Skills Strategy Roadmap 2023

Project No. 601217-EPP-1-2018-1-BE-EPPKA2-SSA-B

Document Details

Deliverable Number:	D4.10
Due Date :	June 2023
Leading Organisation:	EWF
Participating Orgnisations:	UBRUN, ISQ, IDONIAL, LORTEK, IMR, EPMA, CECIMO, LMS, LAK, EC Nantes, FA
Reviewer(s):	Materialise, EC Nantes
Review Date:	31.03.2023
Languages(s):	English
Dissemination level:	Public

Contents

1. EXECUTIVE SUMMARY

SAM (Sector Skills Strategy in Additive Manufacturing) project delivered together with all partners and stakeholders a shared vision and collaborative skills solutions capable to foster and support the growth, innovation and competitiveness in the Additive Manufacturing (AM) sector.

Within Work Package 4 (see Figure 1), a structured approach has been followed to develop and implement the European Observatory, together with its specific set of rules and operational procedures (**D4.1** – Observatory Rules and Operations Procedures). As an interactive online tool, it has gathered inputs based on figures and trends on AM skills and shortages, through data that has been collected from different sources, then analysed and validated at project workshops (**D4.3 –** Workshop to Analyse Data and **D4.4** – Workshop for the Validation of Needs).
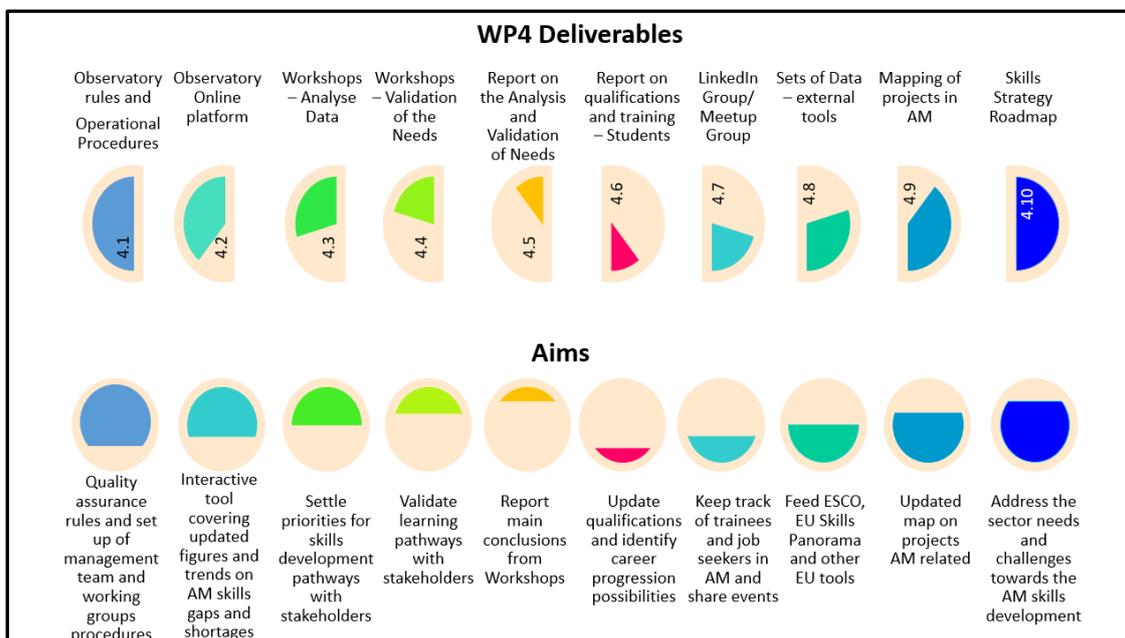
Figure 1 – Overview of WP4 deliverables and their objectives

The current version of deliverable **D4.10** corresponds to the 2023 **Skills Strategy Roadmap**, providing an update of the AM Skills strategy until 2023, as well as an analysis on how the project addressed the strategy implementation.

SAM project has defined strategic objectives to face up to AM challenges and mitigate its impact on the sector. The flagship activity of the Skills Strategy Roadmap will continue to be the deployment of the International AM Qualification System (IAMQS) through a network of training providers, sustained by a strong connection between a wide range of industrial sectors, which are applying AM in their activity or intending to do so. The 2023 roadmap is expanding on key recommendations with concrete examples on how to carry on with future actions that will enable to achieve the strategic objectives until 2030.

2. INTRODUCTION

SAM addressed the common vision and actions to support the growth, innovation and competitiveness of the AM sector.

The 2023 Skills Strategy Roadmap (see Figure 2**Error! Reference source not found.**) presents the updated version of the Sector Skills Strategy for Additive Manufacturing until 2030. Two versions of the Roadmap were published for different periods, 2020 and 2023, in order to reflect the dynamic features of the sector and increasing speed in which AM technologies are evolving. Moreover, the 2023 version includes the monitoring of the actions defined in the first version.
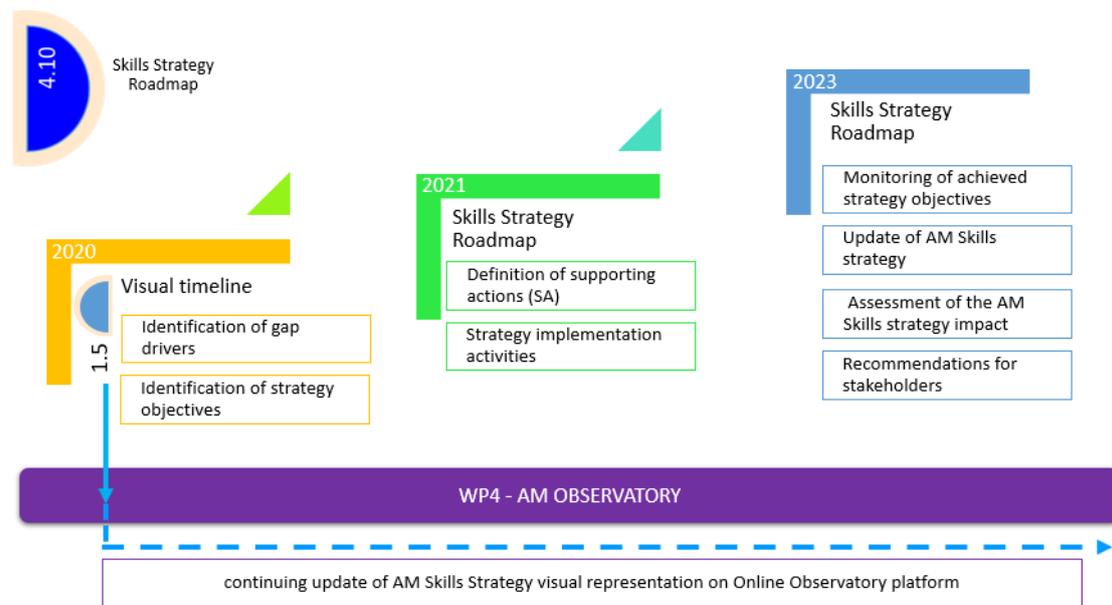
Figure 2 - Representation of planned timeline and "feedback loop" for the Strategy Roadmap for two years

The Sector Skills Roadmap from 2021 helped steering the implementation of the individual activities that have been identified to mitigate a set of 7 Gap Drivers, as well as monitor their effectiveness in addressing the challenges highlighted in the sector, through the activities that have been planned to tackle these.

By updating the roadmap, the SAM consortium is presenting a clear analysis of the path taken in the past two years of activities, particularly on how the Skills Strategy for AM necessarily evolved, adapted and adjusted to the trends in the sector.

The current Roadmap for 2023 includes an updated version of :

- Skills Strategy Roadmap implementation
- Strategic objectives and outline of recommendations and possible examples of actions put forward beyond SAM.
- Summary conclusion about the Strategy

Co-funded by the
Erasmus+ Programme
of the European Union

3. METHODOLOGY

The 2023 Roadmap is built upon the methodology developed in 2021 to settle the AM Skills Strategy Roadmap, requiring a close collaboration between stakeholders, supported by a wide integration of activities within the European Observatory.

The update of AM Skills Strategy Roadmap was substantiated by a series of validation steps focused on (1) assessment of variations regarding the challenges in AM; (2) advancements related with technological trends and (3) monitoring of the skills strategy implementation.

To effectively convey the interaction between the identified Gap Drivers, their equivalent strategic objectives and relevant activities, the consortium has structured the roadmap in the following way:

- **Challenges in Additive Manufacturing (Gap Drivers)**, which have resulted from the continuous consultation, from the outset of the project with sector professionals and industry representatives, illustrating the foremost obstacles to the development of the European AM sector.
- **Strategic objectives,** which represents a macro-level approach to a specific challenge. Objectives were defined as purpose statements, grounding the overall sector skills roadmap vision and measurable steps to overcome the challenges faced by the AM sector.
- **Actions,** which illustrate the concrete and feasible solutions addressing each gap driver. For the strategy to succeed, specific "Supporting Actions" were considered together with "Implementation Activities" helping to maximize the success of the strategy.
- **Impact** which represents the expected degree of success at countering each gap driver successfully.
- **Recommendations,** which were formulated as proposals, best practices, and guidance actions for further implementation by the different target groups, to take the best course of actions.
- **Target groups,** which correspond to four main groups of stakeholders (e.g. Education, Industry, EU citizens/workers, Legislators and Policy Makers) responsible for, directly or indirectly, contributing for the recommendations, as described in table 1:

Table 1 -AM Skills Strategy Roadmap Stakeholders

STAKEHOLDERS / TARGET GROUPS	
EDUCATION • Vocational Education and Training organisations • Higher Education Institutions • Engineering Students, Researchers and Professors • Vocational Education and Training Students and Trainers • Primary School and High School Students	
INDUSTRY • Industry (full and associated partners) • Large, Small and Medium Enterprises • Industrial companies employing manufacturing personnel, from different sectors • Recruitment Agencies focused on manufacturing industry • HR Departments of Industrial Companies • Industrial Trade Unions • Industrial European Federation for Industry and Manufacturing workers • Industrial Employers' and or Workers/Employees' associations, e.g.: ETF European Transport Workers' Federation	**EU CITIZENS / WORKERS** • Unemployed looking to re-skill; • Professionals willing to improve their skills or get qualified in new cutting-edge manufacturing technologies; • Anyone interested to learn more about 3D printing, despite their age or background **LEGISLATORS AND POLICY MAKERS** • Decision makers of educational policy makers at national, regional and European levels • Decision makers, managers and other professionals of manufacturing enterprises • National Employment and /or Qualification Agencies

Co-funded by the
Erasmus+ Programme
of the European Union

SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING

4. SAM CONTRIBUTION FOR THE STRATEGY IMPLEMENTATION - OVERVIEW ON ACTIONS

The current section describes how SAM project has contributed for implementing the European Skills Strategy Roadmap and to which extend the results were achieved. Globally, the activities undertaken have enabled the following impact (see Figure 3):

1) Reduced skills gaps and ensure alignment between the training offers and the industry needs

2) Increased number of AM Qualified personnel, being by re-skilling, up-skilling and/or by of training the "new" workforce

3) Increased number of organizations delivering AM training

4) Enabled a wider pool of qualified personnel that can "move" between different countries and industrial sectors

5) Improved foresight of skills needs for the AM Sector

6) Increased number of people/students trained in AM in the short and long term across Europe

7) Enabled the information and access to funding to support AM-related skills development and sustainment

Figure 3 – SAM activities impact for the Sector Skills Strategy

Co-funded by the
Erasmus+ Programme
of the European Union

SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING

The Skills Strategy Roadmap is grounded in **seven strategic objectives**, defined to face up the main gap drivers (see Figure 4) related to AM skills development.   In a nutshell these objectives refer to:

- Strengthen the collaboration between industry and training organisations
- Tackle the lack of AM personnel at the European level
- Prepare European, National and Regional organizations to provide relevant AM training for different educational levels
- Tackle the diversity of sectors and applications of AM
- Constant update of the AM European workforce
- Prepare the future workforce
- Leverage on existing funding programs and mechanisms

Figure 4 - Strategic Objectives foreseen in the Strategy.

