EU Market for 3DP Demonstration Equipment and Services – Draft Executive Summary

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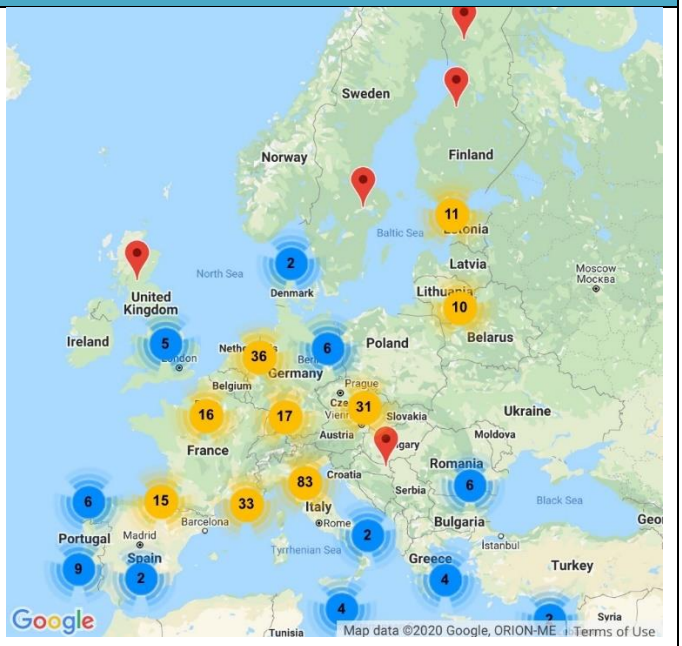
Introduction and Context

This executive summary has been drafted in the context of the **DG GROW** **3DP Pan EU Project**[1] and aims at providing a summary of the main results from the report on 'EU Market for 3DP Demonstration Services', which is available in full here. The report aimed at conducting a 'gap analysis' of (demonstration) support services for 3D printing ('3DP'), relying (among others) upon insights derived from the data set complied in the context of the 3DP PAN EU project. More specifically, the report aims at further assessing the alignment of demand and supply of demonstration services now and in the near future as well as to assess how actors providing testing/validations-related services in Europe can, eventually, better serve/anticipate on the needs (current and expected) of the industry.

The core of the report lies on the analysis of the (current and expected) Demand and Supply of **demonstration services**. Such analysis is based on data gathered in the context of the **3DP Pan EU Project** (see table below for a brief overview of the data). To identify and assess current and upcoming industrial trends influencing the demonstration-related activities, the present report starts with a global/overall analysis of the 3D Printing landscape in Europe. Such analysis is based on extensive desk research[2]. Finally, the report concludes with a list of key trends and policy recommendations for an adequate 3D Printing demonstration-services landscape.

Figure 1: 3DP Pan EU data base – Brief overview

3DP Pan EU Data Base – In a nutshell	
▸ **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).	

Below, in the subsequent pages key takeaways from the overall report are presented. Interested readers are invited to consult the full report for further details.

[1] The 3DP Pan EU project is a European Parliament pilot action managed by the European Commission (DG GROW) and implemented by a consortium consisting of Brainport Development, IDEA Consult, ART-ER, CIVITTA and Asterion Europe.

[2] AMFG, (2020), The Additive Manufacturing Landscape Report 2020; EASME (2020). Advanced Technologies for Industry – Product Watch. 3D printing of hybrid components; EASME (2017). Advanced Technologies for Industry – Technology Watch. The disruptive nature of 3D Printing.; Ernst & Young, (2019), 3D printing: hype or game changer?; AM-motion, (2018), AM-motion Roadmap; Wohlers Associates, (2020), Wohlers Report 2020: 3D Printing and Additive Manufacturing - Global State of the Industry

Demand Side - A particularly strong dynamism in some segments…

The box below provides a general overview of some **key worldwide trends** that illustrate the extent to which the AM market is increasingly growing.

