
POLITECNICO
MILANO 1863
SKILLS4ADVANCED MANUFACTURING
Unlocking the Industrial Green Transition
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mecc
DIPARTIMENTO DI ECCELLENZA
MIUR 2018-2022

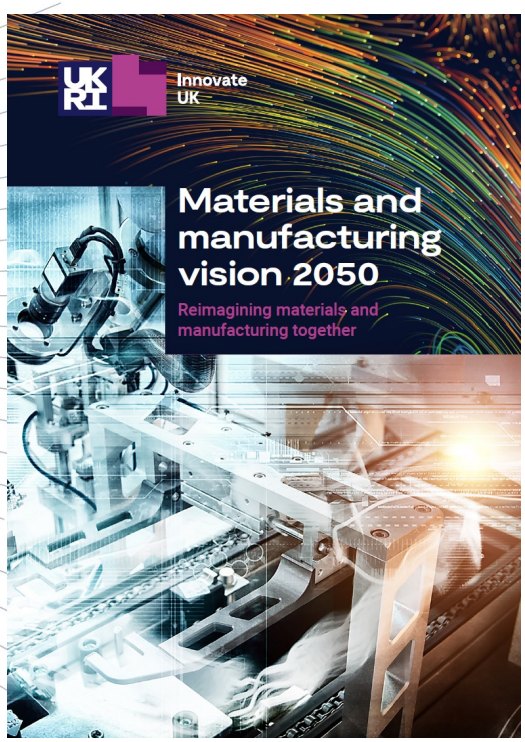

UNLOCKING THE INDUSTRIAL GREEN TRANSITION:
STRATEGIC ROADMAPS
HOLISTIC PERSPECTIVE
KEY ENABLING TECHNOLOGIES FOR A NEW GENERATION OF GREEN PRODUCTS AND PROCESSES

DIGITAL+GREEN – THE «TWIN» TRANSITION
Strategic Roadmaps in Manufacturing

NATIONAL STRATEGY FOR ADVANCED MANUFACTURING

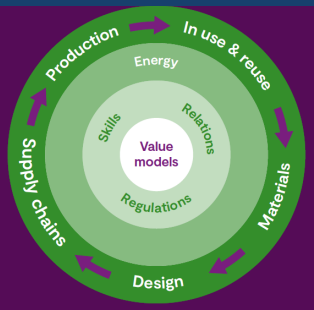
A Report by the
SUBCOMMITTEE ON ADVANCED MANUFACTURING
COMMITTEE ON TECHNOLOGY

of the
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL



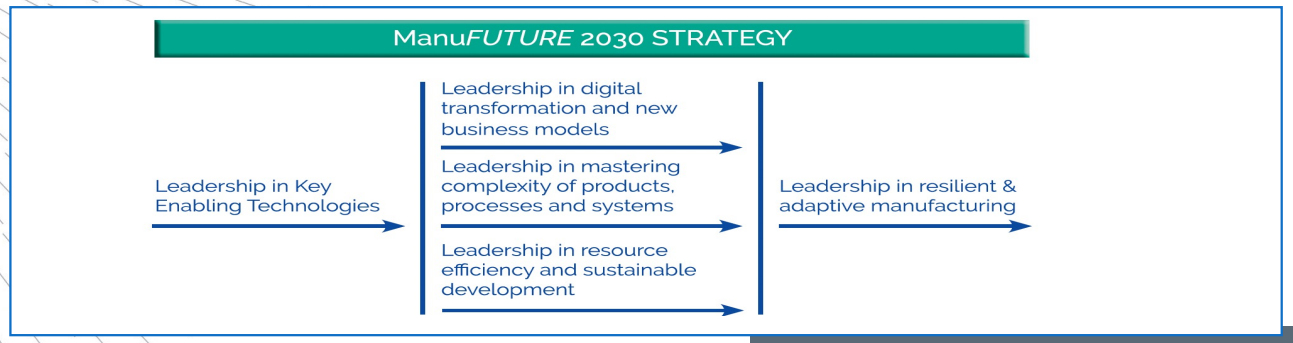
DIGITAL+GREEN – THE «TWIN» TRANSITION
Strategic Roadmaps in Manufacturing