Each individual objective was translated into concrete activities, differentiated into 26 **Supporting Actions (SA)**, which were general activities defined to address the objectives, and 34 **Implementing Activities,** which were more concrete actions that needed to be undertaken to achieve the expected results.

The flagship activity of the Skills Strategy Roadmap continues being the deployment of the International AM Qualification System (IAMQS) through a network of training providers, sustained by a strong connection between a wide range of industrial sectors, which are applying AM in their activity or intend to do so (see Figure 5).

Co-funded by the
Erasmus+ Programme
of the European Union

European Network of Training Centres using the IAMQS

Creation of the European AM Observatory

International AM Qualification System Implementation & National Roll Out

European AM Observatory is responsible for collecting and analysing data through a forecast methodology for the identification and anticipation of skills needs in the AM sector, as well as manage the implementation of an International Qualification System for AM.

International AM Qualification System is composed by a set of qualifications for different proficiency levels in the field of AM technologies, grounded in industry requirements and validated by experts.
Within the system, a single syllabus for each level is defined, supported by a harmonized system for assessment and quality assurance, resulting in the same qualification being awarded independently from the country.

A Network of Training Centres in AM is brought together, from both VET and HE, which are implementing the common trans-national curriculum. The training centres belonging to this network also share the same Quality Assurance standards in the assessment of learning outcomes, in accordance with the IAMQS Training Guidelines.

The Qualification of the AM Workforce is possible through the upskilling (improving existing skills) and reskilling (training in new skills) of workers. The IAMQS uses a modular structure to design its qualifications and training programs. The outcome is that training guidelines can be used in a flexible way, aligned with the specific needs of users.

The existing AM Qualification System covers Metal AM Qualifications for Operators, Designers, Supervisor, Inspector, Coordinator and Engineers. More are to come namely for Polymers.

Figure 5 - Sector Skills Strategy Roadmap - Flagship Activity

The timelines tables, presented below, illustrate the overall progress of the implementing actions defined for each strategic objective from 2021 until 2023, which were performed through SAM activities in the different work packages of the project.

Later on, in section 5, Recommendations are described in detail together with examples of activities to be undertaken by the target stakeholders.

As the European AM Observatory is a key structure involved in the implementation of the strategy, the linkage between the described actions and the AM Observatory (platform) is undertaken, whenever applicable.

Co-funded by the
Erasmus+ Programme
of the European Union

4.1 Strengthen the collaboration between industry and training organisations

For "Strengthening the collaboration between industry and training organisations", A1.3 "Create an open platform for industries to provide their inputs on skills and qualifications for AM" and A1.5 "Implementation of mainstreaming Steering Committees" were accomplished.

The AM Observatory was established in SAM as an interactive platform gathering and presenting data on Additive Manufacturing current and future skills needs. The Observatory is represented by a wide community of experts involved in the International Qualifications (IAMQC) and Industrial Councils (IAMIC). As a result, a joint skills strategy was defined with the support of industrial stakeholders, which have a key role in validating the skills needs priorities in alignment with SAM forecast methodology and kits.

Strategic Objective	1: Strenghten the collaboration between industry and training organisations	Short term scenario		Foresight term scenario	
		2022	2023		2030
IMPLEMENTING ACTIONS	A1.1 Identify and anticipate skills needs in the AM sector (R*)	SAM		☞	
	A1.2: Engage industry in the identification of skills and validation of training programmes (R*)	SAM		☞	
	A1.3: Create an open platform for industries to provide their inputs on skills and qualifications for AM	SAM			
	A1.4: Define a joint skills strategy with the main industrial partners (R*)	SAM		☞	
	A1.5 Implementation of Mainstreaming Steering Committees	SAM			

(R*) - Recommendation

Three actions **A1.1" Identify and anticipate skills needs in the AM Sector"**, **A1.2 "Engage industry in the validation and identification of skills and training programmes" and A1.4 "Define a joint skills strategy with the main industrial partners"** will continue as recommendations for further implementation by the European AM Observatory.

Find our more in the European Observatory sections: *Happening Now in AM > Open Surveys & Abouts Us > AM Observatory Structure*

Co-funded by the
Erasmus+ Programme
of the European Union

SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING

4.2 Tackle the lack of AM Personnel at European Level

All activities defined for "Tackling the lack of AM Personnel at European level" were addressed by SAM and will continue in the future as recommendations through the IAMQS and the European AM Observatory.

Strategic Objective	2: Tackle the lack of AM personnel at the European Level	Short term scenario		Foresight term scenario	
		2022	2023		2030
IMPLEMENTING ACTIONS	A2.1: Implement the International AM Qualification System (R*)	SAM			
	A2.2: Funding for the preparation of training centres (R*)	European Commission			
	A2.3: Create an open platform for AM training providers to provide information on skills and qualifications for AM they can offer (R*)	SAM		📋	
	A2.4: Promote International Qualifications in AM, through national events and through supporting activities focused on training centres (both VET and HE) (R*)	SAM			
	A2.5: Establish mutual recognition protocols between training providers (R*)	SAM		IAMQS	
	A2.6: Share data on AM Workforce Employability (R*)	SAM		📋	

(R*) - Recommendation

Some of the existing qualifications in AM, already contemplated in the IAMQS, were revised while new qualifications and/or competence units were designed according to the needs of the labour market. As an outcome, an Online Qualifications Catalogue was developed to compile the AM training offers. The IAMQS education and training courses were regularly conducted from 2020 to 2023, through 34 courses (most of them remotely) focused on a diversity of advanced and specialized subjects in the field of AM processes, materials, design, standardization, and even business development and sustainability.

In the future, part of the AM Workforce Employability data will come from students undergoing a training course or qualification under the IAMQS. Other than this, national statistics data could be initiated and reported in the AM Observatory. Job offers will continue to be displayed in the open LinkedIn group and AM Observatory, thus bridging interaction between job seekers and recruiters.

The opportunities for funding A2.2 "Funding for the preparation of training centres" are shared by the Observatory.

Find out more in the European Observatory sections: AM Education and Training > IAMQS /> Training Offers & Happening Now in AM > Events & AM Market World > SKILLS /> Employability />Market Analysis >Calls for funding

4.3 Prepare European, National and Regional organizations to provide relevant AM training for different educational levels

As part of SAM activities, the implementation of the IAMQS and delivery of AM training was ensured through a consolidated network of training centres complying with EWF Quality Assurance System. The implementation process followed a top-down approach, meaning that scope and curricula for AM were defined at European level through harmonised training guidelines and then up taken at the national level by each training centre, under the supervision of the representative organisation in the AM field.

A total of 17 training organisations are authorised for the IAMQS implementation in Italy, Spain, Germany, Portugal, Turkey, Ireland, England and France.

During SAM pilot courses, conditions were established for different organisation from Vocational Education and Training (VET) and Higher Education (HE) institutions to cooperate. A good example of this

collaboration was the joined effort made by SAM partners to deliver the 1st European Course for Metal AM Coordinators, mobilizing their expertise and resources to qualify the first group of AM Coordinators for Industry.

All activities defined for "Preparing European, National and Regional organizations to provide relevant AM training for different educational levels" were addressed and will continue in the future as recommendations through the IAMQS and the European AM Observatory.

(R*) - Recommendation

The opportunities for funding A3.3 "Funding for the "upskilling" of training centres with a focus on AM" will be shared by the Observatory.

Find out more in the European Observatory sections: AM Education and Training > IAMQS /> Training Offers & Happening Now in AM > Events & AM Market World > SKILLS /> Employability />Market Analysis>Calls for funding

4.4 Tackle the diversity of sectors and applications of AM

All activities defined for "Tackling the diversity of sectors and applications of AM" were addressed in SAM and will continue in the future as recommendations through the IAMQS and the European AM Observatory.

Being AM, a cross sectorial technology, the engagement with the diversity of sectors was ensured in key areas such as: Aerospace (NADCAP, FAA and EASA), Health (FDA), Automotive – Blueprint for automotive sector (DRIVES), Maritime – Blueprint for Maritime sector (MATES), Defence – Blueprint for Defence sector (Assets+). Also, non-sector specific organizations were engaged, such as EIT Raw Materials, EIT Manufacturing, ISO, ASTM and ASME. Some preliminary discussions were established with the Construction and Energy sectors as well.

As part of the Observatory, the International Additive Manufacturing Industrial Council (IAMIC) was created, involving all industrial issues linked to the AM sector, which included the identification and validation of current and future skills needs, technological trends and recommendations for the development of new products. As a result, a specific training module for aerospace, for quality of parts was designed using a modular approach.

SAM raising awareness and dissemination campaign included events such as AM Open Day, webinars and workshops in different countries (e.g. UK, Greece, France, Germany, Italy) to increase awareness of AM technology and qualifications in order to speed up the industry-wide uptake of AM, alongside creating of a wider pool of qualified personnel that can move between different countries and industrial sectors.

Strategic Objective	4: Tackle the diversity of sectors and applications of AM	Short term scenario		Foresight term scenario	
		2022	2023		2030
IMPLEMENTING ACTIONS	A4.1: Engage with different sectoral organizations to allow a sectoral view on skills and qualifications for AM (sectors like Aerospace, Medical, Automotive, Maritime, etc) **(R*)**	SAM			
	A4.2 Use a modular approach in the development of the training with some sector/process specific modules **(R*)**	SAM			
	A4.3: Identify common requirements between the different sectors **(R*)**	SAM			
	A4.4: Implement International Qualifications that are recognised by different sectors supported by a Quality Assurance System **(R*)**	SAM IAMQS			
	A4.5: Organise events and disseminate the International AM Qualifications to different industrial sectors **(R*)**	SAM			

(R*) - Recommendation

Find out more in the European Observatory sections: *Happening Now in AM > Events* & *Happening Now in AM > Open Surveys & Abouts Us > AM Observatory Structure & AM Market World > Skills*

4.5 Constant update of the AM European workforce

Regarding the "Constant Update of the AM European workforce", all activities were accomplished during SAM linked to the development and update of the forecast methodology and tools addressing the real case, short term, and foresight scenarios.

Strategic Objective	5: Constant update of the AM European workforce	Short term scenario		Foresight term scenario	
		2022	2023		2030
IMPLEMENTING ACTIONS	A5.1: Develop and promote skills mapping mechanisms and anticipation tools **(R*)**	SAM			
	A5.2: Develop and update, in a continuous way, modules related to new advances in AM **(R*)**	SAM IAMQS			
	A5.3: Carry out market searches, with a focus on Research Organizations, to identify new trends in AM **(R*)**	SAM			
	A5.4: Development of knowledge and skills in AM to keep up with the fast-evolving technology **(R*)**	SAM IAMQS			

(R*) - Recommendation

The monitoring of AM skills needs and technological trends will continue as recommended core activities for the AM Observatory activity, namely: **A5.1 "Develop and promote skills mapping mechanisms and anticipation tools"**, **A5.2 "Continuously update the learning modules related to advances in AM"**, **A5.3 "Carry out market research with focus on research organizations to identify new trends"** and **A.5.4 "Development of knowledge and skills in AM to keep up with the fast-evolving technology".**

Find out more in the Observatory sections: *AM Education and Training > AM Qualifications /> Training Offers & AM Market World >Market Analysis*

Co-funded by the
Erasmus+ Programme
of the European Union

4.6 Prepare the AM Future Workforce

Regarding the "Preparation of the AM Future Workforce", "**A6.2: Organize events to raise awareness of AM and its capabilities, focusing on creativity, for young students**" and "**A6.5: funding to equip schools, fab labs or industrial experience accelerators and allow them to do AM related awareness activities**" were accomplished during SAM.

A wide range of events were organized in a joint bid to engage directly with the different target audiences.

The whole ecosystem, in fact, from creating AM awareness to reskilling or upskilling of the current workforce, needs a robust sustainability strategy. This is why the SAM project is creating a map of available funding opportunities –both private and public- at regional, national, and European level that will support those wishing to implement AM related awareness activities, being them schools or companies all over Europe. The AM Observatory contains information on the availability of funding to equip schools, fab labs or industrial experience accelerators.

