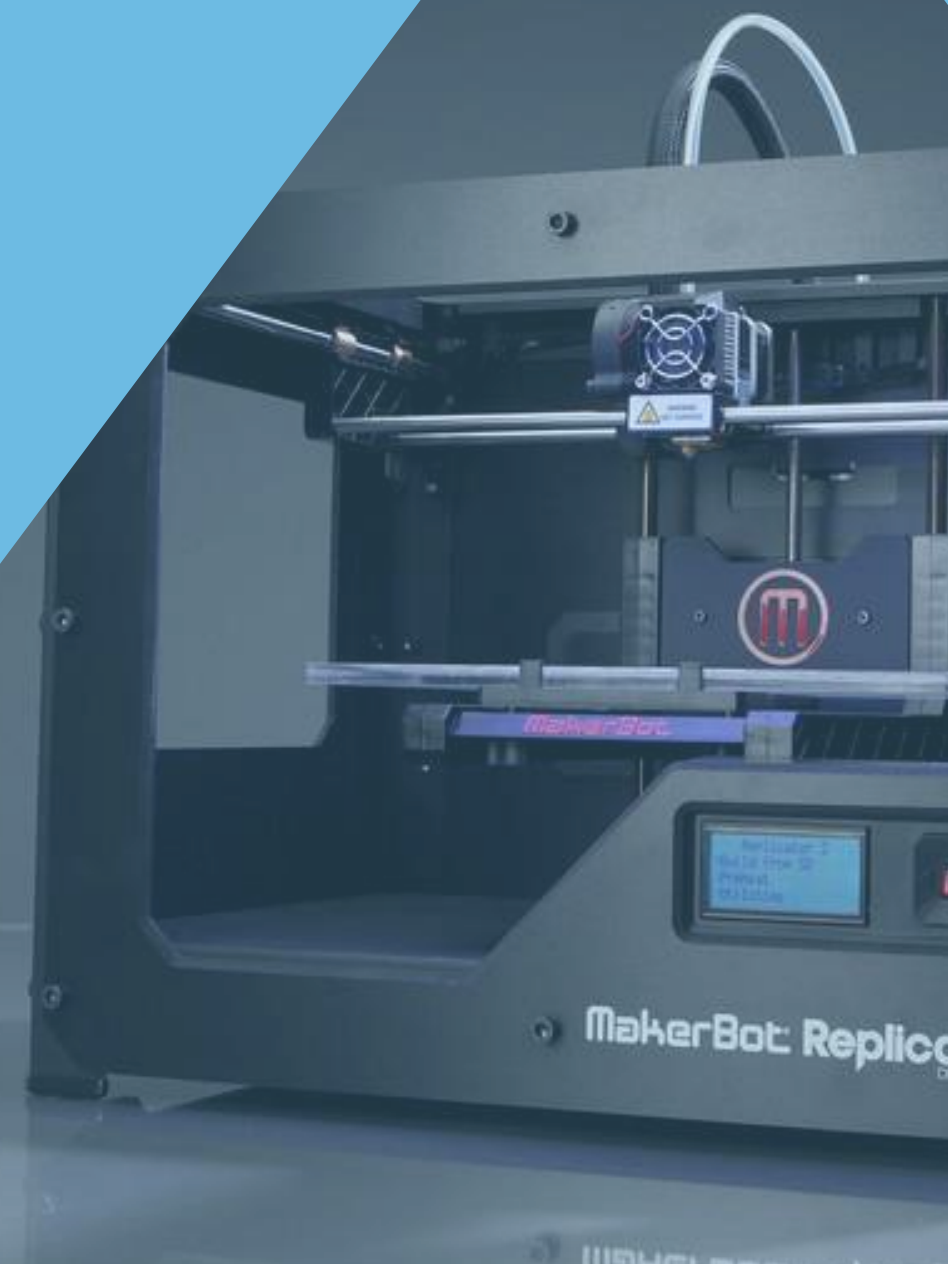


# 3DP PAN EU Webinar

## *Additive Manufacturing in the EU – Report on the EU Demonstration 3D Printing Industry*



# Programme

10:00	<b>Welcome and Introduction</b> <i>Tim Daniels – Brainport Development</i>
10:05	<b>3DP PAN EU Background</b> <i>Milda Vitkauskaitė - CIVITTA</i>
10:15	<b>Key results from the study on Additive Manufacturing in the EU</b> <i>Jean-François Romainville – IDEA Consult</i>
10.45	<b>Expert views on the Additive Manufacturing Industry</b> <i>Christian Wögerer - ProFactor</i>
11.05	<b>3D Printing needs of SMEs</b> <i>Carolina Lavecchia - REJOINT</i>
11:25	<b>Role of international facility centres in the European Additive Manufacturing industry</b> <i>Luca Tomesani – University of Bologna</i>
11:45	<b>Q&amp;A</b>
11:55	<b>Closing remarks and next steps</b> <i>Marshall Hsia – European Commission</i>

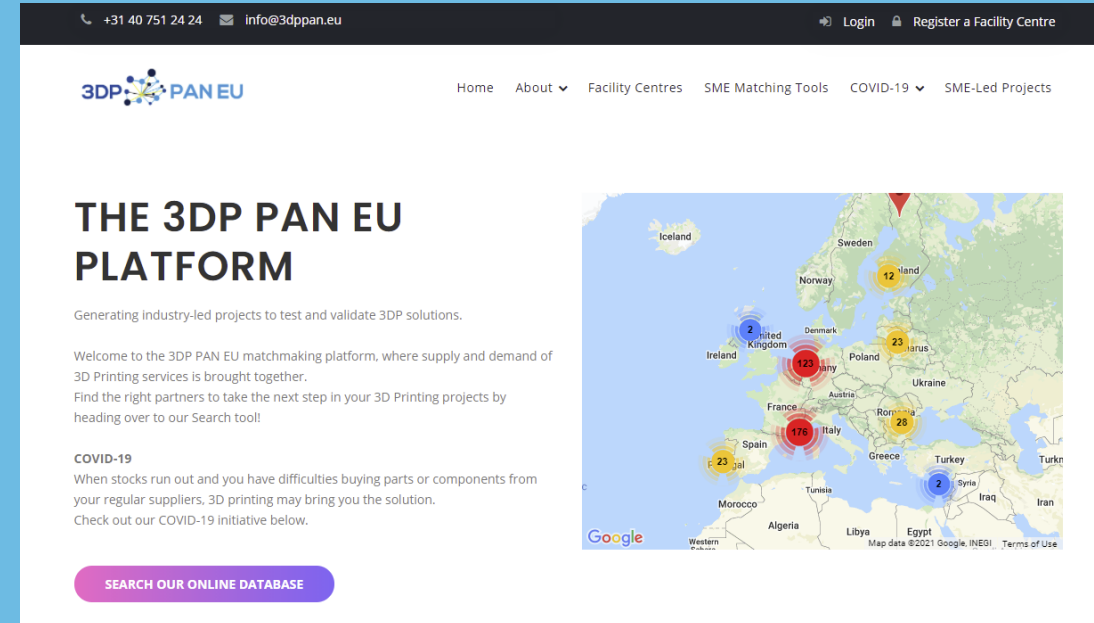
# 3DP PAN EU Background

- European Parliament pilot action
- Goals
  - Fostering awareness, knowledge and uptake of 3D Printing
  - Promoting SME access to high quality AM services
- Core activities
  - Launching and managing the 3dppan.eu online platform
  - Call for SMEs – 10 SME led industrial demonstration/validation projects
  - Analysis: EU Market for AM demonstration equipment and services
- Project consortium

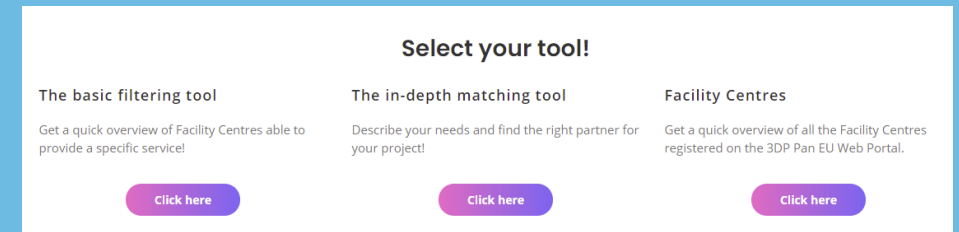


# 3DP PAN EU Activities

- 3dppan.eu online platform launched March 2020
  - Matchmaking tools designed to bridge supply & demand
- Call for SMEs
  - 10 SME led industrial demonstration projects currently ongoing
- Analysis: EU Market for AM demonstration equipment and services
  - Ongoing, final delivery October 2021



The screenshot shows the homepage of the 3DP PAN EU platform. At the top, there is a dark navigation bar with contact information (+31 40 751 24 24, info@3dppan.eu) and links for Login and Register a Facility Centre. Below this is a white header with the 3DP PAN EU logo and a main navigation menu (Home, About, Facility Centres, SME Matching Tools, COVID-19, SME-Led Projects). The main content area features the title "THE 3DP PAN EU PLATFORM" and a sub-header "Generating industry-led projects to test and validate 3DP solutions." A welcome message follows, stating the platform's purpose for bringing supply and demand of 3D printing services together. A "COVID-19" section mentions difficulties in buying parts and promotes the platform's initiative. A purple button labeled "SEARCH OUR ONLINE DATABASE" is positioned below the text. To the right, a map of Europe displays various countries with colored circular markers and numbers, indicating the presence of facility centers or projects in specific regions.



This section, titled "Select your tool!", offers three options for users. The first option, "The basic filtering tool", provides a quick overview of facility centers and includes a "Click here" button. The second option, "The in-depth matching tool", allows users to describe their needs and find a partner, also featuring a "Click here" button. The third option, "Facility Centres", provides an overview of all registered centers and includes a "Click here" button.

# Matching Tools

## Select your tool!

### The basic filtering tool

Get a quick overview of Facility Centres able to provide a specific service!

[Click here](#)

### The in-depth matching tool

Describe your needs and find the right partner for your project!

[Click here](#)

### Facility Centres

Get a quick overview of all the Facility Centres registered on the 3DP Pan EU Web Portal.

[Click here](#)

Services

- Any -

[Add another service](#)

Main Sector of Application

- Any -

Material used

- Any -

Product Size

- Any -

[Search](#)

## 3DP PAN EU SME Matching Tool

Find the partner(s) you need by providing answers to any (i.e. one, two or all) of the questions below and (when ready) click on 'search', at any time! The more information provided, the more accurate is the match!

Applications Area And Challenges



Sector Type Challenge

Characteristics Of The Part / Component



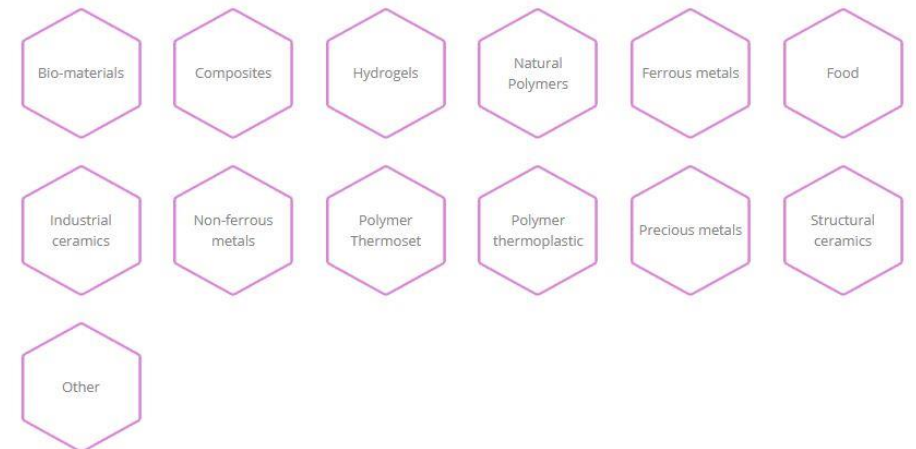
Material Size Shape

Services You Are Looking For



Services Quality Technology Model Software Amount

—WHICH IS (ARE) THE MATERIAL(S) YOU WISH TO USE?—



[Next](#)

[Search](#)

[Reset](#)

## Search Criteria

Sector : Any

Size : 300 - 500 mm

Shape : Any

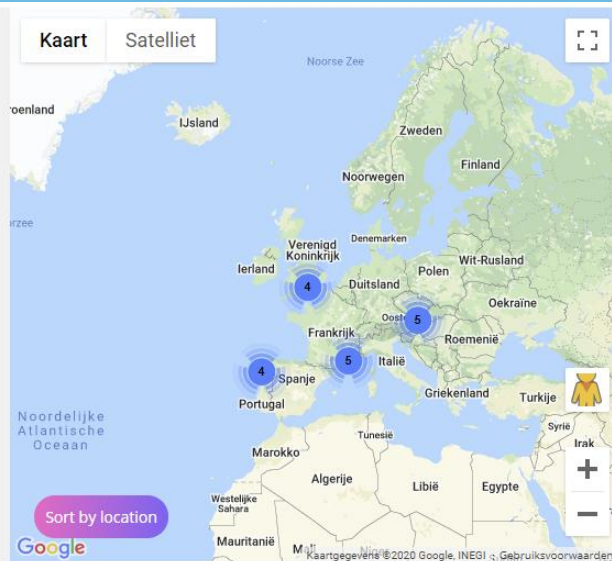
Material : Ferrous metals

Quality : Any

Model : Any

Technology : Any

Software : Any



## 18 FACILITY CENTRE(S) FOUND IN 9 COUNTRY(S)

### 3D Medlab

Private

France

Available filter: 300 - 500 mm, Ferrous metals



### 3T Additive Manufacturing Ltd

Private

United Kingdom

Available filter: 300 - 500 mm, Ferrous metals



### Any-Shape SA

Private

Belgium

Available filter: 300 - 500 mm, Ferrous metals



### Oceanz 3D printing

Private

Netherlands

Available filter: 300 - 500 mm, Ferrous metals



## FACILITY CENTRE



Facility Centre Name: **Oceanz 3D printing**

Facility Centre Type: Private

Facility Centre Region: Gelderland, The Netherlands

Address: Maxwellstraat 21, 6716 BX, Ede, Netherlands.

Website: [www.oceanz.eu](http://www.oceanz.eu)

share via: [Facebook](#) [Twitter](#) [LinkedIn](#) [Email](#) [PDF](#)

# COVID-19 Response Initiative

- Global health crisis negatively impacted EU supply chains
- 3D Printing as a possible solution
- Extension of the scope of 3dppan.eu but limited to the COVID-19 action
- Open to any Facility Centre across the EU (124 registered)
  - Specification related to COVID-19 action within the registration process

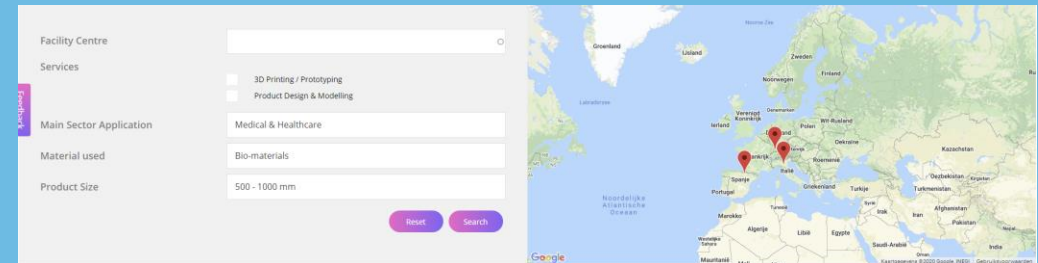
## COVID-19



Are you open for 3D printing production orders by third parties?



Are you open to receiving emails from interested actors?

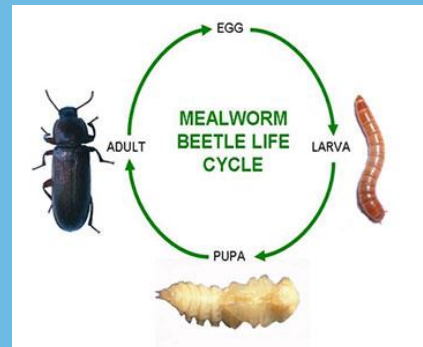


The screenshot shows the registration interface for 3dppan.eu. On the left, a sidebar lists categories: Facility Centre, Services, Main Sector Application, Material used, and Product Size. The main form area contains input fields for these categories. The 'Services' section has checkboxes for '3D Printing / Prototyping' and 'Product Design & Modeling'. The 'Main Sector Application' field is set to 'Medical & Healthcare'. The 'Material used' field is set to 'Bio-materials'. The 'Product Size' field is set to '500 - 1000 mm'. There are 'Reset' and 'Search' buttons at the bottom of the form. To the right of the form is a map of Europe with several red location pins indicating registered facility centres across various countries.



