

[Facts Sheet]

2nd Round of AM Surveys 2020

December 2020



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3D Printing Skills

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AM courses provided for technological skills are market-oriented

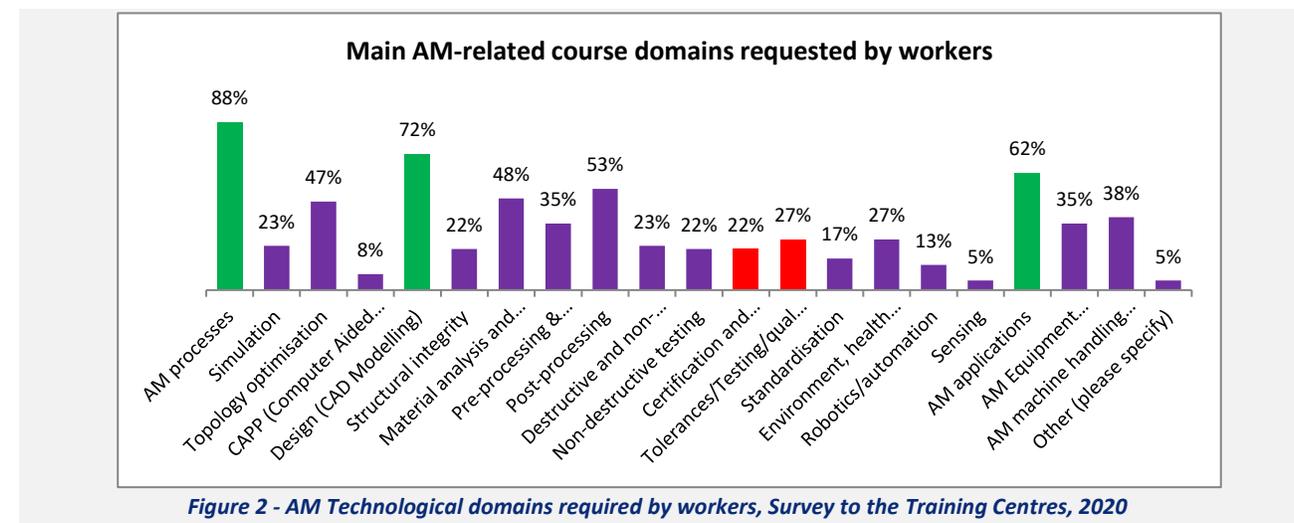
Educational Training Practices in Additive Manufacturing

A survey to characterize the nature of AM Training was conducted in 2020 with 96 education and training organisations, mostly universities, training institutes and other entities. It was clear that higher qualification levels are the focus in the educational provision for AM. 2/3 of the offers (65.52%) and thus the majority can be assigned to the level of the Bachelor's or Master's degree (see **Figure 1**). While AM is therefore already very well represented in Higher student education, there are hardly any offers for the level of vocational qualification of EQF level 4 and none for EQF level 5.



Most of the training activities take place in training centres and in companies, addressing the Master degree level (45%) and short-term courses (46%). Only 27% of the organizations offered online trainings for AM.

Findings indicate that **AM Courses provided for technological skills seem to be market-oriented**, as the top three technological skills addressed in training are also the most requested by companies and workers. The most required technical skills by workers correspond to (see **Figure 2**): AM process (88%), Design (CAD Modelling) (72%) and AM applications (62%).



The major obstacles identified in the delivery of training by those organisations that don't provide AM training yet (corresponding to 12 % of the respondents) are linked with the lack of requests (45%) and the lack of AM equipment (36%), whereas the lack of trainers was only 9%.

Know-how in AM gained by workers occurs in the company environment

Additive Manufacturing Industry – Workers/Professionals Skills Needs

The AM Industry survey was conducted with 138 Professionals working in the companies applying the technology, to identify their current (Real Case Scenario) and future skills needs (within period of 2 years – Short Term Scenario). The relevance in order of results are summarized in the table.

