

November 2016

ADVANCED MANUFACTURING, MATERIALS & ENGINEERING

EXECUTIVE SUMMARY





“Taken together, whether as a sector / sub sectors/clusters/individuals, the contribution that AMME companies make to the Northern Ireland economy is impressive and a testament to the quality of our advanced engineers. Northern Ireland’s Advanced Manufacturing, Materials & Engineering (AMME) capability should not be understated – it is a powerful force.

“Yes, manufacturing, by any definition has and will continue to face difficult times, but by and large, NI’s AMME businesses survived the recession, have emerged more confident than before and are once again investing in growth.

“The challenges they identify, whether keenly felt in 2016 or anticipated for the future, should be considered in the context of a sector that can see enormous development opportunity.

“As such Matrix impresses upon government the need to respond in a comprehensive and timely manner to the recommendations within this report, so that in working together NI’s full AMME potential can be realised.”

Dr Rob Hardeman, AMME Chair (MATRIX Deputy Chair)

Foreword

Dr. Rob Hardeman

I am delighted on behalf of Matrix to present what I believe to be our most comprehensive report on Advanced Manufacturing, Advanced Materials and Advanced Engineering (AMME) in NI to date. Building on the 2013 UK Foresight Study - “Future of Manufacturing: a new era of opportunity and challenge for the UK”, the report re-examines the future of advanced manufacturing in Northern Ireland and its importance to the local economy beyond 2016.

Over the course of this study we engaged with many AMME business leaders, academic partners, representative associations and government bodies – locally and nationally. What we learnt from that engagement, combined with the use of extensive data sets from a wide range of sources is that there is a surprising level of sustained activity and export achievement given many reports of the “demise of manufacturing”. We have a strong manufacturing heritage, which still lies at the heart of industries in NI.

In fact, there is still a higher percentage concentration of manufacturing businesses here than there is in the UK as a whole. During the downturn, manufacturing industry here kept on track better than other UK regions. R&D didn’t fall away and exports, largely speaking, remained strong. So we have a big and vibrant sector with a fascinating range of companies and products and the signs are good.

NI’s AMME sector today is a leaner version of the one Matrix reviewed in 2008 and the most encouraging impression we take away in 2016 is that businesses, in being more flexible, have diversified and are better placed to adapt in a rapidly changing world. What we can see, in line with many other parts of the UK, is that companies have restructured their operations away from competing primarily on price and towards a greater emphasis on differentiation by product quality, knowledge, customer collaboration and brand. Yes, the recession was an incredibly difficult period for all manufacturers in Northern Ireland, but throughout the lowest points of the downturn advanced manufacturers continued to invest in R&D and that commitment to product and process, design and development has stood them in good stead.

Our decision to combine into AMME has been made in recognition of the levels of synergy and interdisciplinary working across those areas that we previously reviewed separately. Diversification has enabled lower-tier companies to serve multiple markets (and indeed many may not now associate themselves with any particular one) and innovation in any of the markets could spillover into others. Sub sectors and indeed sectors are becoming increasingly hard to separate.

We learned how success increasingly depends on collaboration and the network of partnerships that connect employees, suppliers, technical experts and academia. Nowhere is this ‘Industrial Commons’ more evident than in the UK government’s commitment to the High Value Manufacturing Catapult. It is the Catapult’s CEO Dick Elsy who makes the point that “it is no coincidence that the 2 industries that spend the most on innovation – aerospace and automotive – have seen the greatest productivity gains and continue to do well”. Matrix couldn’t agree more. “Innovation, after all, is the source of good, long-term business. And our role is to support a thriving business community here.”

We also take note of a manufacturing resurgence in the US where government investment has been better targeted to strengthen the Industrial Commons by supporting cross- sectoral partnerships including academia, industry and representative organisations to produce ideas and capabilities that support commercialisation and scale-up activities across a wide swathe of firms

– this points to the renewed need for some centralised facilities to support smaller companies be that through training /testing/production line trialling..