For the remaining actions, which were also addressed by the project, recommendations are defined for further implementation linked to **"A6.1: Raise Awareness campaign focused on different target groups",
A6.3: Relate European AM Qualifications with NQF (National Qualifications Framework) using European tools, such as EQF, ECTS, ECVET, and EQAVET and "A6.4: Create AM awareness 'activities' that can be used by schools according to the students age".**

Find out more in the Observatory sections: Happening Now in AM > Events & AM Education and Training

> IAMQS /> Training Offers & Calls for Funding

4.7 Leverage on existing funding programmes and mechanisms

Finally, concerning the "Leveraging existing funding programmes and mechanisms", all actions started during the last year of the project, through the identification of funding opportunities to support AM-related skills development and sustainment as well within the annual engagement of SAM partners in spin-off proposals. All activities will be shared by the Observatory.

Co-funded by the
Erasmus+ Programme
of the European Union

SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING

| Strategic Objective	7: Leverage on existing funding programmes and mechanisms	Short term scenario		Foresight term scenario	
		2022	2023		2030
IMPLEMENTING ACTIONS	A7.1: Funding to equip training centres and schools with AM equipment and software	European Commission			
	A7.2: Map and promote funding relevant for AM skills and qualifications **(R*)**	SAM			
	A7.3: Recommend calls for AM-specific activities **(R*)**	SAM			
	A7.4: Organise events to facilitate networking and collaboration in EU and National calls for AM **(R*)**	SAM			

(R*) - Recommendation

Find out more in the Observatory sections: *Happening Now in AM > External Initiatives & Happening Now in AM > Events & Calls for Funding*

5. STRATEGIC RECOMMENDATIONS FOR THE AM SECTOR

The strategic recommendations for the AM sector were developed based on a validation process with SAM stakeholders of the revision of the AM sector gap drivers and strategic objectives progression, held between January and March 2023.

This section outlines the **30 recommendations** identified by SAM Sector Skills Strategy Roadmap along with examples and target groups. The recommendations are crucial to support and guide SAM stakeholders, including partners and associated partners, in carrying out future actions for AM competitiveness and growth.

5.1 Recommendations for strengthening the collaboration between industry and training organisations
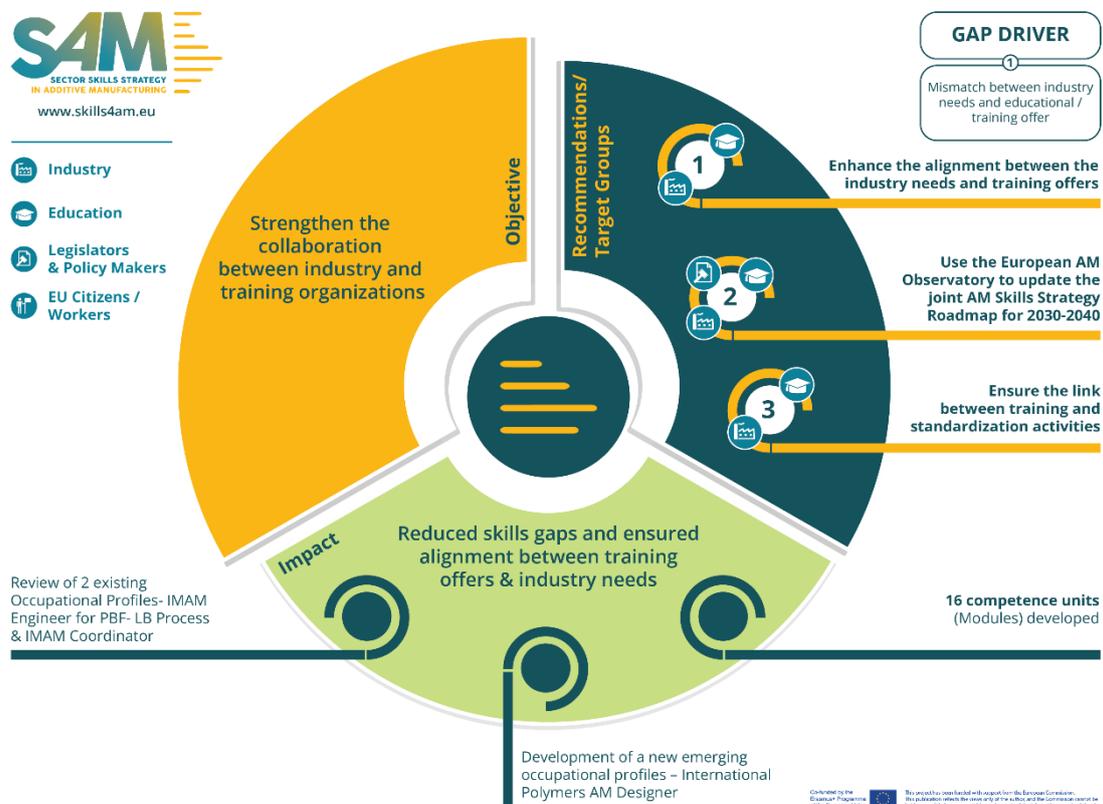
To continue **strengthen the collaboration between industry and training organizations,** it is recommended that the different target groups follow three recommendations:

| RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
Enhance the alignment between the industry needs and training offers	EDUCATION / INDUSTRY	• By continuing the implementation of the forecast methodology for the AM sector • By mobilizing the engagement of industrial organisations in the identification of skills and validation of training programmes, through the AM Observatory Industrial Councils

Co-funded by the
Erasmus+ Programme
of the European Union

SAM

Use the European AM Observatory to update the joint AM Skills Strategy Roadmap for 2030 -2040		• By promoting forecast workshops with industrial organisations • By implementing foresight scenarios auscultation with industrial experts • By addressing the literature review as a method for forecast • By updating the Observatory data on Skills needs
Ensure the link between training and standardization activities (CEN, ISO)		• By identifying the relevant standards impacting the AM training • By working and approving on the development of standards for the Qualification of AM personnel

5.2 Recommendations for tackling the lack of AM Personnel at European level
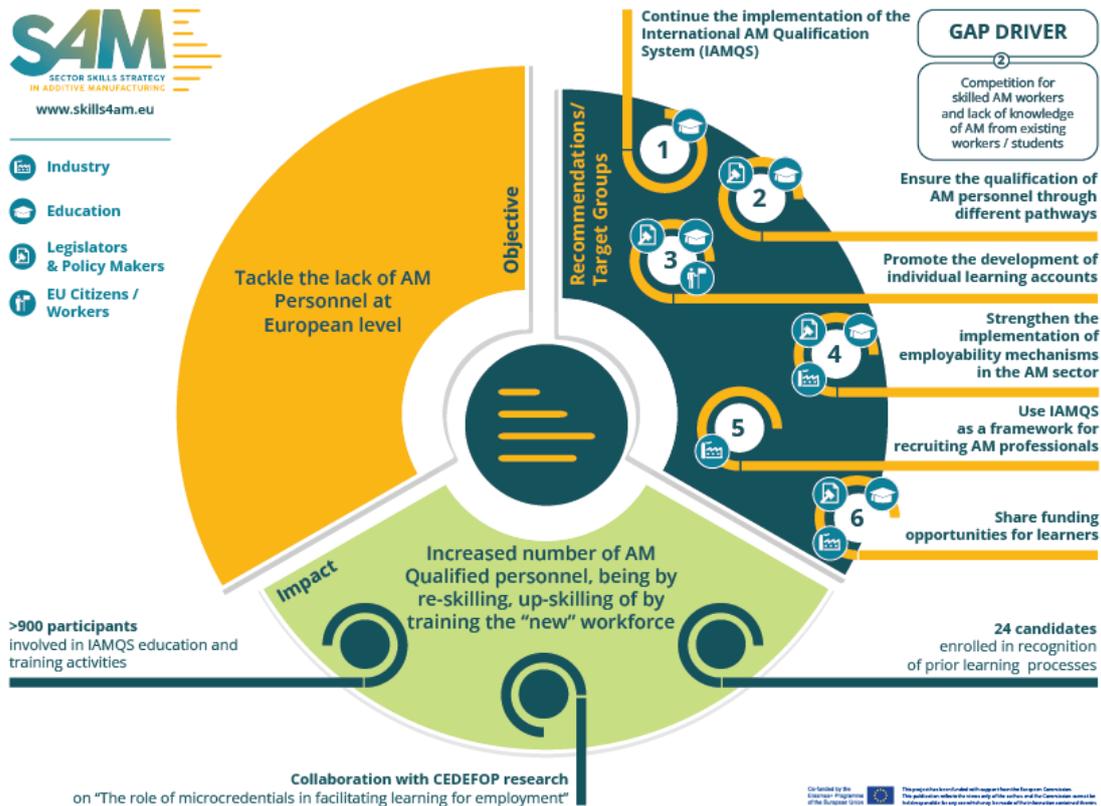
To continue **tackling the lack of AM Personnel at European level,** it is recommended that the different target groups follow five recommendations:

RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
Continue the implementation of the International AM Qualification System (IAMQS)	EDUCATION	• By continuing to increase the network of AM ANBs/ATBs • By expanding AM ATBs training offers • By continuing to develop/update AM qualifications based on a modular approach • By displaying the AM training catalogue in the European AM Observatory
Ensure the qualification of AM personnel through different training pathways	EDUCATION / LEGISLATORS & POLICY MAKERS	• By ensuring access to relevant vocational education and training, higher education and recognition of prior learning. • By promoting up-skilling and reskilling pathways By promoting lifelong learning approach to AM skills development
Promote the development of individual learning accounts	EDUCATION / LEGISLATORS & POLICY MAKERS / WORKERS EU CITIZENS	• By establishing mutual cooperation protocols between AM ATBs & training providers to deliver a full qualification path (MoU- Annex 1) • By awarding micro-credentials (e.g. Record of Achievement) for each completed unit of learning outcomes
Strengthen the implementation of employability mechanisms in the AM sector	EDUCATION / INDUSTRY / LEGISLATORS & POLICY MAKERS	• By continuing the activity of the LINKEDIN Students, Trainees and Job seekers in AM group • By sharing AM recruitment offers in the European AM Observatory
Use IAMQS as a framework for recruiting AM professionals	INDUSTRY	• By informing HR departments and recruitment agencies about the different levels of specialization and occupations in AM • By integrating IAMQS description in job adverts
Share funding opportunities for learners	EDUCATION / INDUSTRY / LEGISLATORS & POLICY MAKERS	• By providing funding /programmes information on the European AM Observatory

Co-funded by the
Erasmus+ Programme
of the European Union

SAM

5.3 Recommendations for preparing European, National and Regional organizations to provide relevant AM training for different educational levels
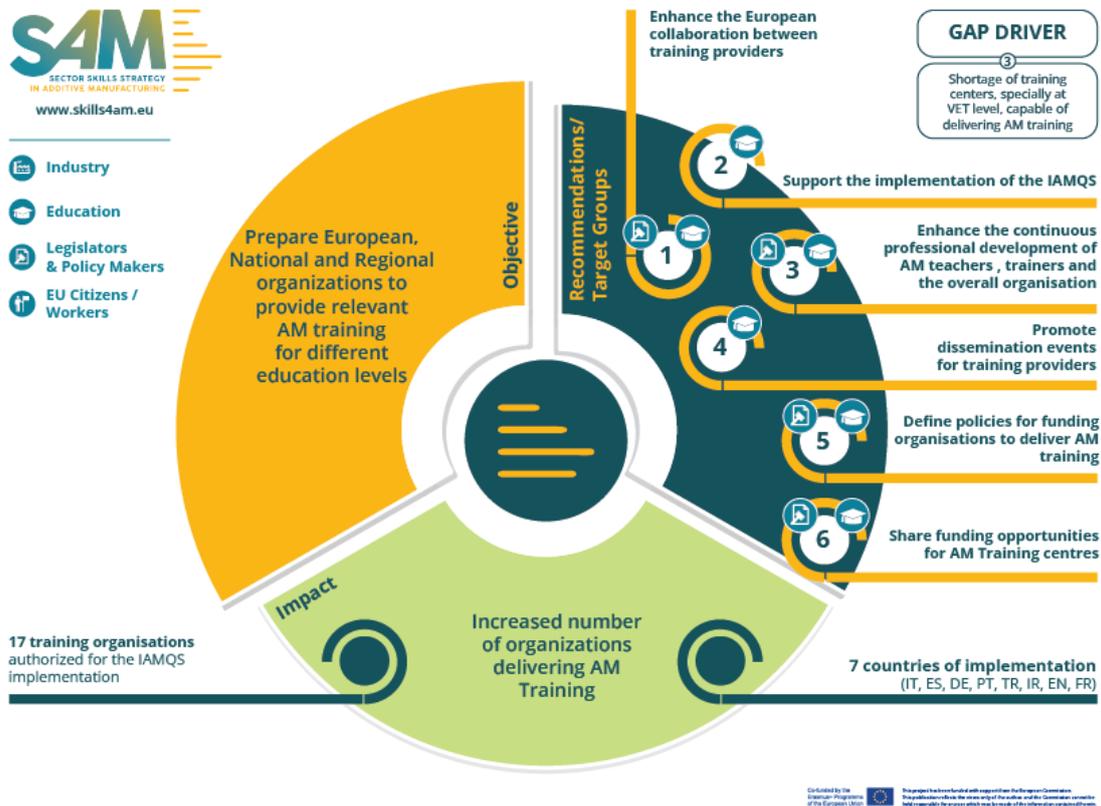
To continue **preparing European, National and Regional organizations to provide relevant AM training for different educational levels,** it is recommended that the different target groups follow five recommendations:

RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
Enhance the European collaboration between training providers	EDUCATION / LEGISLATORS & POLICY MAKERS	• By continuing to develop national cooperation networks of authorized training centres in AM (AM ATBs)
Support the implementation of the IAMQS	EDUCATION	• By adopting diverse training methodologies, including work-based learning, project-based learning, blended learning, distant learning, among others. • By displaying the list of AM ATBs and their training offer in the European AM Observatory
Enhance the continuous professional development of AM teachers, trainers and the overall organisation	EDUCATION / LEGISLATORS & POLICY MAKERS	• By implementing continuous train the trainers courses • By implementing systematic peer-learning actions • By promoting a lifelong learning culture within the training organisation learning actions

Promote dissemination events for training providers	EDUCATION	• By presenting the IAMQS training offers and quality assurance system
Define policies for funding organisations to deliver AM training	EDUCATION / LEGISLATORS & POLICY MAKERS	• By defining policies that support the capacitation of staff • By defining policies that support equipping organisations
Share funding opportunities for AM Training centres	EDUCATION / LEGISLATORS & POLICY MAKERS	• By providing funding /programmes information on the European AM Observatory • By establishing partnership in the scope of EU funding projects

5.4 Recommendations for tackling the diversity of sectors and applications of AM
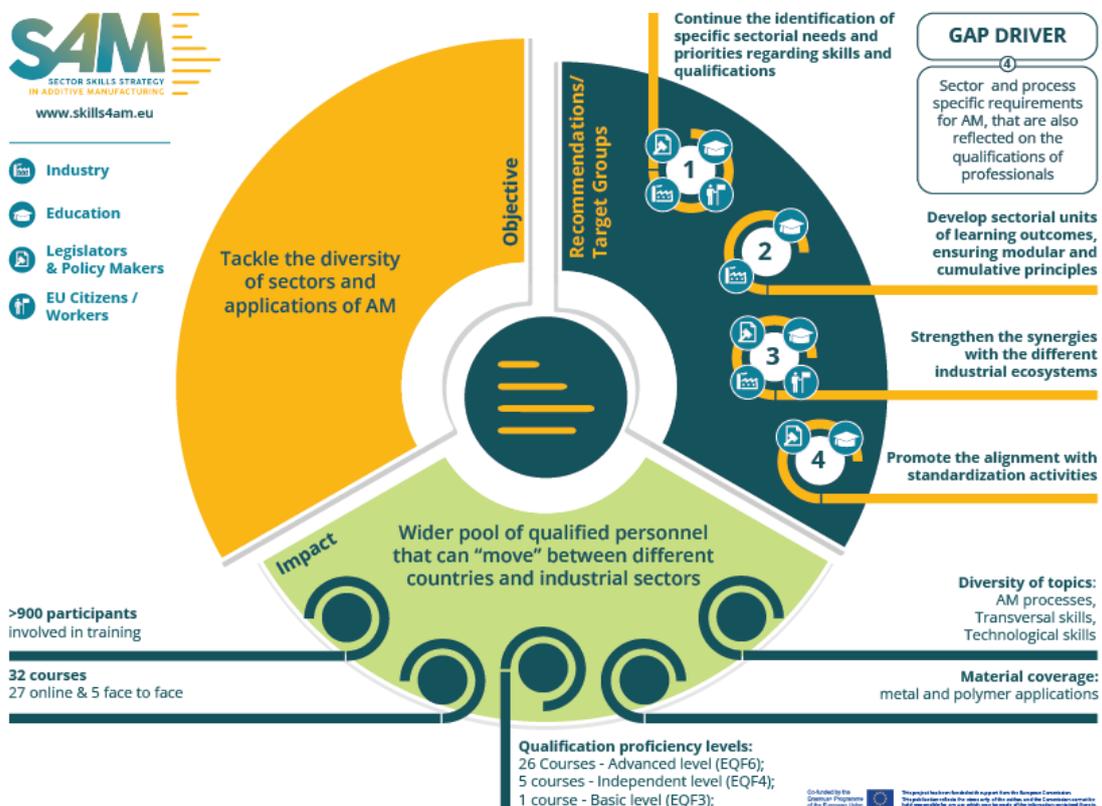
To continue **tackling the diversity of sectors and applications in AM,** it is recommended that the different target groups follow three recommendations:

Co-funded by the
Erasmus+ Programme
of the European Union

SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING

RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
Continue the identification of specific sectorial needs and priorities regarding skills and qualifications.	EDUCATION / INDUSTRY / UPSKILLING WORKFORCE / RESKILLING WORKFORCE	• By ensuring the involvement of different industrial stakeholders in the identification and validation of skills needs
Develop sectorial units of learning outcomes, ensuring modular and cumulative principles	EDUCATION / INDUSTRY	• By using a modular approach in the development of the training with some sector/process specific modules • By identifying common requirements between the different sectors • By recognising up-skilling and reskilling pathways • By implementing IAMQS courses that promote professionals reskilling , namely among welding professionals
Strengthen the synergies with the different industrial ecosystems	EDUCATION / INDUSTRY / UPSKILLING WORKFORCE / RESKILLING WORKFORCE	• By implementing IAMQS training supported by a Quality Assurance System and recognised by different sectors • By organising events and disseminating the International AM Qualifications to different industrial sectors
Promote the alignment with standardization activities	EDUCATION / INDUSTRY	• By identifying industrial requirements • By making the linkage between AM personnel qualifications and sectoral/industrial requirements

Co-funded by the
Erasmus+ Programme
of the European Union

5.5 Recommendations for the constant updating of the AM European workforce
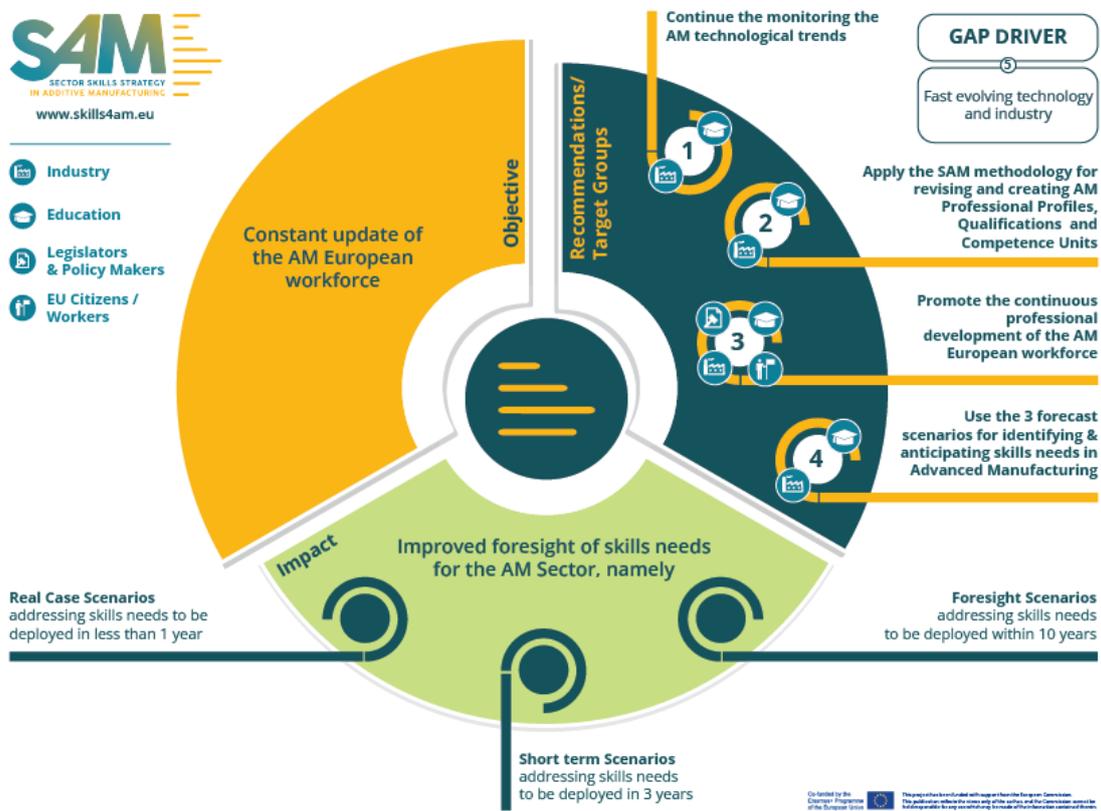
To **constantly update the AM European workforce**, it is recommended that the different target groups follow three recommendations:

RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
Continue monitoring the AM technological trends		• By identifying new AM technological trends • By continuing the implementation of the forecast and skills anticipation in AM
Apply the SAM methodology for revising and creating AM Professional Profiles, Qualifications and Competence Units		• By identifying the skills gaps origin • By making a comparative analysis based on similarities and differences with existing Professional profiles /qualifications /CUs • Conducting working sessions with experts reviewing AM Professional Profiles and Qualifications • By developing new qualifications and/or units of learning outcomes based on AM technological developments
Promote the continuous professional development of the AM European workforce		• By implementing courses, workshops and other educational initiatives targeting current and future AM workforce

Co-funded by the
Erasmus+ Programme
of the European Union

Use the 3 forecast scenarios for identifying & anticipating skills needs in Advanced Manufacturing		• Assessing skills needs for real case (less than 1 year), short term (less than 3 years) and foresight scenarios (required in 10 years

5.6 Recommendations for preparing the AM future workforce
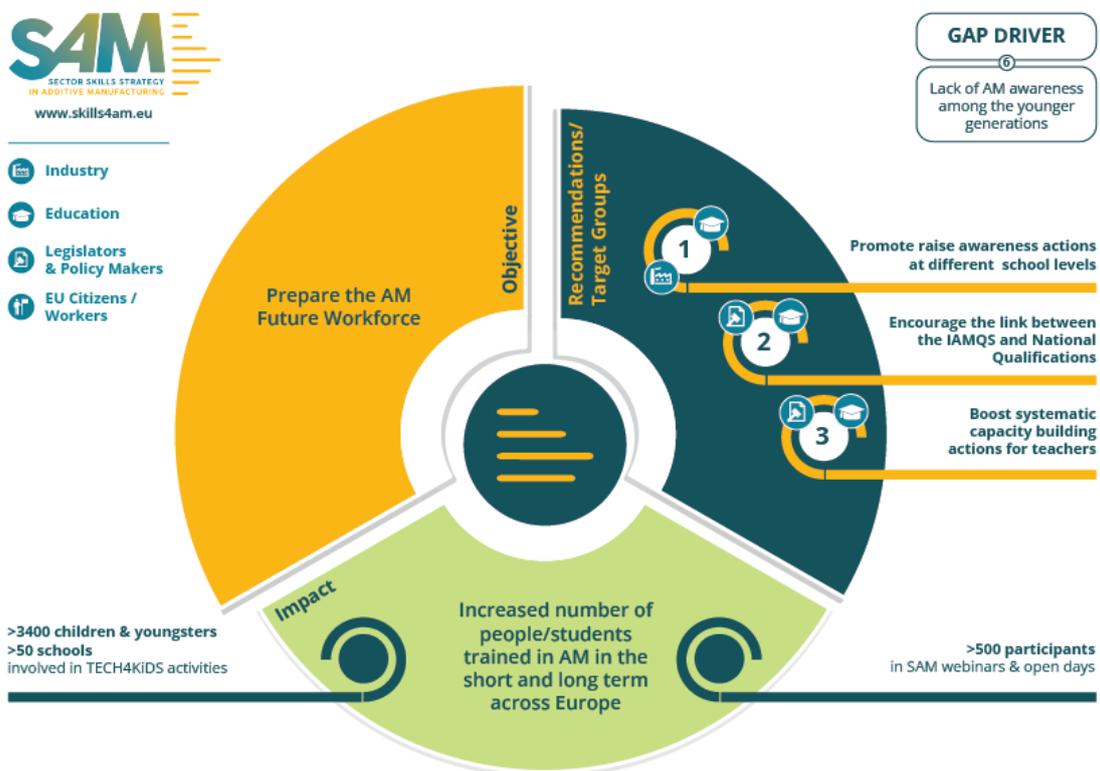
To continue **preparing the AM future workforce,** it is recommended that the different target groups follow three recommendations:

RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
Promote raise awareness actions at different school levels		• By sharing TECH4KIDS tools • By organizing events to raise awareness of AM and its capabilities, focusing on creativity, for young students • By ensuring the free access to raise awareness materials/tools in the AM Observatory • By boosting the implementation of the CU "AM for your career" to increase the attractiveness

Co-funded by the
Erasmus+ Programme
of the European Union

		of the sector among youngsters and knowledge about AM training offers
Encourage the link between the IAMQS and National Qualifications		• By following up National Roll Out Strategies • By reaching new countries in IAMQS • By integrating AM Qualifications in National Qualification Systems
Boost systematic capacity building actions for teachers		• By sharing the Educational Kit for Schools • By implementing systematic peer-learning activities • By promoting dissemination events with teachers

5.7 Recommendations for leveraging on existing funding programs and mechanisms
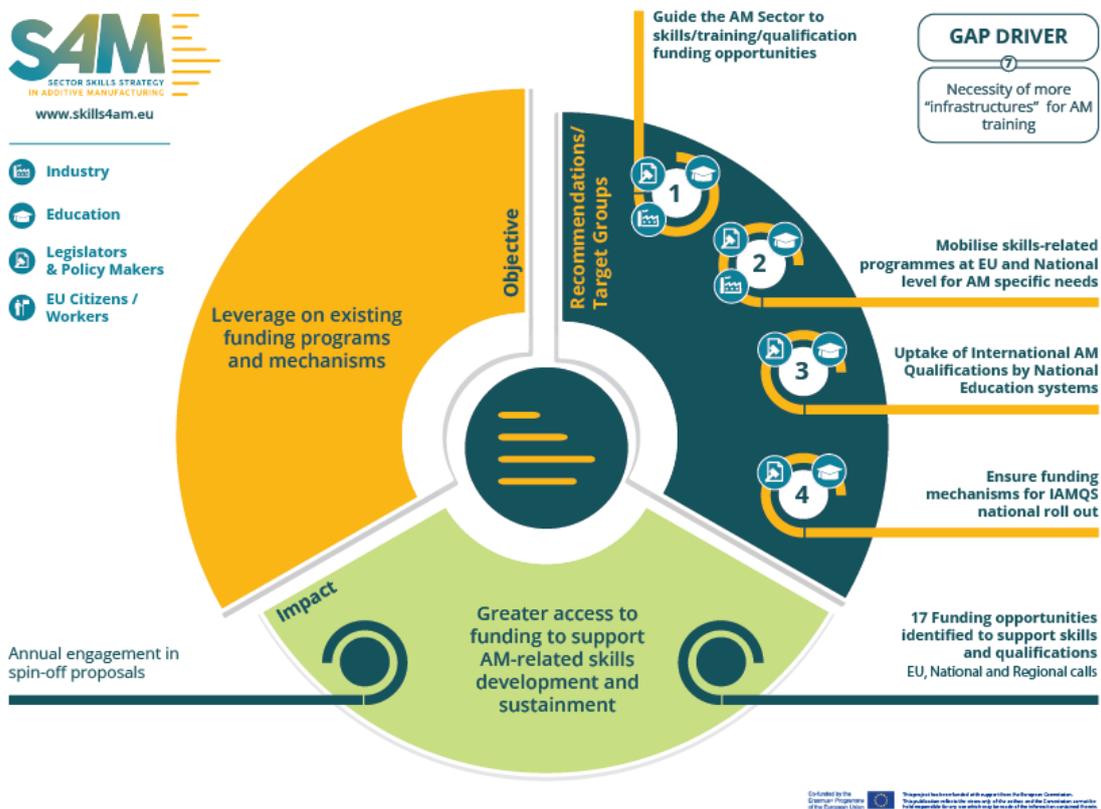
To continue **leveraging on existing funding programs and mechanisms,** it is recommended that the different target groups follow two recommendations:

RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
Guide the AM Sector to skills/training/qualification funding opportunities		• By sharing information on funding programmes that can enable training centres and schools with AM equipment and software • By mapping and promoting funding relevant for AM skills and qualifications

		• By organising events to facilitate networking and collaboration in EU and National calls for AM
Mobilise skills-related programmes at EU and National level for AM specific needs		• By sharing information on calls for AM-specific activities
Uptake of International AM Qualifications by National Education systems		• By undertaking the direct referencing of IAMQS to EQF • By recognising technological scope foreseen in the IAMQS in national qualifications
Ensure funding mechanisms for IAMQS national roll out		• By opening specific calls for supporting the implementation of AM training

6. CONCLUSIONS

This deliverable provided an update of the AM Skills strategy until 2023, as well as an analysis on how the SAM project addressed the strategy implementation.

It is important to highlight that during the update of the 2023 Skills Roadmap no new gap drivers and strategic objective were identified, although it was suggested to clarify the target group focus between strategic objectives 2 (people) and 3 (organizations) , which was integrated in the current version of the Roadmap.

SAM defined strategic objectives to face up to these challenges and mitigate their impacts on the sector. The flagship activity of the Skills Strategy Roadmap will continue to be the deployment of the International AM Qualification System (IAMQS) through a network of training providers, sustained by a strong connection between a wide range of industrial sectors, which are applying AM. The 2023 roadmap expanded on 30 key recommendations supported by concrete examples on how to carry on with future actions that will enable to achieve the strategic objectives until 2030

IAMQS

MEMORANDUM OF UNDERSTANDING

(MOU)

Between

[Name of ATB]

and

[Name of Training Institution, company or organization]

This is an agreement between [ATB Name] and [Name of Training Institution, company or organization].

Having regard to the Rules for the implementation of the European Federation for Welding, Joining and Cutting & Additive Manufacturing International Guidelines, for the education, training, examination and qualification of persons involved in Additive Manufacturing (IAMQS-001-21).

Whereas:

1) [ATB Name] is a formally AM Approved Training Body in accordance with AM ANB [AM ANB name] rules,
2) [Name of Training Institution, company or organization] is fully aware of these rules and freely choose to comply with them in the scope of this MOU,
3) [ATB Name] is formally responsible for collecting and providing to the AM ANB [AM ANB name] all required evidence in the scope of its approval, including all required documentation related with the current MOU,
4) [Name of Training Institution, company or organization] pledges not to release and/or publicly share the confidential information related with IAMQS,

Have agreed as follows:

I. PURPOSE AND SCOPE

The purpose of this Memorandum of Understanding (MOU) is to clearly identify the roles and responsibilities of each party as they relate to the collaboration and partnership in providing training in the scope of the International Additive Manufacturing Qualification System (IAMQS). It provides a framework within which all collaborative activities will be undertaken between [ATB Name] and [Name of Training Institution, company or organization].

AM Guideline(s) or Competence Units covered in the framework of this MOU:

a) _____
b) _____
c) _____
d) _____

II. COOPERATION

The Parties may cooperate by sharing and/or exchanging expertise and best practices developed in the implementation of their respective mandates, inter alia in the following areas:

a. Implementation of IAMQS Qualifications/Competence Units;

b. Training facilities and logistics;

c. Training materials;

d. Experts and trainers;

III. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of [ATB Name] and [Name of Training Institution, company or organization] authorized officials. It shall be in force from XXXXXXXXXX,

20XX to XXXXXXXX, 20XX.

On behalf of [ATB Name]   And   On behalf of [Name of Training Institution, company   or   organization]

_____   _____

[Name]   [Name]

[Title]   [Title]

GAP DRIVER 1	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS
Mismatch between industry needs and educational/training offer	**1: Strengthen the collaboration between industry and training organizations**	SA1.1 Ensure engagement of Industry in the identification and validation of the necessary skills and training programmes	**Reduced skills gaps and ensured alignment between the training offers and the industry needs, by:** • Reviewing existing Occupational Profiles /Qualifications –International Metal AM Process Engineer for Powder Bed- Laser beam (PBF-LB) & International Metal AM Coordinator • Developing an emerging Occupational Profile /Qualification– International AM Designer for Polymers • Developed 16 Competence Units /Modules, namely: • Developing specific technological skills – Metal AM Binder Jetting process for Independent and Advanced levels; • Developing sectoral skills – AM for Aerospace & Part Quality Control • Developing transversal skills linked to Entrepreneurship – Business for AM & Outlook of professional careers in Additive Manufacturing • Developing transversal skills linked to Sustainability, Circular economy and Life Cycle Assessment - Sustainability for AM; Metal AM Sustainability and Circularity CU; Polymer AM Sustainability and Circularity
		SA1.2 Support the link between training development and standardization activities (like CEN and ISO)	
		SA1.3 Ensure a link between stakeholders of the AM value chain, in terms of skills needed	

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES
A1.1 Identify and anticipate skills needs in the AM sector	**WP1. Sector Skills Strategy in the Additive Manufacturing Sector** • Literature review as method to identify skills needs and external reports in 2019 • Continuous use of the skills Intelligence tool & Consultation of Industry experts • Review of global and societal challenges and milestones (D1.2 Global and Societal Milestones) and technological trends and their influence within the AM skills needs (D1.3 Long Term technological and Industrial Plan) • D1.4 Professional Profiles and skills roadmap • D1.5 Visual Timeline **WP2. Forecast Methodology: Assessment of current and future skills in AM** • Development and fine-tuning of five Forecast Kits for (D2.2 Real case Scenarios kit), (D2.3 Short term Scenarios kit), (D2.4 Foresight Scenarios kit), as well as for conducting surveys/interviews (D2.1 Surveys and Interviews kit) and (D2.8 Workshops and working sessions kit) **WP4. Observatory in Additive Manufacturing**

GAP DRIVER 1	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS
Mismatch between industry needs and educational/training offer	1: Strengthen the collaboration between industry and training organizations	SA1.1 Ensure engagement of Industry in the identification and validation of the necessary skills and training programmes SA1.2 Support the link between training development and standardization activities (like CEN and ISO) SA1.3 Ensure a link between stakeholders of the AM value chain, in terms of skills needed	Reduced skills gaps and ensured alignment between the training offers and the industry needs, by: • Reviewing existing Occupational Profiles /Qualifications –International Metal AM Process Engineer for Powder Bed- Laser beam (PBF-LB) & International Metal AM Coordinator • Developing an emerging Occupational Profile /Qualification– International AM Designer for Polymers • Developed 16 Competence Units /Modules, namely: • Developing specific technological skills – Metal AM Binder Jetting process for Independent and Advanced levels; • Developing sectoral skills – AM for Aerospace & Part Quality Control • Developing transversal skills linked to Entrepreneurship – Business for AM & Outlook of professional careers in Additive Manufacturing • Developing transversal skills linked to Sustainability, Circular economy and Life Cycle Assessment - Sustainability for AM; Metal AM Sustainability and Circularity CU; Polymer AM Sustainability and Circularity

