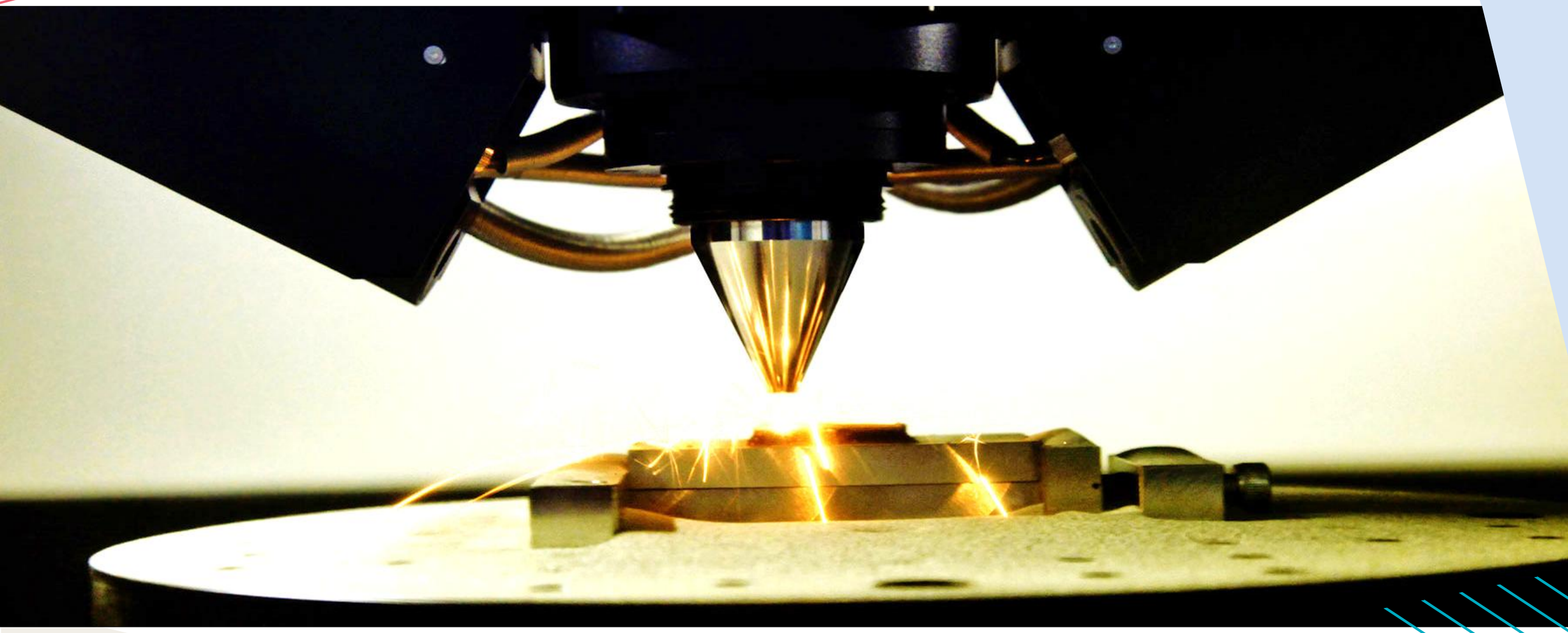
Additive manufacturing

V1.0 – April 2026



Connect with us

Hoda Amel, MTC
hoda.amel@themtc.org

Evren Yasa, AMRC
e.yasa@amrc.co.uk

Additive manufacturing

Manufacturing processes that join materials to make parts from 3D model data, layer upon layer.

HVM Catapult is accelerating the UK's leadership in additive manufacturing, advancing design (DfAM), next generation materials, digital workflows and scale-up production. Building on our extensive network capabilities we have enhanced performance, cost efficiency and value retention. In partnership with industry and academia, we are shaping a future of resilient, circular and data-driven manufacturing – unlocking scale-up opportunities for additive manufacturing.

Why: Demand drivers

- Improved component performance and next-generation design capabilities
- Reduced manufacturing cost through efficient, flexible and rapid production
- Sustainable manufacturing enabled by reduced waste and energy use
- Life cycle value extension through repair, remanufacturing and on-demand replacement
- Integration of advanced digital tools, data processing and industry 4.0 frameworks.