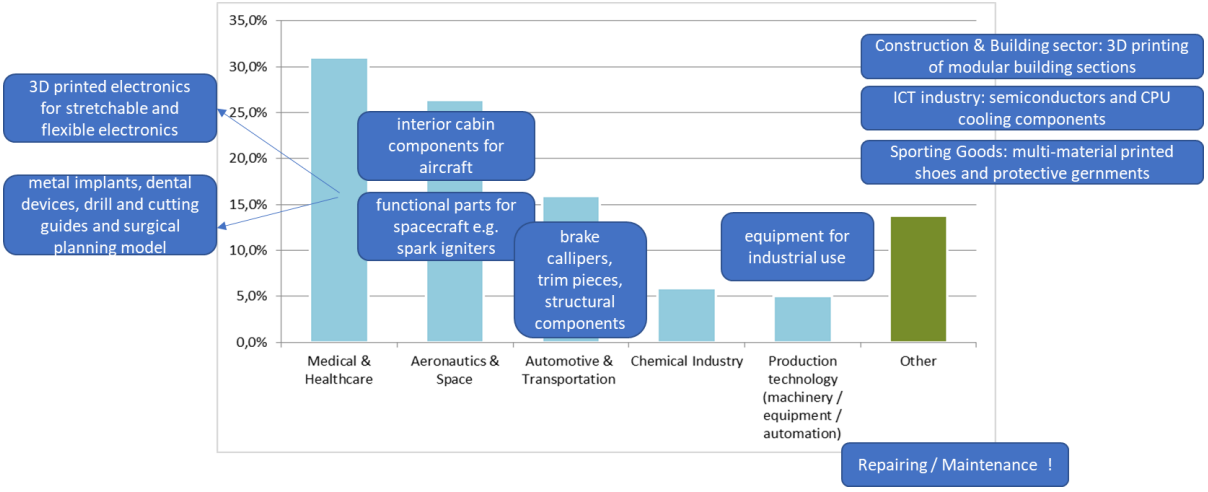
Box 1: The Worldwide AM-market: key trends

€	• 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)

Source: IDEA Consult based on AMFG (2020), EASME (2020), EASME (2017), Ernst & Young (2019), AM-motion, (2018), Wohlers Report 2020, SAM (2021), 3DP Pan EU Data

When looking at **AM current and future applications areas for final products,** as indicated below, the 3DP Pan EU searches made on the 3DP Pan EU platform tend to confirm trends that have been identified through desk researches[3], i.e. demonstration requests were mainly associated to the following sectors: Medical & Healthcare, Aeronautics & Space, Automotive & Transportation, which are sectors where AM is relatively well deployed. However, extensive desk research and industrial expertise enabled to identify 1) new emerging segments/components in the 'traditional' sectors for which 3D printing will be particularly relevant in the future and 2) new sectors where the use of 3D printing will be growing. Such new sectors and segments are highlighted in the figure below and the discussed in the details in the report.

Figure 2: Top 5 sector searches on the 3DP Pan EU Platform, per sector (% of total searches)): a view on upcoming users

