

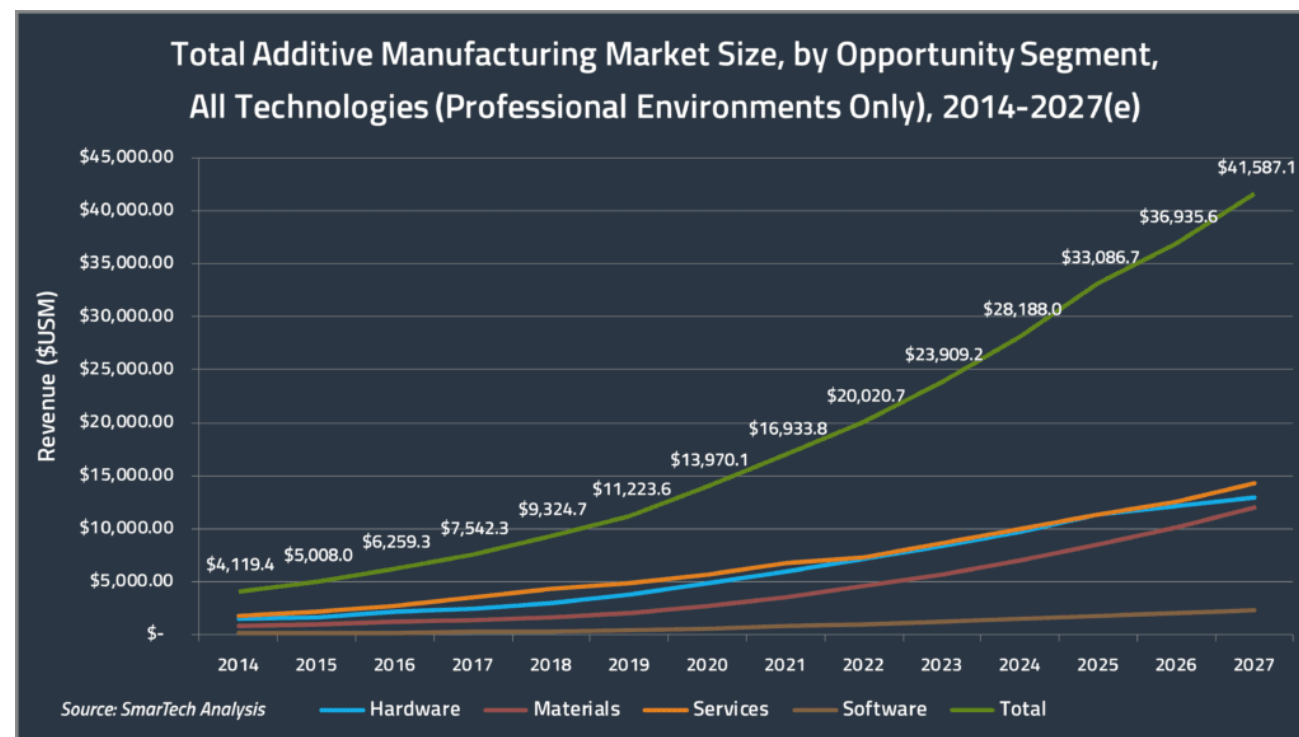
# AM Future

Industry Growth  
Sustainability  
Software  
Technology Developments

# AM

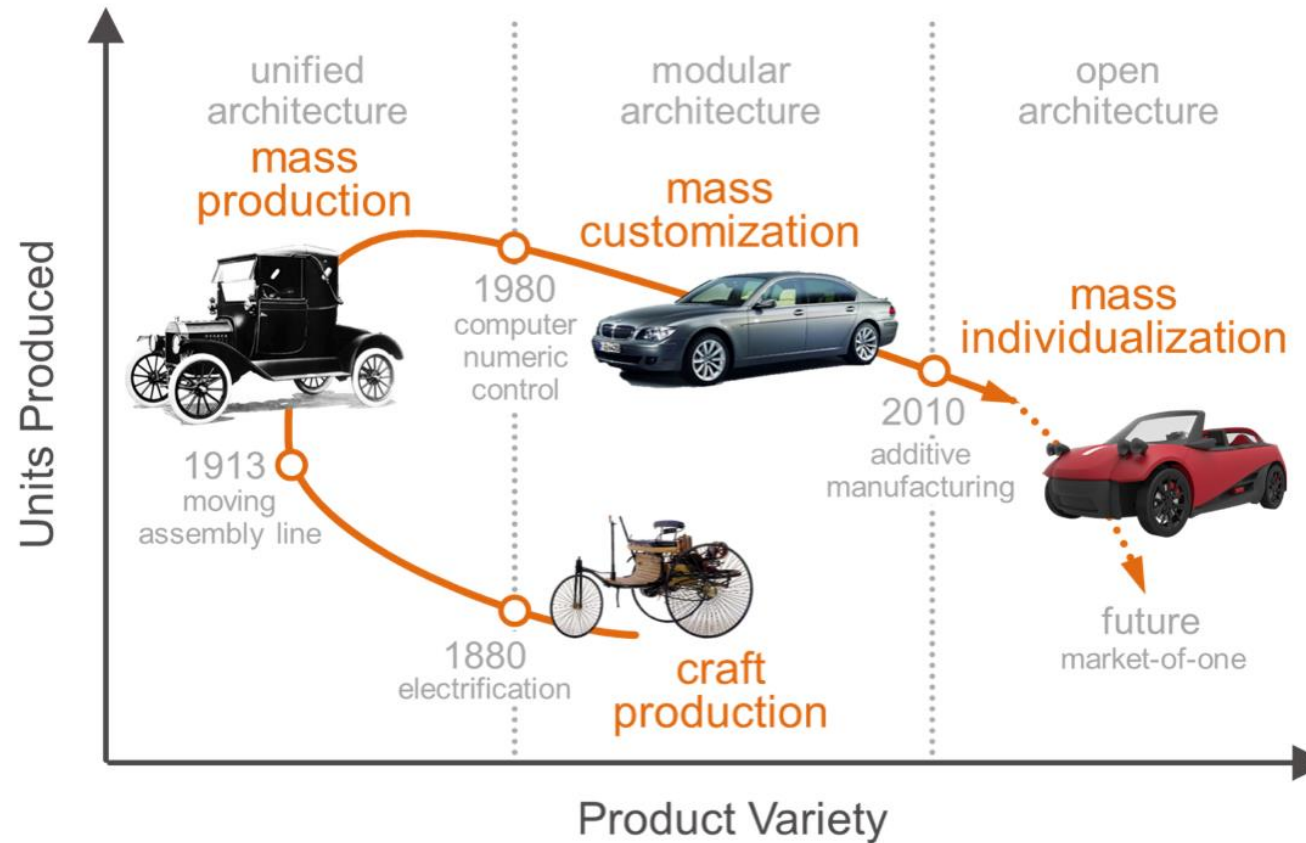
## Road to mainstream adoption

- Previously AM was only viewed as a prototyping solution
- Today, AM is gradually becoming mainstream (Improving materials, properties, consistency, speed and costs)
- Companies have only recently started exploiting the benefits
- AM won't replace conventional processes, but it will become a viable production method to be used on par with other technologies



# AM

## Production History & Future



# Improved Sustainability

## Through Design

- AM allow parts to be lighter, with less material and less parts (through consolidation). Contrary to conventional manufacturing, removing material does not increase lead time, cost and waste
- With AM being an automated process, there is less risk (compared with welding for example), so less waste
- Sustainable benefits come from both the manufacturing process itself and the end us application