# SME led industrial projects

- Call for SMEs open April – August 2020
- 10 SME-led industrial 3D Printing demonstration/validation projects
  - Interregional consortia – 1 SME & (at least) 2 Facility Centres
  - Multiple industrial sectors / application areas represented





# EU Market for AM demonstration equipment and services

*Jean-François Romainville, IDEA Consult, Expert in  
Innovation and Industrial Policy*

*Federico Bley, IDEA Consult, Consultant in  
Innovation, Competiveness and Sustainability*



# Today's presentation

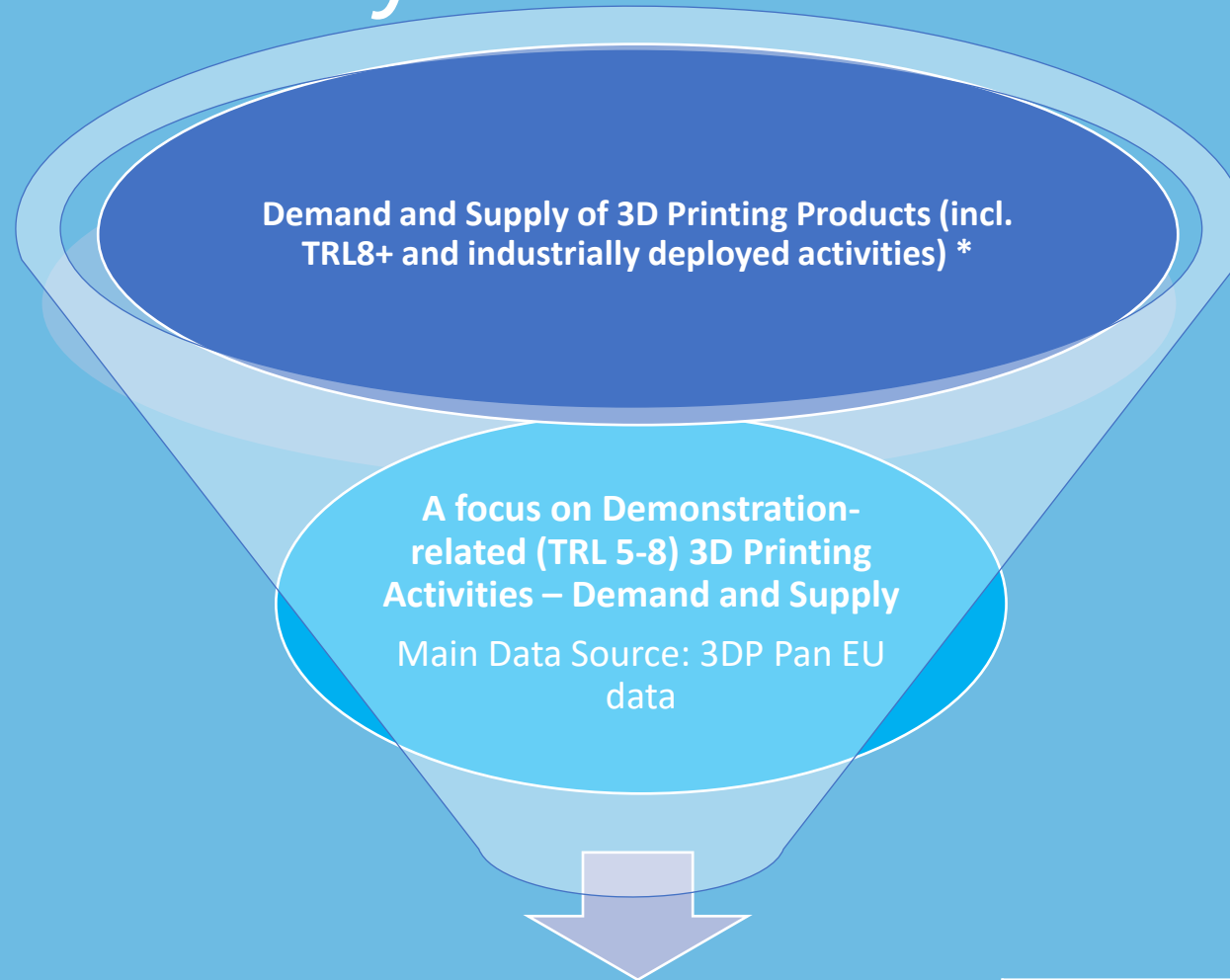
- Goals:

1. Presentation preliminary findings (supply's side in particular)
  - ➔ Draft report available on 3DP Pan EU
2. Gather comments/remarks
  - ➔ Final report made available in October 2021

- Structure:

- Demand Side major trends
- Supply Side analysis
- Preliminary conclusions

# Approach of the study



\*Data Sources: Extensive Desk Research: AMFG (2020), EASME (2020), EASME (2017), Ernst & Young (2019), AM-motion, (2018), Wohlers Report 2020, SAM (2021), 3DP Pan EU Data

# Zoom on 3DP Pan EU Data

- **380 Facility Centres** (i.e. public or private organisations providing demonstration services (and associated equip.) to SMEs);
- **1.300 pieces of Equipment** listed and described;
- **1.087 services** listed and described;
- **3.500 searches** between March – October 2020, using available matching tools (i.e. connecting demand and supply of demonstration services).



# Demand Side Analysis

# AM-based solutions increasingly deployed and further growth expected...\*

## Some key worldwide trends

€

- Revenues for AM Service Providers: +884% from 0,5 to 4,9 billion € (2010-2019)
- Total value: x 10, to approach 16 billion € (2019-2029)

N° Actors

- Material suppliers: +115% from 71 to 153 (2017-2020)
- Manufacturers of industrial systems: +545% from 33 to 213 (2012-2019); 94 in the EU
- Overall, EU accounts for 55% of all 'AM' firms, in 2019

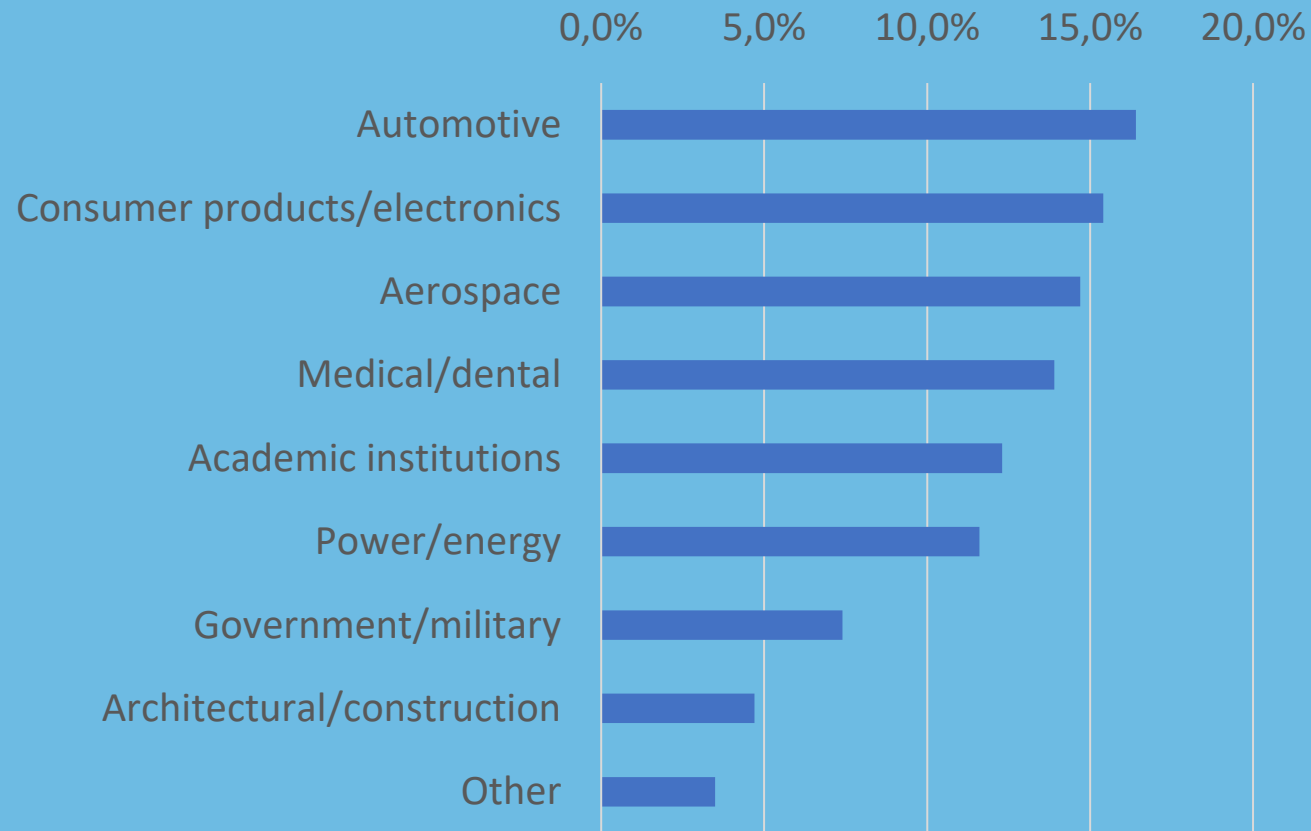
N° Printers

- Printers: +474% from 1,4 million to 8,04 million (2018-2027) - forecast
- Industrial AM systems: 30k in use in the EU, 20k sold in 2019 (30% by EU companies)



# ...With a particularly strong dynamism in some segments...

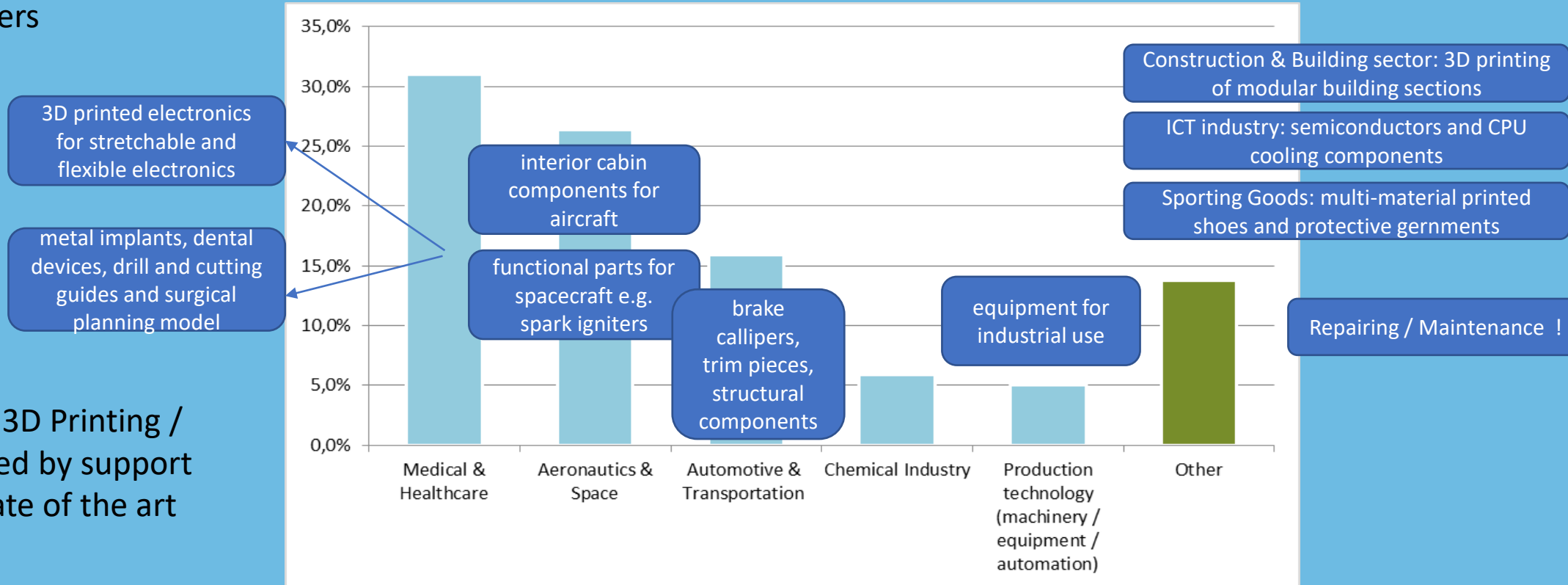
**Surveyed AM stakeholders worldwide indicating their current users per sector, in %**



Source: Wohlers Associates, Inc., 2020

# ...With a particularly strong dynamism in some segments...

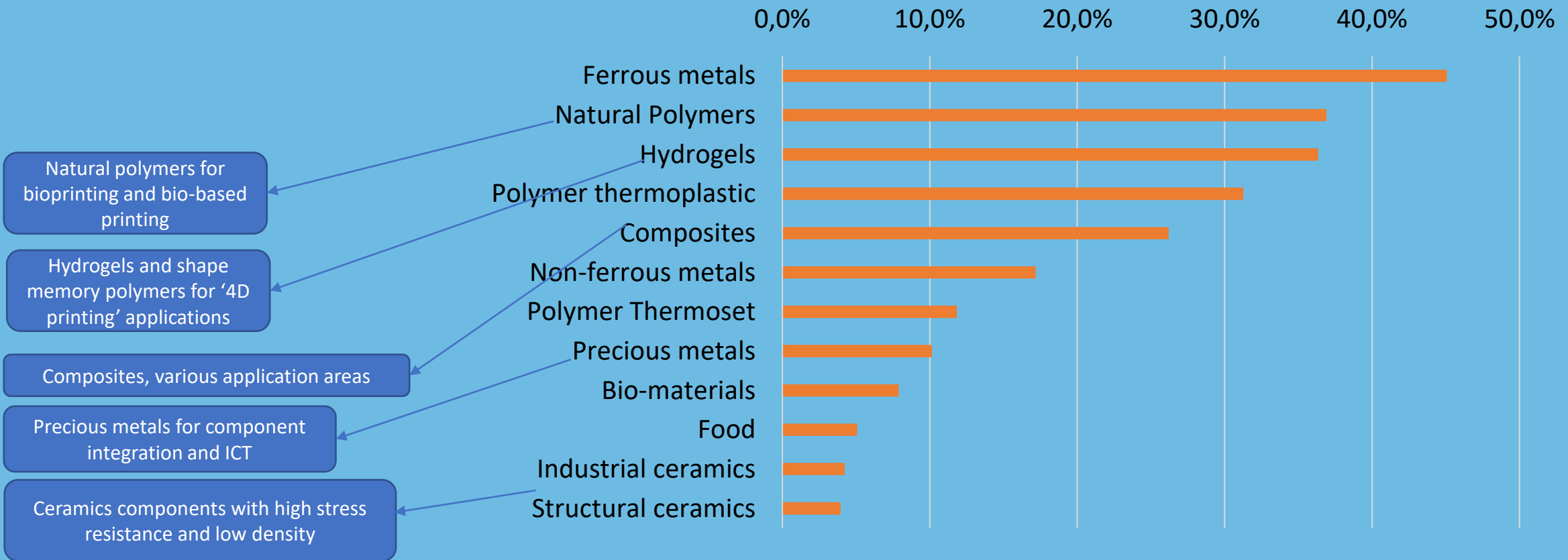
**Top 5 sector searches on the 3DP Pan EU Platform, per sector (% of total searches): a view on upcoming users**



Services searched: 3D Printing / Prototyping followed by support services, mainly state of the art technical studies;

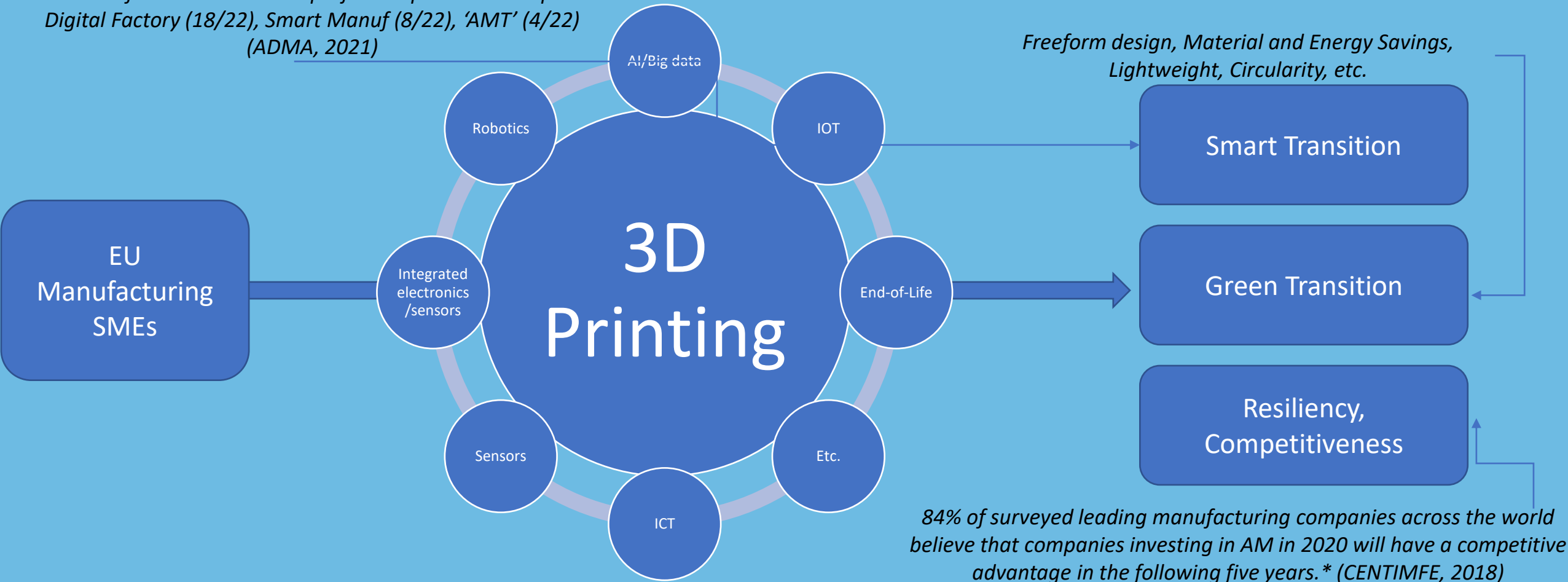
# ...With a particularly strong dynamism in some segments...

Searches made in % of material-specific searches



# ...relying upon generic advantages of AM: AM as 'factory-floor connector' between data and productions, instrumental for key transitions !

Priorities of 'DG GROW ADMA project' Implementation plans:  
Digital Factory (18/22), Smart Manuf (8/22), 'AMT' (4/22)  
(ADMA, 2021)



# But major barriers remain for further deployment, (especially among downstream SMEs) !

Still, some **technology developments** needed, especially at frontier of various tech fields

Innovation  
Generation

Innovation  
Dissemination

**Costs/ reproducibility** towards larger series

- E.g. Need for Automatized and integrated post-processing;
- (Process) Standardisation/certification to facilitate AM uptake

Awareness

Assessment

(Specific)  
Innovation  
Absorption

Business  
Return

Peer  
learning

Source: IDEA Consult, based on DG GROW ADMA project, 2021

**Lack of Awareness**

- Perceived costs vs perceived gains

Actions and support to **trigger changes and accompany in transformation** (which can sometimes be fundamental)

**Skills/trainings** for operators and beyond

‘Structural’ facilitated access to **pan-EU** demonstration service and equipment

# Illustrative list of promising generic innovation areas

## Sustainability/Recyclability

- End of life considerations for composite materials to be achieved through 1) Material research; 2) Design improvements ; 3) Recycling capabilities
- Lighter components → Material research

## Large Parts

- On-site production for construction to be achieved through further research and demo cases
- Printing of large parts with composite materials, complex geometrics

## Large Series

- Automated and integrated post processing
- Large volumes production for commercial use. Aspects to be improved are 1) Speed; 2) Cost; 3) AM integration

## Industry 4.0

- AM and Robotics → Digitalisation of manufacturing
- AM and embedded electronics/sensors → research, conceive of new applications

## Higher quality materials (and parts)

- Hydrogels as “smart materials” → research + demonstration cases
- 4D printing for wearable electronics → raise awareness/interest in key sectors
- Ceramics components with high stress resistance and low density → demonstration cases
- Precious metals for component integration and ICT → research





Do you agree with these identified trends? **Do you see other promising AM-based 'areas'** (specific combinations of technologies and/or of application areas materials and materials) that will be relevant/highly demanded in the coming years?