- Enable clean and sustainable manufacturing to support **decarbonization**;
- Implement advanced manufacturing in support of the **bioeconomy**;
- Lead the future of **smart** manufacturing (additive Manufacturing);



The 3 strategic imperatives will be:

- net zero and resource efficient
- resilient and responsive
- technologically advanced and digital



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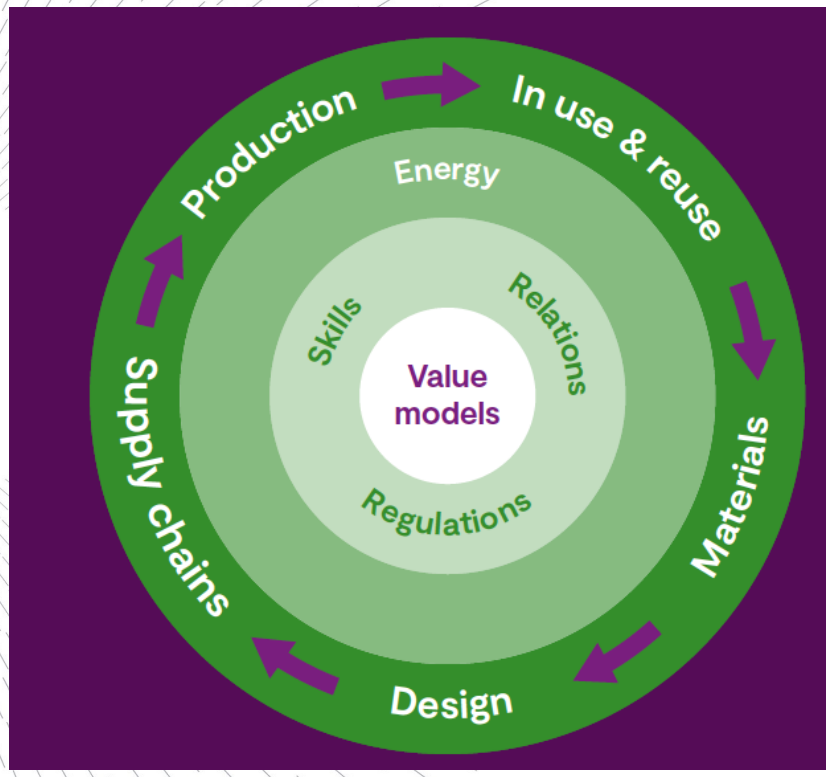
Strategic Roadmaps in Manufacturing



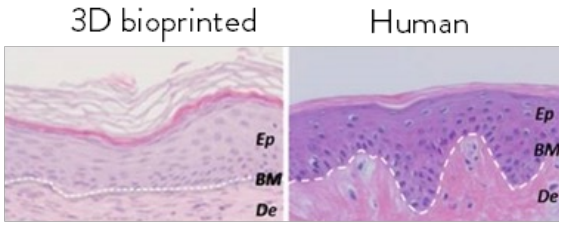
Holistic perspespective:

