SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING

WWW.SKILLS4AM.EU

THE NEW ERA OF SKILLS

IN ADDITIVE MANUFACTURING

Co-funded by the
Erasmus+ Programme
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IAMQS

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SAM PROJECT

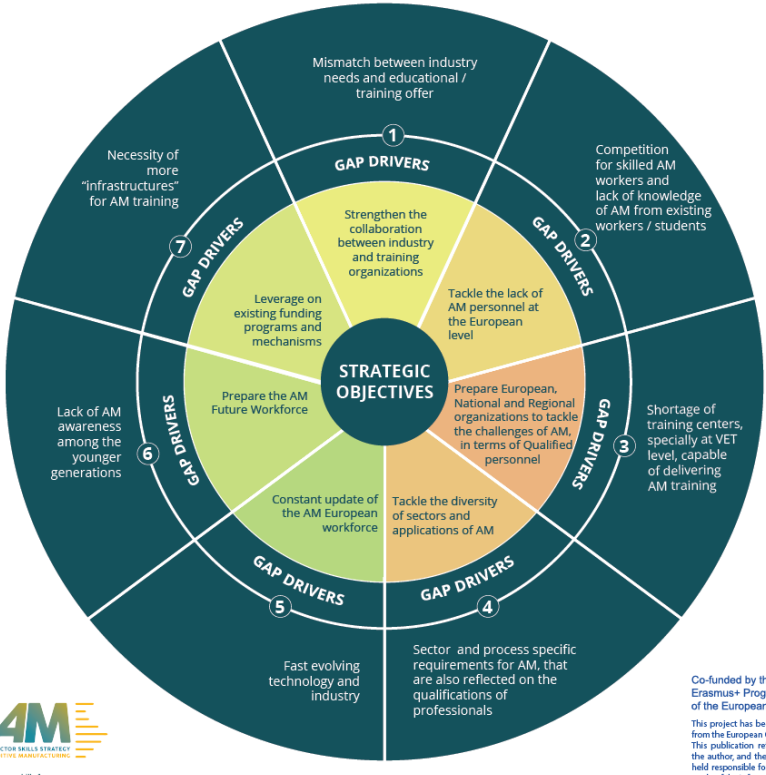
SAM (Skills for AM) is the EU-funded "blueprint project" that is consolidating and implementing the International Additive Manufacturing Qualification System (IAMQS), starting its activities in January 2019. Since then, project partners developed a European AM Observatory aimed at mapping, understanding, and addressing the skills needs and shortages in the European Additive Manufacturing ecosystem.

The AM Obervatory also plays a key role in the update of the IAMQS and its implementation. Today, we are experiencing the first deployment of the Qualification System, and it has come from the daily work of the consortium in the last 4 years and thanks to the funding received from the European Commission. The long-term objective of the project is to keep the Qualification System alive (see Section 1.2) and deploy it internationally through a wide range of industrial sectors that are using Additive Manufacturing in their activities.

CONSORTIUM PARTNERS

Skills Strategy Roadmap

The system will follow the Skills Strategy Roadmap, developed within the SAM Project, and aimed at defining the overall guidance to implement the project's objectives until 2030. The roadmap includes the key challenges the AM Sector is facing, the outline of the proposed actions and implementation activities put forward by SAM, the proposed timeline, an overview of the required Professional Profiles, Qualifications, and Skills linked with the AM value chain, materials, and processes.