 Start presenting to display the poll results on this slide.

# Supply Side Analysis

# Equipment availability – materials and technology

## Equipment registered on 3DP PAN EU platform by materials

- Strong in metal and plastics AM
- Hydrogels as promising material!
- Precious metals for ICT will gain importance
- Composites - Ceramics

	Italy	Spain	Belgium	France	Germany	The Netherlands	EU Total
Polymer thermoplastic	157 (43,3%)	89 (57,4%)	37 (40,2%)	34 (42,5%)	16 (20%)	57 (50%)	529 (45,6%)
Non-ferrous metals	56 (15,4%)	40 (25,8%)	39 (42,4%)	32 (40%)	9 (11,3%)	16 (14%)	263 (22,7%)
Ferrous metals	46 (12,7%)	27 (17,4%)	32 (34,8%)	38 (47,5%)	28 (35%)	14 (12,3%)	244 (22,1%)
Polymer Thermoset	19 (5,2%)	18 (11,6%)	26 (28,3%)	24 (30%)	5 (6,3%)	19 (16,7%)	124 (10,7%)
Bio-materials	60 (16,5%)	8 (5,2%)	3 (3,3%)	5 (6,3%)	10 (12,5%)	1 (0,9%)	115 (9,9%)
Composites	55 (15,2%)	18 (11,6%)	13 (14,1%)	0	2 (2,5%)	3 (2,6%)	115 (9,9%)
Industrial ceramics	48 (13,2%)	18 (11,6%)	7 (7,6%)	4 (5%)	4 (5%)	14 (12,3%)	103 (8,9%)
Structural ceramics	29 (8%)	5 (3,2%)	8 (8,7%)	1 (1,3%)	11 (13,8%)	0	65 (5,6%)
Natural Polymers	25 (6,9%)	11 (7,1%)	9 (9,8%)	0	4 (5%)	2 (1,8%)	58 (5%)
Food	20 (5,5%)	0	0	0	0	0	20 (1,7%)
Precious metals	3 (0,8%)	3 (1,9%)	3 (3,3%)	0	0	2 (1,8%)	16 (1,4%)
Hydrogels	2 (0,6%)	0	0	0	0	0	2 (0,2%)

# Equipment availability – materials and technology

Globally similar trends per sector

## Materials use per sector by facility centres in % of total FCs

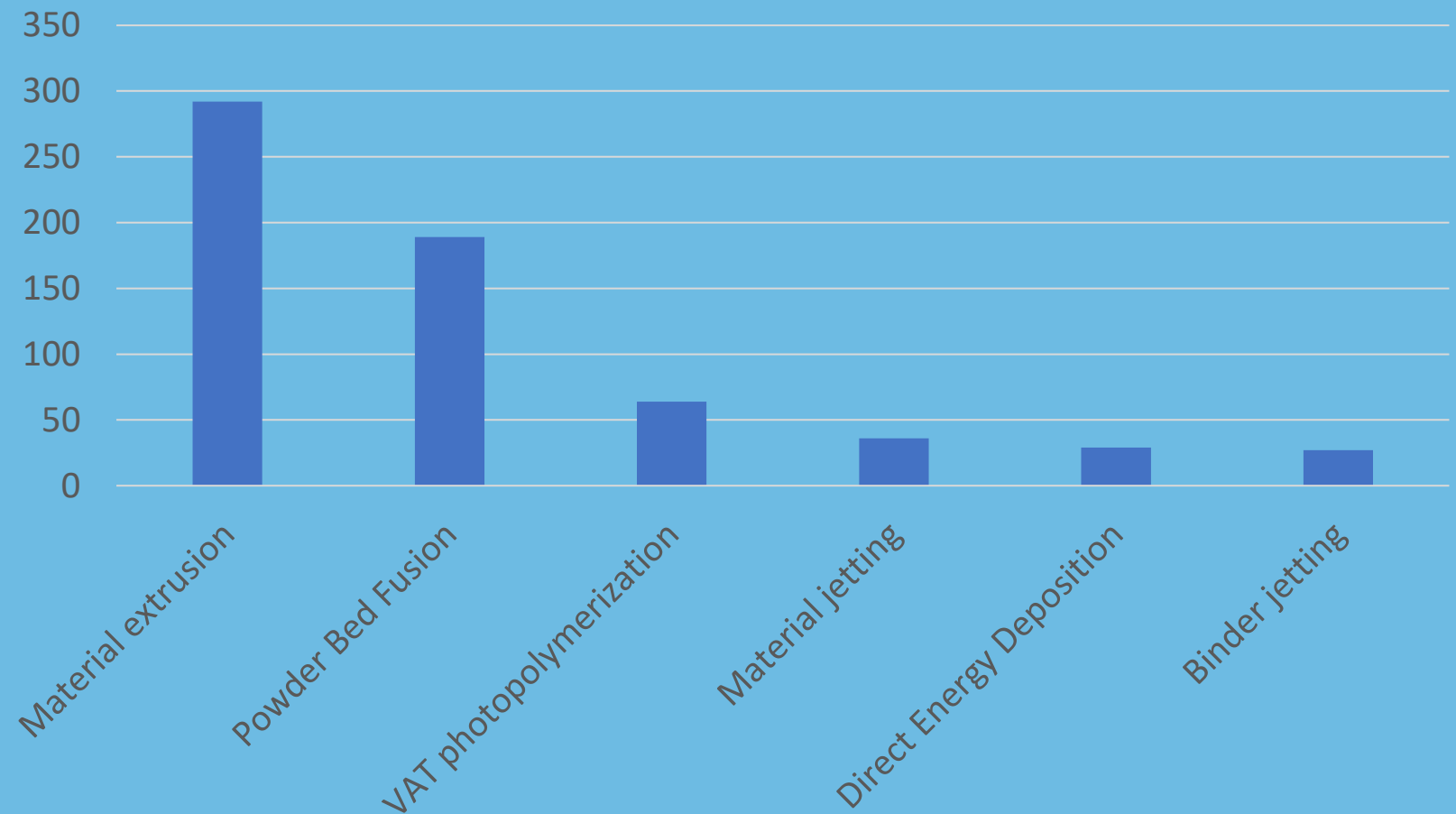
	Bio-materials	Composites	Ferrous metals	Hydrogels	Industrial ceramics	Natural Polymers	Non-ferrous metals	Polymer thermoplastic	Polymer Thermoset	Precious metals	Structural ceramics	Other
Aeronautics & Space	1,8%	3,4%	18,4%	0,1%	1,0%	4,0%	20,7%	17,3%	14,8%	8,0%	2,7%	5,6%
Automotive & Transportation (excluding ships and boats)	4,9%	11,0%	17,5%	0,2%	1,9%	2,0%	17,3%	17,7%	14,0%	0,9%	0,7%	7,2%
Chemical Industry	5,7%	5,3%	20,1%	1,3%	9,1%	2,2%	21,1%	17,0%	8,2%	0,0%	7,2%	0,0%
Construction & Building sector	3,6%	7,3%	5,1%	0,0%	9,3%	9,7%	13,6%	17,2%	16,5%	0,1%	3,4%	13,3%
Consumer Goods & Products (excluding sporting goods, textile and furniture)	3,6%	17,9%	14,8%	0,3%	0,9%	3,8%	15,0%	22,2%	11,9%	0,5%	0,0%	5,2%
Energy	2,8%	3,8%	22,6%	0,0%	6,8%	3,1%	23,1%	11,1%	8,0%	0,7%	3,1%	7,1%
Environment	21,4%	14,3%	0,0%	3,6%	0,0%	17,9%	10,7%	10,7%	3,6%	0,0%	0,0%	14,3%
Food	0,1%	0,0%	20,0%	0,1%	0,0%	0,0%	19,9%	20,0%	20,0%	19,9%	0,0%	0,0%
Furniture	5,1%	14,3%	4,1%	0,0%	1,0%	9,2%	6,1%	20,4%	5,1%	0,0%	1,0%	18,4%
ICT industry (including electronics, computer and communication related products)	11,6%	11,6%	7,1%	0,0%	1,6%	3,9%	6,1%	19,7%	18,7%	1,0%	0,8%	14,0%
Measurement	4,5%	1,1%	3,4%	2,2%	43,8%	3,4%	2,2%	6,7%	4,5%	2,2%	5,6%	16,9%
Medical & Healthcare	2,7%	3,4%	19,6%	0,3%	0,9%	1,9%	19,8%	18,7%	13,7%	11,4%	1,2%	2,4%
Production technology (machinery / equipment / automation)	2,9%	4,1%	21,2%	0,0%	2,8%	0,8%	19,2%	17,6%	14,2%	8,2%	3,1%	3,3%
Ships and Boats	0,6%	0,8%	0,5%	0,0%	0,5%	19,0%	18,5%	19,3%	18,8%	0,3%	0,0%	19,7%
Sporting Goods	0,5%	19,1%	18,1%	0,0%	0,0%	0,5%	12,6%	20,0%	16,3%	0,0%	1,9%	0,5%
Textile & Fashion	13,6%	16,1%	1,6%	0,0%	1,9%	4,7%	2,8%	19,0%	28,5%	0,0%	0,6%	11,1%

# Equipment availability – materials and technology

Equipment registered per AM technology

- Overall strong in metal + plastics technologies
- DED + Binder jetting few equipment on platform

**Equipment registered on 3DP PAN EU platform by AM technology**

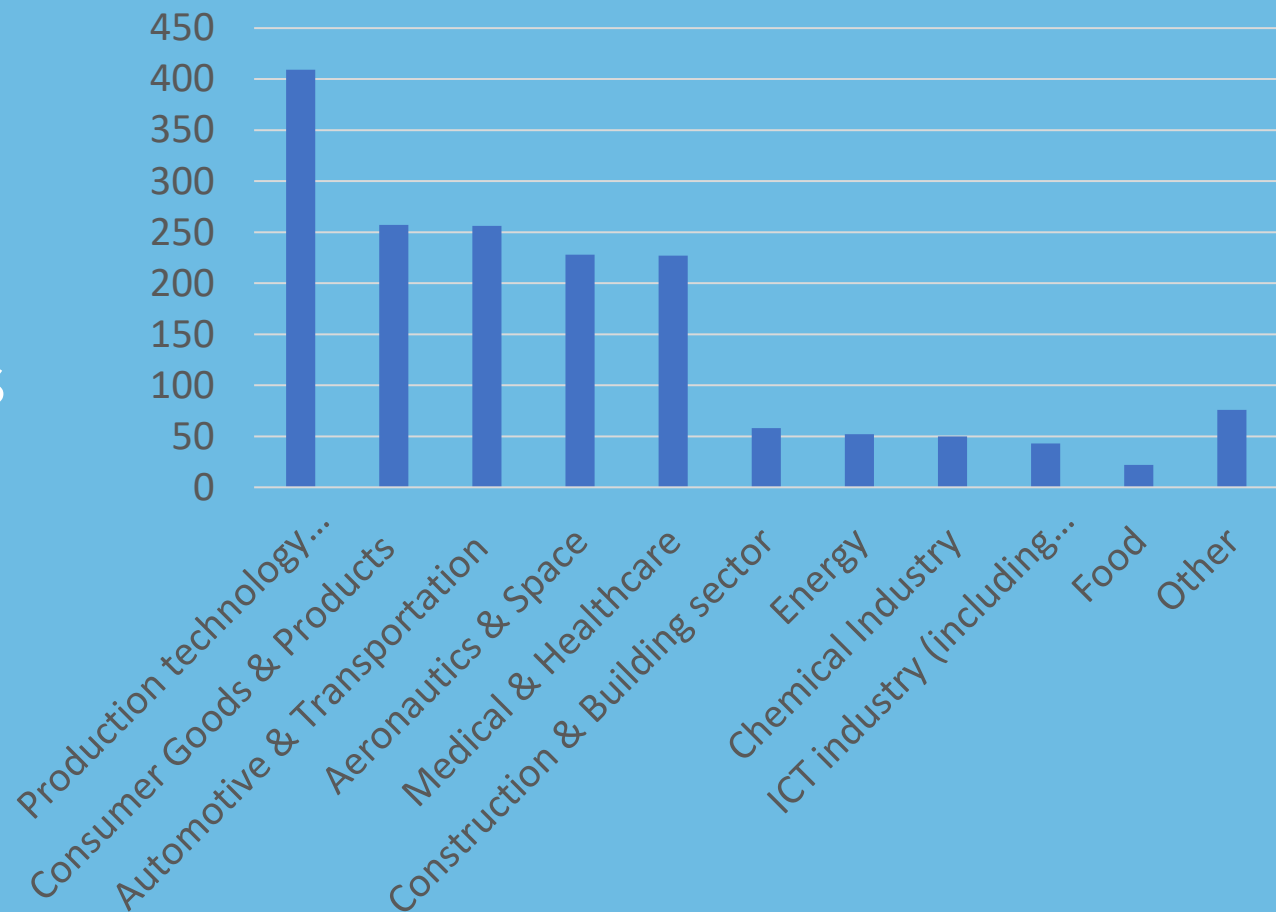


# Equipment availability – targeted application areas

Number of equipment by application sector:

- 60% in NL for Production Technology
- 74% in BE for Consumer Goods
- 51% in BE for Medical & Healthcare
- 39% in ES for Aeronautics & Space

**Equipment registered on 3DP PAN EU platform by sectors**





# Equipment capabilities – targeted application areas

Number of equipment by application sector:

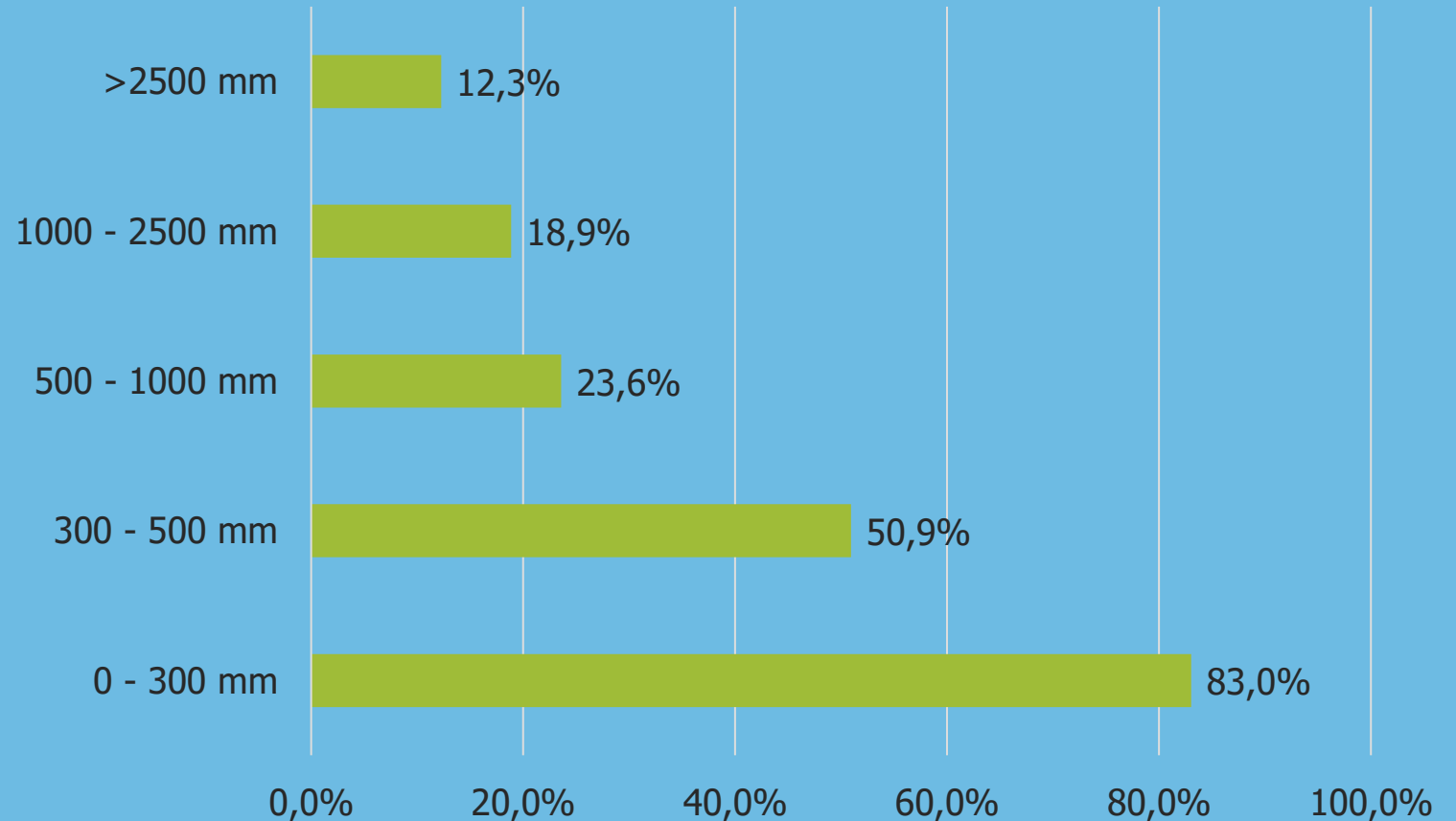
Application sector	Italy	Spain	Belgium	France	Germany	The Netherlands	EU Total
Production technology (machinery / equipment / automation)	199 (54,8%)	40 (25,8%)	4 (4,3%)	19 (23,8%)	21 (26,3%)	69 (60,5%)	409 (35,3%)
Consumer Goods & Products	84 (23,1%)	35 (22,6%)	68 (73,9%)	2 (2,5%)	5 (6,3%)	2 (1,8%)	257 (22,2%)
Automotive & Transportation	56 (15,4%)	47 (30,3%)	16 (17,4%)	13 (16,3%)	17 (21,3%)	19 (16,7%)	256 (22,1%)
Aeronautics & Space	67 (18,5%)	61 (39,4%)	12 (13%)	21 (26,3%)	2 (2,5%)	20 (17,5%)	228 (19,7%)
Medical & Healthcare	94 (25,9%)	14 (9%)	47 (51,1%)	18 (22,5%)	14 (17,5%)	16 (14%)	227 (19,6%)
Construction & Building sector	6 (1,7%)	12 (7,7%)	0	0	0	3 (2,6%)	58 (5%)
Energy	19 (5,2%)	14 (9%)	3 (3,3%)	16 (20%)	0	0	52 (4,5%)
Chemical Industry	0	7 (4,5%)	24 (26,1%)	0	6 (7,5%)	5 (4,4%)	50 (4,3%)
ICT industry (including electronics, computer and communication related products)	8 (2,2%)	13 (8,4%)	1 (1,1%)	3 (3,8%)	3 (3,8%)	2 (1,8%)	43 (3,7%)
Food	21 (5,8%)	0	0	0	0	1 (0,9%)	22 (1,9%)
Other	9 (2,5%)	21 (13,5%)	9 (9,8%)	7 (8,8%)	13 (16,3%)	5 (4,4%)	76 (6,6%)