Design & Materials & Manufacturing

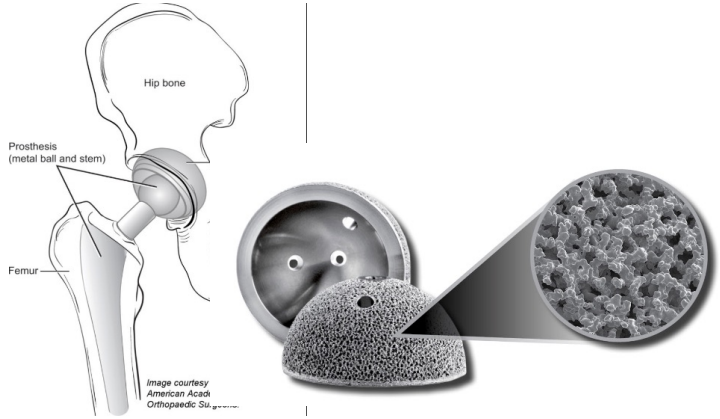
combining

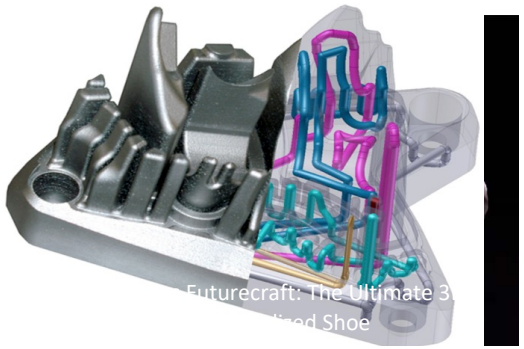
Skills & Relations & Regulations

What do they have in common?