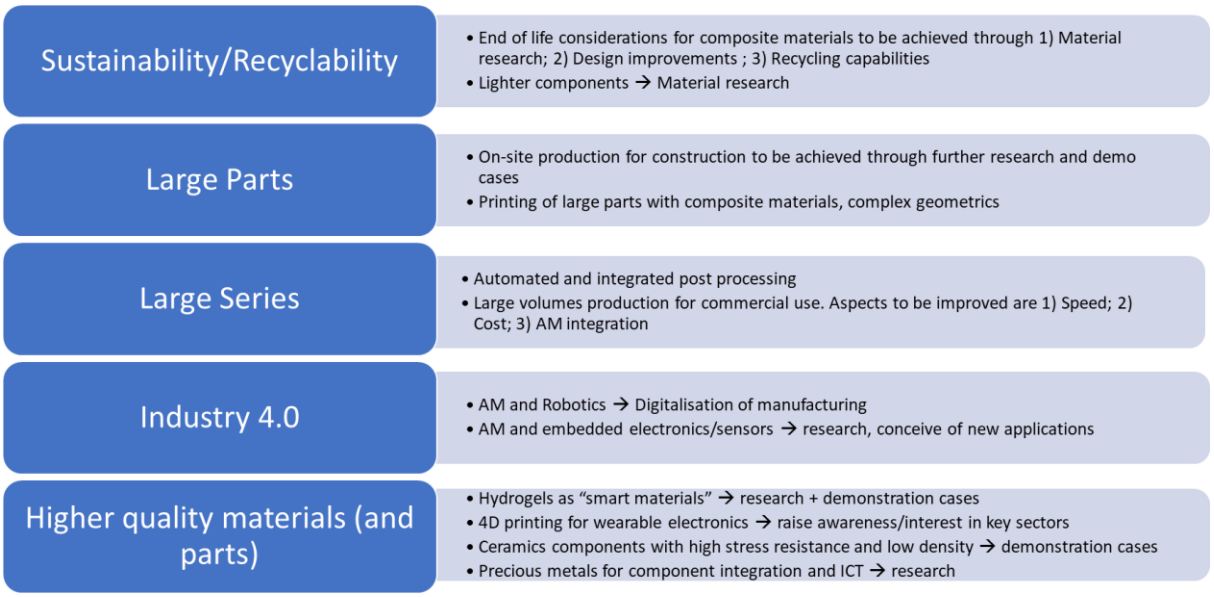


Source: Source: IDEA Consult, based on 3DP PAN EU Platform data, 2021

[3] E.g. Wohlers Associates, (2020), Wohlers Report 2020: 3D Printing and Additive Manufacturing - Global State of the Industry, p. 22.

In terms of **Innovative technologies and processes of 3D Printing** and related demonstration needs, while the proof for where innovations are leading towards in the near future is mainly anecdotal, the figure below provides an overview of 'innovation areas' that will be particularly important in the future. These are 'areas' where the deployment of innovations is expected in view of strengthening further the position of 3D printing as the key, automated, factory-floor integrator between data and tangible products.

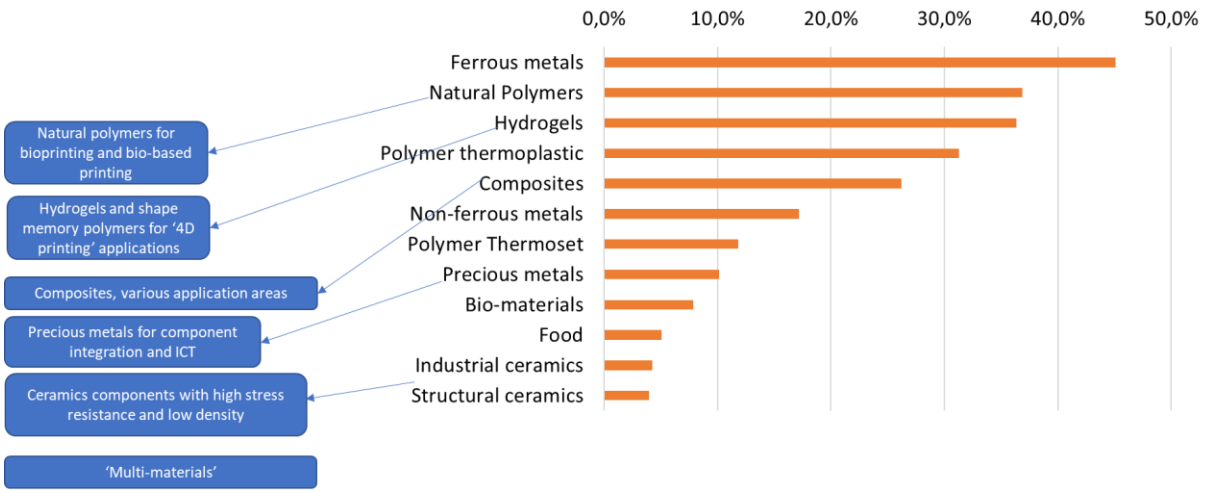
Figure 3: Illustrative list of promising 'innovation areas', where solutions are expected to improve the impact of 3D printing on business outcomes



Source: IDEA Consult

When looking in more details at **specific materials** expected to gain in importance, the following figure puts forward the materials that were most often looked for in the 3DP Pan EU Platform (i.e. searches made in % of material-specific searches). This information is complemented by an overview of the materials (and associated applications) that are expected to gain in importance in the coming years. These combinations of materials and applications are detailed in the report.