# Equipment capabilities – size

Equipment share by  
manufactured size possible:

- Relatively many equipment for large parts in PL (furniture) and NL (construction)
- FR and DE, less equipment for >500 mm

**Component size capabilities of facility centres in EU**



# Equipment capabilities – size

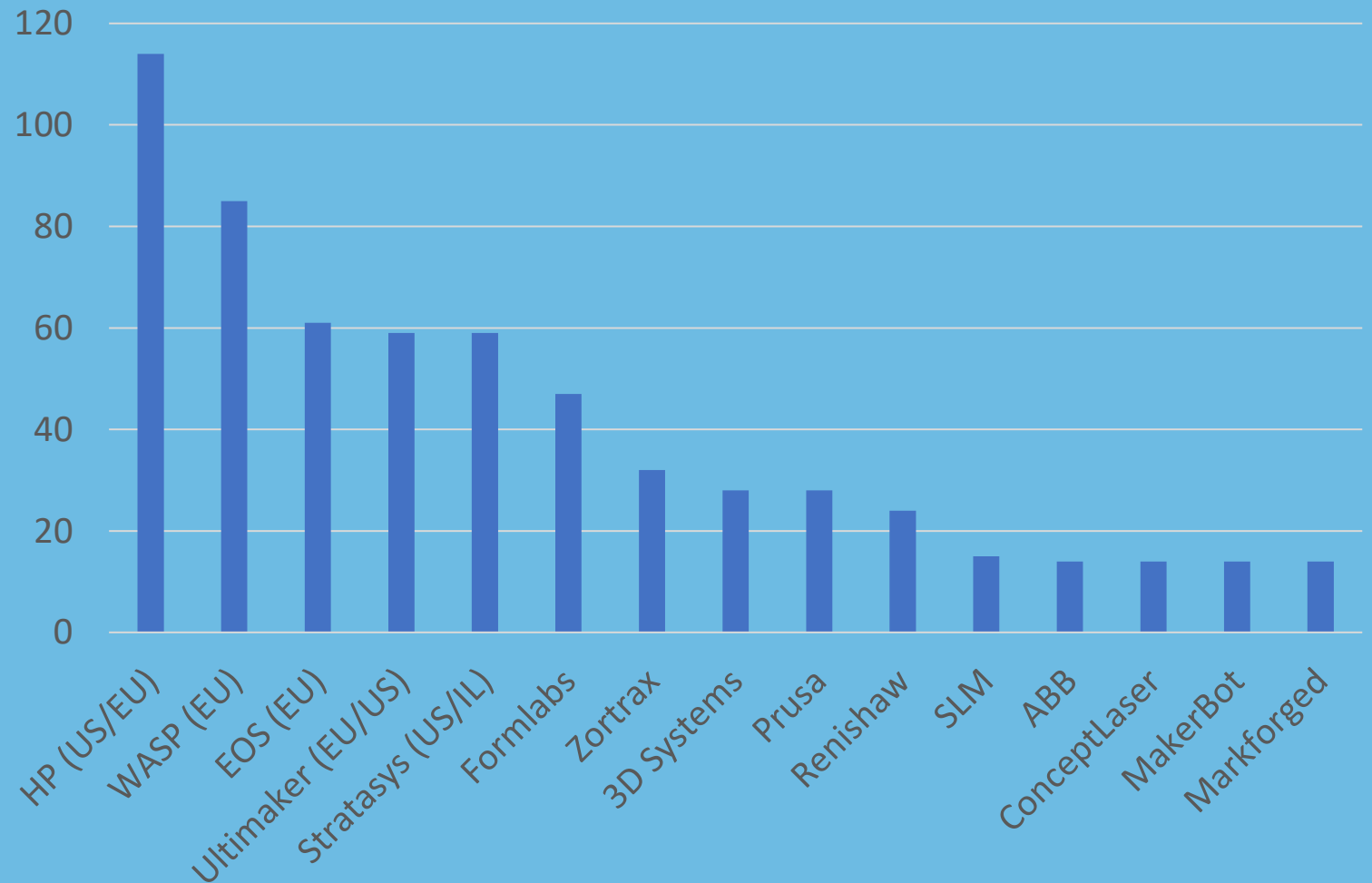
## Component size capabilities of facility centres in EU

Component size	Italy	Spain	Belgium	France	Germany	The Netherlands	EU Total	EU facility centres
0 - 300 mm	87	96	37	53	34	64	463	88
300 - 500 mm	34	19	33	9	13	3	146	54
500 - 1000 mm	19	3				0	33	25
1000 - 2500 mm	7	6	5		1	1	29	20
>2500 mm	10	5	5			16	97	13

# Brands and models

European OEM in top 5 of most popular brands in registered facility centres

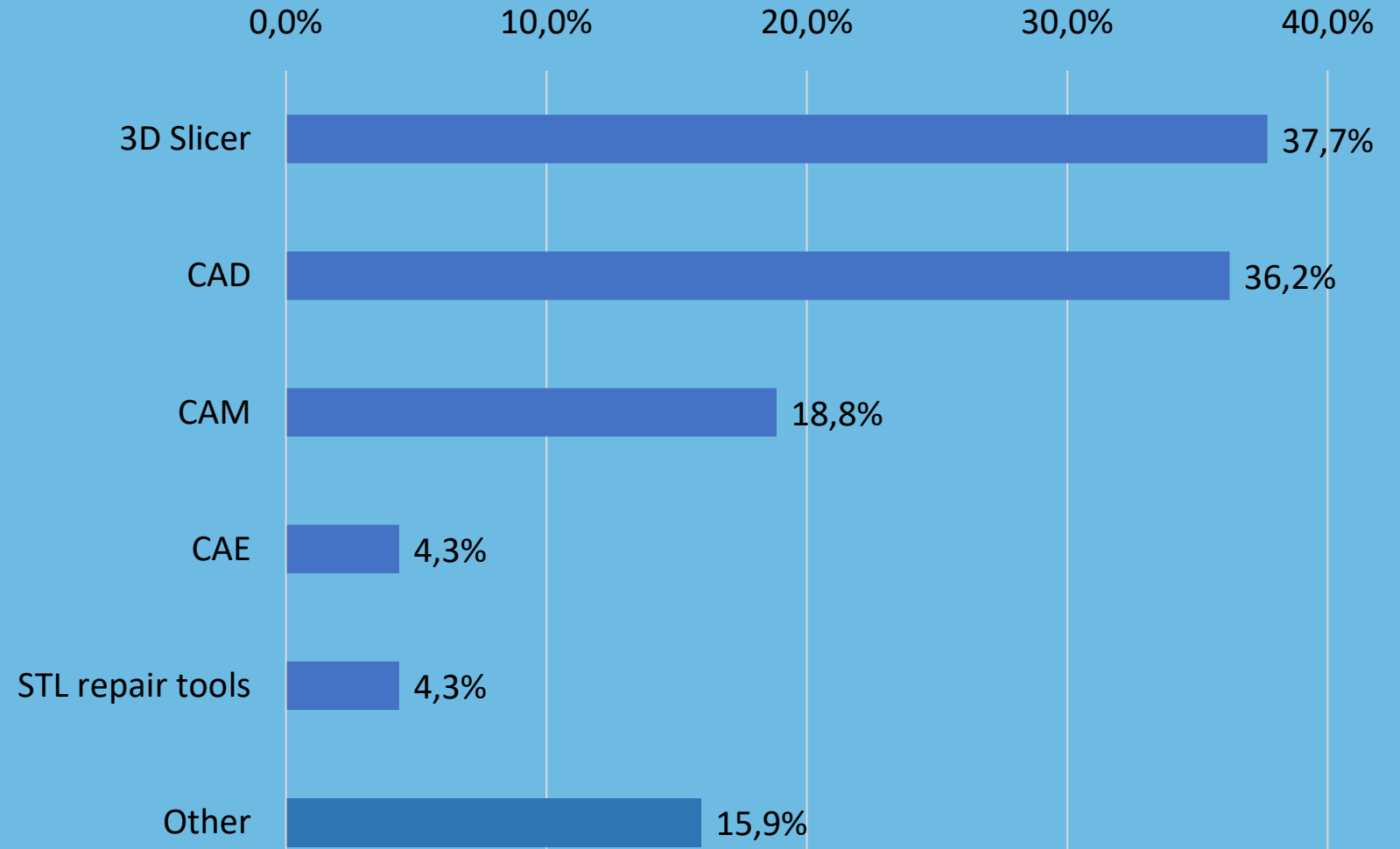
**Top 15 brands of AM equipment registered on the 3DP PAN EU platform**



# Software

Software for advanced materials – appropriate coverage?

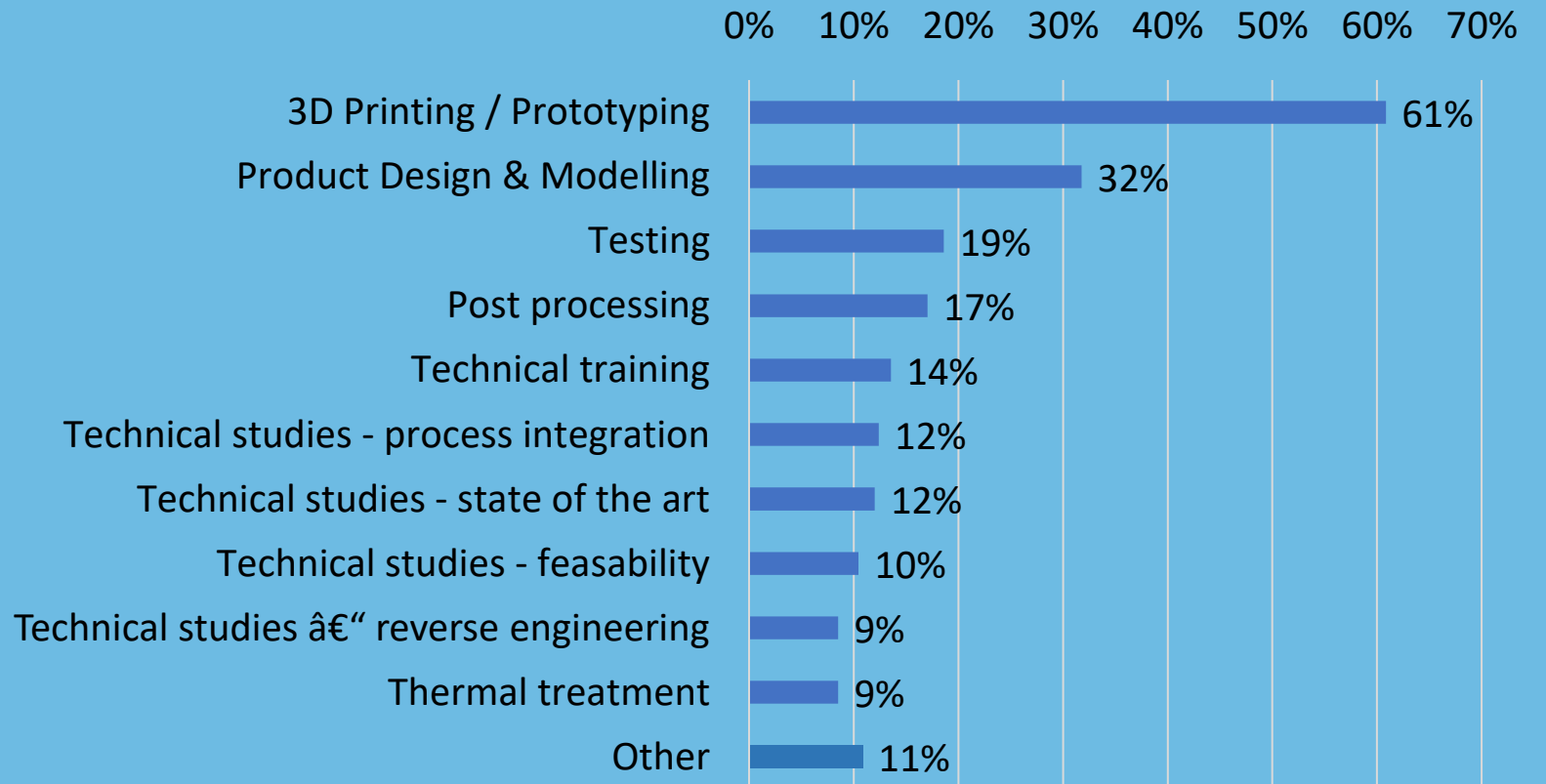
**Main software used by facility centres**



# Services

- Technical training remains crucial
- Technical studies are highly demanded – and offered

## Top 10 services offered by facility centres





# Services

Facility centres offering services per sector:

- ES most active in automotive + aeronautics
- DE least active in aeronautics compared to other top 5 countries





Have you experienced/are you aware of some SMEs needs for demonstration services that are not well covered by Facility Centres from your regions? If so, can you elaborate on these needs (materials, technologies, software, services, etc.)?

 Start presenting to display the poll results on this slide.

# Preliminary Generic Conclusions and paths for improvements

## Demonstration services

- **Basic/Standard needs'**: growingly-adequate 'national' coverage
- But **emerging, complex needs**: need for smooth cross border cooperation and access across 'specialised' FCs
- Working towards **proactive and efficient EU coverage**:
  - *Continuous and comprehensive monitoring demand evolutions and supply availability*
  - *Avoiding unnecessary investment duplications (but taking into account local anchorage needs)*

## The overall AM ecosystem

- Mass-deployment? Need for AM-related actors **further integration and connections** across the whole 'SMEs innovation sequence':
- *from raising awareness to peer learning;*
  - *from innovation generation to innovation absorption*

## Beyond AM

- Need to connect AM (and associated actors) further with:
- *Relevant **technological/technical fields** related to advanced/smart manufacturing*

# Thank you!

## *Questions?*

Jean-François Romainville (IDEA Consult)

[Jean-francois.romainville@ideaconsult.be](mailto:Jean-francois.romainville@ideaconsult.be)

# Expert views on the Additive Manufacturing Industry

Dipl. Ing. Christian Wögerer, MAS MSc  
PROFACTOR GmbH

- Introduction and information on PROFACTOR
- Involvement of PROFACTOR in the project – Call for SMEs project
- Reflections on the analysis - match between the analysis and what I see from the industrial perspective from your position/role

# Our Profile



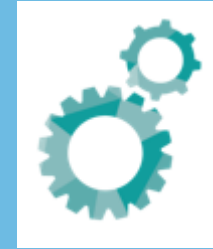
Research



Industrial Assistance Systems



Additive Micro/Nano-Manufacturing



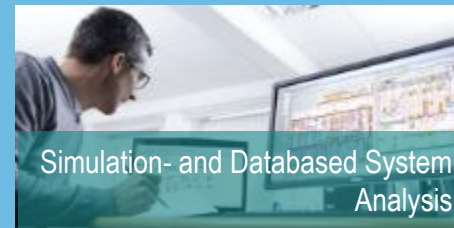
Solutions



Machine Vision



Flexible Robotics



Simulation- and Databased System  
Analysis



Perception and Projection



Nano-/Micro-Structures



Functional Surfaces

# Facts and Figures

Since 1995 



LOCATIONS:  
**STEYR and VIENNA**

~75   
EMPLOYEES

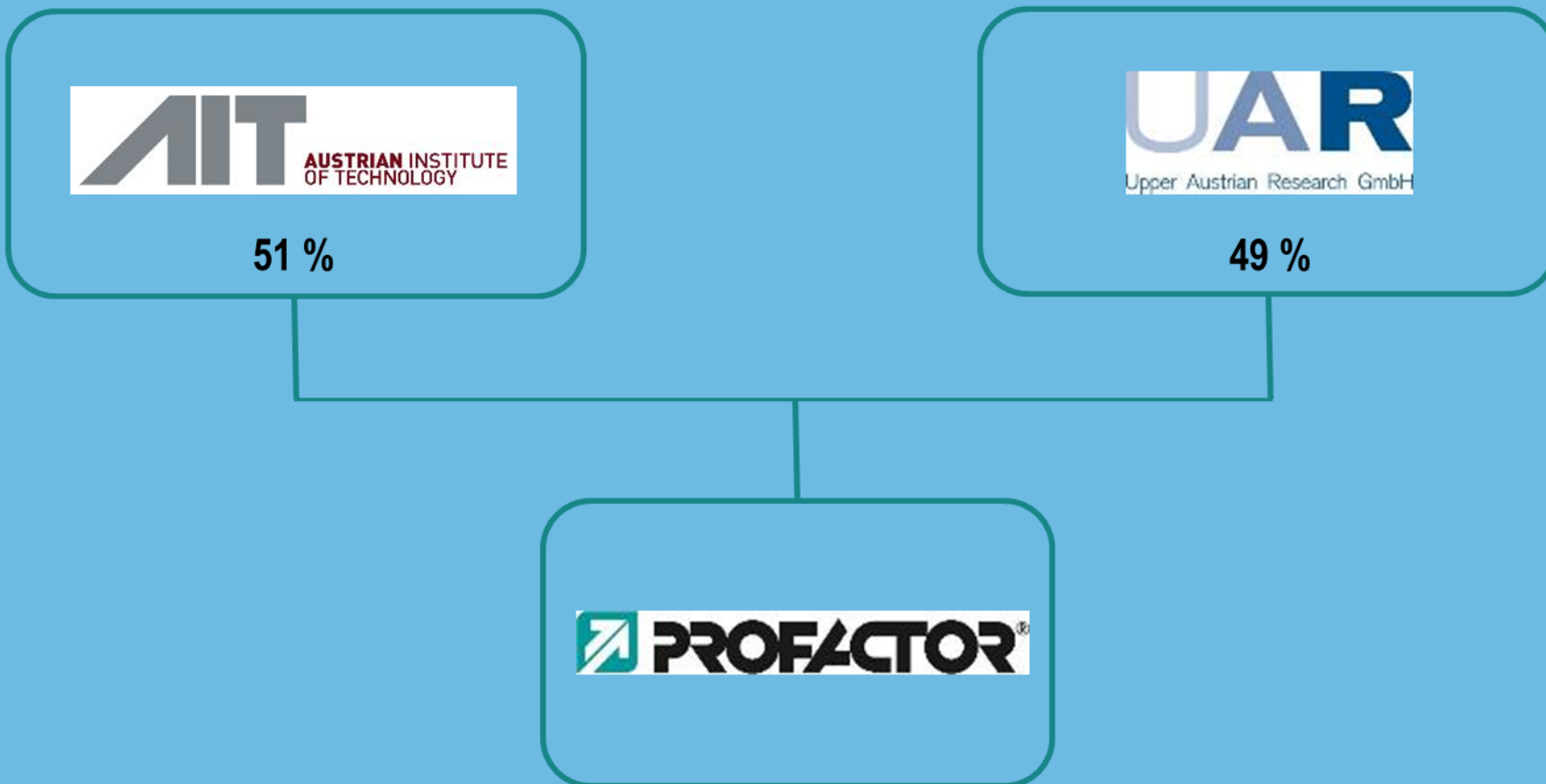
**140 EU projects as  
Coordinator and as  
participant**