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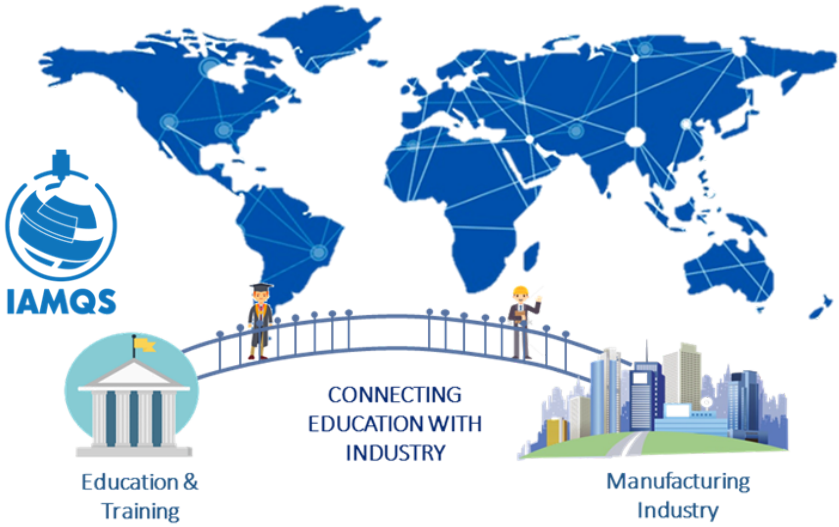
THE IMPORTANCE OF TRAINING
in Additive Manufacturing

As with every emerging technology, the ecosystem is not ready to exploit the AM's full potential and the wider public has disaggregated information about the opportunities related to it. In this regard, training practices are fundamental to make the workforce prepared for shifts in skills needs and generate competitive advantages that can help boost their careers. Contemporarily, companies should be aware of the need and the importance to reskill their employees. Here you can find some reasons why training in AM is particularly significant today:

- **New jobs around AM** will be created and finding the workforce with the right competencies is a challenge.
- **Industries currently face obstacles** to identifying and recruiting the necessary people such as technicians, engineers, designers, and operators specialised in AM.
- **AM professionals** are expected to be creative, to have technological and engineering skills, but also green and digital skills.
- **Technological and engineering skills** required vary widely and there is a need for a more consistent and uniform approach to training.
- **AM training will upskill, preserve, and further develop** the employability of EU workers.
- **Specific training and educational activities** can target key sectors, including automotive, aerospace, and consumer industries.
- **An integrated and interdisciplinary approach** will prepare the current and future workforce to boost AM's real potential.
- One of the most **important barriers hindering the industrial application of AM is limited expertise**, as a result of the lack of certification methodologies. This leads to a reluctance for a potential AM venture uptake, especially by SMEs.

IAMQS

International Additive Manufacturing Qualification System



The **International Additive Manufacturing Qualification System** was created by industry and for the industry to ensure that companies and professionals are equipped with the right set of skills to implement Additive Manufacturing at the industrial level.

The IAMQS assure harmonized knowledge, skills, autonomy and responsibility for any holder of a diploma, in any region of the world, and comprises Education, Examination and Qualification Guidelines for different professional levels.

Harmonization is possible among different countries because of the following elements:

- Training guidelines describing the learning outcomes, contents and recommended hours and workload of training
- Harmonized assessment procedures and tools, performed by a third-party organisation (e.g., the body responsible for the assessment is different from the one delivering the training)
- Rules and requirements for training organisations that implement the Systems' training Guidelines

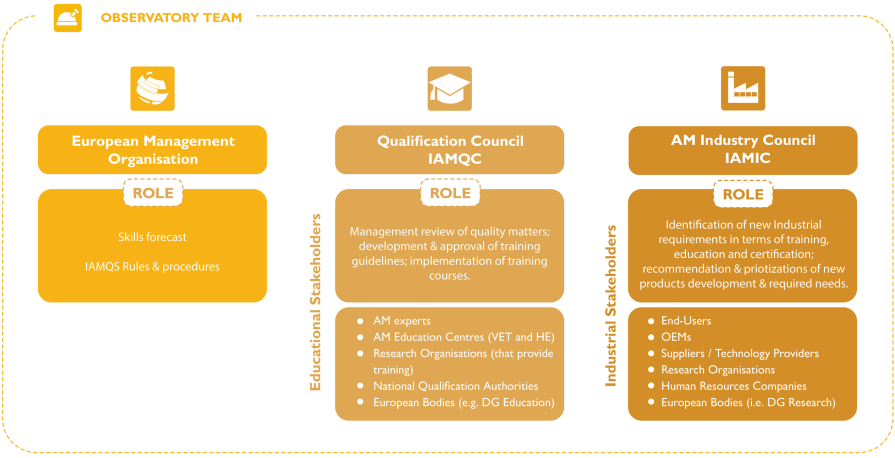
The quality assurance system, underpinning the IAMQS, guarantees its relevance, competitiveness and harmonisation. As a result, trainees have access to the same training content and assessment procedures, regardless of the country in which they are taking their courses.