Figure 4: Searches made in % of material-specific searches and identification of relevant materials-applications in the future

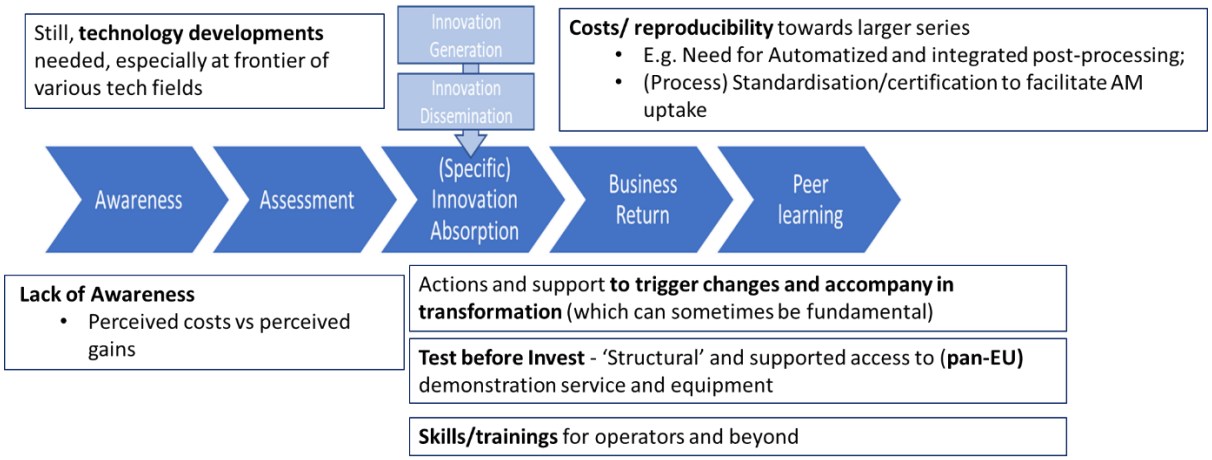


Source: IDEA Consult, based on 3DP PAN EU Platform data, 2021 and Desk Research

…But major barriers remain for further deployment

The figure below presents an overview of main demand-related barriers that do hamper the deployment of 3D printing among SMEs (downstream SMEs, in particular). These barriers can be associated to various steps in the 'innovation chain' that are necessary for the uptake of innovations. These barriers, among other more technical ones, are discussed more in details in report.

Figure 5: Barriers to uptake 3D printing – A look at downstream SMEs 'innovation chain'



IDEA Consult, based on DG GROW ADMA project, 2021 and DG GROW 3DP Pan EU project

Supply side - Availability of equipment and services

The table below provides information about **materials** that are used on the 3D printing equipment of all facility centres registered on the 3DP Pan EU platform. It appears that there is a wide coverage of equipment printing in metal and plastics AM but an overall and relative lack of equipment using materials that will be more and more important in the future: Hydrogels; Precious metals for ICT; Composites – Ceramics.

Figure 6: Number of equipment registered on 3DP PAN EU platform working with different materials and % of the total number of equipment in a country

	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%)

Source: IDEA Consult, based on 3DP PAN EU Platform data, 2021

The following table illustrates what materials facility centres are able to work with per sector. As an example on how to read the table, it indicates that of all the equipment registered on the platform that manufacturers parts for the Aeronautics and Space sector, 1,8% are capable of producing parts made out of bio-materials. Globally, rather similar trends across sectoral uses can be pointed out.