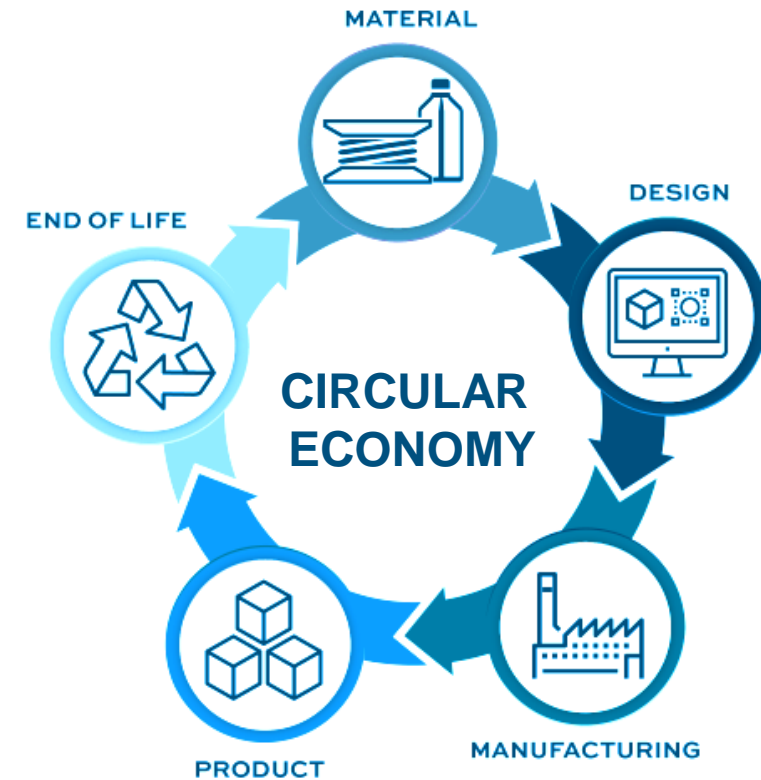
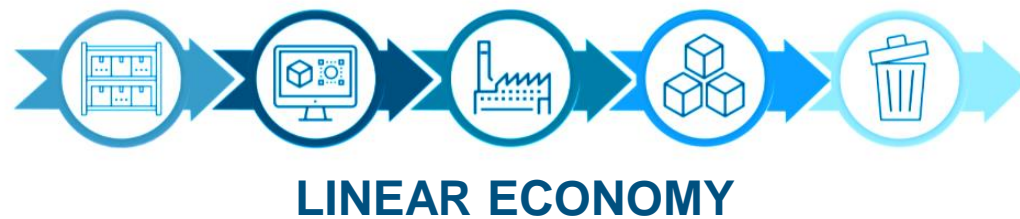


Source: [additivemanufacturing.media](http://additivemanufacturing.media)

# Improved Sustainability

## Linear vs Circular Economy

- Increasing sustainability awareness mean companies are looking to go from a linear to circular economy model



Source: [additivemanufacturing.media](http://additivemanufacturing.media)



# Improved Sustainability

## Through Materials

- A growing number of manufacturers are providing recycled and bio-degradable polymers (like PLA)
- Companies are converting their post-production plastic waste into filaments to be used by 3D printers
- The focus now is to recycle waste from the customers to close the circular loop on plastic production



Source: [additivemanufacturing.media](https://additivemanufacturing.media)