Unquestionably, the current climate is challenging – manufacturing is changing at a pace which is relentless yet exhilarating. The link to Digital ICT through the use of big data and data analytics is but one example of that change. The number of devices connected to the Internet is predicted to double by 2020, to 30bn, nearly all of that growth will be accounted for not by laptops, tablets or smart phones, but by machines, products and sensors that primarily do something else. That explosion in the potential of technology, and the opportunity it provides to reinvigorate the manufacturing sector (often referred to as Industry 4.0) should not be underestimated. Another area where enormous challenge and opportunity lies is a realisation of the benefits of the circular economy in which we work to design in reusability as well as recover and regenerate products and materials at the end of each service life.

Perhaps however the greatest challenge we face as a region, along with many others is that of Skills provision – the availability of the right skill sets at the right time. At the outset of this study I reported that I'd be fairly confident that one conclusion will be that we need to work harder on the development of skills at all levels, from school leavers to PhD qualified engineers. That indeed remains the case. Skills are going to be vital to the continued growth of manufacturing here....and it needs to be right up there on every agenda.

The development of clear and sustainable objectives for AMME in NI needs to be aligned with the current strengths of the sector – of which there are many. There are strong clusters already in existence but not always highly visible. From Aerospace to Materials Handling, Polymers to Agri-engineering, and Construction products to Automation, with many highly specialised individuals in between, the sector is ready to take advantage of specific initiatives to enhance competitiveness and propel forward. Therefore, it is important that we put in place initiatives which have impact, that we measure progress against the recommendations and suggested actions in the report and that we respond to any hesitation in achieving what we set out.

NI AMME needs leadership and a voice. In terms of looking towards key opportunities for growth in the future, we need to identify, grow and compete in the global market on our key strengths – and to do that we need to, as a region, exploit that which differentiates NI AMME from its competitors. We need to shout from the roof tops NI's AMME reputation for innovative design and the world leading quality and reputation of our engineers. In the report we talk about NI AMME's 'strength in adaptability' – the sector has shown its ability to diversify and respond to the changing demands of manufacturing of the future, which when combined with an already high degree of specialism and excellent service, means NI AMME is ideally placed to take advantage of niche global requirements – always building on the great heritage and brand of NI engineering

With the draft Programme for Government of the next 5 years just published and a refocused Economic Strategy with a vision to 2030 to follow, Matrix looks forward to providing advice and support to Minister Hamilton and his officials in the Department for the Economy as we work together with NI's AMME business community, education and research institutions to build on what is already an incredibly impressive performance.

EPSRC's Production Nation blueprint for a creative, innovative, competitive economy has as a central pillar "Establish a new place for industry that is built upon a 'make it local, make it bespoke' approach." The evidence presented in this Matrix report tells us that NI's AMME businesses can do just that, and what's more, they can make it better!

Dr Rob Hardeman

AMME Chair



Executive Summary

Matrix – The Northern Ireland Science Industry Panel.

Supporting Advanced Manufacturing, Materials & Engineering (AMME) businesses and maximising the impact of public funding by:

- *Promoting NI AMME*
- *Providing recognition and focus for the sector*
- *Encouraging research collaboration*

A Powerful Contribution to the Northern Ireland Economy

The NI Advanced Manufacturing, Materials & Engineering sector is diverse, with activities ranging from aerospace, automotive, pharmaceuticals, and chemicals to heavy plant, automotive, agri-engineering and construction products.



Since the 2012 recession, the NI manufacturing sector has created 6,500 new jobs – nearly 3 times the UK growth rate.