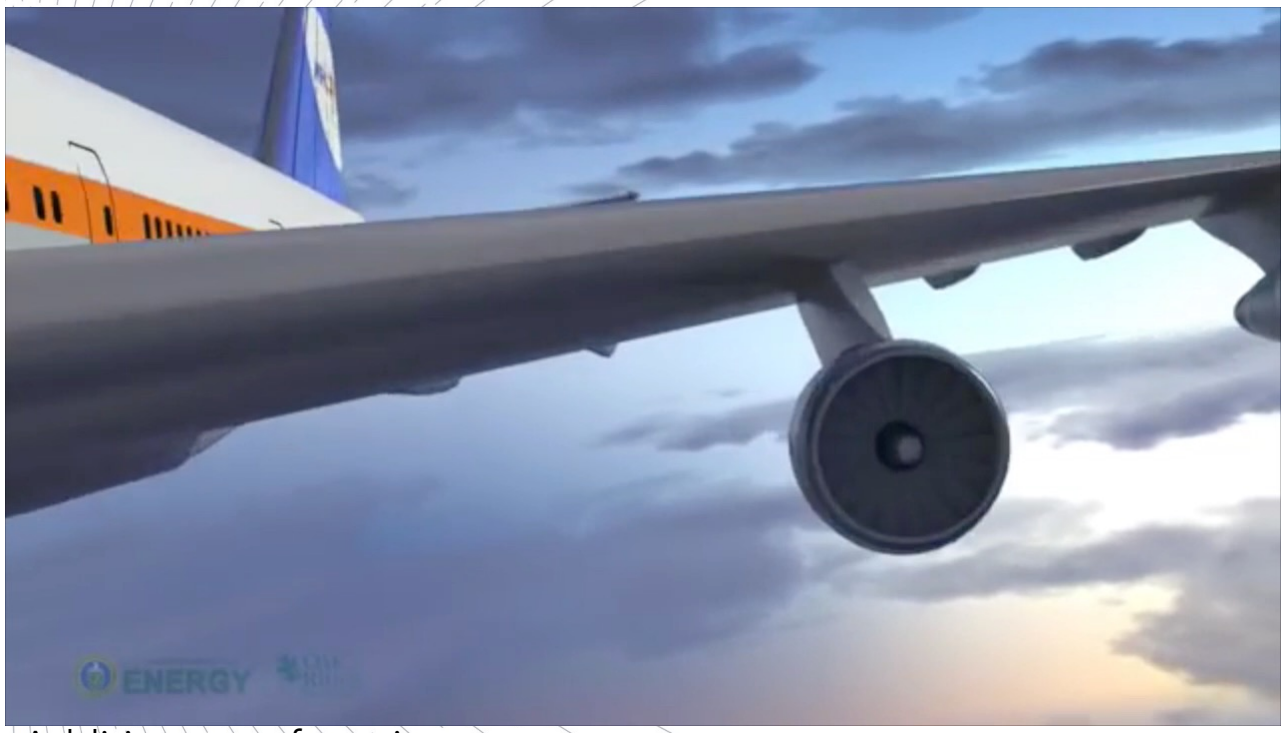


Bioprinted skin

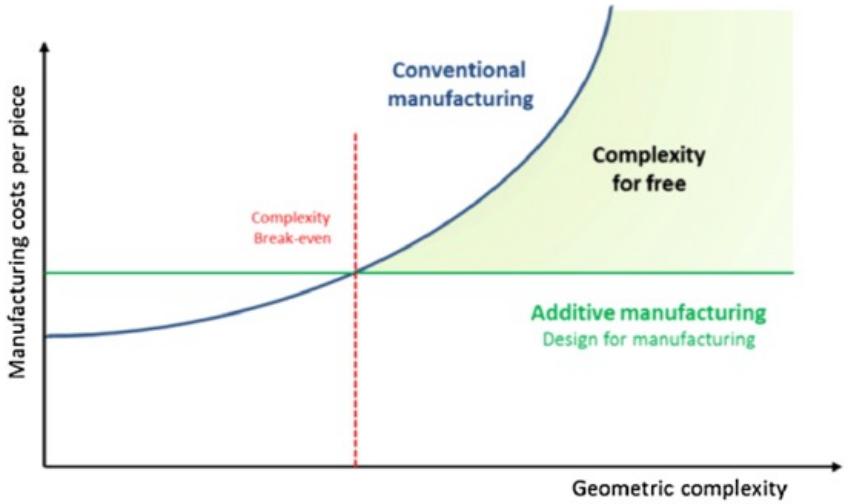




Additive Manufacturing - Complexity for free



An example of metal AM – power bed fusion via EBM



Additive manufacturing:
"the process of joining materials to make parts from 3D model data, usually layer upon layer, as opposed to subtractive and formative manufacturing methodologies."

The green transition

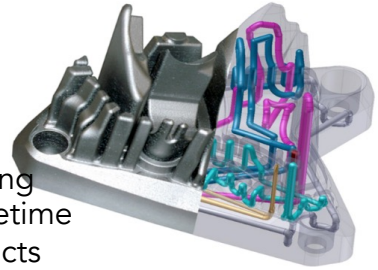
- Green performances
  lightweight, energy-efficient, small number of components, material just where needed
- First-time-right
- Zero-defect
- Circular (extend lifetime, repair, recycle)
- Produce when and where it is needed

Satellites: Bracket

- Weight reduction: - 60 %
- Waste reduction: - 98 %
- Cost reduction: - 53 %

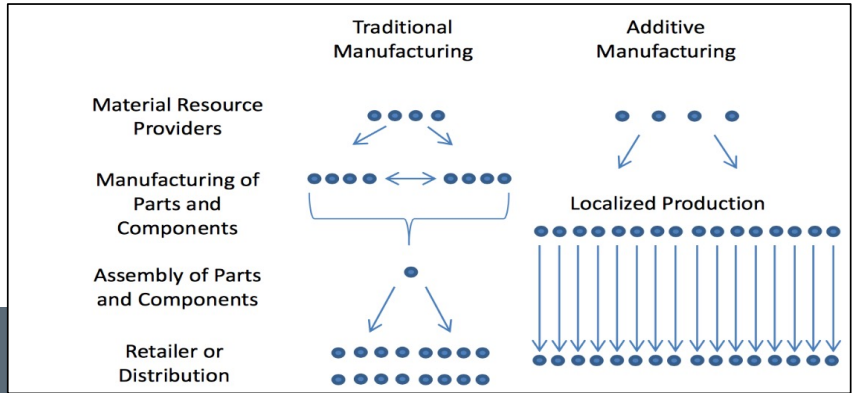
GE Fuel nozzle (Leap jet Engine)
- Reduce # components
- More durable (5X)
- 25% lighter (15% fuel savings)