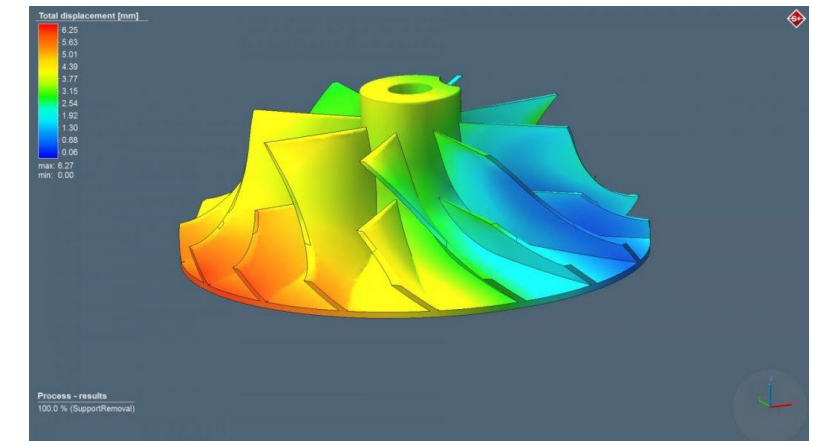


Source: Dezeen

# Improved Sustainability

## Through Software

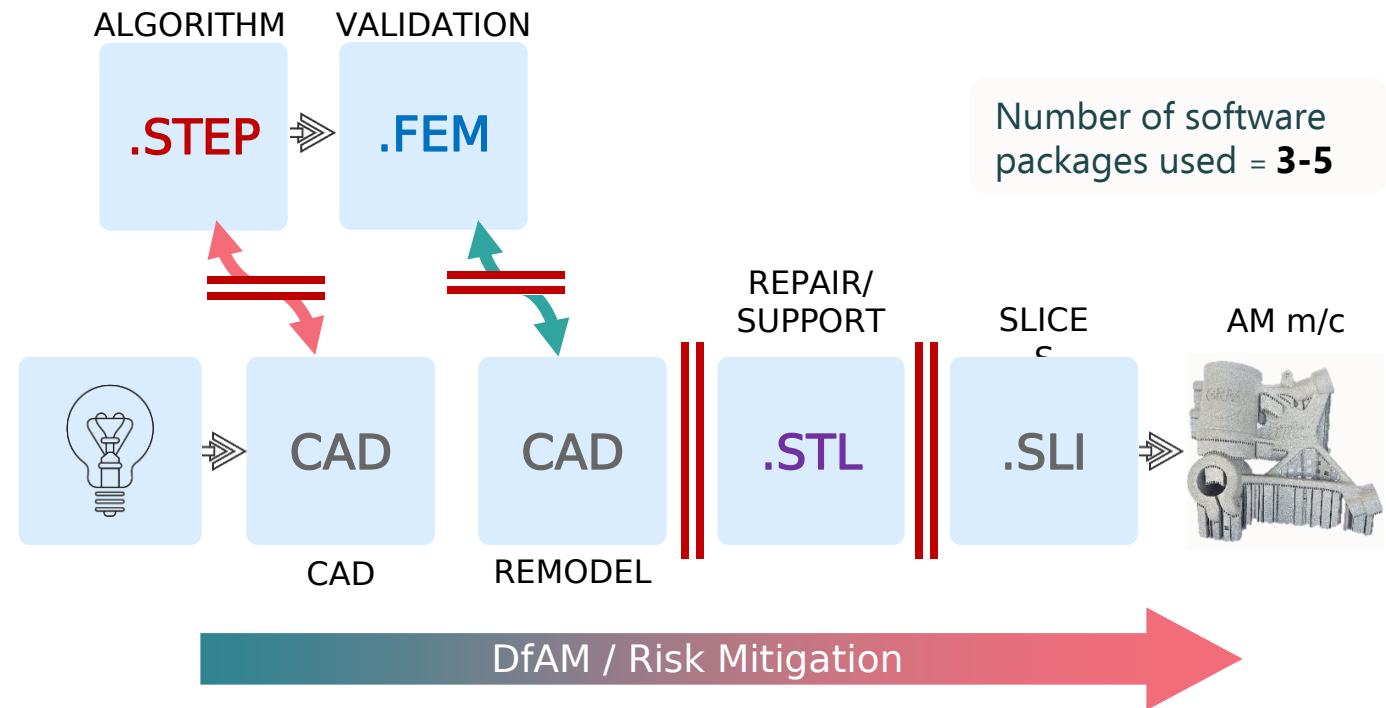
- AM tailored software tools are becoming increasingly more advanced:
  - Topology optimisation
  - Generative design
  - Build preparation
- Ability to create complex structures
- Rapid prototyping is being replaced with digital prototyping through process (or build) simulation software



# Software

Past → Today

- CAD packages not optimised for the design requirements of AM
- Limited capability to create complex structures, and difficult to create graded materials, complex lattice structures or model porosity
- Fragmented Workflow - Forced to switch between different software solutions
- Limited to STL models