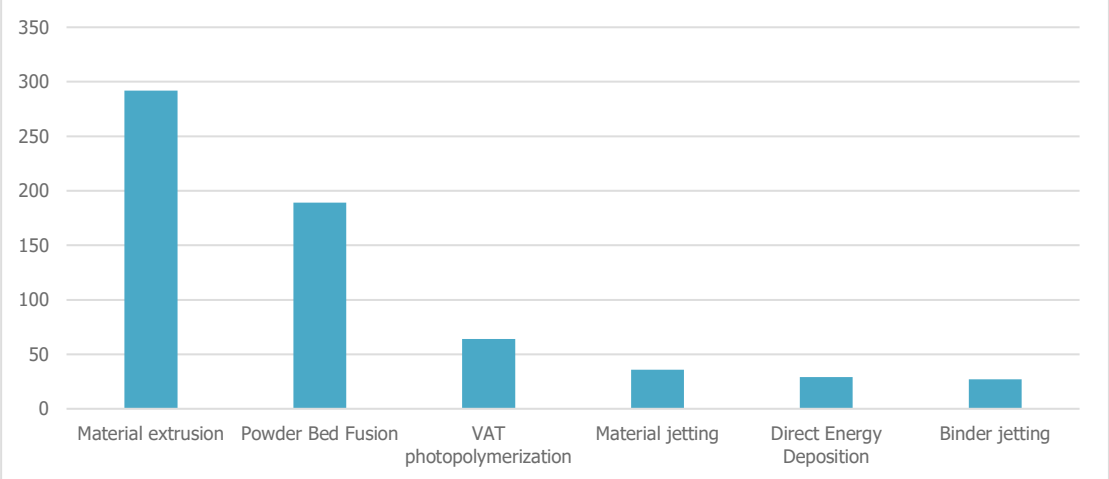
Figure 7: Materials use per sector by facility centres registered on the 3DP PAN EU Platform (in % of the total FCs)

	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%

Source: IDEA Consult, based on 3DP PAN EU Platform data, 2021

The following figure provides an overview of what **technologies** the facility centres having registered their equipment on the platform apply within additive manufacturing. Material extrusion (mainly plastics based) and powder bed fusion (for metal AM) are the technologies within additive manufacturing that the highest share of equipment performs (45,5%).

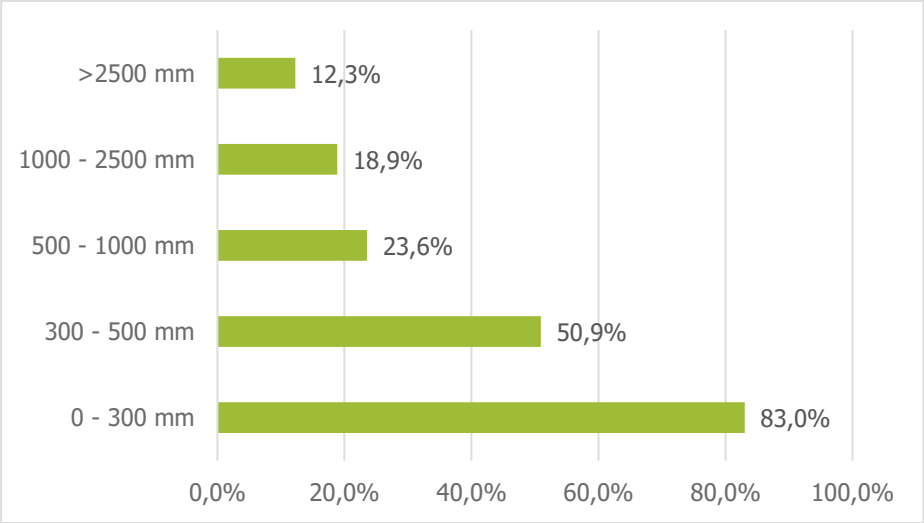
Figure 8: Equipment registered on the 3DP PAN EU platform per AM technology used



Source: IDEA Consult, based on 3DP PAN EU Platform data, 2021

Of the facility centres having indicated what **size** parts they are able to produce, 83% indicated to be able to manufacture small parts between 0 and 300mm. As larger parts require larger printers, larger facilities and oftentimes bigger investments, only 12 facility centres with a total of 97 printers and AM systems in Europe are able to manufacture large parts above 2.5m.

