Additive Manufacturing – strategic value to UK industry

LIGHT project showcase event
26 April 2016, Bristol

Robin Wilson
Lead Technologist, Manufacturing

Innovate UK
• Innovate UK - our new Delivery Plan

• Strategic value of additive manufacturing

• Connected Digital Manufacturing
  - Fourth Industrial Revolution
The UK’s innovation agency

We know that true innovation disrupts. It will create new products, services and industries that we don’t even know about yet.

It’s our vision to help the UK economy grow head and shoulders above other nations by inspiring and supporting pioneering UK businesses to create the industries of the future.

We already have a strong track record of driving growth, by working with companies to de-risk, enable and support innovation.
up to £13.1bn return to the economy

7,600 organisations supported

£ up to £7.30 of GVA for every £1 invested

helped to create 55,000 jobs

>7 jobs created for every business invested in
A new phase

• The start of a new Spending Review period, 2016-20
• The government plans to publish a National Innovation Plan in 2016.
• Part of this will be Innovate UK’s new strategy, describing our aims over the next four years.
• Meanwhile our Delivery Plan explains what we are doing in the first year of this new phase – the financial year 2016/17.
“Whether you have a small or large business or are involved in any way in innovation, this plan will explain how we are working this year to accelerate its pace - and ultimately increase UK productivity and growth.”

*Ruth McKernan, Chief Executive*
Important changes

We are:

• aligning our programmes into new **simpler sector groups**
• changing our sector **funding competitions** to be simpler and broader in scope
• enhancing our **innovation networks** - nationally and regionally
• piloting competitions for **new innovation finance products**
• Introducing a new online **competition applications system** – the Innovation Funding Service.
5-point plan

1. Working with the research community and across Government to turn scientific excellence into economic impact

2. Accelerating UK economic growth, nurturing small, high-growth companies with strong productivity and export success

3. Building on innovation excellence throughout the UK, investing locally in areas of strength

4. Developing Catapults within a national innovation network

5. Evolving our funding models; helping public funding go further
Sector focus to accelerate growth

Emerging and Enabling Technologies
Identifying and investing in technologies and capabilities that will lead to the new products, processes and services of tomorrow

Health and Life Sciences
Focused on agriculture and food and healthcare, underpinned by bioscience and medical research and enabled by engineering and physical sciences

Infrastructure Systems
Optimising transport and energy systems and integrating them with other systems such as health and digital

Manufacturing and Materials
Advancing manufacturing readiness so R&D and technology developments increase productivity and capture value in the UK
Funding: simpler competitions

- Two broad competitions for funding in each sector group this year; each open to a much wider range of applications than previously.
- An ‘open’ funding programme – with two rounds per year - for applications from any technology area or sector.
- Competitions and programmes run in partnership with other public sector organisations.
Our budget

- £137 million
- £150 million
- £117 million
- £71 million
- £86 million

£561m Core budget for 2016/17

- Emerging and Enabling Technologies 15%
- Infrastructure Systems 27%
- Open Programme 13%
- Manufacturing and Materials 24%
- Health and Life Sciences 21%
This year we will:

- Run two broad Manufacturing and Materials competitions
- Continue investing in the High Value Manufacturing Catapult, including the new National Formulation Centre and Graphene Centre
- Run an Additive Manufacturing competition (opens 23 May)
- Run a Manufacturing Readiness competition focusing on later-stage innovation
- Run a Connected and Autonomous Vehicles 2016 competition
- Continue our delivery partnership with the Advanced Propulsion Centre and Aerospace Technology Institute
- Continue the Integrated Delivery Programme - a delivery partnership with OLEV
Strategic value of additive manufacturing

Multi-sector application
- Aerospace
- Automotive including motorsport
- Consumer goods including sport, leisure and jewellery
- Defence
- Energy
- General industrial products including machinery and equipment
- Health, pharmaceuticals and medical equipment
- Space
- Transport including rail and marine

Value leverage
AM has already become a crucial lever to enable some companies to compete, eg: having one critical AM component within a high performance system, such as a jet engine or F1 race car, can transform the performance of the entire product and make the difference between commercial success and failure.

“We will not print all of our aero engines, but we cannot be an aero engine manufacturer in the future without AM”
Neil Mantle, Rolls-Royce plc
We estimate a potential £1.1 billion of additional GVA can be created in the UK economy by 2021, with just 2 sectors (Business Services and Machinery & Equipment) representing 75% of this value.

Figures based on Annual Business Survey (Nov 2015) for selected SIC codes and estimates by UK Strategy development group of how much AM will diffuse into each activity area by 2021 as a proportion of the current ABS £ figure, eg: 0.01%.

Which UK sectors will see revenues from AM direct production in 5 years’ time?

Growing to £5bn by 2025

Chart shows GVA split by Sector Families, total value £1.1bn
The Fourth Industrial Revolution – here, now!
Connected Digital Manufacturing
- the Fourth Industrial Revolution

Megatrends

- Additive manufacturing
- Advanced Robotics
- Autonomous Vehicles
- Biological processing
- Digital everything
- New Materials
The 6 key principles of Industry 4.0 are summarised as follows:

1. Interoperability: the ability of cyber-physical systems (i.e. workpiece carriers, assembly stations and products), humans and Smart Factories to connect and communicate with each other via the Internet of Things and the Internet of Services.

2. Virtualization: a virtual copy of the Smart Factory which is created by linking sensor data (from monitoring physical processes) with virtual plant models and simulation models.

3. Decentralization: the ability of cyber-physical systems within Smart Factories to make decisions on their own.

4. Real-Time Capability: the capability to collect and analyse data and provide the derived insights immediately.

5. Service Orientation: offering of services (of cyber-physical systems, humans or Smart Factories) via the Internet of Services.

6. Modularity: flexible adaptation of Smart Factories to changing requirements by replacing or expanding individual modules.
What could these principles look like for additive manufacturing?

1. More effective use of virtualisation, or smart simulation of the AM production process, created by linking sensor data (from monitoring physical processes) with virtual models of the machine platform.

2. Using data from analysis of the design specification and AM production process options to provide insights about technical feasibility, production cost and marketing impact, integrating this multi-disciplinary knowledge as instantaneous feedback within the design toolset.

3. Better interoperability between humans and the AM manufacturing process elements, achieved through innovation in machine or factory equipment, process monitoring and internet-enabled connectivity and messaging.

4. In-process validation during AM build, using high speed processing of layer integrity data to enable machines to make decisions on their own and automatically optimize the build process in real time.

5. AM build schedule driven directly by market data to minimize stock of slow-moving products and ensure quick supply of top selling items.

6. Modular approach to matching available production capacity with actual demand, by connecting customers to the optimum technology platforms and appropriate supplier options for their particular requirements.
Summary

• Additive Manufacturing remains a priority area for Innovate UK – dedicated AM funding call opens soon

• Strategic value of direct AM is multi-sector and estimated to be worth £5bn to UK by 2025, additional leverage effect of AM is hard to quantify

• Acquisition of AM design expertise/ production capability will become critical to the future success of many companies

• Start your journey now towards Connected Digital Manufacturing, actively embrace the 4th Industrial Revolution
We can’t stop thinking about the future

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Delivery Plan publication page plus questions document

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