**3,0**  
MILLIONS EURO  
OPERATING REVENUE IN  
INDUSTRIAL PROJECTS

**7,0**  
MILLIONS EURO  
TURNOVER

**4,0**  
MILLIONS EURO  
OPERATING REVENUE IN  
FUNDED PROJECTS

# Our Owners







*Competitive production systems*

Combining human and machine interaction, intelligence and processing power, human expertise and machine power

*Partial automation for Mass Customization*

## Additive Micro-/Nano- Manufacturing



Individualized Products

Competitive small lot size  
production

(nearly) endless freedom of design  
and material combinations

More (new) functions as  
competitive advantage

Scalability for mass fabrication



# Gripp3D

*Lightweight, flexible, smart, and  
additively manufactured robot gripper*

26.11.2020

Pavel Kulha  
Oscar Alonso  
Ronald Naderer

# Gripp3D

- **3DP PAN EU** launched a Call for SMEs to test and validate a number of industrial demonstration 3D Printing bases projects in different application fields, making use of the pan-European platform, <https://3dppan.eu/call-smes>
- **Gripp3D** is the 1st Demo-Case which we have prepared in the frame of Vanguard 3DP DemoCase6 “multi-material inkjet 3D structural electronics”
- <https://www.s3vanguardinitiative.eu/>
- Project Starts: 01/2021
- Duration: 9 months







- world leader in the development and sale of flexible, intuitive robotic equipment
- patented Active Compliant Technology ACT establishes every common robot setup with a special ingredient – tactile sense.
- innovative IoT devices establish autonomous system cooperation, they are the pinpointed solutions for sanding, grinding and polishing processes



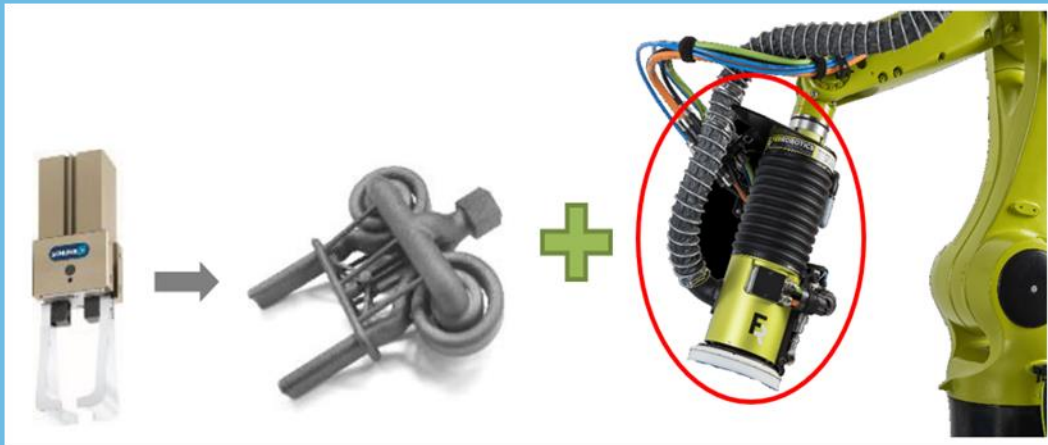
- applied research company
- research in the field of industrial assistive systems and additive micro/nano manufacturing.
- technological focus is on robotics, machine vision, functional surface and nanostructures
- Process development enabling 3D printed structural electronics



- private no profit RTO with more than 110 years of valuable experience in industrial innovation
- applied R&D activities in areas advanced materials, advanced manufacturing, renewable energies, storage system, circular economy, sustainability and biotechnology
- with the mission to accelerate the adoption and development of AM/3DP technologies in EU manufacturing sectors

# Project Idea

- implementing AM/3DP technologies in fabrication of lightweight, flexible and sensor functionalized flange and gripper.
- The objective is to develop and deploy physical intelligence-based solution for handling operations in robotic applications in the production industry through AM/3DP technologies.



conventional gripper

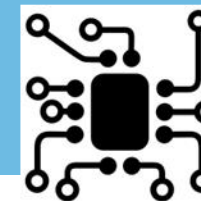
lightweight 3D printed gripper



AM/3DP



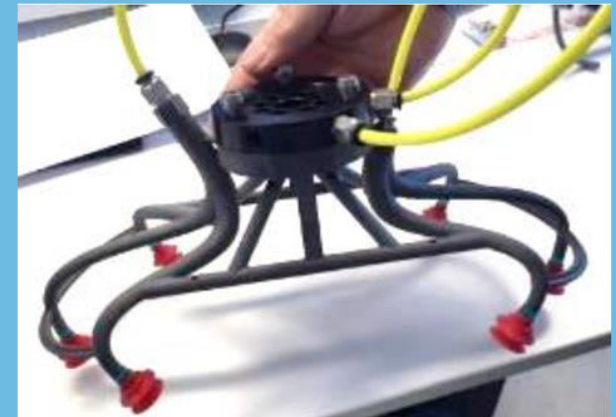
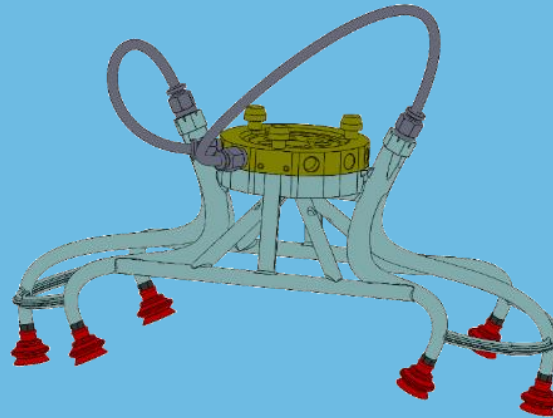
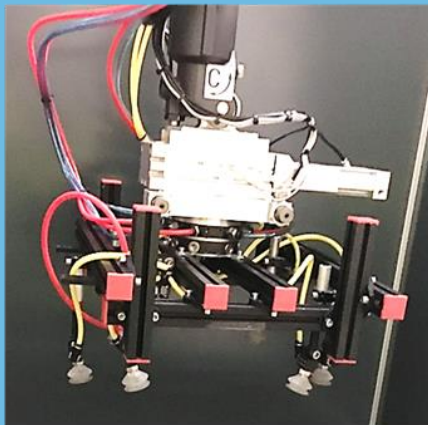
Integrated sensors  
Temperature/Pressure



Interconnections

# Key tasks - LEITAT

- Establish strategies and methodologies for effective and efficient handling processes.
- Determine applicable AM/3DP materials and technologies and its characteristics for obtaining benefits.
- Develop design strategies for the optimal gripper design.
- Validate the functionality of the automatic design tool and grippers for testing using 3D printing.



3DP grippers designed in Leitat for grabbing -through vacuum- and manipulating injection molding parts in the production industry.



# Key tasks - PROFACTOR

- Developing fabrication technologies based on multi-material inkjet printing
- Research on suitable materials for rigid, flexible parts and conductive tracks
- Optimizing printing processes (mainly multi-material) and curing/sintering strategies
- Functionalization of flange and gripper, integration of conductive tracks and simple sensors

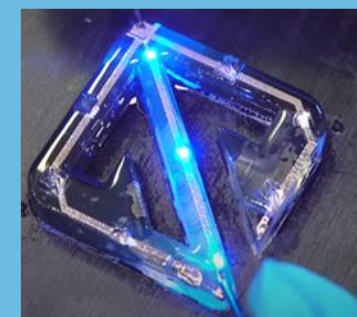
- Direct feeding
- Heated tray
- Thermal management
- IR lamp for drying and sintering
- UV Mercury/LED curing lamps
- Custom software for UV LED controll



Polyjet Connex2 development printer



Fully printed electronic parts embedded in printed robotic arm





# Integration and Validation - FERROBOTICS

- specifically optimized 3D printed grippers that will integrate IoT embedded sensors for sensing capability (proximity, product features, connectivity, etc.)
- more efficient manufacturing processes,
- reduction of time to market
- affordable solution for smart customized robot end-of-arm tools



# Reflections on the analysis - match between the analysis and what I see from the industrial perspective from your position/role

- In general, 3d printing was first sold as something that could be done with almost anything.
- The technology developed very quickly to market maturity (different for different technologies).
- The study analyses very well the inventory of 3D printing services and facilities.
- Markets are well mapped
- Future in-depth comprehensive technology roadmaps should be developed



## 3D PRINTING NEEDS OF SMEs

Lavecchia Carolina Eleonora  
R&D Director



# Sommario

---

## **Personalised Medicine 4**

YourKnee 5

Subject-specific solution 6

## **Additive Manufacturing 7**

EBM workflow 9

## **AM product development 8**

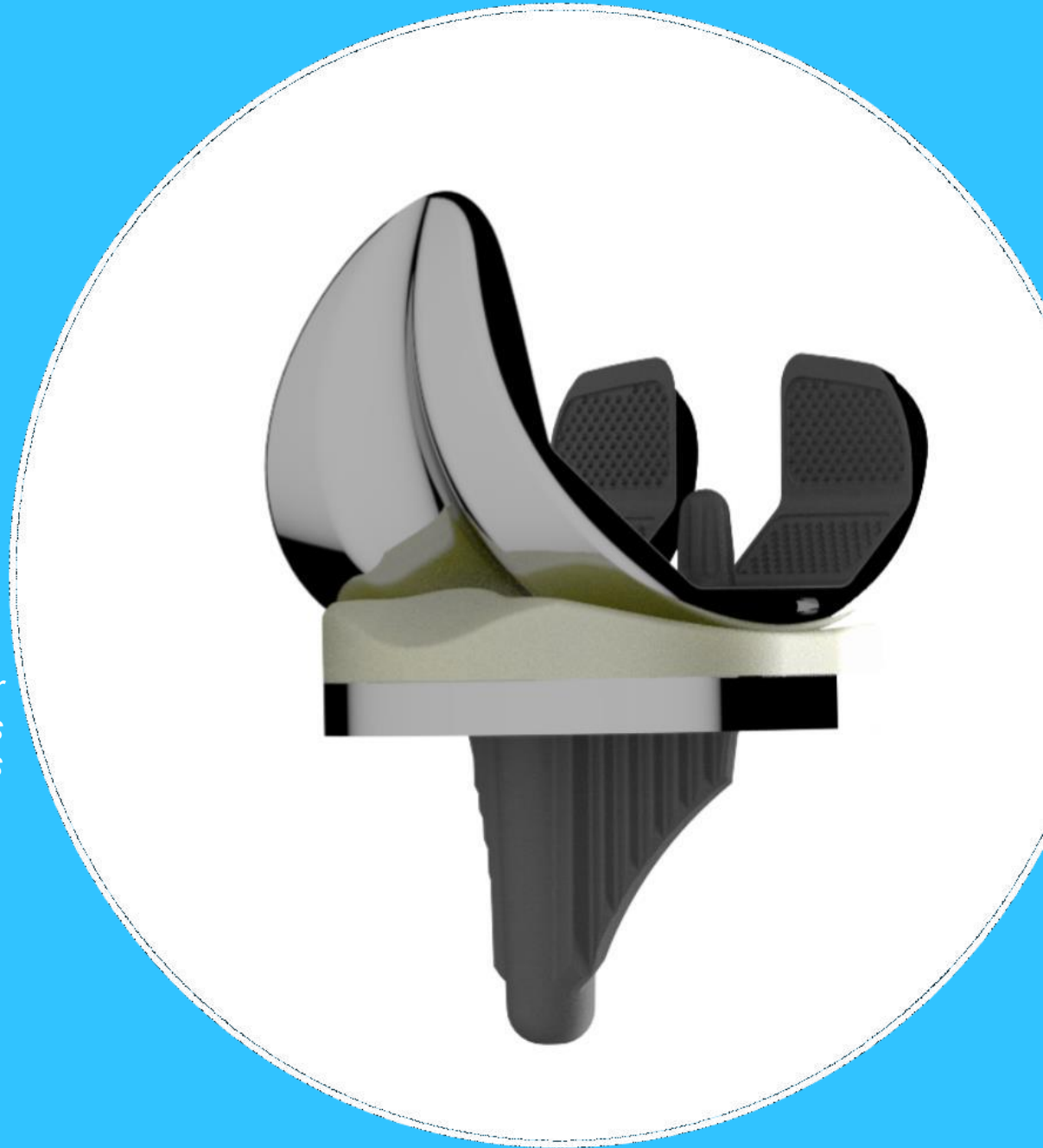
Lattice structure to enhance osteointegration 11

AM development – facility centre 12

# Take your patient's Experience

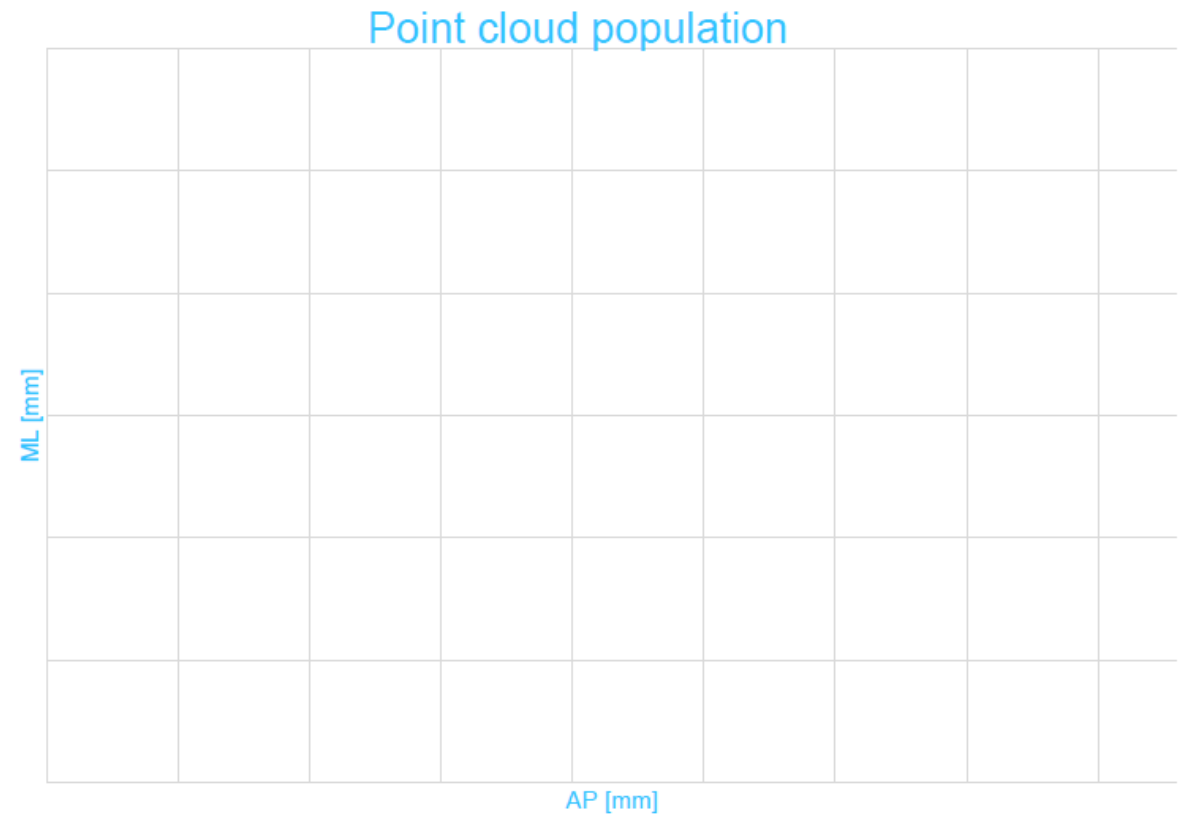
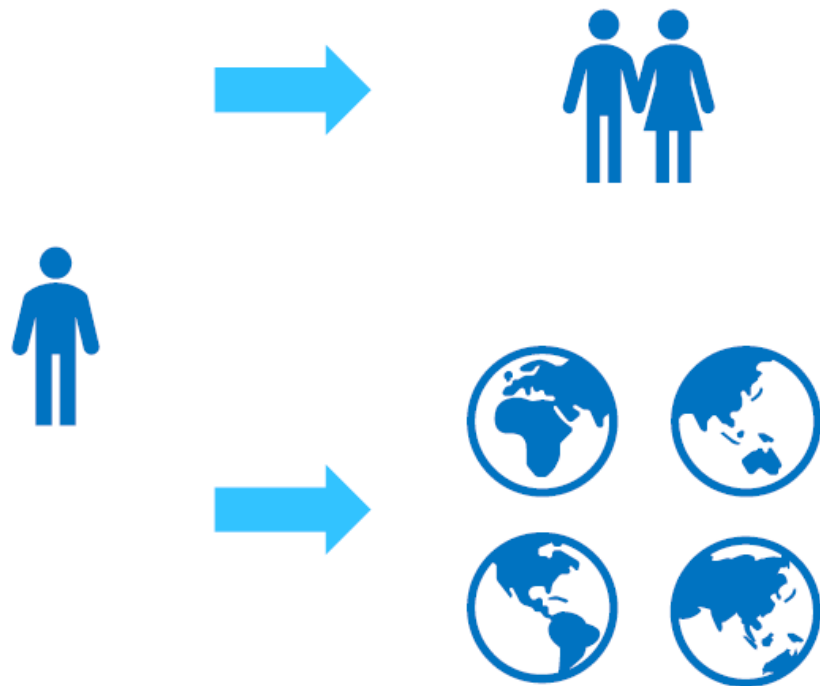
to the next level and beyond!

