more local innovation initiatives for capability development in the tail of SMEs, (iii) and as an intelligence source and advocate for the region internationally and with policymakers. It should be clearly ‘industry led’ rather than ‘academic led’ in this activity.



Priorities for AMIC

Six key themes have been identified as priorities for AMIC, assessed as offering very substantial and persistent medium to long-term improvement in Northern Ireland's global advanced manufacturing competitiveness.

Four themes are assessed as able to be readily adopted by the supply chain or adopted with concerted efforts by government and industry, as the capability already exists:



Connected, integrated products and supply chain and business models including:

- Connected supply chain
- Sectoral leadership



Lightweight, high spec/high-performance materials including:

- Lightweight structures and components
- Manufacture and assembly of high-performance materials



Testing and simulation services including:

- Digital simulation of design, manufacturing, and installation
- Digitisation/capture of test data
- Materials evaluation and testing
- Data handling for testing and analytics services



Robotics, automation, and digital manufacturing including:

- Robotics, digital innovation, automation – strategic network
- Digital manufacturing test bed
- Supply chain digitalisation
- Intelligent automation including robotics and alternative energy vehicles

The following two themes are assessed as presenting a scale of challenge that needs significant investment at a UK ecosystem level. This offers the potential of a pioneering role for Northern Ireland.



Manufacturing decarbonisation including:

- New manufacturing power sources (e.g., hydrogen/biofuel/electric)
- Circular economy
- Renewables including hydrogen



Food and drink processing including:

- Service for skills and knowledge transfer
- Lightweight sustainable packaging, processes, and components for agile, lean waste reduction
- Digital innovation support ecosystem
- Automation and digital integration with easy-to-use data analytics for decision making

The scale of the challenge in decarbonisation reflects the wider national picture in this area for what is a recognised major global issue, and the scale of challenge in food and drink processing reflects the even greater gap in innovation capability that may exist in that sector (particularly SMEs) as described above, compared to other industries. In all cases, AMIC may offer a major opportunity, not only in exploiting technologies, but also – critically – in removing the associated gaps in industry skills and leadership capability that are the principal barriers to their exploitation.

A parallel exercise specific to composites, conducted by the National Composites Centre, has shown good alignment with the general themes and priorities identified in this study, together with further information on composites technology and capability development priorities.



What role can AMIC play for Industry?

AMIC can have a vital role in promoting and enhancing advanced manufacturing, given the importance of manufacturing to the Northern Ireland economy. The innovation support landscape is complex and in need of better integration. A key role for AMIC, therefore, should be to act as a focus for, and broker of, the range of available support.

AMIC should ensure that as well as supporting large, world-class companies it also supports the core of smaller ones to enhance their innovation capability and competitiveness. This role should include providing access to the wider UK innovation support network. The precise mechanisms for fulfilling this role remain to be defined.

AMIC should have a strong industry focus. It should focus on industrial priorities, rather than academic ones and ensure that its engagement style is responsive to the needs of industry (for example on timescales).

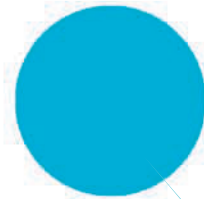
AMIC should support research collaboration in areas such as sustainability, digital and creation of more value-added products – in technologies such as digitalisation and automation, and particularly in food and drink processing where the sector is coming from a low base but there is a lot of ‘low hanging fruit’.

Learning transfer from between sectors, fostering links within the UK and beyond and helping companies to understand global markets, should be a strong focus.

Areas of capability where AMIC might focus support

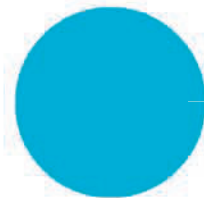
Product technology

Lightweight structures, composites, and topology optimisation
New sustainable, including recyclable, packaging technologies
Energy efficiency
Waste/recycling technology
Electrification: fuel cells
Energy storage



Funding, partnering

Partnering for accelerated innovation (AMIC + others)
Enabling policy, funding, and legal support: Levelling Up



Other enabling technology

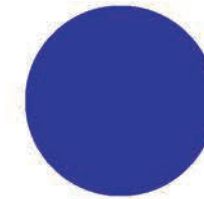
Carbon lifecycle analysis
Simulation and certification



AMIC
TECHNOLOGIES
CAPABILITIES
AND
ENABLERS

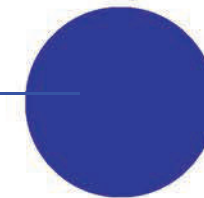
Production technology and enabling digital technology

Automation, advanced cobotics, robotics, exoskeletons
End-to-end manufacturing systems integration
Automated, high-rate polymer manufacture (including polymer composites)
Digital systems integration, IoT and interoperability
Industry 4.0 technology production and trials