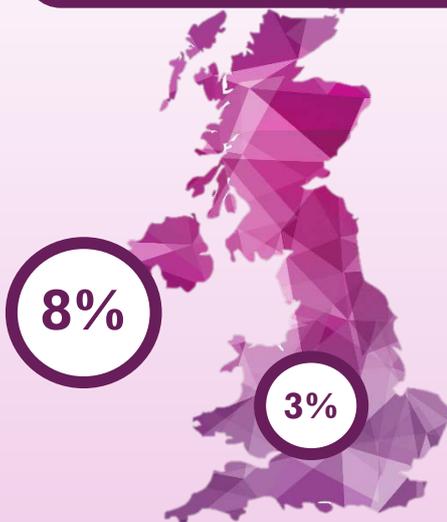
TOTAL NUMBER EMPLOYED IN THE NORTHERN IRELAND MANUFACTURING SECTOR IN 2016:

80,170



TOTAL NUMBER EMPLOYED IN AMME IN NORTHERN IRELAND IN 2016:

44,170



The outlook remains positive, but growth will be lower, reflecting the difficult international trading environment and the recent announcements at JTI, Michelin, Seagate and Bombardier (with the impact being most significantly felt in 2017 and 2018).

Geographical & Sectoral Spread



Highly Specialist Individuals

There are also several important specialist companies which don't fit within any of these groups, but which make up approximately one third of all AMMEs in Northern Ireland.



Key Findings

NI has a strong cohort of individual AMME companies making a very significant contribution to the local economy – these companies are competing globally and are Research & Development and Innovation (R&D&I) intense.

Critical mass :

AMME activity in NI (whether formally clustered or not) exists around three leading areas:-

Aero, Defence, Security & Space (ADSS)

Materials Handling (MH)

Polymers

(together these 3 groups account for 39% of top AMME performers).

Strong performance:

In addition there is evidence of strong performance within:

Automotive

Construction Products

Agri-Engineering

(together these three groups account for 29% of top AMME performers)

Significant and unique:

Individual companies classified within AMME as 'Highly Specialised Individuals' together account for over 30% of top AMME performers.

Heritage and innovation:

The ability of NI's AMME businesses to innovate successfully and diversify to pursue long-term growth paths is clear.

R&D intensity: Investment in R&D over a prolonged period and sustained throughout the downturn is a clear signal that R&D is embedded across the top 200 AMME performers.

Longevity: Many of NI's top 200 AMME companies (38%) are established 25years +; of which over a fifth can trace their roots back more than 40 years.

Respected and globally renowned – a strong brand:

Irrespective of the particular area of AMME they are employed in, NI's AMME professionals are globally respected, with NI engineering firmly reputed for excellence in quality, innovation and cutting edge design.

What AMME companies told us - what matters most to AMME companies in NI today?

Frequent and consistent themes:

Skills

Consistent with many other AMME communities, by far the most important issue concerning NI's AMME leaders is the availability of the right number of relevantly qualified workers at the right time. Matrix wholly endorses the earlier findings of the 2015 NI Skills Barometer and the recent and proposed developments within NI Apprenticeships. In that context, AMME skills are considered in detail in the report, along with a number of suggested potential recommendations to Government, Industry and Academia.



Costs

As with skills, the issues raised are not unique to NI, and not all are of equal concern to each AMME company. However, when taken together, the key concerns around energy, foreign exchange, corporation tax, rates stability, logistics costs and others present significant challenge to a sector which has been under persistent threat over recent decades.

There is a general acceptance that some of these areas fall outside NI control. However, the recommendation to government is that, when policy is being developed, that the impact on NI's AMME businesses is front and centre of decision making. This report points to the recommendations relating to costs within the 2016 Oxford Economics report commissioned by Manufacturing NI.



Sectoral Development

NI's combined AMME strength is a formidable force, in any context. The companies have grown, diversified, survived the recession, sustained their investment in R&D and are now hitting global playing fields with renewed purpose. The impact of sectoral development already undertaken is evident (e.g. the Aerospace, Security & Defence Group (ADS) and SC21 for the Aerospace, Defence, Space & Security sector and the work of the Northern Ireland Polymer Association for polymer businesses).