*Rejoint is a start-up pioneer  
in new technologies  
and surgical approaches  
in Knee Arthroplasty.*



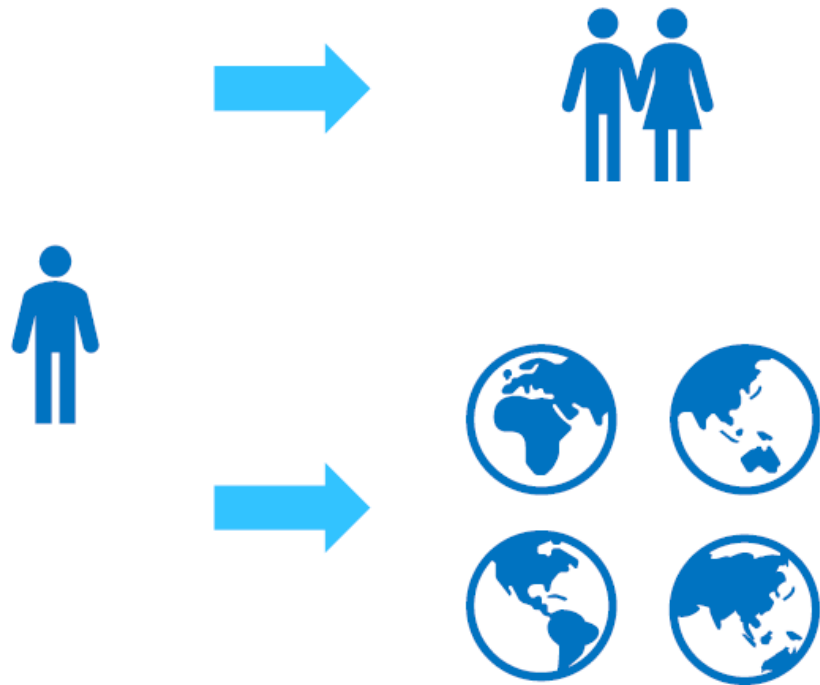


# Personalised Medicine

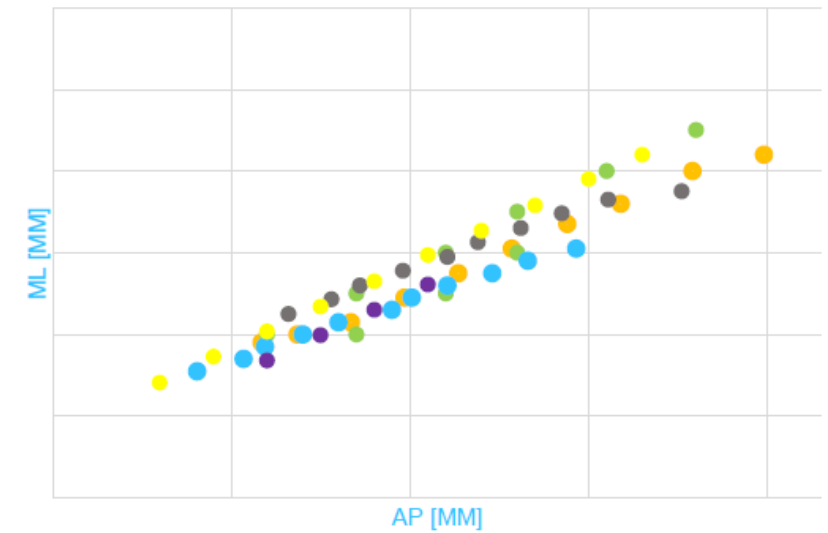


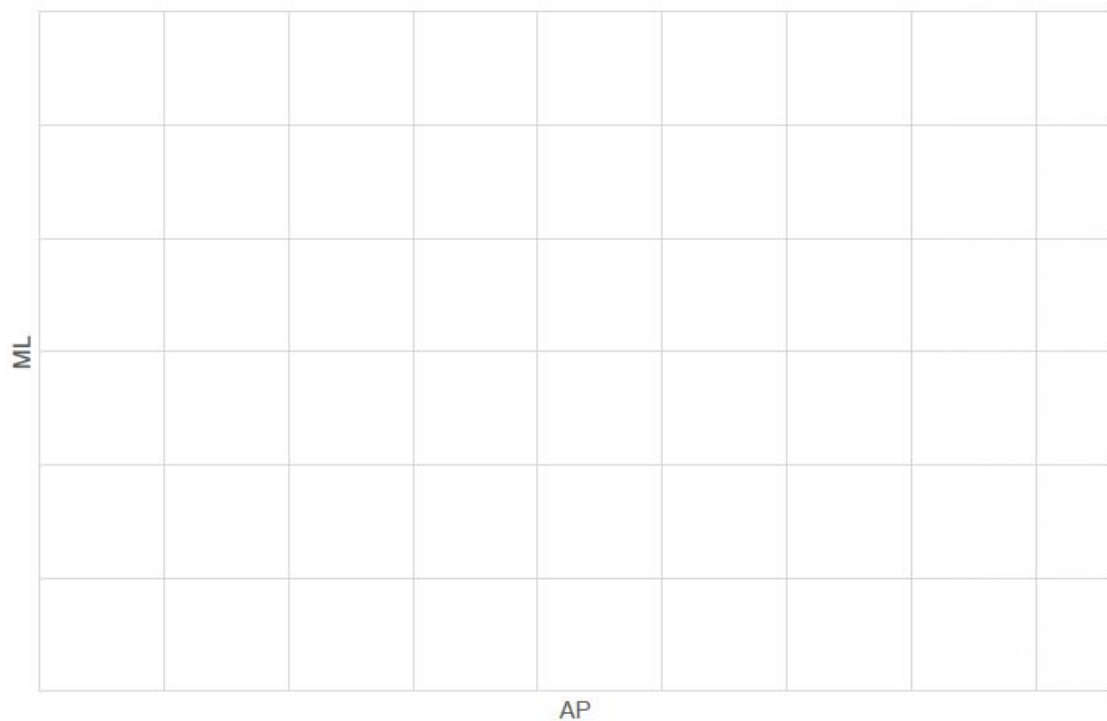


# Personalised Medicine



Point cloud population





Rejoint offers a variety of sizes to cover anatomical variations across the population.



## WE ARE CREATING A NEW WAY TO THINK AT TKA

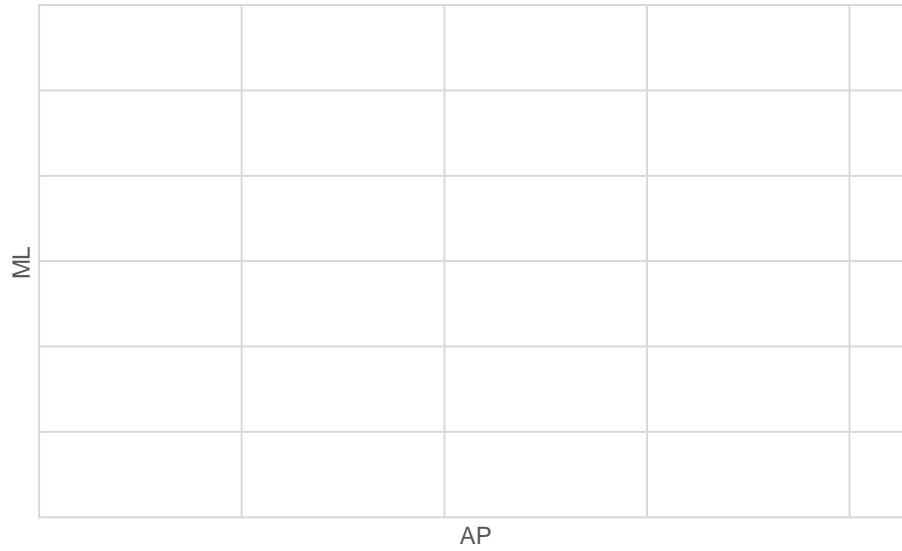
by developing patient specific solutions for the new generation of patients and e-patients and new tools for surgeons and healthcare providers to improve efficiency and clinical outcomes.



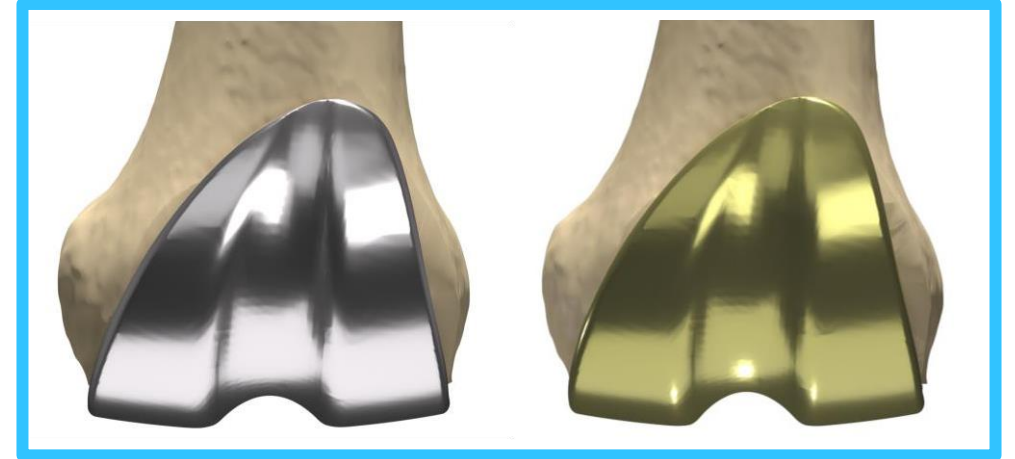


# REJOINT YourKnee

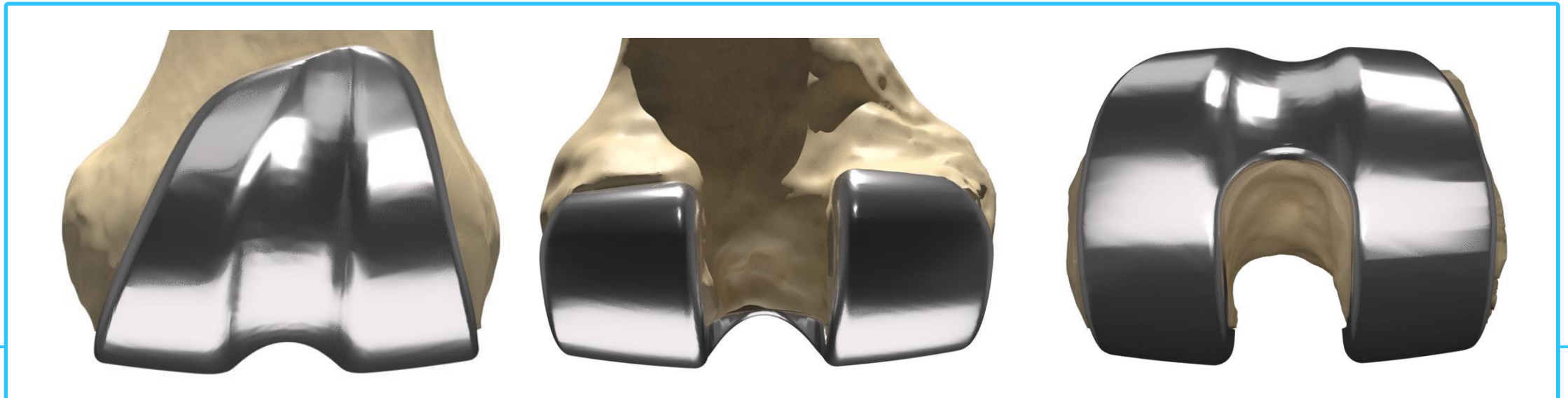
## Personalised solution



## Coating options



## Design options

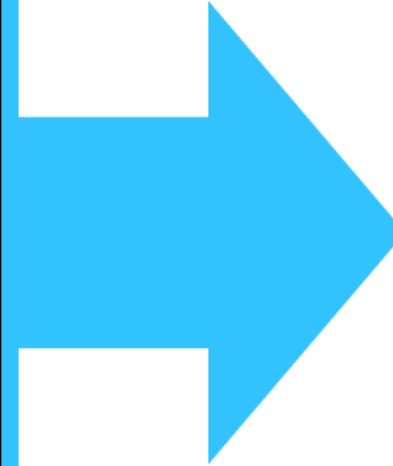


# REJOINT YourKnee

## Total Knee Replacement (TKR)

Personalised approach to the TKR

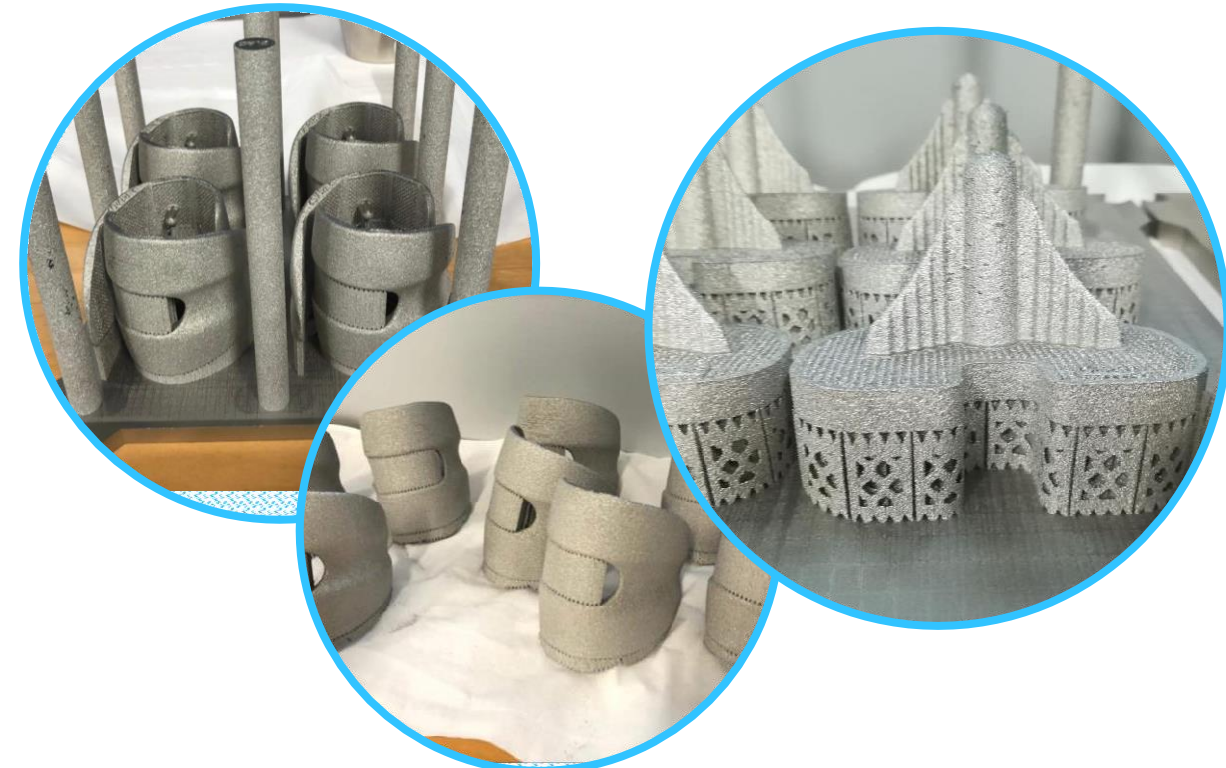
- Specific CT scan protocol
- 3D model reconstruction
- Evaluation of the best-fit size
- Native kinematics