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES
	• Implementation of the forecast methodology and tools for skills identification and anticipation; • Four rounds of auscultation using interviews and surveys for Real case and Short-term needs & Delphi method combined with workshops/brainstorm sessions for foresight needs (e.g. AM Skills to be deployed every 10 years) among the different target groups (e.g. Industry, Education, Research organisations and Recruitment agencies) • Conduction of eight workshops to analyse skills needs as well as to validate skills priorities and trends among IAMIC and key experts; • Development of 5 reports on skills needs data and workshops results (D4.5 1st /2nd/3rd /4th Report on the Analysis and Validation of Needs; and D4.5 Additive Manufacturing Foresight Report) • Contact and engagement with AM projects in 2022 to share ongoing surveys **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Use working groups feedback regarding the implemented training to revise qualifications; Feedback from working groups in Metal AM and Polymers;
A1.2: Engage industry in the identification	**WP2. Forecast Methodology: Assessment of current and future skills in AM** • Update Real Case; Short Term, Foresight Scenarios timeframe for the annual surveys and industry rounds, to allow the identification of their needs; **WP4. Observatory in Additive Manufacturing** • Engagement during the auscultation phase and during the <u>four D4.4 external validation workshops to validate skills needs</u>: 1st workshop on 27 February

GAP DRIVER 1	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS
Mismatch between industry needs and educational/training offer	**1: Strengthen the collaboration between industry and training organizations**	SA1.1 Ensure engagement of Industry in the identification and validation of the necessary skills and training programmes	**Reduced skills gaps and ensured alignment between the training offers and the industry needs, by:** • Reviewing existing Occupational Profiles /Qualifications –International Metal AM Process Engineer for Powder Bed- Laser beam (PBF-LB) & International Metal AM Coordinator
		SA1.2 Support the link between training development and standardization activities (like CEN and ISO)	• Developing an emerging Occupational Profile /Qualification– International AM Designer for Polymers • Developed 16 Competence Units /Modules, namely: • Developing specific technological skills – Metal AM Binder Jetting process for Independent and Advanced levels; • Developing sectoral skills – AM for Aerospace & Part Quality Control
		SA1.3 Ensure a link between stakeholders of the AM value chain, in terms of skills needed	• Developing transversal skills linked to Entrepreneurship – Business for AM & Outlook of professional careers in Additive Manufacturing • Developing transversal skills linked to Sustainability, Circular economy and Life Cycle Assessment - Sustainability for AM; Metal AM Sustainability and Circularity CU; Polymer AM Sustainability and Circularity

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES
of skills and validation of training programmes	2020 in Brussels; 2nd workshop online on the 29 January 2021; 3rd online on the 29 April 2022 Workshop; 4th workshop on 27 April 2023 in Leuven; • Engagement with Industrial experts during the Foresight brainstorm workshop on 10th May 2021 • Use of participants feedback, including industrial participants, to fine-tune the adequacy of the delivered AM Training Programmes during 1st,2nd and 3rd stage of pilots (D4.6 1st/2nd /3rd Feedback Reports on the existing Qualifications and training modules) • Use of participants feedback, including industrial participants, to fine tune the delivered AM Training Offers, based on the follow up (6 months) perceived impact (D4.6 1st 2nd, 3rd Follow up and impact of AM Training Reports **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Engagement among education and industrial organizations during the working sessions aiming to o develop and validate the structure and content of training guidelines / programmes for Qualifications and Competences units (modules): AM Designer for Polymers Qualification; Certification Qualification and Standards CU, Business for AM CU, Metal AM Binder Jetting Independent and Advanced CUs, Sustainability for AM CU (D5.2 1st Stage Real Case Scenarios Documental Revision Report, D5.4 2nd Stage Real Case Scenarios-Professional Profiles /Qualifications and Competence Units /Modules; D5.6 Short Term Scenarios - New Professional Profiles /Qualifications and Competence Units /Modules) **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Engagement among education and industrial organizations in working sessions aiming to validate the structure and content of new training guidelines / programmes for: Review of the metal AM coordinator Qualification; -AM for Aerospace & Part Quality Control CU; Metal AM Sustainability and

GAP DRIVER 1	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS
Mismatch between industry needs and educational/training offer	**1: Strengthen the collaboration between industry and training organizations**	SA1.1 Ensure engagement of Industry in the identification and validation of the necessary skills and training programmes	**Reduced skills gaps and ensured alignment between the training offers and the industry needs, by:** • Reviewing existing Occupational Profiles /Qualifications –International Metal AM Process Engineer for Powder Bed- Laser beam (PBF-LB) & International Metal AM Coordinator • Developing an emerging Occupational Profile /Qualification– International AM Designer for Polymers • Developed 16 Competence Units /Modules, namely: • Developing specific technological skills – Metal AM Binder Jetting process for Independent and Advanced levels; • Developing sectoral skills – AM for Aerospace & Part Quality Control • Developing transversal skills linked to Entrepreneurship – Business for AM & Outlook of professional careers in Additive Manufacturing • Developing transversal skills linked to Sustainability, Circular economy and Life Cycle Assessment - Sustainability for AM; Metal AM Sustainability and Circularity CU; Polymer AM Sustainability and Circularity
		SA1.2 Support the link between training development and standardization activities (like CEN and ISO)	
		SA1.3 Ensure a link between stakeholders of the AM value chain, in terms of skills needed	

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES
	Circularity CU; Polymer AM Sustainability and Circularity CU; Outlook of professional careers in Additive Manufacturing CU (D6.1 Real Case Scenarios- New Professional Profiles /Qualifications and Competence Units /Modules Updated); D6.3 Short term Scenarios – Review of Professional Profiles /Qualifications and Competence Units /Modules; D6.5 New Professional Profiles /Qualifications and Competence Units /Modules) • Use of participants feedback, including industrial participants and trainers, to fine-tune the adequacy of the delivered AM Training Programmes, during the Advanced Metal AM coordinator Course (D6.3 Short term Scenarios- Review and implementation of the Metal AM coordinator Qualification)
A1.3: Create an open platform for industries to provide their inputs on skills and qualifications for AM	**WP4. Observatory in Additive Manufacturing** • As part of the Observatory, SAM created a European Industrial Council (IAMIC) composed of industrial members users from several sectors (D4.1 AM Observatory Rules and Operational Procedures) • The IAMIC Advisory groups involved key organizations representing Machine Manufacturers, End-users as well as relevant AM companies; • The IAMIC has a leading chair, a Siemens expert and involved 35 experts ; • The D4.2 European AM Observatory platform displays an online catalogue with the Professional Profiles/Qualifications and CUs foreseen IAMQS **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • After the development and implementation phases had been completed (pilots), the AM Qualifications and Competence Units/Training Modules revised, if needed, were integrated into an online catalogue of IAMQS training offers (D5.8 Online qualifications catalogue)

GAP DRIVER 1	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS
Mismatch between industry needs and educational/training offer	**1: Strengthen the collaboration between industry and training organizations**	SA1.1 Ensure engagement of Industry in the identification and validation of the necessary skills and training programmes SA1.2 Support the link between training development and standardization activities (like CEN and ISO) SA1.3 Ensure a link between stakeholders of the AM value chain, in terms of skills needed	**Reduced skills gaps and ensured alignment between the training offers and the industry needs, by:** • Reviewing existing Occupational Profiles /Qualifications –International Metal AM Process Engineer for Powder Bed- Laser beam (PBF-LB) & International Metal AM Coordinator • Developing an emerging Occupational Profile /Qualification– International AM Designer for Polymers • Developed 16 Competence Units /Modules, namely: • Developing specific technological skills – Metal AM Binder Jetting process for Independent and Advanced levels; • Developing sectoral skills – AM for Aerospace & Part Quality Control • Developing transversal skills linked to Entrepreneurship – Business for AM & Outlook of professional careers in Additive Manufacturing • Developing transversal skills linked to Sustainability, Circular economy and Life Cycle Assessment - Sustainability for AM; Metal AM Sustainability and Circularity CU; Polymer AM Sustainability and Circularity

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES
	WP6. Implementation of SAM's final methodology for developing Professional Profiles • After the development and validation by the IAMQC working groups, the four news Competence Units/Training Modules were uploaded into the updated online catalogue (D6.7 Updated Catalogue)
A1.4: Define a joint skills strategy with the main industrial partners	**WP2. Forecast Methodology: Assessment of current and future skills in AM** • Implemented Foresight Scenarios' kit and Foresight Workshop with industry experts on 10th May 2021 • IAMIC meeting on 14 December 2021 addressing the validation of the Digital and Entrepreneurship frameworks for each AM Proficiency level **WP4. Observatory in Additive Manufacturing** • A workshop with PBF -LB machine manufacturers was organised on the 23 October 2020 to define a joint strategy for skills in AM. On that occasion the strategy (D4.10 Sector Skills Strategy Roadmap 2021) and progression were made with the following machine manufacturers: Renishaw; GE Additive • SLM Solutions; EOS;TRUPF; Prima Additive; 3DSystems; DMG Mori). • The last IAMIC meeting was conducted on the 27 April in Leuven to present the Sector Skill Strategy Roadmap 2023, including the 30 Recommendations (D4.10 Sector Skills Strategy Roadmap 2023)
A1.5 Implementation of Mainstreaming Steering Committees	**WP8. Dissemination and Exploitation** • The Mainstreaming Steering Committees (MSC) activities were performed within WP8, following the Communication and Dissemination Strategy, ensuring

GAP DRIVER 1	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS
Mismatch between industry needs and educational/training offer	**1: Strengthen the collaboration between industry and training organizations**	SA1.1 Ensure engagement of Industry in the identification and validation of the necessary skills and training programmes SA1.2 Support the link between training development and standardization activities (like CEN and ISO) SA1.3 Ensure a link between stakeholders of the AM value chain, in terms of skills needed	**Reduced skills gaps and ensured alignment between the training offers and the industry needs, by:** • Reviewing existing Occupational Profiles /Qualifications –International Metal AM Process Engineer for Powder Bed- Laser beam (PBF-LB) & International Metal AM Coordinator • Developing an emerging Occupational Profile /Qualification– International AM Designer for Polymers • Developed 16 Competence Units /Modules, namely: • Developing specific technological skills – Metal AM Binder Jetting process for Independent and Advanced levels; • Developing sectoral skills – AM for Aerospace & Part Quality Control • Developing transversal skills linked to Entrepreneurship – Business for AM & Outlook of professional careers in Additive Manufacturing • Developing transversal skills linked to Sustainability, Circular economy and Life Cycle Assessment - Sustainability for AM; Metal AM Sustainability and Circularity CU; Polymer AM Sustainability and Circularity
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
	wide outreach, and promoting the project at every related event or workshop. • The MSC was renamed "EU AM Community Network", being composed by SAM partners, Associated partners, AM Authorized Nominated Bodies (ANBs) and AM Authorized Training Bodies ATBs), AM students /graduated students coming from industrial, education, and research organizations in AM. The AM Community network serves as a platform for effective dissemination of project outcomes through activities like events, knowledge exchange, and best practice sharing (D8.9 AM Community Network).		