What: Priority industry capability needs

- Improved cost, rate, scale and quality of additive manufacturing processing to enable economic and sustainable applications
- Digital tools that enable an effective design workflow and digital thread
- Standards and best practice guidance for manufacturing and certification of AM components
- A mature, robust and flexible UK supply chain with a capable workforce, manufacturing equipment and material
- Building a skilled additive manufacturing workforce through advanced education initiatives.

How: Priority innovation requirements

- Develop and apply priority additive manufacturing technologies to process materials and create components to enable new applications and life extension
- Develop end-to-end process chain that integrates with the additive manufacturing processes
- Demonstrate an effective design workflow and digital thread, supported by material data, process simulation and process data capture
- Support pull-through of emerging technology developments into the additive manufacturing process and to exist in the supply chain
- Implement technical and commercial training programmes, including apprenticeships and upskilling of existing roles.

Key HVM Catapult capabilities in additive manufacturing

National Centre for Additive Manufacturing, MTC (Coventry)

End-to-end additive manufacturing capability, combining metal, polymer and ceramic additive manufacturing systems with process validation and advanced powder characterisation to support industrial adoption.

Large-scale DED and solid-state additive manufacturing, NMIS (Renfrew)

Supporting manufacturing and remanufacturing with precision micro-deposition through to high-rate, large-scale production using DED-laser and DED-arc technologies, supporting hybrid manufacturing workflows. Advanced high-pressure cold-spray technologies for solid-state coatings, cladding, feature addition and full AM builds, delivering high-integrity surface enhancement with reduced heat input and integrated digital control systems.

Large-scale solid-state additive manufacturing, AMRC (Samlesbury)

Friction stir and related processes to produce defect-free, high-integrity components with minimal thermal distortion, integrated with digital process control, real-time monitoring and automated handling.

Multi-material additive manufacturing, WMG (Coventry)

Enabling the integration of dissimilar materials within a single build to optimise performance, functionality and lightweighting, supported by digital design tools, process simulation and scalable manufacturing routes for rapid industrial deployment.

ReMake Value Retention Centre, NMIS (Renfrew)

Pioneering circular manufacturing and value-retention through advancing reuse, remanufacture and refurbishment of high-integrity assets with systems-level collaboration, cutting waste and emissions, strengthening supply chains and accelerating net-zero impact.

Advanced med tech product design and development, CPI (Sedgefield)

Additive manufacturing for med tech, enabling rapid prototyping, design iteration and scalable production of regulated medical devices through materials expertise, validation and translational product development support.

Connect with us

Dr Hoda Amel, MTC
hoda.amel@the-mtc.org

Dr Evren Yasa, AMRC
e.yasa@amrc.co.uk

Connected technology platforms

Through cross-domain analysis, eight connected technology platforms have been identified. They underpin both the core advanced manufacturing process technologies and the cross-cutting enabling technologies set out in this strategy.

They provide a shared foundation of insight and collective capability, showing where coordinated effort across our domains can best strengthen, connect and accelerate the technologies that matter most to UK industry.

An industrial AI for advanced manufacturing UK adoption plan is now being developed in partnership between Made Smarter, Make UK, HVM Catapult and the Department for Business and Trade, led by the AI Champion for Advanced Manufacturing.

Priority: Artificial intelligence enabled advanced manufacturing

Enhancing human capabilities with industrial AI technologies applied across the product development and operational lifecycle

Harmonised life-cycle assessment

Standardising assessment methods and data ontologies to consistently measure environmental impact across a product's lifecycle

Value retention

Preserving the life of products, components and materials through recycling, repair, remanufacturing etc (Re-x)

Manufacturing with advanced materials

Accelerating the deployment of next generation materials across the full value chain, and supporting the development of an agile and responsive UK supply base

Capability development

Advanced and interconnected process modelling

Integrating detailed simulations and enabling interoperability across the value chain to optimise manufacturing performance

Automation of processes and digital integration

Streamlining manufacturing processes through digitally connected systems and interoperability

Digital thread

A seamless flow of data connecting design, production and operations across a product's life cycle

Intelligent manufacturing assurance and regulatory engagement

Leveraging smart systems to ensure quality and compliance, and early-stage dialogue to decrease barriers and accelerate validation and verification

Interpreting our roadmaps

The strategy structure

Why: Demand drivers
External pressures or opportunities that create the need for new or improved manufacturing capabilities.

