

2nd Report on the Analysis and Validation of Needs

Executive Summary



The Sector Skills Strategy in Additive Manufacturing (SAM) ERASMUS+ project is a strategic approach to skills in Additive Manufacturing (AM), which is developing a dynamic forecast methodology focused on skills gaps, shortages and mismatches identification, anticipation, and validation, in order to develop and/or revise qualifications and profiles in AM with the engagement of relevant stakeholders within the European and National landscapes.

The project's outcomes has already shown that implementing Additive Manufacturing (AM)/3D printing requires investment in workers' skills and know-how at an unprecedented scale, in such a way as to allow the current workforce to reskill and adjust to the new reality.

The work conducted by the SAM consortium is of crucial importance to ensure that the European AM sector expands and grows relying on a highly trained and knowledgeable workforce.

SAM's data collection and feedback phases allowed for the identification of gathered skills gaps and demands of the AM gaps and shortages were framed according to different scenarios:

- **Scenario 1:** Real case, in which extent skills need to be addressed in less than 6 months.
- **Scenario 2:** Short-term, how relevant skills / trends need to be addressed in the less than 2 years.
- **Scenario 3:** Foresight scenarios, how relevant skills / trends need be addressed in the future, within the next 10 years.

The current Summary focus on efforts carried out the by the consortium in collaboration with key stakeholders in setting up a baseline to identify and anticipate skills gaps and demands of the AM Sector for the real case and short-term scenarios. This Summary on the 2nd Report on the Analysis and Validation of Needs, corresponds to the 2nd round of auscultation using surveys and interviews with key target groups, namely companies, AM workers, training organisations and recruitment agencies from June 2020 to April 2021.

Four criteria were used to determine the priorities to tackle the identified skills needs and gaps, which were: sectors relevance in alignment with ISO activities, urgency, impact on employability and relevance towards raising awareness on AM. The validated data on skills needs are used as reference to support the European AM Skills Strategy and to revise existing training programmes of the International AM Qualification System (IAMQS) and develop new ones.

In a nutshell, the skills gaps and demands for each scenario and target group are summarized below:

| Skills | Addressed in AM Courses (Source 2019 survey) | AM Workers Skills Gaps (Real Case and Short term Scenario survey, 2020 - 2022) | AM Companies Skills Gaps (Real case Scenario 2020 survey) |
|---|--|--|---|
| Technological | <ul style="list-style-type: none"> AM Processes AM Applications Design (CAD Modelling) Materials analysis and characterisation | <ul style="list-style-type: none"> AM processes AM applications Materials' analysis and characterization Design | <ul style="list-style-type: none"> Post-processing Certification and validation, standards and costs |
| Entrepreneurial | <ul style="list-style-type: none"> Creativity Working with others Learning through experience | <ul style="list-style-type: none"> Learning through experience Working with others Vision Spotting opportunities | <ul style="list-style-type: none"> Creativity Financial and economic literacy Working with others |
| Green | <ul style="list-style-type: none"> Eco-design, Circular economy Life Cycle Analysis (LCA) | <ul style="list-style-type: none"> Resource efficiency management Circular economy | <ul style="list-style-type: none"> Life Cycle Analysis (LCA) Circular economy Resource efficiency management |
| Digital | <ul style="list-style-type: none"> Cybersecurity Ability to think 3D | <ul style="list-style-type: none"> Ability to think 3D, Digital data management Digital data analysis | <ul style="list-style-type: none"> Ability to think in 3D Digital data analysis, Digital data management |
| New knowledge on trends until 2022 for AM Workers (survey, 2020 - 2022) | <ul style="list-style-type: none"> Materials namely towards the implementation of new applications and products for all materials; related to the development and standardization of new materials; multi-material parts; AM processing namely about AM machines for multi -materials; multi-functional parts incl. Parts with embedded sensors, hybrid machines and faster AM metal machines; Post-processing namely processing trends, new quality standards, design to minimize post-processing, improved heat treatments as well as new surface finishing and automation of support removal; ICT and quality control related to improved AM process control, new inspection techniques and advanced monitoring systems. | | |
| AM Companies (2020 survey) | Materials | Required AM Professional Profiles | Future upskilling needs |
| | Metals followed by Polymers | Process engineer, the AM designer and the materials engineer | R&D staff and quality managers on technological aspects such as standards, post processing, design and the AM process |
| Employability in AM (Recruitment Agencies Survey, 2021) | AM Occupations (Both Metal AM and Polymers) | Sectors with more job demands | Growth of AM demand |
| | Process engineer, Designer, Materials engineer and Operator/Technician | Automotive and Aerospace | Demand for AM professional has grown 21-30 % from 2019 to 2021 |