EUROPEAN AM OBSERVATORY

The European Additive Manufacturing (AM) Observatory is the structure that puts in practice a methodology for a sustainable and continuous assessment of current and future skills needs in AM, providing real-time mapping and monitoring of AM industry needs, technological trends, skills shortages and mismatches, as well as policies and figures for AM.

The AM Observatory also manages the implementation of the IAMQS at transnational, national and regional levels supported by a network of experts in AM and stakeholders belonging to education, industry, civil society and government.

The AM Observatory ensures that implementation process follows a top-down approach, meaning that the scope and curricula for AM are defined at the European level through harmonised training guidelines and then uptaken at the national level by the training centres, under the supervision of the representative organisation in the AM field, but always ensuring that it is accessible to everyone.

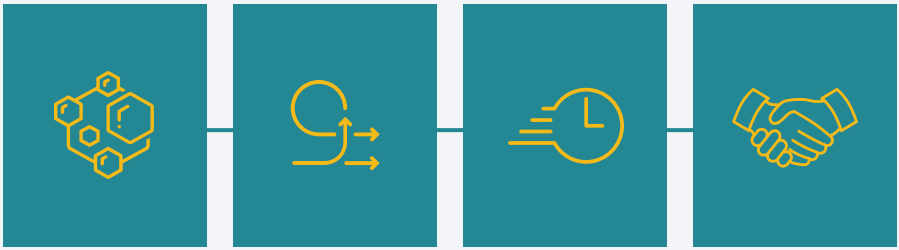


The workflow and synergies between IAM Qualification Council and the IAM Industry Council are explained in the previous scheme. Several supporting activities will be initiated in SAM and are to be kept in the future within the AM Observatory scope, namely:

- **Collection of data** on the AM skills' gaps and shortages;
- **Revision of existing professional profiles** in AM and development of new profiles, if necessary;
- **Providing data** for revising/creating new professional profiles in AM;
- **Mapping the training courses** offered at regional, national and European levels;
- **Monitoring the matching system** (i.e., needs/training offers/industry offers);
- **Collection of sets of data** to support external EU tools, such as ESCO and Skills Panorama;
- **Mapping of funded projects in AM** from 2020 to 2030 and promoting the engagement with those projects;
- **Prepare and update** the Skills Blueprint for AM;

The AM Observatory will also benefit from the support of an online platform to monitor all activities and processes. Through the platform, data on AM skills is uploaded and updated regularly. For further details about the online platform and functionalities, refer to D. 4.2 (AM Observatory Platform).

IAMQS ADVANTAGES



Flexibility and Modularity

The Qualification System is composed of different competence units, and they are used to describe the expected knowledge and skills acquired by professionals after the successful completion of the training courses.

The architecture of this system is convenient for both companies and trainees. This is because students can **develop their training plan** according to their needs, time constraints, and starting skills. On the other hand, companies can agree on a **flexible schedule** with their employees to minimize the impact on their working day or at least subdivide the effort into different periods.