Co-funded by the
Erasmus+ Programme
of the European Union

SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING

GAP DRIVER 2	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	Impact & Results
Competition for skilled AM workers and lack of knowledge of AM from existing workers/students	**2: Tackle the lack of AM personnel at the European level**	SA2.1: Facilitate access to AM-relevant vocational educational training and higher education	**Increased number of AM Qualified personnel, being by re-skilling, up-skilling and/or by training the "new" workforce, namely:** • Over 900 participants were involved in IAMQS education and training activities; • Around 662 hours of training • 24 candidates enrolled the recognition of prior learning • Reference into CEDEFOP Fiches • Collaboration with CEDEFOP study on "The role of Micro credentials in facilitating learning for employment"
		SA2.2: Develop a recognised EU-level qualifications and training supported by a harmonized accreditation system for training and educational organizations, at both VET and HE levels	
		SA2.3: Support the implementation of different paths for qualifications in AM	
		SA2.4: Support the implementation of different training methodologies for qualifications in AM	
		A2.5: Facilitate continued European collaboration between training providers	
		SA2.6: Support the implementation of employability mechanisms in the AM sector	
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
A2.1: Implement the International AM Qualification System	**WP3. Methodology for developing and revising professional profiles and skills** • Development and fine-tuning of the methodology (D3.1 Methodological guideline for the creation and revision of professional profiles) & tools (D3.2 Kit of templates) to review AM Professional Profiles and CUs / Modules • The review of existing qualifications in AM and development of new Units of Learning Outcomes and/or Qualifications • An operational guideline on AM context and training tools was developed to support future training (D3.3 Operational Guideline on context and training tools). • The IAMQS was designed using a modular approach, composed by a set of Competence Units that can taught and assess individually, thus facilitating the recognition and development of individual learning accounts (Micro credentials). **WP4. Observatory in Additive Manufacturing** • The European AM Observatory addresses the implementation, consolidation and update of the IAMQS • Integrated rules for the Qualification system implementation (D4.1 AM Observatory, Rules and Operational procedures) **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • The working session with experts aimed to review of the Metal AM PBF-LB Engineer Qualification; develop a new AM Design Polymers Qualification; as well as new CUs on Sustainability for AM and a multi-level CU on Metal AM Binder Jetting process • All developed training programmes for AM, corresponding to the 1st, 2nsd and 3rd stage of pilots, were tested by VET/HE partners, requiring the development of supporting training materials, when applicable, and assessment tools • Recognition of prior learning mechanisms and tools were developed and tested for specific CUs (D4.6 3rd Overall report on the feedback on the existing		

GAP DRIVER 2	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	Impact & Results
Competition for skilled AM workers and lack of knowledge of AM from existing workers/students	**2: Tackle the lack of AM personnel at the European level**	SA2.1: Facilitate access to AM-relevant vocational educational training and higher education	**Increased number of AM Qualified personnel, being by re-skilling, up-skilling and/or by training the "new" workforce, namely:**
		SA2.2: Develop a recognised EU-level qualifications and training supported by a harmonized accreditation system for training and educational organizations, at both VET and HE levels	• Over 900 participants were involved in IAMQS education and training activities;
		SA2.3: Support the implementation of different paths for qualifications in AM	• Around 662 hours of training
		SA2.4: Support the implementation of different training methodologies for qualifications in AM	• 24 candidates enrolled the recognition of prior learning
		A2.5: Facilitate continued European collaboration between training providers	• Reference into CEDEFOP Fiches
		SA2.6: Support the implementation of employability mechanisms in the AM sector	• Collaboration with CEDEFOP study on "The role of Micro credentials in facilitating learning for employment"

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES
	qualifications and training modules). • The harmonised implementation of the IAMQS, following EWF Quality Assurance System, by a network of 17 training centres; inside and outside the consortium **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Several working sessions were conducted using the final version of the methodology, enabling to develop 4 new CU /modules: AM for Aerospace & Part Quality Control; Metal AM Sustainability and Circularity; Polymer AM Sustainability and Circularity; Outlook of professional careers in Additive Manufacturing (D6.5 New Professional Profiles/Qualifications and Competence Units). • Delivery of the Advanced Metal AM coordinator course at European level, based on the revised Metal AM coordinator qualification (D6.3-part 2 Short-term review of Professional Profiles/qualifications and Competence Units/ Training Modules).
A2.2: Funding for the preparation of training centres	**WP4. Observatory in Additive Manufacturing** • The mapping of projects in AM (D4.9 Mapping of project in AM) as well as AM Initiatives was performed every year • The online Observatory platform (D4.2 Observatory in AM) displays information on call for funding **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Two Train the Trainer Workshops (D5.1 Train the trainers workshops) were conducted on 19 and 21 October 2020 & 14 Abril 2021 to capacitate trainers towards delivering courses for the new/update training programmes **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Development of four new CUs: AM for Aerospace & Part Quality Control; Metal AM Sustainability and Circularity; Polymer AM Sustainability and

GAP DRIVER 2	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)		Impact & Results
Competition for skilled AM workers and lack of knowledge of AM from existing workers/students	**2: Tackle the lack of AM personnel at the European level**	SA2.1: Facilitate access to AM-relevant vocational educational training and higher education		**Increased number of AM Qualified personnel, being by re-skilling, up-skilling and/or by training the "new" workforce, namely:**
		SA2.2: Develop a recognised EU-level qualifications and training supported by a harmonized accreditation system for training and educational organizations, at both VET and HE levels		• Over 900 participants were involved in IAMQS education and training activities;
		SA2.3: Support the implementation of different paths for qualifications in AM		• Around 662 hours of training • 24 candidates enrolled the recognition of prior learning • Reference into CEDEFOP Fiches
		SA2.4: Support the implementation of different training methodologies for qualifications in AM		• Collaboration with CEDEFOP study on "The role of Micro credentials in facilitating learning for employment"
		A2.5: Facilitate continued European collaboration between training providers		
		SA2.6: Support the implementation of employability mechanisms in the AM sector		
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**			
	Circularity; Outlook of professional careers in Additive Manufacturing (D6.5 New Professional Profiles/Qualifications and Competence Units). • The development of 4 new Qualifications/Units of Learning Outcomes can become in input for the necessary identification of funding for the training centres			
A2.3: Create an open platform for AM training providers to provide information on skills and qualifications for AM they can offer	**WP4. Observatory in Additive Manufacturing** • IAMQC establishment (WG Metal and WG Polymers with a total of 69 experts; • The AM Observatory contained information about SAM pilots training offers; • Upload of the online catalogue with the PP/qualifications foreseen IAMQS & the integration of the revised and new Qualification / Competence units • Upload and give visibility to AM training offers in the Observatory online platform (D4.2 European AM Observatory) • Opportunity for AM job offers promotion linked with IAMQS & informative tool on recommended training "Find your path" • Development of a database with AM training offers grounding the AM Observatory & settle procedures for updating training offers in the observatory Identification and sharing of funding opportunities for equipping training centres in the Observatory **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Online catalogue of IAMQS training offers (D5.8 Online qualifications catalogue) was integrated within the Observatory **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Development of new AM Training offers, that were displayed online in the Observatory (D6.7 Updated Catalogue)			
A2.4: Promote through national events and	**WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Two Train the Trainer Workshops (D5.1 Train the trainers workshops) were conducted on 19 and 21 October 2020 & 14 Abril 2021 to capacitate trainers			

GAP DRIVER 2	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)		Impact & Results
Competition for skilled AM workers and lack of knowledge of AM from existing workers/students	**2: Tackle the lack of AM personnel at the European level**	SA2.1: Facilitate access to AM-relevant vocational educational training and higher education		**Increased number of AM Qualified personnel, being by re-skilling, up-skilling and/or by training the "new" workforce, namely:**
		SA2.2: Develop a recognised EU-level qualifications and training supported by a harmonized accreditation system for training and educational organizations, at both VET and HE levels		• Over 900 participants were involved in IAMQS education and training activities;
		SA2.3: Support the implementation of different paths for qualifications in AM		• Around 662 hours of training • 24 candidates enrolled the recognition of prior learning
		SA2.4: Support the implementation of different training methodologies for qualifications in AM		• Reference into CEDEFOP Fiches • Collaboration with CEDEFOP study on "The role of Micro credentials in facilitating learning for employment"
		A2.5: Facilitate continued European collaboration between training providers		
		SA2.6: Support the implementation of employability mechanisms in the AM sector		

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES			
through supporting activities focused on training centres (both VET and HE) International Qualifications in AM,	towards delivering courses for the new/update training programmes , enabling to capacitate staff /trainers regarding different training methods; • Implementation of three rounds of pilot courses: 1st stage & 2nd stage Real case scenarios pilots; short term 3rd stage of pilot courses from November 2020 to March 2022 • Three debrief sessions were organized for partners to discuss lessons learned and improvements needed to the IAMQs training **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Implementation of the Advanced AM online Course for Metal AM Coordinator Profile from November 2022 to May 2023 • One debrief session was organized for trainers to discuss lessons learned and improvements needed to the IMAM-Coordinator qualification. **WP8. Dissemination and Exploitation** • Dissemination and Exploitation events from 2020 to June 2023 were conducted to give visibility to the IAMQS (D8.8 Dissemination and Exploitation Portfolio); • Dedicated IAMQS national roll out events were conducted from March to June 2023 in the partner countries (France, Portugal, United Kingdom, Republic of Ireland, Italy, Greece, Germany, Spain) and beyond (Hungary, Tunisia) (D8.8 Dissemination and Exploitation Portfolio)			
A2.5: Establish mutual recognition protocols between training providers	**WP4. Observatory in Additive Manufacturing** • D4.1 AM Observatory Rules and Operational procedures document, addresses also: the rules for the IAMQS training to deployed at European level in alignment with a Quality Assurance System; the rules for AM training Centres to belong the European Network, the procedure for updating AM Training offers • The online platform (D4.2 Observatory in AM), gives visibility of IAMQS Training network, their scope /coverage in terms of training; • Within D4.10 Sector Skills Strategy Roadmap, a template for mutual recognition protocols - Memorandum of Understanding (MOM) - was developed			

GAP DRIVER 2	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	Impact & Results
Competition for skilled AM workers and lack of knowledge of AM from existing workers/students	**2: Tackle the lack of AM personnel at the European level**	SA2.1: Facilitate access to AM-relevant vocational educational training and higher education SA2.2: Develop a recognised EU-level qualifications and training supported by a harmonized accreditation system for training and educational organizations, at both VET and HE levels SA2.3: Support the implementation of different paths for qualifications in AM SA2.4: Support the implementation of different training methodologies for qualifications in AM A2.5: Facilitate continued European collaboration between training providers SA2.6: Support the implementation of employability mechanisms in the AM sector	**Increased number of AM Qualified personnel, being by re-skilling, up-skilling and/or by training the "new" workforce, namely:** • Over 900 participants were involved in IAMQS education and training activities; • Around 662 hours of training • 24 candidates enrolled the recognition of prior learning • Reference into CEDEFOP Fiches • Collaboration with CEDEFOP study on "The role of Micro credentials in facilitating learning for employment"
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
	to formally address the collaboration among Education organisations, Authorized Training Bodies (ATBs) and non ATBs, in delivering IAMQS training; as well as to foster the upskilling and reskilling of trainers, as well as for the mobility of trainees belonging to the network; **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Establishment of collaboration arrangement between SAM partners (AM ATBs and non-ATBs) in order to deliver a full CU; **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • The MoU for the "International Metal AM Coordinator" Advanced Training Course implementation was settled as framework with clear arrangements to enable collaboration between a organisations and ensuring quality (e.g. aim; shared content & delivery training between organisations; to consider the procedure for dealing with language);		
A2.6: Share data on AM Workforce Employability	**WP4. Observatory in Additive Manufacturing** • Data regarding employment related to D2.6 (Kit for Tracking Students, future employees and job seekers in AM) implementation, were compiled into D4.6 1st 2nd , 3rd Follow up and impact of AM Training Reports • Establishment of an open group to bridge interaction between job seekers and recruiters (D4.7 -LinkedIn group) with 689 members • Display of AM data on workforce needs and employability within the AM Observatory > AM Market World		

GAP DRIVER 3	STRATEGY OBJECTIVES	SUPPORTING ACTIONS (SA)	Impact & Results
Shortage of training centres, specially at VET level, capable of delivering AM training (cost of the equipment/software, qualified personnel for delivering training)	**3: Prepare European, National and Regional organizations to provide relevant AM training for different education levels**	SA3.1: Support the development of National Cooperation Networks of accredited training centres in AM SA3.2: Include pathways for skills development and knowledge exchange in national and collaborative research, training and capacity building programmes SA3.3: Ensure the engagement of training organizations in the update and implementation of International AM Qualifications SA3.4: Support the development and implementation of Harmonized trans-national curricula	**Increased number of organizations delivering AM Training, namely:** • A total of 17 training organisations are authorised for the IAMQS implementation in Italy, Spain, Germany, Portugal, Turkey, Ireland, England and France.
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
A3.1: Engage industry, academia, training organisations and authorities in projects for collaborative implementation of AM training, supported by a Quality Assurance System	**WP4. Observatory in Additive Manufacturing** • Along SAM, the collaborative implementation of the IAMQS has increased the network of training centres with new AM ATBs (IMR, EPMA, POLIMI) • Implementation of the IAMQS in eight countries with a network of 17 AM Training Providers • More than 20 training resources developed, including case studies and assessment questions • Engagement of AM experts and stakeholders, including SAM partners and Associated, with the IAMIC, **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Engagement of AM experts IAMQC to implement SAM Final Methodology for Creating Professional Profiles, through the delivery of several working sessions to develop new qualifications and competence units;		
A3.2: Create a Network of AM Training providers (National and Transnational)	**WP4. Observatory in Additive Manufacturing** • D4.1 AM Observatory Rules and Operational procedures document, addresses also: the rules for the IAMQS training to deployed at European level in alignment with a Quality Assurance System; the rules for AM training Centres to belong the European Network, the procedure for updating AM Training offers • Mapping of the IAMQS network with information about their location, training offers available (D4.2 Observatory in AM) and D6.7 (Updated Catalogue) **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Conduction of 33 courses addressing the: Revised existing Occupational Profiles /Qualifications –International Metal AM Process Engineer for Powder Bed- Laser beam (PBF-LB); International AM Designer for Polymers Qualifications; Metal AM Binder Jetting process for Independent and Advanced levels; Courses for specific Competence units /modules of training.		