What: Industry capability needs and priorities
The practical abilities industry must have to remain competitive in the future and the priorities for HVM Catapult.

How: Innovation requirements and priorities
The specific technologies, tools, processes, data, skills or system enablers that must be developed, improved or integrated to meet future industry capability needs, and the priorities for HVM Catapult.

Connected technology platforms
Highlight where coordinated effort across our domains can best strengthen, connect and accelerate the technologies that matter most to UK industry

Priority industry capability needs
The most critical capability gaps identified through industry consultation that must be addressed first to deliver impact.

Roadmap activity examples

Establish test beds to develop, integrate and validate novel inspection, measurement and test techniques and processes.

Demonstrated the trustworthy comparative robustness of emerging inspection, measurement and test technologies

The above 'what' items are linked and dependent – denoted by the overlapping boxes

Deployment of increased mechanization to remove variability and increase standardization linked to respective process specifications

Standardised digital weld procedures, reusable qualification libraries, harmonised standards

The above 'how' discreet items that are not linked and occur in different time horizons

IUK Strategic imperatives

Alignment with the Innovate UK vision
Each demand driver is colour-coded to align with the four imperatives of the Innovate UK materials and manufacturing vision 2050.

Innovative and digital
Businesses drive continuous and transformative innovation and create, adopt and export advanced digital technologies

Resilient and responsive
Mitigating risks from supply chain disruptions, national/global crises, and climate change.

Resource-efficient and regenerative
Sectors maximise circularity of materials, energy and water and aim for a net positive impact on the environment

Skilled and empowered
Workforces are highly skilled in executing advanced tasks and are empowered by configurable, open technology stacks

Additive manufacturing

Further details of the **demand drivers**, **industry capability needs** and **innovation requirements** are available online. Follow the QR code or **click here**.

Vision

Lead the UK's advancement in additive manufacturing, driving innovation, AM standards and insight to accelerate adoption, strengthen industrial capability and unlock sustainable economic growth through developing accessible world-class expertise, technical leadership and technology foresighting.

Key

Demand drivers
Why change is needed.

Industry capability needs
What capabilities industry needs to respond to these changes.

Innovation requirements
How capabilities must develop.

Priority industry capability needs
The most critical capability gaps identified through industry consultation that must be addressed first to deliver impact.

2026	2030	2035	2040
Improved component performance and next-generation design capabilities	Improve designs of next-generation components with lower through-life cost	Digital tools that enable an effective design workflow and digital thread	
Integration of advanced digital tools, data processing and industry 4.0 frameworks	Advanced design, materials and manufacturing concepts to enable large complex assemblies with lower part-count	Mature, reconfigurable additive and hybrid manufacturing systems	A mature, robust and flexible UK supply chain with a capable workforce, manufacturing equipment and material
Sustainable manufacturing enabled by reduced waste and energy use	Circular metals strategy supported by efficient recycling loops and material recovery driven by government policy	Standards and best practice guidance for manufacturing and certification of AM components	Fast validation of product performance and shorten development cycle
Life cycle value extension through repair, remanufacturing and on-demand replacement	Building a skilled additive manufacturing workforce through advanced education initiatives	Improved cost, rate, scale and quality of AM processing to enable economic and sustainable applications	Automate design workflow for high-complexity geometries supported by process modelling
Reduced manufacturing cost through efficient, flexible, and rapid production	Adoption of circularity principles by UK industry, specifically supply chains	Support pull-through of emerging technology developments to integrate into the AM process and to exist in the supply chain	AI-supported part inspection and predictive quality
	Partner with powder suppliers and universities to develop and qualify new and recycled materials	Develop and apply priority AM technologies to process materials and create components to enable new applications and life extension	Implement technical and commercial training programmes, including apprenticeships and upskilling of existing roles
	Automate design workflow for high-complexity geometry supported by process modelling	Demonstrate an effective design workflow and digital thread, supported by material data, process simulation and process data capture	Develop end-to-end process chain that integrates with the AM processes
			Improve efficiency and efficacy of part inspection for QA, creating routes to rapid qualification