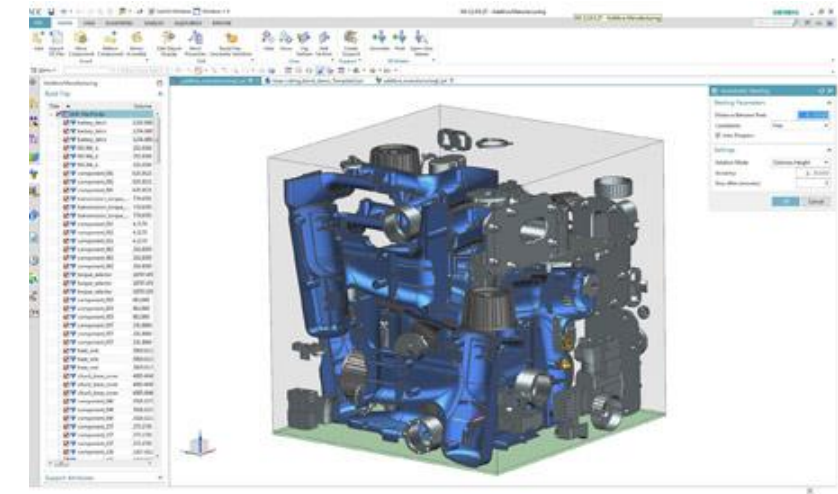
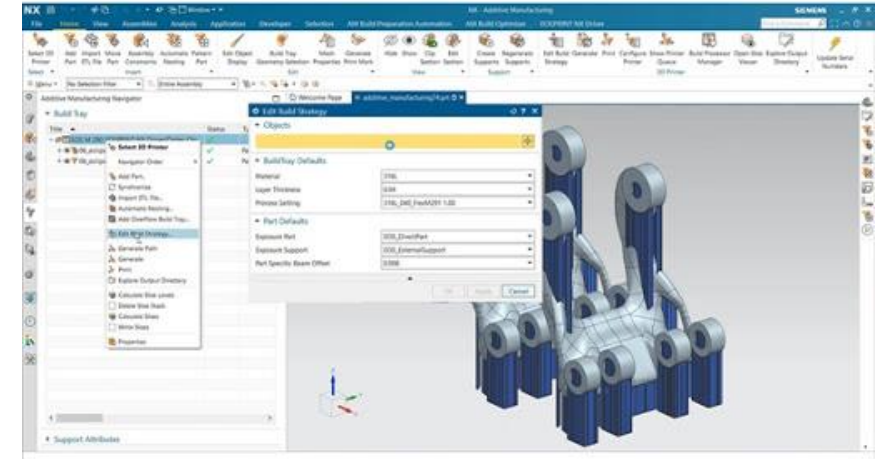




# Software

Today → Future

- Fully integrated workflow from design to build preparation and from simulation to post-build analysis
- No need to switch between different software
- CAD packages tailored for the needs of DfAM
- 3mf acceptance
- Direct slicing



# Technology Development

## AI Integration & Closed Loop Systems

- Inkbit (US based start-up), are developing a multi-material inkjet 3D printing “with eyes and brains”!
- Each layer is scanned at micron resolution immediately after deposition, meaning;
  - Geometry deviations are compensated in real time by remapping the next layer (closed loop system)
  - Enables material behaviour prediction (AI)
  - Quality control
- All this would mean
  - Better quality parts
  - Greater consistency
  - Less waste