Flexible management

IAMQS syllabus is **adjustable** according to the students' needs, as the teaching time is recommended to achieve the expected results. Moreover, the AM ATBs has freedom to:

- **define the training implementation plan** (e.g. timetable, scheduling and frequency of the sessions)
- **define the context for the course implementation** (e.g. either online, face to face or blended)
- **address more contents than the ones recommended** in the training guidelines
- **address less contents than the ones recommended**, if the reduction (of contact hours) is not higher than 20%.

Faster path

Recognition of prior learning mechanisms are in place to ensure the validation of skills in AM, streamlining the awarding of a qualification based on to the candidate profile.

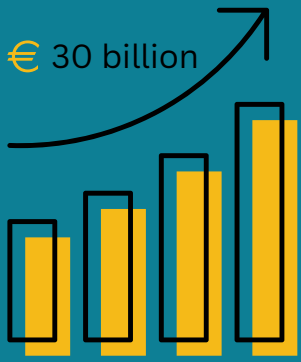
Partnerships for cooperation

AM ATBS belonging to the network, can **easily cooperate with companies** to have access AM equipment, as well as with other ATBs to share resources or even complement their scope of training.

FOR COMPANIES

Companies can **train their personnel according to their needs** and most importantly benefit from **training aligned with recognised industrial standards**. This process is guaranteed by a validation process that involves an Industry Council which identifies technological trends and training requirements. On the other hand, the Qualification Council ensures the management and the review of quality matters related to the training performed and the content of the competence units.

According to the 2019 Wolhers report, the AM sector is expected to reach almost 30 billion euros of market value by 2025. Moreover, AM products and related services are experiencing a growth of around 19% on an annual basis. As with other core technologies of industry 4.0, there is the concrete risk that the employees will not be qualified or skilled enough to exploit the full potential of AM. That is why companies need to anticipate their future needs and invest in flexible training practices to upskill a part of their workforce.



The IAMQS is the solution because it guarantees alignment with industrial needs in terms of skills but also on how to deliver training in the most effective way for both the employer and the employee.

FOR PROFESSIONALS AND TRAINEES

The current workforce and future trainees can benefit from **flexible and tailor-made training**. Trainees can progress more easily within the qualification systems by updating their knowledge and skills, avoiding the duplication of contents (re-learning). This is guaranteed by the structure of curricula made of competence units.

The possibility to have a hybrid way of learning through online material and on-site training is a core advantage together with the wide network of experts and stakeholders in the community that can act as a catalyst of opportunities.

Through the IAMQS, engineers (and other professionals) can have more chances to change their career paths by getting qualified in a different area (up-skilling), thus beating the competition in a sector that currently lacks qualified professionals.

FOR EDUCATIONAL ORGANISATIONS

For educational systems, both Vocational Education and Training and Higher Education Entities, the IAMQS represents an opportunity for addressing technical contents or emergent technologies which are required by the sector. Therefore, they can easily integrate their programmes and enhance the dissemination of training practices at the national level and in the less technologically developed countries.

For educational systems, it also represents an opportunity for designing individual learning pathways that might be automatically recognized once they have been successfully completed. Moreover, the system could favour the interconnection between educational organisations and industry, generating more up to date university courses and improving the professional skills of graduates.

QUALIFICATIONS

International Metal AM Qualifications

The IAMQS was initially focused on Metal Additive Manufacturing and is now broadening its scope including the development of training guidelines for Polymers AM, ensuring a full alignment with industry requirements and technological breakthroughs.

The system offers 12 Qualifications in Additive Manufacturing that have already been implemented in 7 countries, namely: France, Germany, Italy, Portugal, Spain, Turkey and United Kingdom.

The IAMQS covers different AM professional profiles, in particular Operator, Supervisor, Designer, Process Engineer, and Coordinator. Moreover, below you can also find the classification for qualifications and curricula foreseen by the system.