# Best-fit Total Knee Replacement

## REJOINT YourKnee TKR:

- 75000+ sizes
- Cemented and uncemented



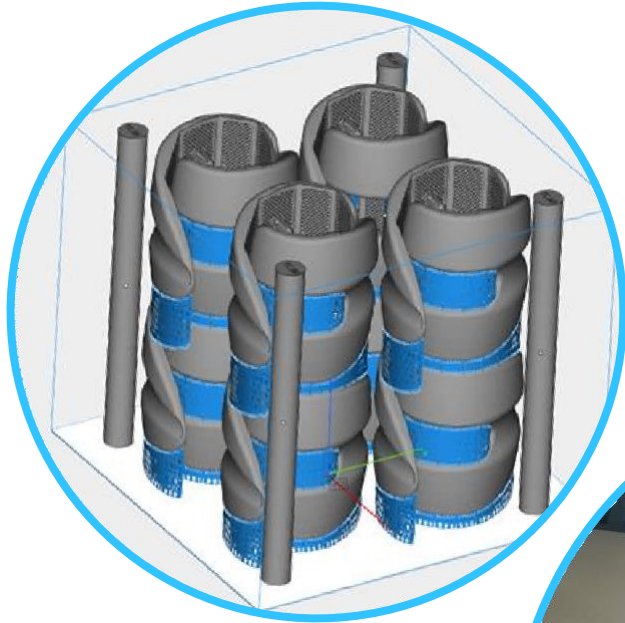
## Additive Manufacturing





# EBM Workflow

## Pre-processing phase



## EBM 3D printer setup



## Printing phase



## Post-processing

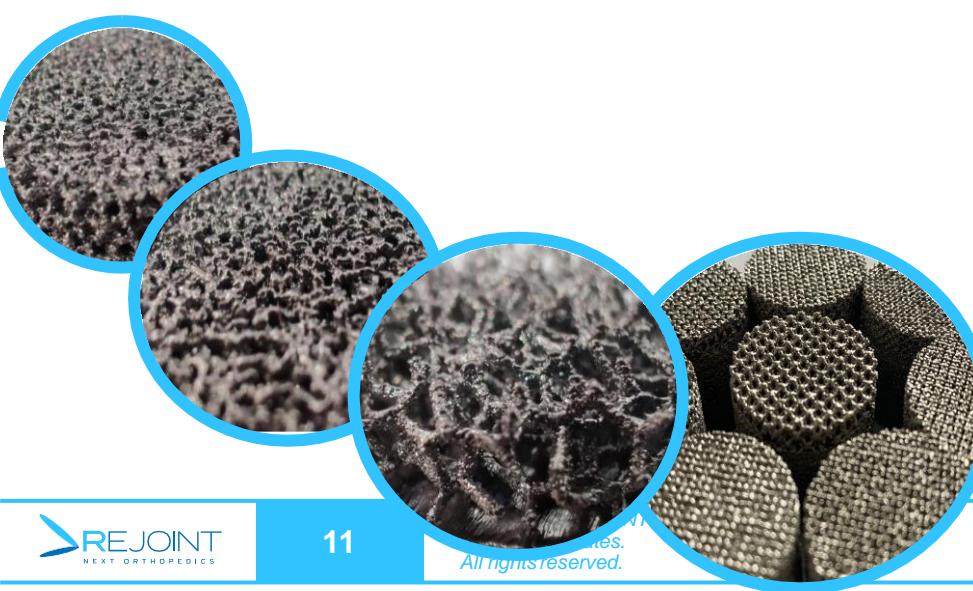
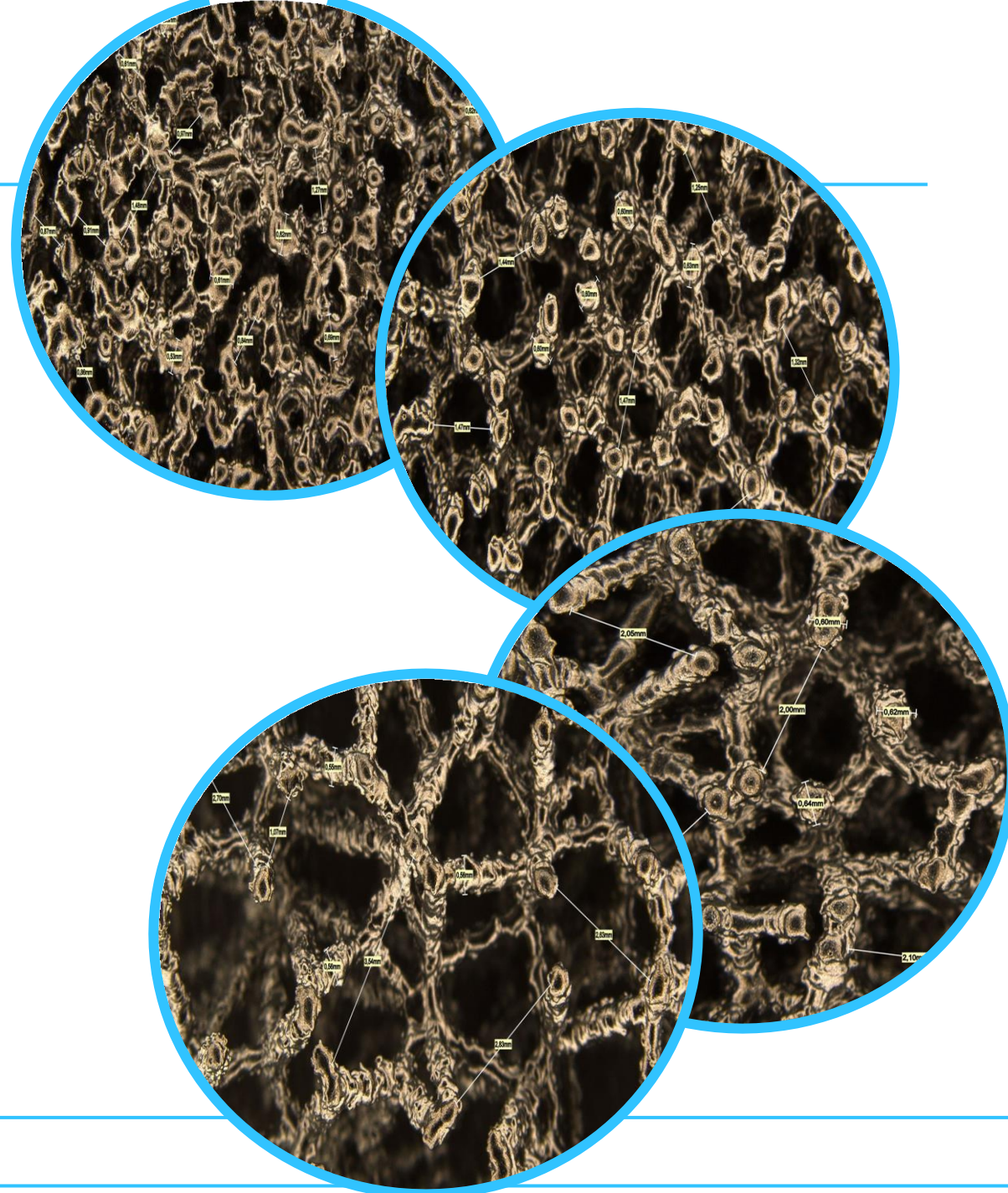




# AM Product development

## Additive Manufacturing advantages

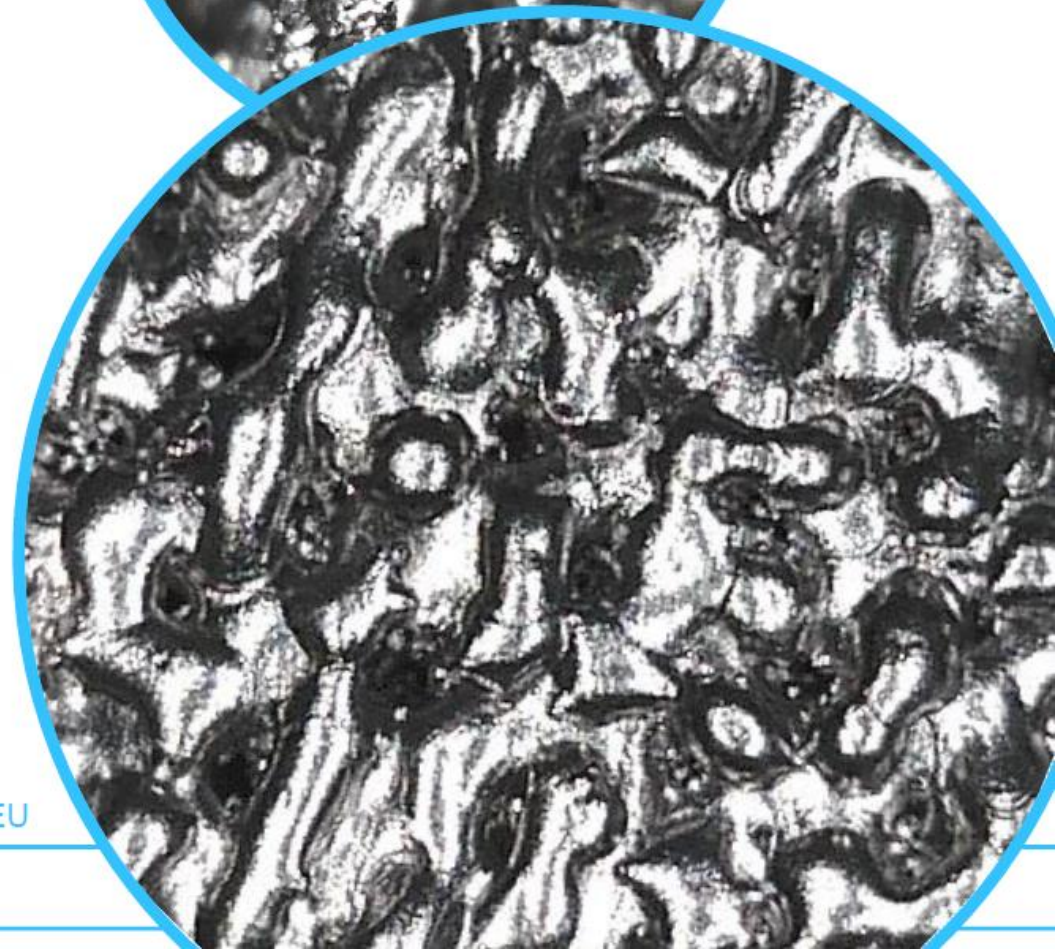
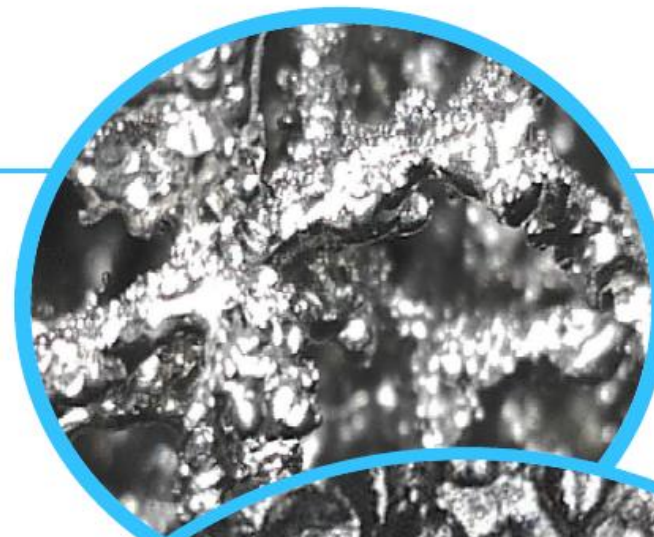
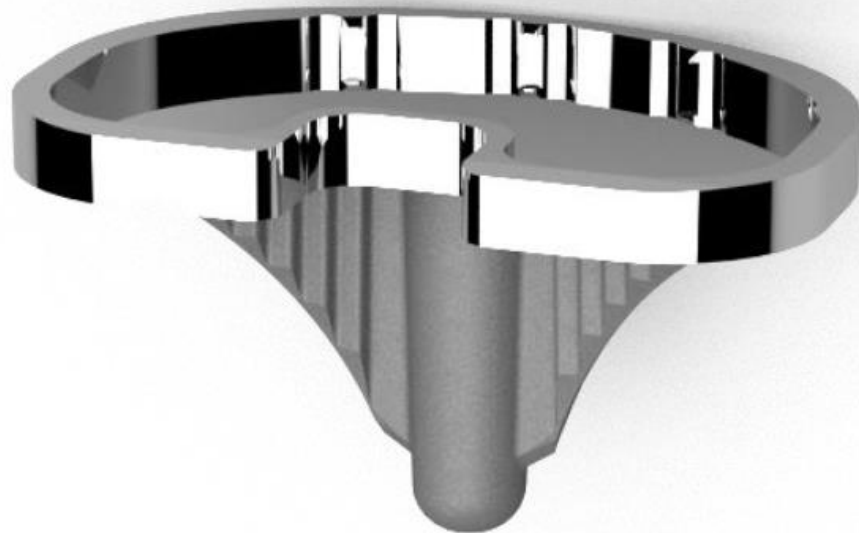
- Rapid prototyping
- Printing on demand
- Complex part design





# Lattice structure for osteointegration

Uncemented tibial tray with lattice structure

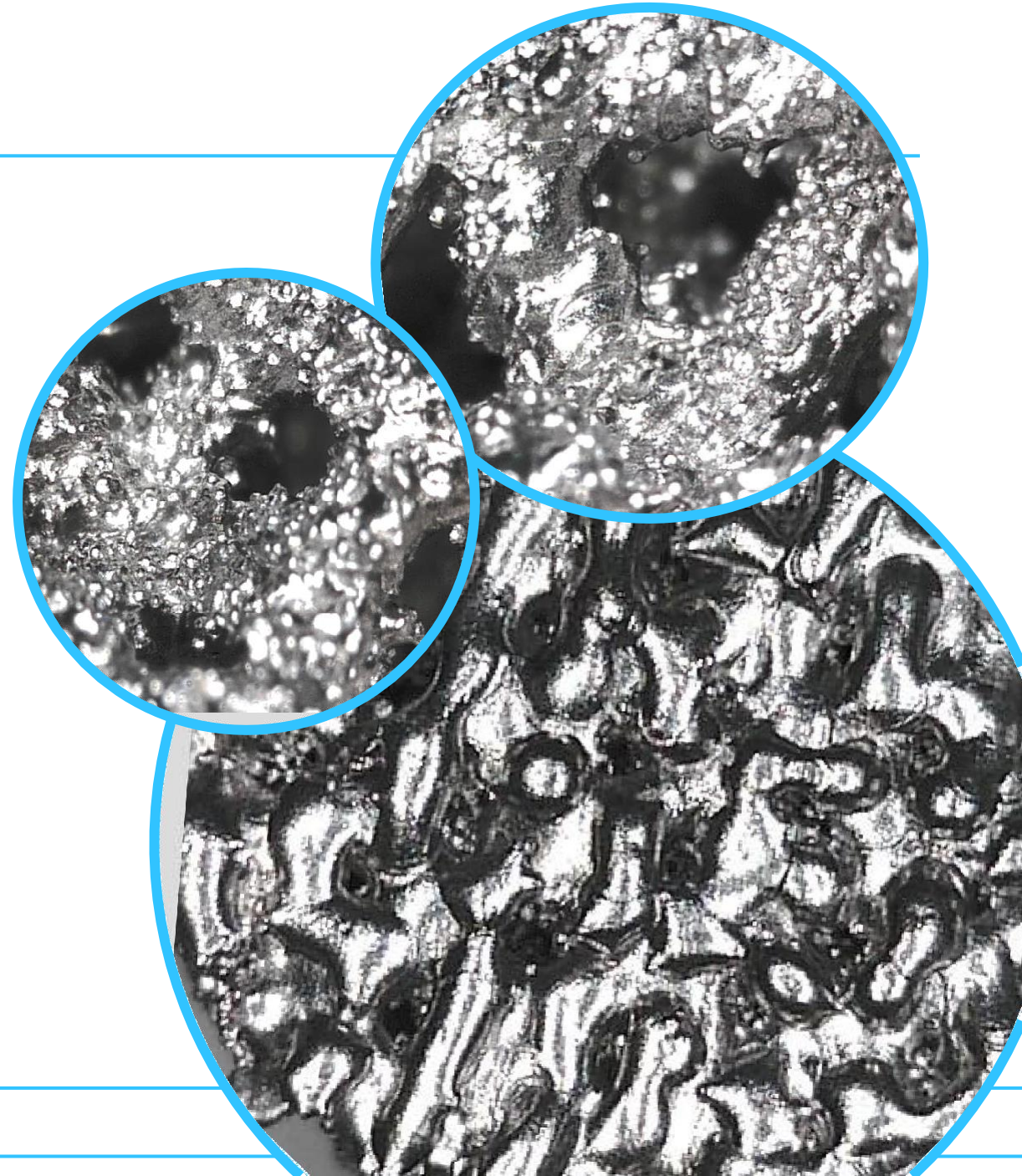
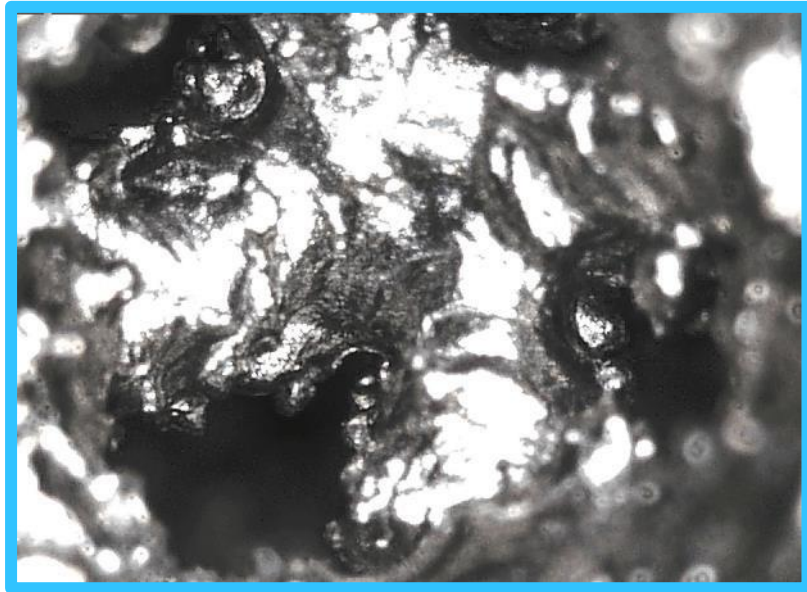


Product finalisation granted by 3DPanEU



# AM Product development

## Design and development of a medical device



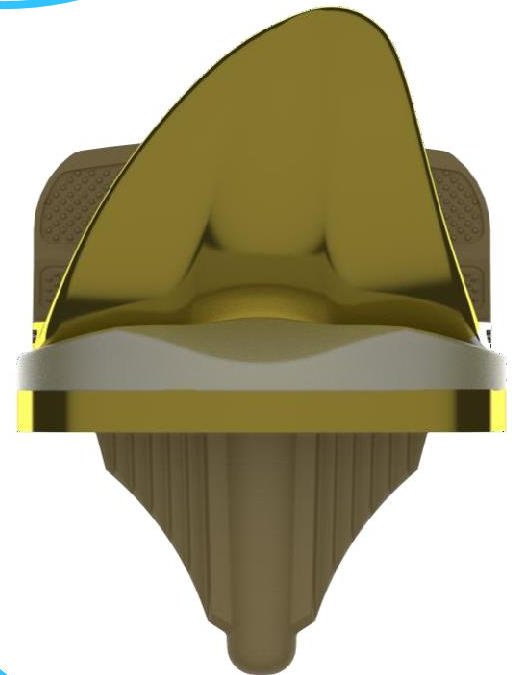
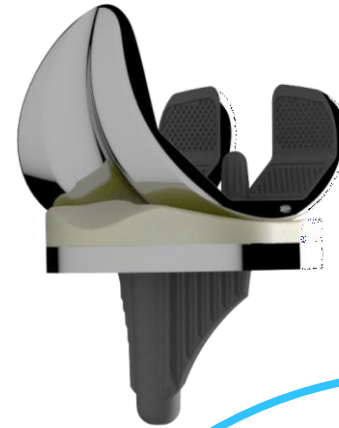
- Evaluation of different materials
- Design and process optimisation
- Product development in collaboration with experts
- Access to equipment for prototyping and/or feasibility studies