Relevance of AM Categories of Skills, according to Workforce Survey 2020				
Categories of Skills		Real Case (2020)	Short Term (2021-2022)	Evolution / Conclusions
Technological	MOST	<ul style="list-style-type: none"> AM processes Materials' analysis and characterization AM applications Design 	<ul style="list-style-type: none"> AM processes AM applications Materials' analysis and characterization Design 	<ul style="list-style-type: none"> Consistency in terms of needs; In general the relevance of all skills is estimated higher in 2021/2022 than in 2020 Knowledge and Skills on Standardization loses relevance Materials' analysis and characterization appears in 2021/2022 as most demanded
	LESS	<ul style="list-style-type: none"> Numerical modelling CAPP (Computer Aided Process Planning) for AM Robotics/Automation 	<ul style="list-style-type: none"> Numerical modelling CAPP (Computer Aided Process Planning) for AM Robotics/Automation 	
Entrepreneurship	MOST	<ul style="list-style-type: none"> Learning through experience Working with others Motivation and perseverance Creativity 	<ul style="list-style-type: none"> Learning through experience Working with others Vision Spotting opportunities 	<ul style="list-style-type: none"> Motivation is maintained as most demanded Financial and economic literacy and Mobilising others are maintaining in both scenarios as less chosen
	LESS	<ul style="list-style-type: none"> Ethical and sustainable thinking Financial and economic literacy Mobilising others 	<ul style="list-style-type: none"> Self-awareness and self-efficacy Financial and economic literacy Mobilising others 	
Digital	MOST	<ul style="list-style-type: none"> Ability to think in 3D Digital data management (big data, statistics...) Digital data analysis (Artificial Intelligence, Machine learning...) Coding/Programming 	<ul style="list-style-type: none"> Ability to think in 3D Digital data analysis (Artificial Intelligence, Machine learning...) Digital data management (big data, statistics...) Coding/Programming 	<ul style="list-style-type: none"> There are no changes in terms of relevance in 2020/2021 Ability to think in 3D has a high importance in both scenarios;
	LESS	<ul style="list-style-type: none"> Cybersecurity 	<ul style="list-style-type: none"> Cybersecurity 	
Green	MOST	<ul style="list-style-type: none"> Circular economy Life Cycle Analysis (LCA) Green awareness Resource efficiency management 	<ul style="list-style-type: none"> Resource efficiency management Circular economy Green resources Green products 	<ul style="list-style-type: none"> In 2021-2022 workers seem to be aware that these Green skills become more relevant
	LESS	<ul style="list-style-type: none"> Green resources Green products 		

AM Workers Profile

- Predominant materials knowledge on **metals** (30% indicated high and 29% very high expertise) and **polymers** (29% indicated high and 27% very high expertise);
- **Lacking** knowledge regarding **ceramics** (43% have no and 26% low expertise), **biomaterials** (48% have no and 23% low expertise) and **composites** (32% have no and 22% low expertise);
- Most **process expertise** in Powder Bed Fusion **PBF** (20% indicated high and 35% very high expertise) and Material Extrusion **ME** (19% indicated high and 26% very high expertise);
- Value-chain expertise is predominant regarding **AM Process** (39% indicated high and 34% very high expertise) and **Materials** (37% indicated high and 24% very high expertise);
- **End of life** was one area where expertise was generally low (15% indicated non and 34% low expertise), followed by **Modelling/Simulation** (20% indicated non and 28% low expertise);
- 60% of respondents had been working in AM for 1-5 years;
- 50% of the candidates stated they had not received training for their role!
- Most people acquired knowledge through **learning by doing** (53%) and **on job mentoring** (48%), followed classroom education (40%) and online courses (32%), see **Figure 3**;