Each qualification is made of different Competence Units (CUs) according to the specific AM professional profile. However, the system has also developed three transversal CUs that can be flexibly included in the tailored training: Certification, qualification, and standardisation in AM; Business in AM; Sustainability for AM

International Metal AM Operator for DED- ARC Process (IMAM-O-DED ARC)
Course Duration **80.5 hours**

International Metal AM Operator for DED- LB Process (IMAM-O-DED LB)
Course Duration **87.5 hours**

International Metal AM Operator for PBF- LB Process (IMAM-O-PBF-LB)
Course Duration **60 hours**

International Metal AM Process Engineer for DED- ARC (IMAM-PE-DED ARC)
Course Duration **143.5 hours**

International Metal AM Process Engineer for DED- LB (IMAM-PE-DED LB)
Course Duration **129.5 hours**

International Metal AM Process Engineer PBF- LB (IMAM-PE-PBF -LB)
Course Duration **122.5 hours**

International Metal AM Designer for DED Processes (IMAM-D-DED)
Course Duration **87.5 hours**

International Metal AM Designer for PBF Processes (IMAM-D-PBF)
Course Duration **87.5 hours**

International Polymers AM Designers (IPAM-D)
Course Duration **73.5 hours**

International Metal AM Coordinator (IMAM-C)
Course Duration **185.5 hours**

International Metal AM Supervisor (IMAM-S)
Course Duration **80.5 hours**

BECOME THE NEXT
Authorised Training Body

AM ATB APPROVAL

After assessment and AM ANB approval, the Training Center fulfils all requirements for delivering training in accordance with EWF AM Guidelines, under a specific scope of authorization.

ASSESSMENT CONDITIONS

There are two stages:

Stage 1 – Documental Review

- Evaluate own scope,
- Conformity with AM Syllabus,
- Facilities and Equipment
- Health and Safety requirements,
- Appropriate quality classrooms,
- Good quality visual aids,
- Teaching staff.

Stage 2 – Audit to verify the compliance with EWF AM Rules requirements.

TRAINING CENTER'S APPLICATION

The Training Center selects an AM ANB to which presents its application to become an AM ATB.

PROCEDURES FOR APPROVING AM ATB

The AM ANB assesses the application based on conditions set by procedures elaborated and updated by IAMQC (EWF AM Rules).

If your Training Centre is interested in becoming part of the IAMQS and being officially accredited as an Authorised Training Body, you have to go through a simple process that will guarantee reliability and high quality of the training practices and course uniformity.

To apply to become an AM ATB, the interested organisation needs to undertake the following steps:

- Training centre **application**
- **Assessment** of the application based on conditions, by the AM Authorised Nominated Body. Done in two stages:
- **Stage 1** – Documental Review
- **Stage 2** – Audit to verify the compliance with EWF AM Rules requirements
- If the Training Centre fulfils all requirements for delivering training, the authorisation for the specific **scope of training is granted**

A set of documents needs to be submitted as part of the application.

Organisations wishing to become an AM ATB, have to reach the AM ANBs (www.ewf.be), that is responsible for supervising the course implementation.

BECOMING AN AUTHORISED TRAINING CENTRE FOR AM

- Access to an internationally acknowledged qualification system
- System in line with industrial needs and with standardization rules.
- Qualification recognised by CEDEFOP (European Centre for the Development of Vocational Training)

FLEXIBILITY FOR AM ATBS

The AM ATB has the freedom to decide about the languages and modes of delivery form the AM Courses, as long as the minimum quality standards are met.

The degree of freedom for AM ATBs is related to:

- defining the training implementation plan, namely the timetable, scheduling and frequency of the sessions
- defining the context for the course implementation, either online, face to face or blended
- addressing more contents than the ones recommended in the training guidelines
- addressing less contents than the ones recommended, if the reduction (of contact hours) is not higher than 20%
- using and develop the training materials for the courses
- selecting the resources (e.g., equipment, trainers)
- implementing the training in the national language

CONTACT US
for more details

ewf@ewf.be

http://www.skills4am.eu

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