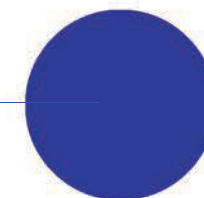
Research and academia

R&D access to equipment, incentives, and funding



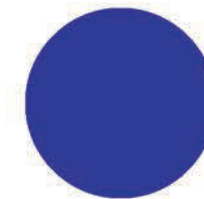
People, processes, and organisation

Strategic skills and workforce plan to address skills deficit
New enterprise models



Materials technology

Circular materials
Advanced materials and additive manufacturing





Competitive position of Northern Ireland advanced manufacturing

Northern Ireland has world-leading mechanical, electrical, healthcare and process companies in multiple sectors; for example, materials handling, aerospace, and life sciences, and indeed offers unique selling points in nanotechnology/photonics, digital/cyber and composites. Food and drink processing has strong product quality and niche brands, together with growing willingness to innovate, but low productivity and competitiveness and historical reliance on immigrant labour, and low levels of administrative automation, with larger firms typically in low margin, commodity markets. At the same time, there is a significant competitive threat to supply chains. Manufacturing in Northern Ireland is dominated by small and medium-sized companies (SMEs), many of which lack innovation capability. Northern Ireland's strengths include the following:

The Strength in Places fund investment for the Smart Nano NI Consortium is boosting USPs in **nanotechnology/photonics**

The **digital/data/cyber** and **composites** sectors are potentially world leading

Aerospace is dominated by a small number of very large companies which are important exporters. These are supported by a strong network of SMEs. 30% of all aircraft interiors are produced in Northern Ireland.

A significant **materials handling** sub-sector serving, for example, mining and earth moving for construction

Very high-tech **satellite equipment** is produced. Currently, however, it is inadequately promoted

The **energy and power** sector consists mostly of SMEs. Despite the lack of large companies in this sector, the relatively small players are increasingly focused on international markets

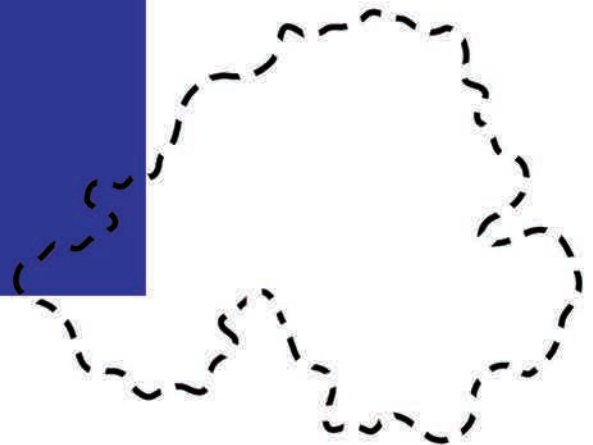
Large companies drive the important **agricultural machinery and materials handling industries**. 80% of their output is exported

The **life sciences** sector in NI is, for the most part, composed of large manufacturing companies and is 90% export driven

Pressure vessels have the potential to be world leading

The **green economy**, an emerging sector, is growing and has a promising supply chain

Other areas of note include **medical devices** and **maritime**



Observations

The Northern Ireland economy is dominated by SMEs who need to significantly increase their innovation capability and who may be reluctant to engage beyond a 'local' support centre

While there are notable exceptions, Northern Ireland's advanced manufacturing is seen by delegates as having a relatively weak global competitive position and low knowledge of international players and requirements

Food and drink processing share many of the same development priorities as other industries, particularly regarding skills and knowledge transfer, digital manufacturing, and automation

There are many regional initiatives so the innovation support landscape may be seen by some as complex and in need of effective integration

The role of AMIC as an incubator as well as capability builder remains to be further developed

A parallel exercise specific to composites, conducted by the National Composites Centre, has shown good alignment with the general themes and priorities identified in this study

Recommendations

As it represents the largest capability and investment, AMIC may consider acting as a capability enhancement facilitator, building consensus on priorities for the development of new technologies and building of innovation capability:

| | | | |
|--------------------------------|---|--|--------------------------------|
| Convener and direction setting | Link to other UK and international facilities | With a focus on mid technology readiness level, larger companies and innovation ready SMEs | Influencing policy development |
|--------------------------------|---|--|--------------------------------|

Other local facilities may engage to provide additional capacity and capability in a range of areas including:

| | | | |
|-----------------|--------------|----------------------------|---|
| Skills delivery | 'Incubation' | Engagement and signposting | With a focus on high technology readiness level and smaller companies |
|-----------------|--------------|----------------------------|---|

AMIC should take an integrated approach across industries (including food and drink), particularly as regards skills and knowledge sharing, digital manufacturing and automation, recognising particularly the need to ensure support to smaller companies.