With confident and ambitious leadership, NI's AMME combined capability can be further developed and promoted effectively for the benefit of all. The report draws out specific recommendations pertaining to sectoral development.



Recommendations

SKILLS

- ✓ School children need practical, hands-on experience to be able to visualise AMME and its potential value in a way which they can relate to. An important first step would be the teaching of STEM through objects vs only through paper (i.e. practical vs theoretical learning).
- ✓ The role of colleges in the school/FE/HE education continuum providing vocational training for youth and continuing education for employees needs to be considered.
- ✓ Matrix should ensure that, as the NI Economic Strategy is refocused within the context of the new Programme for Government 2016-21, that the Department for the Economy is supported and encouraged to continue to build on the current STEM agenda and (important) small gains recorded. This is an essential step to ensuring the delivery of economically relevant skills and qualifications for the AMME sector in the future.

R&D & INNOVATION

- ✓ Public funding of university-business collaborative R&D - Leverage and Value for Money: the development of metrics that identify and measure commercial outcomes as well as those for the university are important, not least in the context of constrained public spending environment.
- ✓ Mechanisms which streamline industry-university engagement should be reviewed in light of becoming more flexible and dynamic – to the benefit of all parties, taking into account ease of access to collaborative R&D for SMEs in particular.
- ✓ Businesses should be encouraged to seek out collaborative opportunities, wherever they lie, based purely on expertise and to look beyond localised networking, where appropriate, to avail of that expertise (e.g. explore HVM Catapult links).
- ✓ Regional funding for collaborative research should be directed to best meet the needs and growth of AMME businesses, irrespective of location of research partner.
- ✓ Additional HMRC resource available to NI businesses via its NI Corporate Tax Office (NirCTO): DfE should renew efforts to ensure all eligible businesses are aware of the totality of support available to them under the HMRC incentives and reliefs – taking full advantage of NirCTO's expertise and guidance.
- ✓ The opportunity to scope a government-led 'whole of AMME R&D&I solution' in response to industry needs within the established Catapult framework should be examined further.

SECTORAL DEVELOPMENT

- ✓ With regards scaling, the need to examine how some of the ‘affinity groups’ of AMME business could move into a form where their combined activity would move them to the next level is recommended. With the appropriate policy in place, Invest NI would be well-placed to work with companies to facilitate that movement.
- ✓ A potential pilot around the application of ADS initiatives to NIPA members would be an ideal starting point.
- ✓ Explore potential to develop a tailored AMME package of support (e.g. akin to Liverpool LEP advanced manufacturing initiative). Sector- specific and across full spectrum of R&D&I to include e.g. skills, trade, etc. and to incentivise AMME collaboration.
- ✓ The NI engineering brand should be developed and promoted and used by all relevant parties to promote NI as a location of choice to do AMME.
- ✓ To address issues relating to accessibility, a “See Inside Manufacturing” or “Manufacturing Day” initiative should be developed to help influence skills choices – “heads and hands”.
- ✓ Develop a programme of education for the legislators. Prioritise the identification of a cross-party Executive ‘Advocate for Engineering’ – (e.g. the UK All-Party Executive Manufacturing Group model). Matrix can lead.
- ✓ Matrix ‘loop and closure’. Need to set out the mechanism by which to bring AMME findings into the advice framework (evaluation of the model) and carry through the development of recommendations through a sub-group which would co-opt representatives from respective communities. Likewise, a conduit to UK government policy and funding should be formalised for NI AMME businesses – a continuing process which will provide feedback and input to next report. Matrix can work in conjunction with DfE to provide leadership.
- ✓ The ‘clean and green’ opportunity is an area which was initially identified in the first Matrix report and one which has been seen only to grow in the intervening period. NI’s AMME companies should therefore be encouraged to explore and supported to engage further with the ‘clean and green’ opportunity, whether through education, the creation of shared value or the identification of partners.