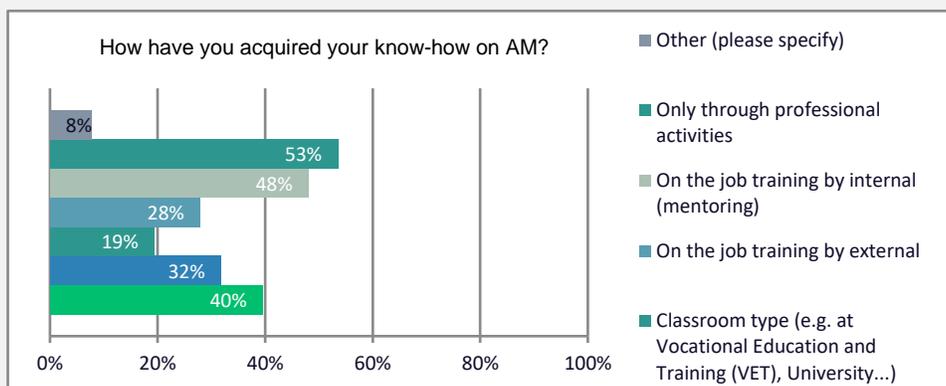


Figure 3 - Origin of know-how in AM, according to the Workforce survey 2020

Digital, Entrepreneurial and Green skills are considered very important for the training of non-AM technological professionals in the future.

Additive Manufacturing Industry – Companies Skills Needs

In parallel the consortium, undertook the 2nd round Survey to identify current and future AM skills needs among 56 AM companies Technology in Europe. The results achieved indicate that the technological skills required by companies are linked with **post-processing** (30% highly and 37% very highly required), **certification and validation** (21% highly and 31% very highly required), **standards** (37% highly and 27% very highly required) and **costs** (43% highly and 23% very highly required).

Digital (96%), followed by Entrepreneurial (87%) and Green (86%) skills are considered very important for the training of non-AM technological professionals in the future, in the company's perspective for the training of non-AM technological professionals in the future (see **Figure 4**)