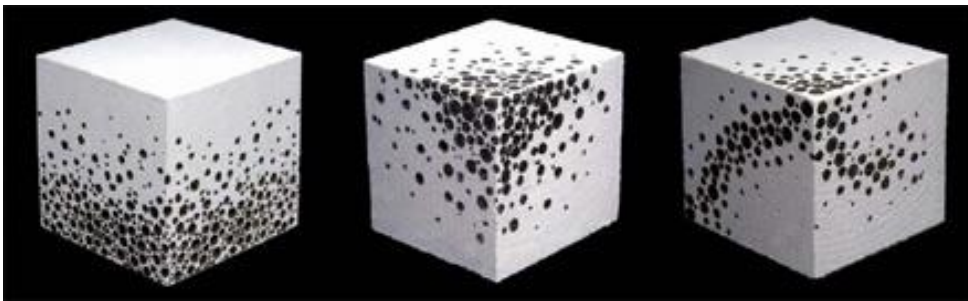


Source: inkbit

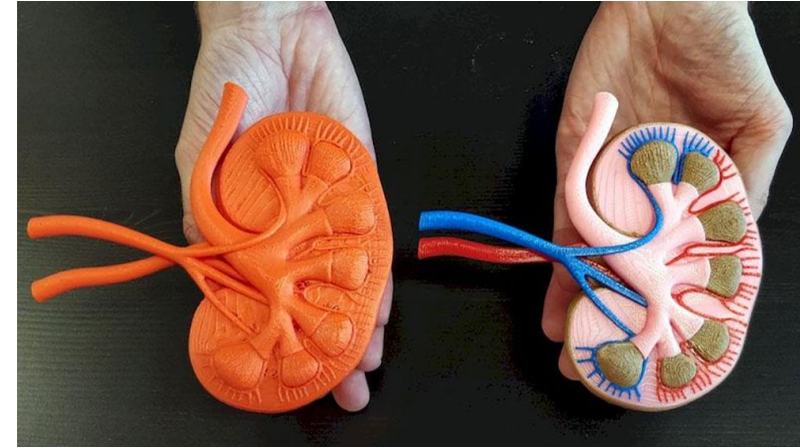
# Technology Development

## Multi-Material/Graded Properties

- Multi-material
- Multi-colour
- Functionally graded material/properties
- Stiffness / flexibility
- Volumetric variation through a part



Source: architects24



Source: SolidSmack



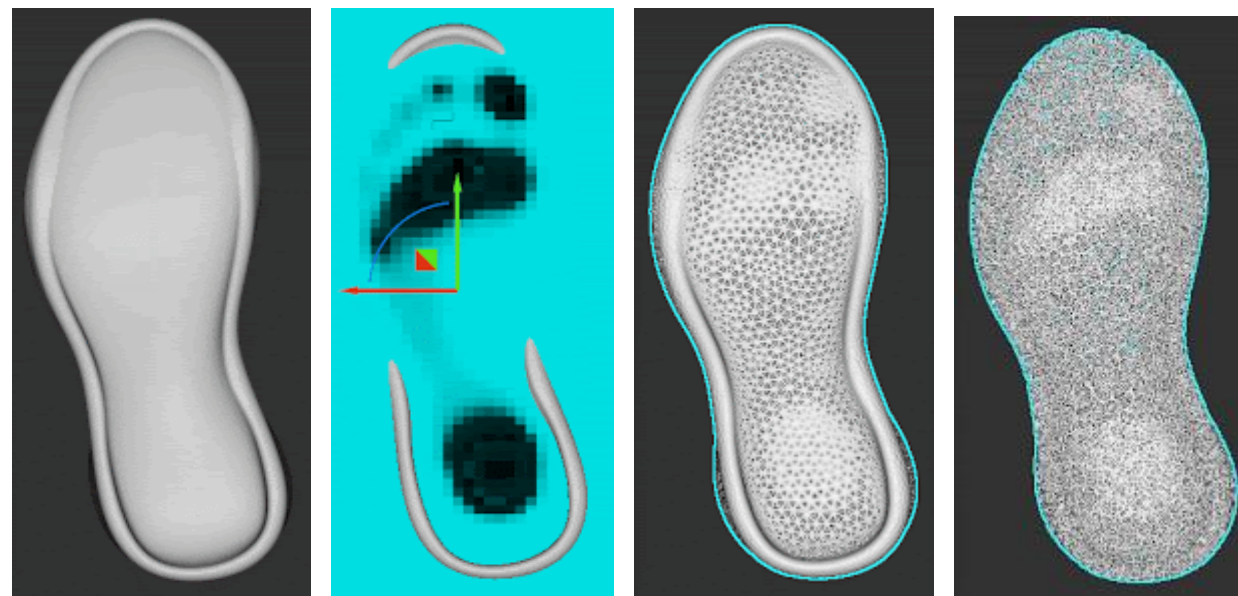
Source: Stratasys



# Technology Development

## Field Based Design

- Use 3D mathematical fields to drive design
- Pressure, temperature, airflow velocity, electromagnetic and mechanical stress are examples of what field inputs
- AM has the capability to manufacture the complex nature of the geometries



Source: nTopology

# AM Future

## Summary

- AM is an exponentially growing industry and becoming much more widely adopted
- AM is disrupting the manufacturing industry, however it is not here to replace conventional processes
- Push towards sustainability
- Software are becoming more optimised for AM and improving in capability. Push towards an integrated workflow
- Technology advancements include AI adoption, multi-material, material property control, improved quality analysis tools