- Material savings

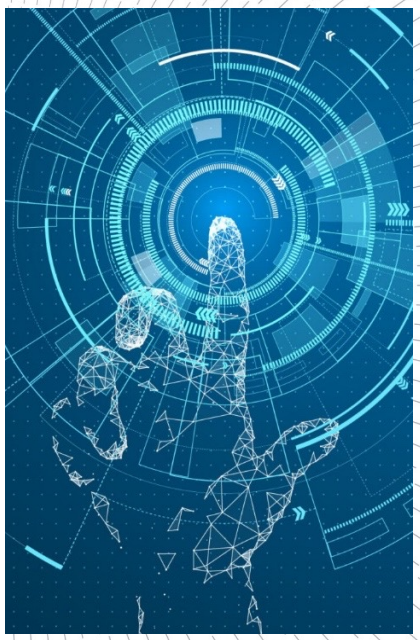


Conformal cooling
- Extended lifetime
- Reduce defects

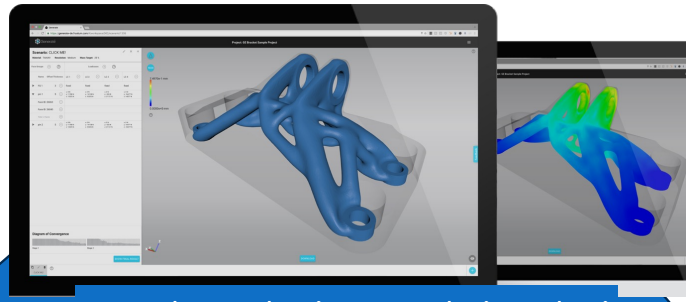
- «green» Supply chain



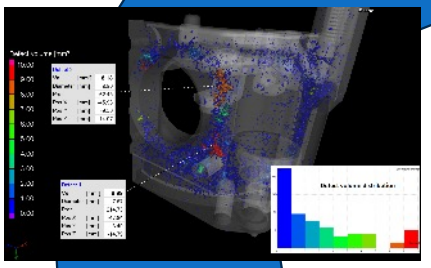
Digital transition



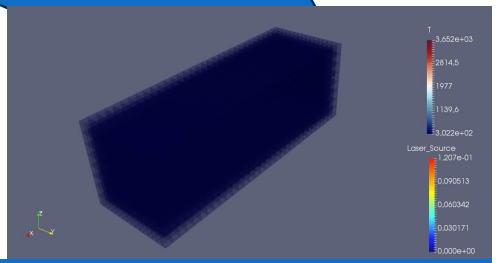
- From physical to digital
- Virtual process & product design (for customization)
- Smart process (real time monitoring and control)
- Digital twin
- IoT
- Cloud computing



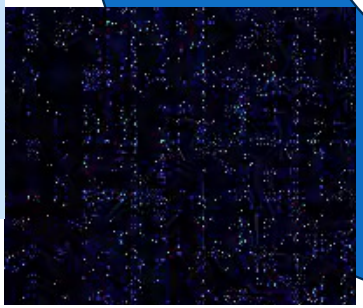
Product design and simulation



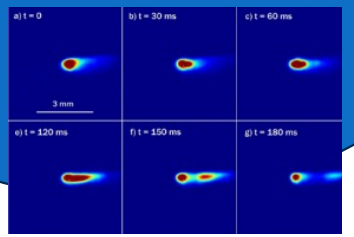
Qualification & testing

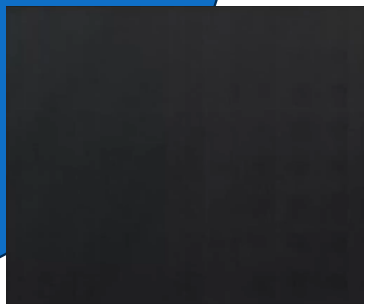


Process design and simulation



In-situ data mining





Projects and opportunities

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SAM
SECTOR SKILLS STRATEGY IN ADDITIVE MANUFACTURING

An Introduction to Sustainability for Additive Manufacturing

This industry expert led introductory course addresses the topics of:

- Sustainability policies
- Eco-design
- Product life cycle
- AM and sustainable production

Made in Italy Circolare e Sostenibile (MICS)

MICS

Extended Partnership funded by MUR to enable a fully closed-loop, self-sufficient, self-regenerative, reliable, safe, and energy-aware design and manufacturing of Made in Italy products and services.

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THANK YOU!

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