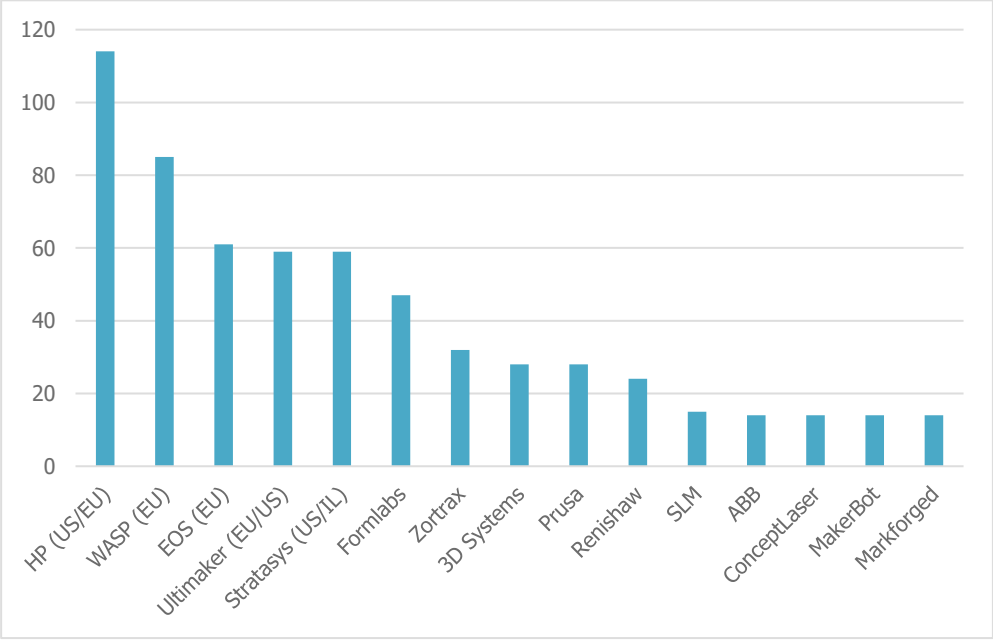
Figure 9: Component size capabilities of facility centres in EU



Source: IDEA Consult, based on 3DP PAN EU Platform data, 2021

Over 1300 pieces of equipment have been registered by facility centres on the 3DP PAN EU Platform. **The top 15 brands** represented make up 60% of all represented brands, of which there are over 160. Facility centres indicated the specific brand of their equipment for 1000 out of over 1300 registered pieces of equipment. The top 3 brands of AM equipment registered on the platform are HP, WASP and EOS.

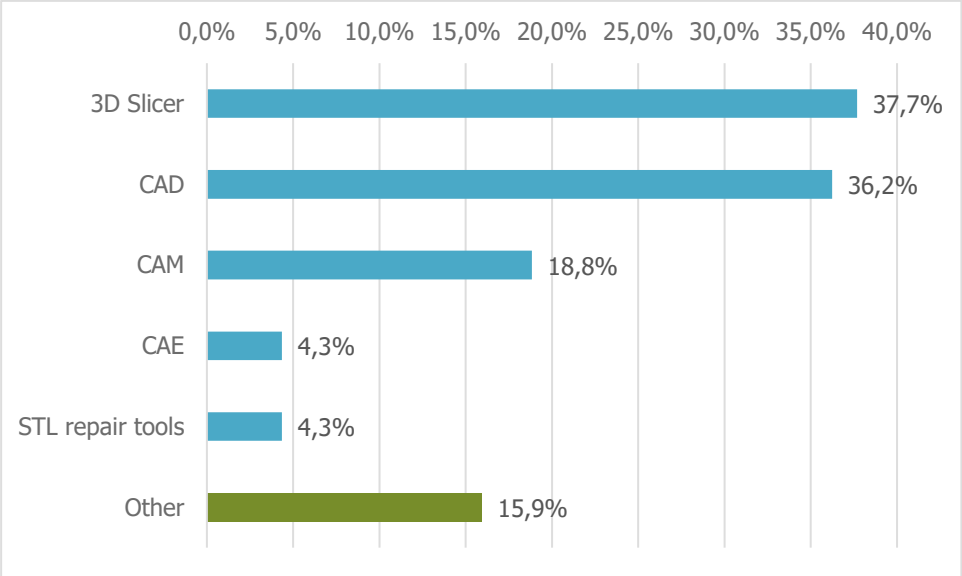
Figure 10: Top 15 brands of AM equipment registered on the 3DP PAN EU platform