FRAUNHOFER PROJECT CENTER  
AT THE UNIVERSITY OF TWENTE





Thanks for your  
attention

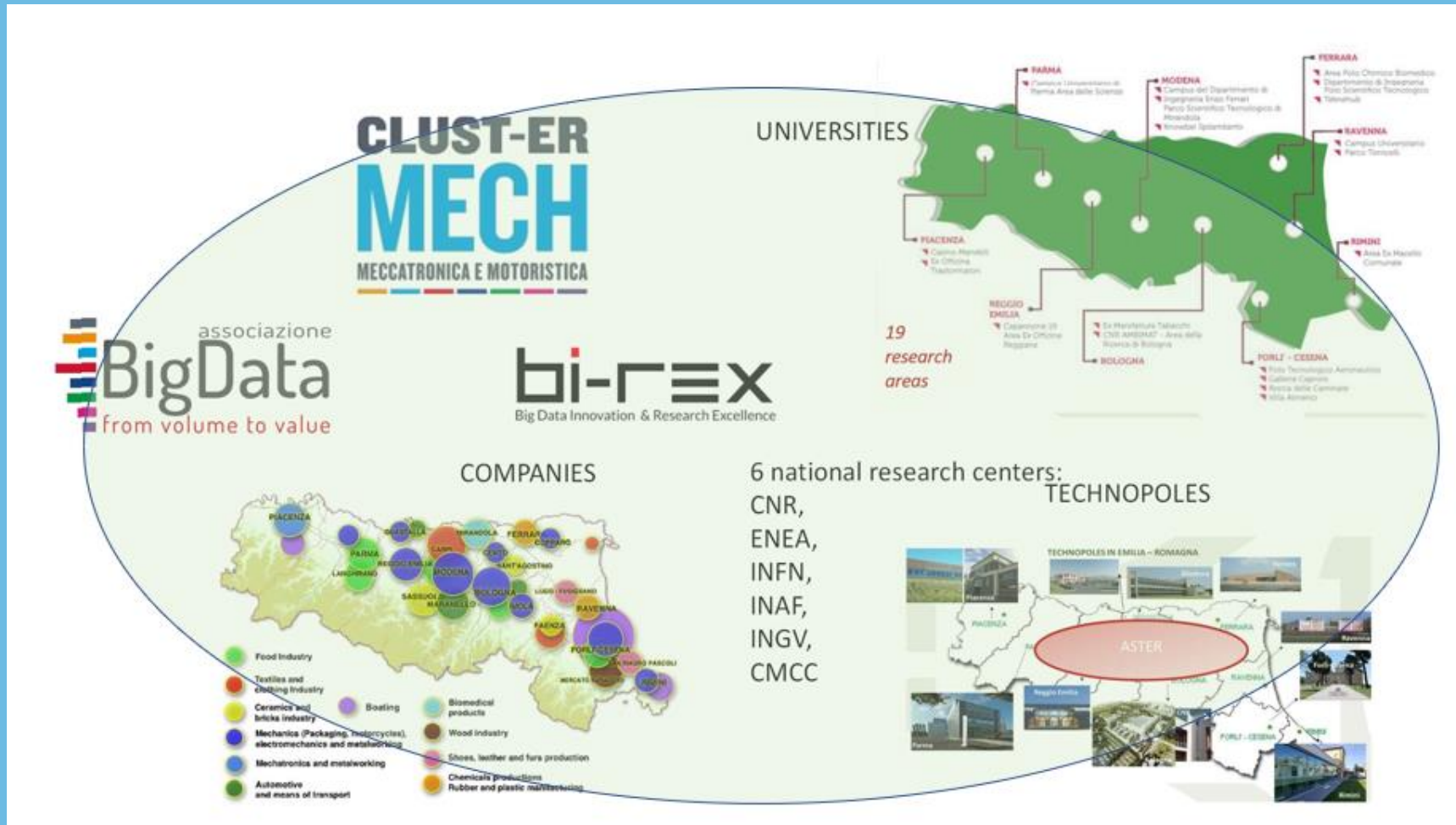


# Role of international facility centres in the European Additive Manufacturing industry

Luca Tomesani, University of Bologna



# A rich environment for innovation



# AM in relation to industrial innovation

One of the more important *Key Enabling technologies* for industrial innovation is Additive Manufacturing, for the immense level of flexibility it allows in product development:

- Digitization
- Almost any geometrical feature
- Easy to understand (in a consumer perspective)
- Customization
- Readyness
- ...

# General AM considerations

Let us be in the perspective of a research center looking for a AM provider for a new concept of a product, to be developed for a customer.

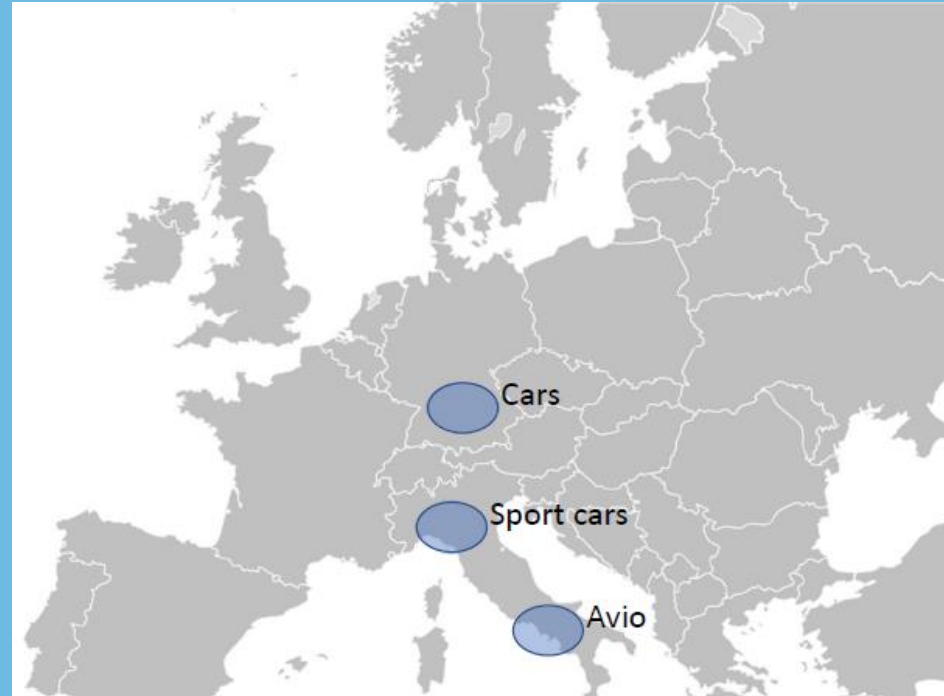


It seems simple, but it's quite the opposite.

- AM Technology selection (SLM, DED, DFM....)
- Material selection and availability
- Design issues (from conventional to generative)
- Manufacturability (samples, strategies, stresses and strains, simulation, optimization)
- Machine issues (volume, speed, cleaning for material substitution)
- Monitoring and Control (during process, on final product)
- Post processing
- Cost issues

# Progressive clustering of AM Capabilities

- Application sector: the AM provider knowledge is fundamentally driven by the industrial sectors targeted by the AM provider: production capability are clustering in regional areas around big OEM
- Beyond the AM process, many other facilities are often needed, which are also related to the industrial sectors of the industrial area, this further increasing clustering of knowledge
- 

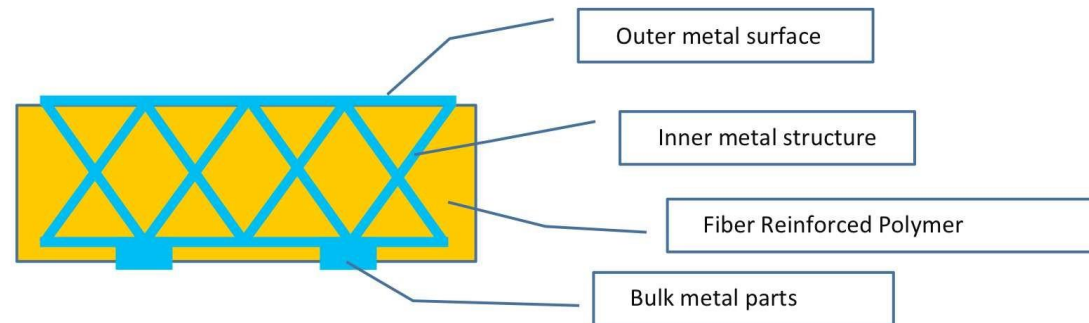


In Vanguard democases, the seek for new applications for the AM technology generates new links that require new «far» knowledge

# Multi-materials components by hybrid 3DP manufacturing

## Demo-case

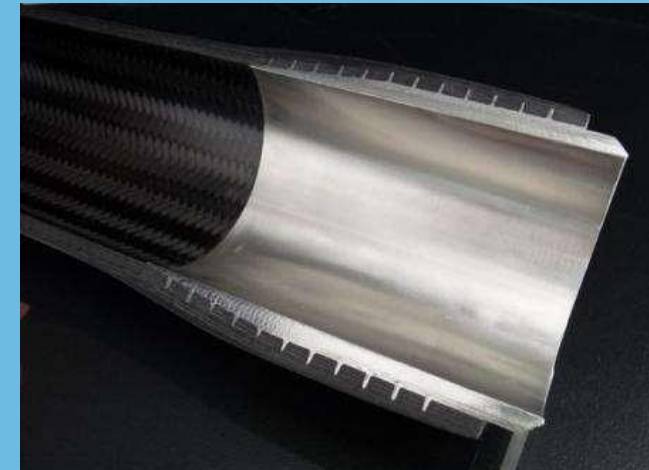
*Multi-Material Hybrid Components* develops technologies for lightweight structural application where there is the need to effectively join metals and polymer-based composites.





# Multi-material hybrid components

In 2015 we were interested in the substitution of metal parts with composite materials, where there always is the need to integrate metal inserts inside the composite part



PINS at the interface between metal and composite could provide much more resistant joining



# Multi-material hybrid components

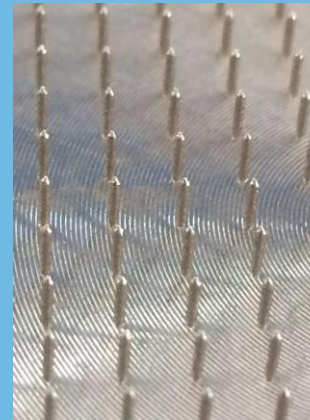
We had to look for pin and lattice constructions, that could be infiltrated by composites

Thus we had to talk to:

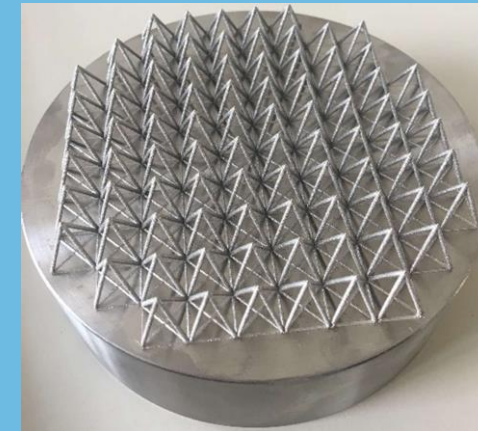
- 3DP experts for pins and lattice manufacturing
- OEM companies for materials selection
- Composite experts for infiltration processing

In the field of 3DP, it is easy to find a printing facility, but it is much more difficult to find the machine working on the particular material you need.

Moreover, you may find very skilled people in the fields you need, whose knowledge is only partially related to the particular problem you have; and they are actually doing something else.



Pin construction  
by Additive  
manufacturing



LATTICE STRUCTURE  
by AM

# The need for expertise

There are two kinds of Experts

1. General expert
2. Closed expert

Question: can we build a lattice structure of pyramids 0.8 mm thick, 10 mm height, all around a cylinder of 50 mm diameter?

General expert:  
I don't know, we must try



3-12 months for  
having the answer

Closed expert:  
Yes, but the maximum  
inclination of the pyramid is  $45^\circ$



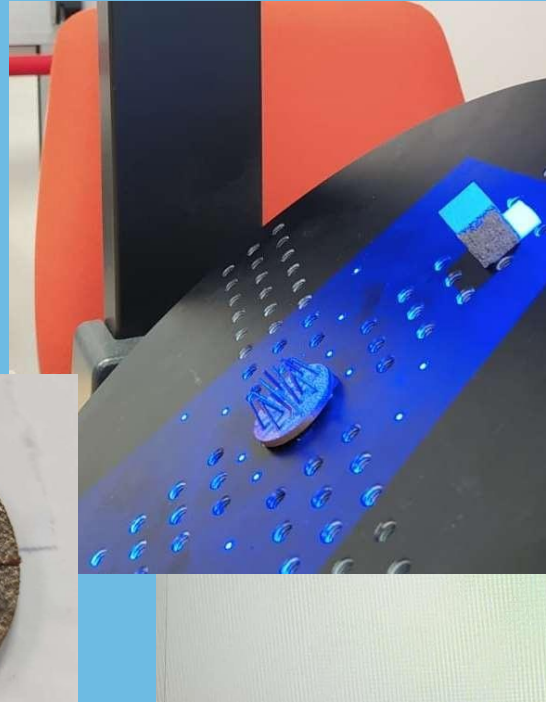
1 second for having  
the answer

# In-house evaluation of process reliability

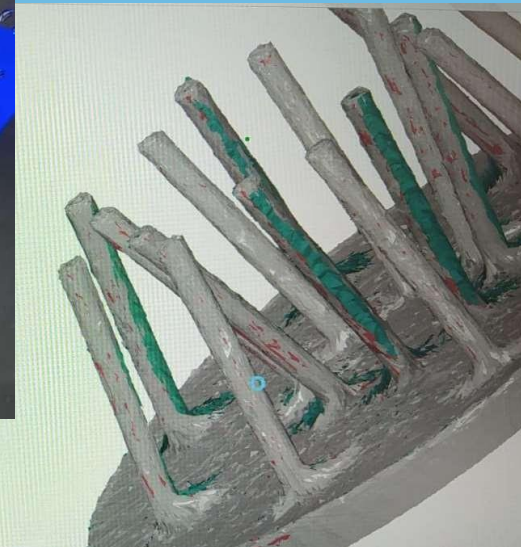
Printed samples



3D scanning



Evaluation



# Conclusions and considerations

If we need to build up complex technological routes, combining different processes and materials, then the product development will proceed very slowly.

So we must consider the SPEED with which we innovation is produced.

The speed depends on the availability of

- Laboratory facilities and tools
- Closed experts in different fields
- A network of industrial facilities

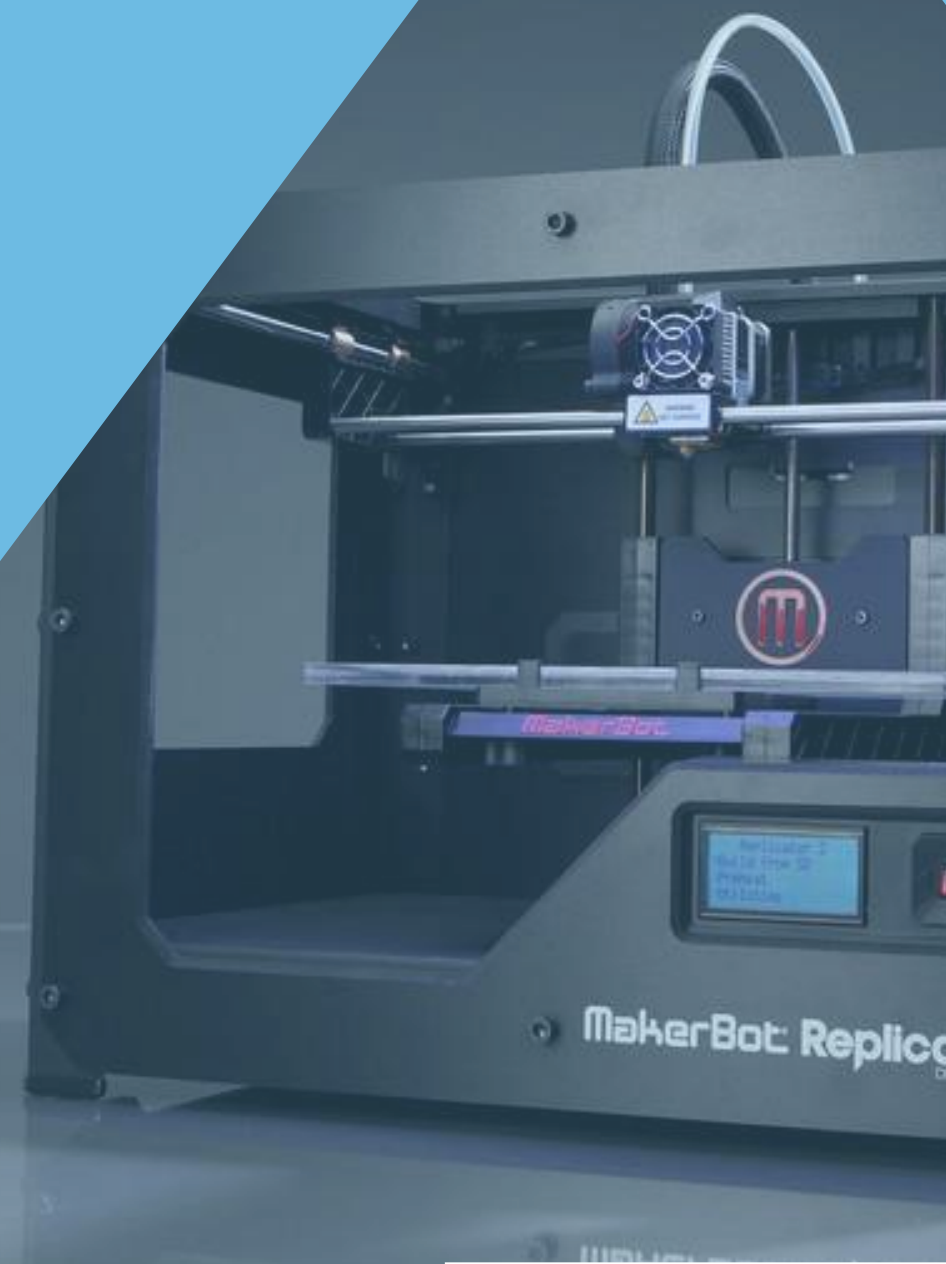
Thus it is absolutely essential to have a vast (inter- regional) network of both:

- experts (RTOs) and
- facilities (Companies)

The Democase of the 3DP Pilot is the place where you create the network of experts and facilities that may be helpful for a particular task (i.e. to build a component made by two distinct materials)

The Democase is also the place where you may draw the masterplan of your job, maybe with the help of an RTO near to the end user company

# Q&A



# Next steps and closing remarks

- October 2021 marks the end of the 3DP PAN EU project
- Activities
  - Further development of the [www.3dppan.eu](http://www.3dppan.eu) platform
  - Wrap-up SME led industrial projects
  - Finalisation report

# Thank you!

[www.3dppan.eu](http://www.3dppan.eu)

[info@3dppan.eu](mailto:info@3dppan.eu)