Additive Manufacturing – demand drivers

Improved component performance and next-generation design capabilities

Advanced design for AM enables complex geometries impossible with traditional methods, improving component functionality and system performance

Lightweight lattice structures reduce mass while maintaining strength, enabling higher-efficiency designs for demanding applications.

Integrated multi-material printing provides tailored properties, enhancing durability, thermal management, and in-service reliability.

AM-enabled part consolidation will reduce assembly steps and improving operational robustness across product lifecycles.

Digital design workflows link simulation and AM processes, accelerating innovation and reducing development time for advanced components

Reduced manufacturing cost through efficient, flexible, and rapid production

On-demand, distributed manufacturing reduces inventory, tooling expense, and long supply-chain reliance.

Rapid iteration cycles minimise rework and development lead times, delivering faster, more cost-effective product refinement.

Tool-less production enables economical low-volume and customised manufacturing compared with traditional forming or machining.

Automated AM workflows improve process repeatability and reduce labour-intensive steps, lowering total cost per part

Advanced design for AM reduces material use by building only required geometry, lowering waste and production costs.

Sustainable manufacturing enabled by reduced waste and energy use

Near-net-shape AM reduces machining operations and associated energy consumption across production lines

Recycled metal powders and polymers extend material life and reduce environmental impact of feedstock sourcing

Digital monitoring optimises build parameters to reduce energy demand and minimise process variability

AM enabled localised production supply chains, decreasing transport emissions and improving environmental performance across supply chains

Process optimisation minimises scrap generation, supporting circular economy goals and resource efficiency

Integration of advanced digital tools, data processing, and industry 4.0 frameworks

Sensor-rich AM equipment with real-time monitoring systems to capture detailed build data for improved control

Develop interoperable data standards enabling seamless communication between design software, AM machines, and downstream inspection processes

Implement automated analytic pipelines that convert raw AM process data into actionable insights for quality assurance

Use digital twins and predictive modelling frameworks to optimise AM workflows, reduce variability, and enhance production efficiency

Create digital warehouse to enable on demand manufacturing of replacement components without the requirement of a physical inventory

Life cycle value extension through repair, remanufacturing, and on-demand replacement

AM repair techniques restore high-value components, reducing replacement needs and extending operational asset life.

Precision deposition enables targeted refurbishment of worn features, improving component performance and durability.

Digital twins support predictive maintenance and AM-enabled repair planning across complex industrial assets.

Customised AM overlays enhance surface properties for improved wear, corrosion, and thermal resistance.

On-site AM repair capabilities reduce downtime and cost, strengthening resilience of critical systems and infrastructure.

Hoda Amel
MTC
Hoda.amel@the-mtc.org

UKRI Innovate UK

Strategic summary

Additive manufacturing is transforming UK industry through innovative component design, efficient digital production, and sustainable, low-waste processes. It extends asset life, reduces costs, and strengthens supply-chain resilience. By enabling advanced materials, rapid iteration, and distributed manufacturing, AM underpins a more competitive, adaptable, and future-ready high-value manufacturing economy.