Source: IDEA Consult, based on 3DP PAN EU Platform data, 2021

The **software** that is most used on the equipment is 3D Slicer, used by 37,7% of the 69 registered facility centres having provided information on the software their equipment runs on. A lack of appropriate coverage for Advanced Materials can be pointed out.

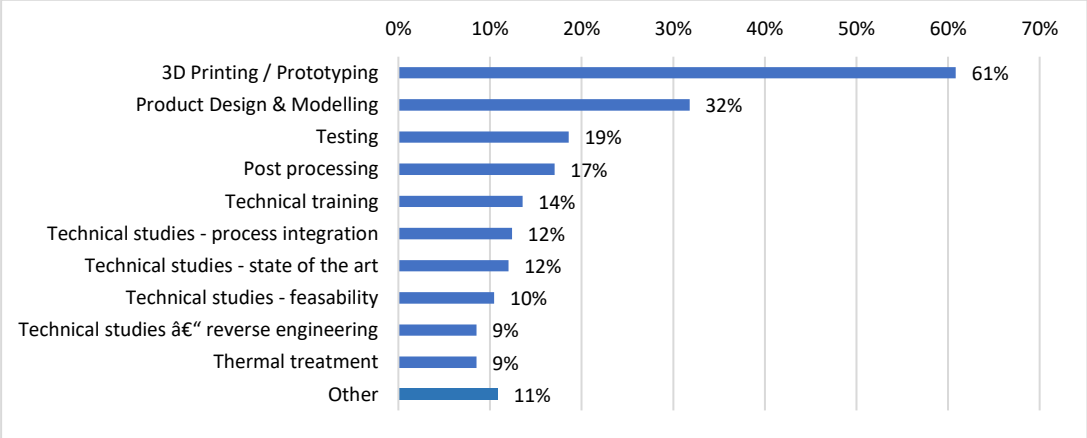
Figure 11 Main software used by facility centres registered on the 3DP PAN EU platform



Source: IDEA Consult, based on 3DP PAN EU Platform data, 2021

The 3DP PAN EU Platform counting 381 Facility Centres in October 2020 gives access to a range of **technical services** to all relevant sectors who potentially benefit from AM technologies.

Figure 12: Top 10 services offered by facility centres



Source: IDEA Consult, based on 3DP PAN EU Platform data, 2021

Country-specific insights show that relatively more facility centres in Spain are active in automotive & transportation and aeronautics and space, which is aligned with the sector-specific equipment use in the country detailed in the report. France is also relatively more active in these sectors than in others. Activities in German facility centres are relatively more spread out across different industries. In general, however the provided services logically follow the trend of the equipment distribution in the top six countries.

Matching Demand and Supply – Gaps?

The figure below provides the generic conclusions based on confronting demand and supply for demonstraton services.

Figure 13: Overall and generic conclusions

More specifically, when looking at the matching between the expected/upcoming demand and supply of demonstration services and the possible gaps that might require corrective (policy) actions. Such analysis is based on the following steps:

1. First, we have identified (relying upon insights from chapters 1-3) some key 'trends' that will characterise the demand for 3D Printing solutions and, in particular, the associated needs in terms of demonstration services. These trends are grouped according to several key categories:
    - Specific future application areas for final products;
    - Production scale (both in component size and batch size) and finishing;
    - Material/applications areas;
    - Technical/technological combinations and segments;
    - Non-technological demonstration services;
    - Ecosystem(s).