From the Training surveys, it was possible to characterize the main AM Training offers and derive recommendations on which learning methods to use according to specific content and skills categories, as well as the most suitable assessment tools, which will be integrated in D3.3 review.

The capacity building of the European, National and Regional Training Organizations with regards to equipment and skilled personnel is a key objective of addressing the challenges facing qualified personnel in the field of AM. The strategy to be followed to achieve the expected impact, which is to reduce skills gaps and ensure alignment of training offers and industry needs, is to strengthen collaboration between industry and education.

The current provided training courses are well oriented and concentrated in order to fulfil important gaps of AM by using efficient training methods and tools. Also, there is obvious that the majority of the training organizations are willing to continue the trainings in the future. The leverage on existing funding programs and mechanisms, namely given by the European Commission, is a key objective towards the investment in educational institutions, so that get into the position of training the next generations of designers, engineers and other specialists on manufacturing-capable 3D printers. It is clear that systematic collaboration between key industry and education stakeholders is essential to tackle the existing mismatch between the demand and supply of AM skills.

From the recruitment agencies, it was able to conclude that there was a significant interest of the agencies in having a platform to search for and post job offers for professionals in the field of AM/3D Printing. This platform, on the SAM project, is being created through the AM Observatory. Another important conclusion was that there has been an increasing job offers for AM/3D Printing professionals with a substantial growth from 2019 to 2021. Besides in terms of the sector demand for profiles in AM/3D Printing, they are aligned with the profiles previously identified by the industry.

The workshops conducted enabled to identify the current and future needs of workers towards the different categories of skills, meaning **technological, entrepreneurship, green and digital skills**. In terms of **priorities** for the **development Professional Profiles Qualifications and Skills linked to the Real Case and Short-Term scenarios**, the following was validated by experts:

Real case (next 6 months)

- Development of new learning units **Business for AM competence unit** (covering entrepreneurial skills and costs) as well as Certification, Qualification and Standardization competence unit (covering basic knowledge about certification and standards)

Short Term (within 2 years)

- Development of a new Design for Polymers Qualifications, where 3D thinking skills will be integrated
- Development of technological skills addressing Binder Jetting for Independent and Advanced levels, although DED-LB was mentioned, the IAMQS already foresees this CU) – for 2 levels.
- Development of a transversal Sustainability Competence unit, where aspects of circular economy and LCA will be approached) to raise awareness.

The table below highlights the main indicators and priorities to be covered in SAM project for two scenarios.

| Scenario | Outcome |
|---|---|
| Real Case Scenario Training to be delivered in less than 6 months * 2nd Round (2nd stage) | 1 new Professional Profile/Qualification New Q/PP for Designers for Polymers (non- Engineers) - 2 new learning unit New CU for Certification/ Standardization New CU for Business for AM |
| Short -term Scenario Training to be delivered in less than 2 years | - 2 new learning units instead of 1 new Professional Profile - New CU for Binder Jetting (Independent and Advanced) - New CU in Sustainability for AM |

Next actions in the project until 2022 foresee to continue the identification of current needs with industrial organisations, educational centres and AM professionals /workers, in order to identify emergent AM skills gaps and needs. Also, the forecast with RTOs and the foresight analysis will be implemented.

Full report is available in **SAM website** (<http://www.skills4am.eu/results.html>)



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