IUK Strategic imperatives

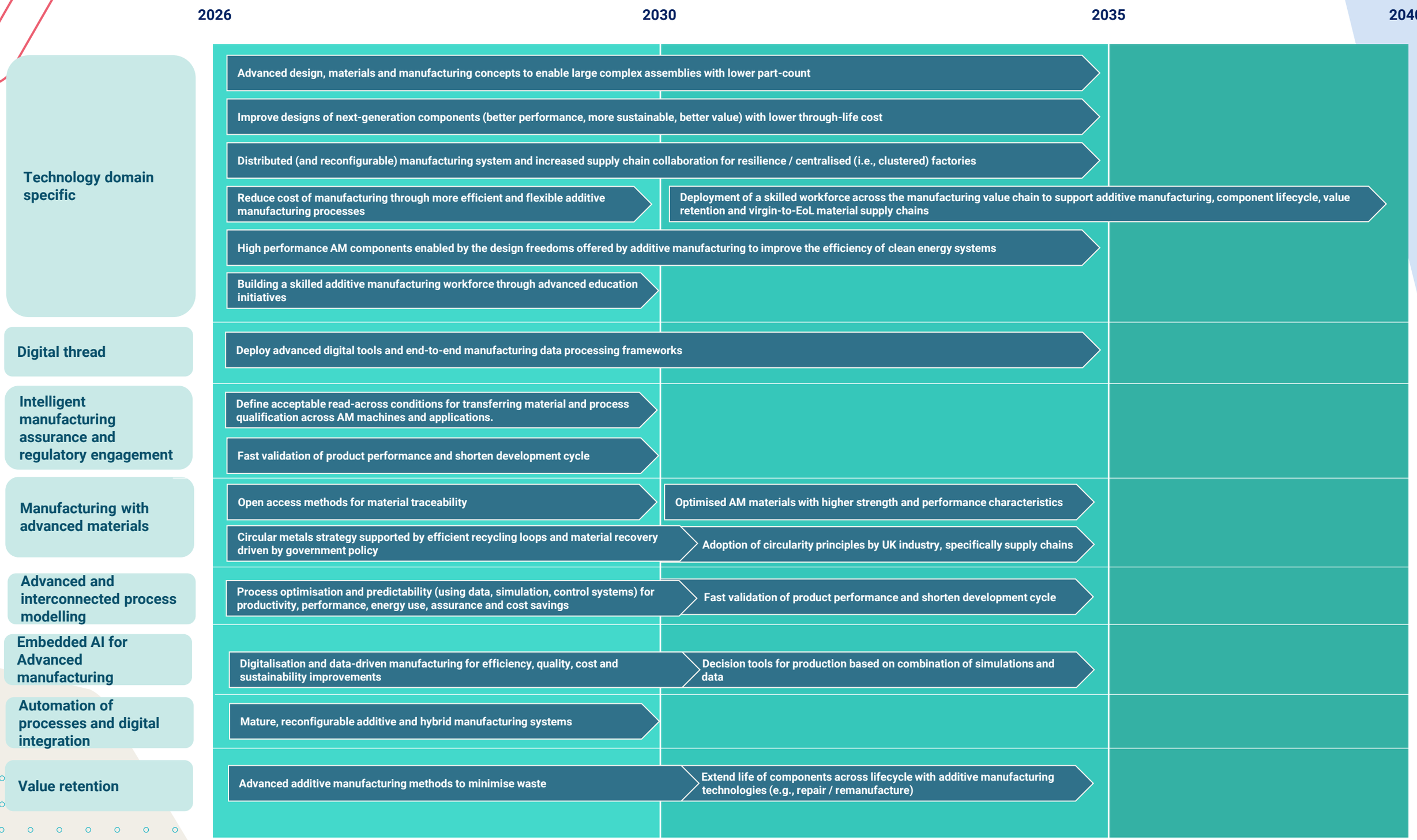
Innovative and digital

Resource-efficient and regenerative

Resilient and responsive

Skilled and empowered

Additive Manufacturing – Industry capability needs



Additive Manufacturing – Innovation requirements

	2026	2030	2035	2040
Technology domain specific	Drive market demand by proving AM's superiority through cost models that highlight value-add and hidden savings overlooked by conventional methods		Pull-through AM technology developments providing step changes in rate/scale/quality	
	Identify areas of strength and weaknesses for UK considering scale-up predictions for key sectors	Explore "digital warehouse" concept for spare parts qualified for AM		
	Post-process development for improving part performance and manufacturing efficiency	Achieve mature, scalable additive manufacturing processes capable of producing larger, high-quality components with consistent reliability		
	Implement AM-focused technical and commercial training programmes, apprenticeships, and skills pipelines to develop a highly capable, future-ready manufacturing workforce			
Digital Thread		Demonstrate end-to-end digital thread		
		Establish HVM Catapult data sharing and ability to share externally, adopting data management structures in line with existing standards		
	Ensure trustworthy, application-ready material property data generated from real additive manufacturing builds			
		Increase digitalisation and process control towards closed-loop for improved quality		
Intelligent manufacturing assurance & regulatory engagement	Improve efficiency and efficacy of part inspection for QA, creating routes to rapid qualification		Continuous improvement of the standards / data sets to keep up with technology developments	
	Clarify current AM standards, certification routes and regulatory for priority sectors and applications, and create practical user guide	Encourage adoption of standardised guidelines across industry		
	Identify where standards are lacking and need support for development			
Manufacturing with advanced materials	Partner with powder suppliers and universities to develop and qualify new and recycled materials	Unlock next-generation higher-value applications through multi-material, functionally graded components and establishing linked design workflows		
	Focus on materials to enable priority industrial applications and support development of emerging high-potential materials			
Advanced and interconnected process modelling	Automate design workflow for high-complexity geometry supported by process modelling	Embed modularisation, DFX and dismantling principles into design standards		
	AM process Modelling for improved performance and reliability for priority applications			
Embedded AI for advanced manufacturing	Develop intelligent in-situ process monitoring using AI to analyse build behaviour and detect deviations instantly	Validate AI-optimised adaptive control systems that autonomously adjust parameters to ensure consistent, high-quality AM production		
		AI-supported part inspection and predictive quality		
Automation of processes and digital integration	Establish rapid build strategies in powder bed systems for increased productivity and cost reduction	Demonstrate automation for scaled-up production, particularly focusing on downstream process steps		