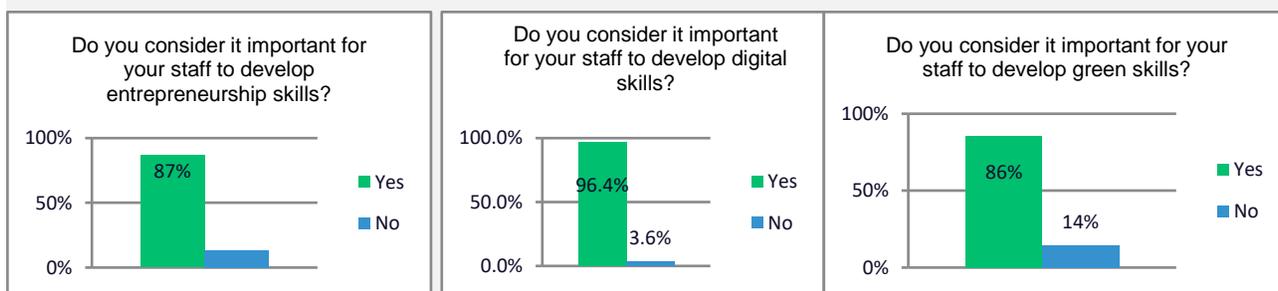
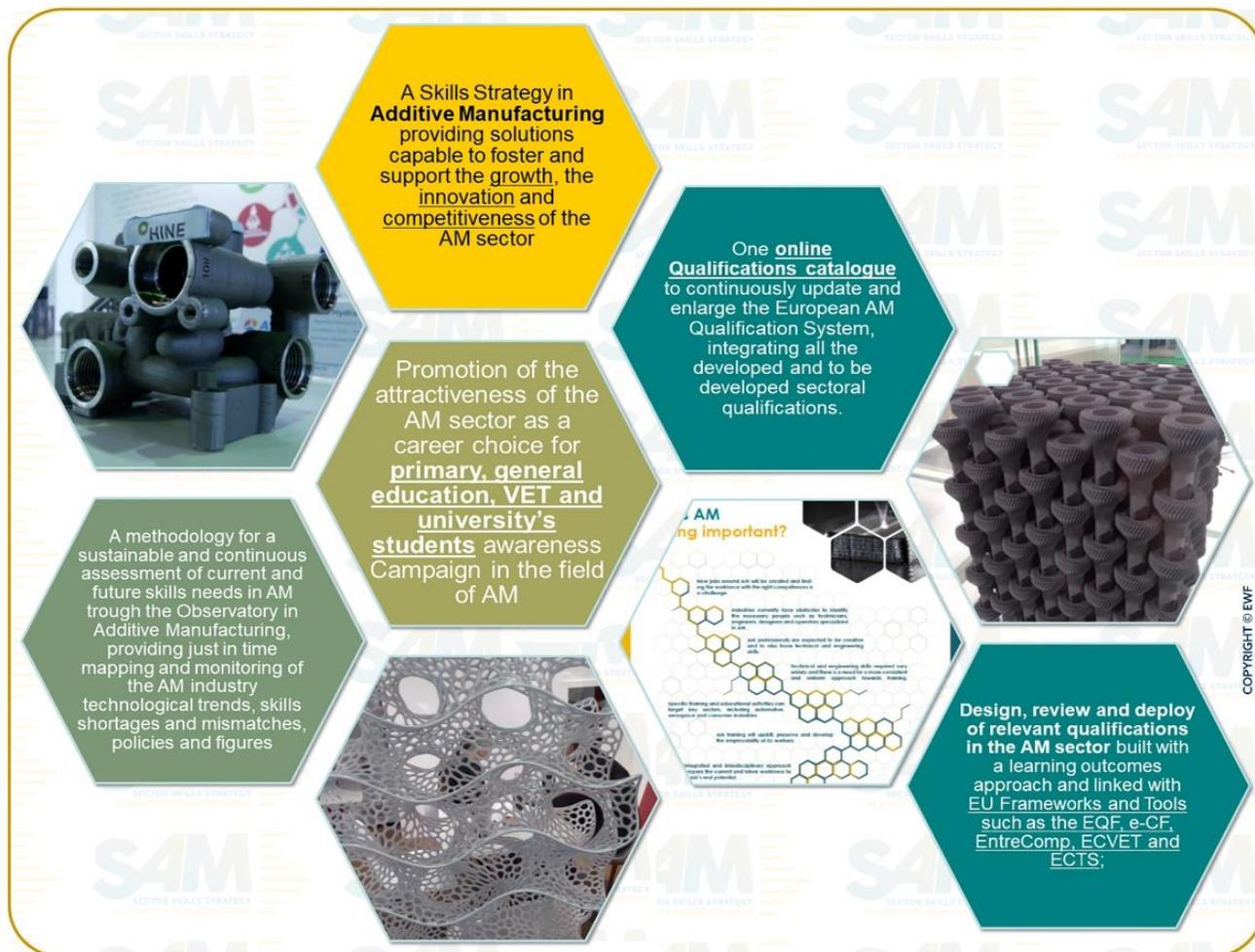


Figure 4 - Importance of non-Technological Skills, according to the Companies Survey, 2020

All these findings are being considered and will be further explored in SAM project, thus with important implications for the consolidation of the International AM Qualifications and training System (IAMQS), as well as for the definition of new professional profile, if needed, or even for upskilling/reskilling of AM workforce.

SAM is developing European Observatory in AM that is identifying and anticipating the right skills and deliver them to the Industry/Companies through a solid network of European Training Centers

About the Project



Erasmus+ Sector Skills Alliances

Sector: Additive Manufacturing

Participants and Countries: 9 countries: Belgium (EWF, EPMA, CECIMO, Materialise), Germany (LZH Laser Akademie), Greece (Panepistimio Patron), France (EC Nantes), Italy (POLIMI), United Kingdom (MTC, Brunel University, Spain (IDONIAL, Lortek, AITIIP), Portugal (ISQ, FavoriteAnswer); Ireland (IMR).

Project duration: 4 years (1.01.2019 – 31.12.2020)

Website: www.skills4am.eu