    Trends in every of these categories have been identified and selected based on evidences presented in the report, including analysis of the 3DP Pan EU data.
2. Second, an assessment of the expected 'ability' of the EU 'supply side' (i.e. demonstration service providers: facility centres) to address/to cover these emerging needs is provided. Such assessment is based on the current and anticipated EU expertise and capabilities based on the insights gathered through, among others, analysis for the 3DP Pan EU data. Overall, for each expected, trend, two distinct qualitative assessment are proposed:
    a. The equipment/expertise/services and innovation support do seem to already gradually adapt to the trends and are filling in the gaps, without important corrective actions needed;

    Or

    b. The equipment/expertise/services and innovation support do not seem to gradually adapt to the trends and corrective actions are needed.

The table below presents the results.

Figure 14: Anticipated demonstration gaps

Identified EU-relevant trends in terms of demand of (demonstration) services		**Readiness (TRL / IRL)**	**EU Demonstration Expertise and Equipment - A preliminary assessment**	
Categories	Key Upcoming Trends	*Higher TRL level reached*[4]	Gaps, but developments on track	Gaps, corrective/supportive policy-actions needed
Specific future application areas for final products	Automotive & Transportation (excluding ships and boats): brake callipers, trim pieces, structural components	*8*	x	
	Medical & Healthcare: metal implants, dental devices, drill and cutting guides and surgical planning model	*6*		x
	Medical & Healthcare: bioprinting of living tissue	*3*		x
	Medical & Healthcare / sporting goods: 3D printed electronics for stretchable and flexible electronics	*7*	x	
	Production technology: equipment for industrial use	*8*	x	
	Aeronautics & Space: interior cabin components for aircraft *(relevant to some EU countries only)*	*8*	x	
	Aeronautics & Space: functional parts for spacecraft e.g. spark igniters *(relevant to some EU countries only)*	*7*		x
	Construction & Building sector: 3D printing of modular building sections	*8*	x	
	ICT industry (including electronics, computer and communication related products): semiconductors and CPU cooling components	*4*	x	x
	Sporting Goods: multi-material printed shoes and protective gernments	*9*	x	
	Food: edibles for space exploration and vitamin delivery to the elderly	*4*	x	
Production scale and finishing	Automatized and integrated post-processing	*6*		x
	Large volume 3D printing for commercial use	*7*	x	
Material/applications areas	Multimaterials for all applications and sectors	*7*		x
	Precious metals for ICT industry	*6*		x
	Ceramics for components with high stress resistance and low density	*8*		?
	Composite materials for all applications and sectors	*7*	x	
	Biomaterials for various applications and sectors	*7*	x	
	Hydrogels (and shape memory polymers) for various applications and sectors (incl. '4D printing' applications)	*4*		x
Technical/technological combination	Recyclability/energy savings properties in AM	*n/a*		x
	Establishing ICT/AI/AM integration	*n/a*	x	x

[4] This provides an assessment of the current technology readiness level of the identified trend (i.e. higher TRL level that is currently reached in the EU).

s and segments	Establishing IOT/AM integration	*n/a*	x	x
	Increased circularity measures in AM	*n/a*		x
Non-technological demonstration services	Skills/training	*n/a*		x
	Standardisation/certification to facilitate AM uptake	*n/a*		x
	Raising awareness of AM possibilities industry-wide	*n/a*		x
	Energy-savings / Circularity-related measures and knowledge in AM (end of life, etc.)	*n/a*		x
Ecosystem(s)	Creating synergies between tech/industrial communities (multisided 'platforms'/integration)	*n/a*		x
	Intersectoral and interregional AM collaborations/synergies for brain-gain and critical mass	*n/a*		x

Matching Demand and Supply – Recommendations

This section will be made available in November 2021, following the treatment of stakeholders and experts feedbacks that will be provided during the Final Conference on November 10th