Value retention	Mature the reuse and recycling of raw materials	Modular design, DfAM methodologies and end-of-life disassembly considerations into additive manufacturing design standards.	Encourage adoption of interchangeable AM processes and interoperable process chain steps	
	Advance repair, reconstitution, and recycling technologies to return materials to prime quality			
Harmonised life cycle Analysis	Fill data gaps in lifecycle assessment databases for priority equipment & materials	Establish LCA databases and carbon accounting standards to measure sustainability across AM		
	Support improvement of standards/data sets to measure environmental impact			

Additive Manufacturing: priority pathways

2026 | 2027 | 2028 | 2029 | 2030 | 2031 | Industry deployment and further innovation | 2035

Improved component performance & next-generation design capabilities

Integration of advanced digital tools, data processing, and industry 4.0 frameworks

Sustainable manufacturing enabled by reduced waste and energy use

Reduced manufacturing cost through efficient, flexible, and rapid production

Lifecycle value extension through repair, remanufacturing, and on-demand replacement

Automate design workflow for high-complexity geometry supported by process modelling

Implement AM-focused technical and commercial training programmes, apprenticeships, and skills pipelines to develop a highly capable, future-ready manufacturing workforce

Demonstrate end-to-end digital thread

Pull-through AM technology developments providing step changes in rate/scale/quality

Establish rapid build strategies in powder bed systems for increased productivity and cost reduction

modular design, DfAM methodologies, and end-of-life disassembly considerations into additive manufacturing design standards

Identify areas of strength and weaknesses for UK considering scale-up predictions for key sectors

Achieve mature, scalable additive manufacturing processes capable of producing larger, high-quality components with consistent reliability

Establish HVM Catapult data sharing and ability to share externally, adopting data management structures in line with existing standards

Support improvement of standards/data sets to measure environmental impact

Encourage adoption of standardised guidelines across industry

Digital tools that enable an effective design workflow and digital thread

Improved cost, rate, scale and quality of AM processing to enable economic and sustainable applications

Standards and best practice guidance for manufacturing and certification of AM components

Diagram Legend

Demand drivers
Why change is needed

Industry capability needs
What capabilities industry needs to respond to these challenges

Innovation requirements
How capabilities must develop

Priority industry capability needs
The most critical capability gaps identified through industry consultation that be addressed first to deliver impact

Industrial strategy growth-driving sectors

Department for Business & Trade

Foundation Industries | **Clean Energy Industries** | **Digital & Technologies** | **Life Sciences** | **Advanced Manufacturing** | **Defence**