In addition to leading on the development of capability, AMIC can have an important role both in promoting the industries' strengths in export markets and in improving local understanding of the global competitive position and priorities

Actions

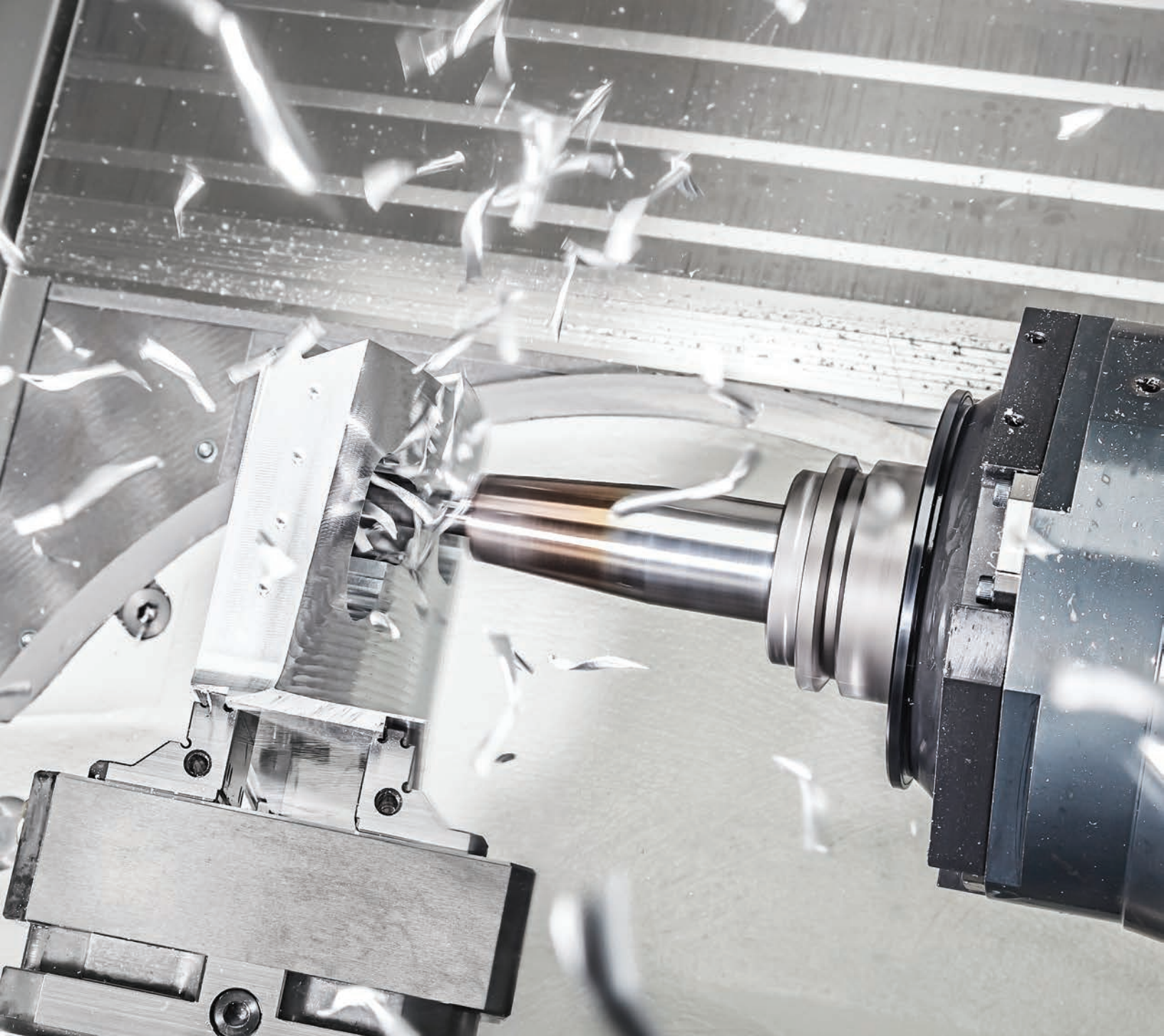
Accelerate the delivery phase of AMIC, as per approved plan

Confirm capability development requirements

1. Map existing capabilities and associated supply chain
2. Confirm capability needs and make appropriate links to existing facilities (e.g., High Value Manufacturing Catapult)
3. Build the AMIC 'horizon scanning' capability for emerging technology trends

Implement early 'launch' projects (short to medium term)

1. Respond to regional circular economy consultations
2. Develop a digital manufacturing testbed workshop and environment
3. Scope requirements for increased 'digital twin' capability



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REPORT

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