GAP DRIVER 3	STRATEGY OBJECTIVES	SUPPORTING ACTIONS (SA)	Impact & Results
Shortage of training centres, specially at VET level, capable of delivering AM training (cost of the equipment/software, qualified personnel for delivering training)	**3: Prepare European, National and Regional organizations to provide relevant AM training for different education levels**	SA3.1: Support the development of National Cooperation Networks of accredited training centres in AM	**Increased number of organizations delivering AM Training, namely:** • A total of 17 training organisations are authorised for the IAMQS implementation in Italy, Spain, Germany, Portugal, Turkey, Ireland, England and France.
		SA3.2: Include pathways for skills development and knowledge exchange in national and collaborative research, training and capacity building programmes	
		SA3.3: Ensure the engagement of training organizations in the update and implementation of International AM Qualifications	
		SA3.4: Support the development and implementation of Harmonized trans-national curricula	
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
	WP6 - Implement SAM Final Methodology for Creating Professional Profiles, • Implementation of the 1st Advanced Course for the International Metal AM Coordinator, based on the revised Metal AM coordinator qualification (D6.3-part 2 Short-term review of Professional Profiles/qualifications and Competence Units/ Training Modules), involving 24 trainers from 8 education providers (both VET and HE) in Europe		
A3.3: Funding for the "upskilling" of training centres with a focus in AM	**WP4. Observatory in Additive Manufacturing** • Development of a database with AM training offers grounding the AM Observatory • The Observatory provides data on AM skills needs and trends (D4.2 AM Observatory > Market world) that will enable a common understanding for training organisation to plan their training offers • The Observatory displays information on funding opportunities for "upskilling" training centres in the Observatory		
S3.4: Support the development and implementation of Harmonized trans-national curricula	**WP3. Methodology for developing and revising professional profiles and skills** • Development and fine-tuning of the methodology (D3.1 Methodological guideline for the creation and revision of professional profiles) & tools (D3.2 Kit of templates) were essential to review and develop the AM Professional Profiles and CUs / Modules, thus contributing to the IAMQS continuous update. • An operational guideline on AM context and training tools was developed to support the implementation of training (D3.3 Operational Guideline on context and training tools). **WP7 Awareness Campaign in AM** • Several events were organized face to face (D7.2 AM Open days) and online (D7.2 Webinars) to give visibility to the IAMQS and project results **WP8 Dissemination and Exploitation** • Several events were organized from 2020 to 2023, to be highlighted those that at national level contributed the national roll out of the IAMQS;		

GAP DRIVER 3	STRATEGY OBJECTIVES	SUPPORTING ACTIONS (SA)		Impact & Results
Shortage of training centres, specially at VET level, capable of delivering AM training (cost of the equipment/software, qualified personnel for delivering training)	**3: Prepare European, National and Regional organizations to provide relevant AM training for different education levels**	SA3.1: Support the development of National Cooperation Networks of accredited training centres in AM		**Increased number of organizations delivering AM Training, namely:**
		SA3.2: Include pathways for skills development and knowledge exchange in national and collaborative research, training and capacity building programmes		• A total of 17 training organisations are authorised for the IAMQS implementation in Italy, Spain, Germany, Portugal, Turkey, Ireland, England and France.
		SA3.3: Ensure the engagement of training organizations in the update and implementation of International AM Qualifications		
		SA3.4: Support the development and implementation of Harmonized trans-national curricula		

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES
	WP4. Observatory in Additive Manufacturing • SAM National events engaged industry and training providers interested in AM. 10 National Roll out events were conducted in 9 countries with 2574 participants • The final conference (8.11 Final Conference) inn Lisbon, gathered 64 participants enabling to engage with relevant international stakeholders and representatives
A3.5: Define training programmes for trainers (VET teachers, etc)	**WP3. Methodology for developing and revising professional profiles and skills** • An operational guideline on AM context and training tools was developed to support the implementation of training (D3.3 Operational Guideline on context and training tools). **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Two Train the Trainer Workshops (D5.1 Train the trainers' workshops) were conducted on 19 and 21 October 2020 & 14 Abril 2021 to capacitate trainers towards delivering courses for the new/update training programmes • Access and availability of relevant AM teaching and training resources applied in WP5 that can support trainers in the AM courses delivery **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • One debrief session was organized for trainers to discuss lessons learned and improvements needed to the IMAM-Coordinator qualification. • Access and availability of relevant AM teaching and training resources applied in WP6 that can support trainers in the AM courses delivery

GAP DRIVER 4	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)		Impact & Results

Sector and process specific requirements for AM, that are also reflected on the qualifications of professionals	**4: Tackle the diversity of sectors and applications of AM**	**SA4.1: Ensure the involvement of different sectoral stakeholders in the identification and validation of necessary skills/qualifications**		**Wider pool of qualified personnel that can "move" between different countries and industrial sectors, namely:**
				• Over 900 participants involved in training
				• A total of 34 courses were conducted
				  ○ 29 Online Courses
				  ○ 5 face to face Courses

		SA4.2: Ensure that sector and/or AM process specific skills/qualifications are identified and addressed		Targeted Proficiency level: • 28 Courses - Advanced proficiency level (Aligned with EQF6)
		SA4.3: Ensure a common base for the Qualifications to allow mobility of the workers between sectors and countries		• 5 courses - Independent proficiency level (Aligned with EQF4) • 1 course – Basic proficiency level (Aligned with EQF3) • Diversity of topics addressed in training:
		SA4.4: Support the creation of International Qualifications/modules focused on a specific industrial sector		○ 7 AM processes in the overall courses ○ transversal skills development ○ Material coverage: metal and polymers applications
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**			
A4.1: Engage with different sectoral organizations to allow a sectoral view on skills and qualifications for AM (sectors like Aerospace, Medical, Automotive, Maritime, etc)	**WP4. Observatory in Additive Manufacturing** • Within its structure, the Observatory ensures the sectoral representation of both the Educational and Industry stakeholders, that are actively enrolled in the IAMQC (Industrial Council and IAMIC (Industry Council). For instance, experts involved are from EIT RM; ISO and relevant AM companies; **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Participants in the pilot courses belong to industry (employed participants) in the 1st stage of Real case Scenarios as well as on the 2nd stage of real case scenarios • A specific training session was conducted in the 3rd stage of pilots named "AM Course "Through AM Industrial Sectors Certification, Standardization, Qualification" targeting participants from aerospace, automotive, health, maritime and construction. The goal was to understand in which sense the CU content could be added value for specific sectoral applications (D4.6 3rd Overall report on Short term Scenarios). **WP7. Awareness Campaign in AM** • A common webinar entitled "Across the AM industry: the required skills-set by the different sectors" (D7.2) was organised by SAM in October 2021 together with the ASSETs+, DRIVES, MATES and the Construction initiatives. The goal was to present the perspectives from different sectors towards the use of AM and to discuss on the different needs according to industrial sectors with regards to AM skills and profiles. • Additional webinars were organized, to showcase AM applications and opportunities in the aerospace, medical as well as in the automotive sectors (D7.2) **WP8 Dissemination and Exploitation**			

GAP DRIVER 4	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)		Impact & Results

Sector and process specific requirements for AM, that are also reflected on the qualifications of professionals	4: Tackle the diversity of sectors and applications of AM	SA4.1: Ensure the involvement of different sectoral stakeholders in the identification and validation of necessary skills/qualifications		Wider pool of qualified personnel that can "move" between different countries and industrial sectors, namely:
				• Over 900 participants involved in training
				• A total of 34 courses were conducted
				   o 29 Online Courses
				   o 5 face to face Courses
				Targeted Proficiency level:
				• 28 Courses - Advanced proficiency level (Aligned with EQF6)
				• 5 courses - Independent proficiency level (Aligned with EQF4)
				• 1 course – Basic proficiency level (Aligned with EQF3)
				• Diversity of topics addressed in training:
				   o 7 AM processes in the overall courses
				   o transversal skills development
				   o Material coverage: metal and polymers applications

		SA4.2: Ensure that sector and/or AM process specific skills/qualifications are identified and addressed		
		SA4.3: Ensure a common base for the Qualifications to allow mobility of the workers between sectors and countries		
		SA4.4: Support the creation of International Qualifications/modules focused on a specific industrial sector		
IMPLEMENTING ACTIVITIES	SAM ACTIVITIES			
	• The Engagement with Sectorial Organizations focusing on the following sectors was entailed with: Aerospace (NADCAP, FAA and EASA, PRI), Health (FDA); Automotive (DRIVES project and ASA); Maritime (MATES project); Defence (ASSETS+ and EDA); Construction (Construction project), Energy (Eddie project and Baker Huge) and Steel-(Steel sector project); • SAM and IAMQS results presentation during specific sectoral events (D8.8 Dissemination & Exploitation Portfolio), namely: General Assembly meeting of the ESSA project and during the Skills and Jobs in the Future-Proven Steel industry" event in May 2021; ASA Automotive Project Market event in May 2022; EDA AM Village event in June 2023, among others; • The engagement with non-sector specific organizations were entailed (D8.8 Dissemination & Exploitation Portfolio) with - EIT Raw Materials, ISO, ASTM and ASME; **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Participants from the 1st European Advance course for Metal AM Coordinators belong to industry (employed participants)			
A4.2: Use a modular approach in the development of the training with some sector/process specific modules	**WP3 - Methodology for designing and revising professional profiles and developing skills** • The use of a modular approach, composed by a set of Competence Units that can taught and assess individually, for the IAMQS allows a faster deployment of the necessary sector skills requirements, facilitating the recognition and development of individual learning accounts (Micro credentials). • The meta-analysis of the 1st & 2nd pilot studies on used training tools and contexts, enabled to develop guidance and recommendations for future courses delivery (D3.3 Operational Guideline on context and training tools);			

GAP DRIVER 4	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)		Impact & Results

Sector and process specific requirements for AM, that are also reflected on the qualifications of professionals	**4: Tackle the diversity of sectors and applications of AM**	**SA4.1: Ensure the involvement of different sectoral stakeholders in the identification and validation of necessary skills/qualifications**		**Wider pool of qualified personnel that can "move" between different countries and industrial sectors, namely:**
				• Over 900 participants involved in training
				• A total of 34 courses were conducted
				  ○ 29 Online Courses
				  ○ 5 face to face Courses
				Targeted Proficiency level:
				• 28 Courses - Advanced proficiency level (Aligned with EQF6)
				• 5 courses - Independent proficiency level (Aligned with EQF4)
				• 1 course – Basic proficiency level (Aligned with EQF3)
				• Diversity of topics addressed in training:
				  ○ 7 AM processes in the overall courses
				  ○ transversal skills development
				  ○ Material coverage: metal and polymers applications

		SA4.2: Ensure that sector and/or AM process specific skills/qualifications are identified and addressed		
		SA4.3: Ensure a common base for the Qualifications to allow mobility of the workers between sectors and countries		
		SA4.4: Support the creation of International Qualifications/modules focused on a specific industrial sector		
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**			
A4.3: Identify common requirements between the different sectors	**WP3 - Methodology for designing and revising professional profiles and developing skills** • The methodology (D3.1 Methodological guideline for the creation and revision of professional profiles) & tools (D3.2 Kit of templates) to review AM Professional Profiles and CUs / Modules, considers the dentifications of common requirements - gap origin- in alignment with the different sector needs • The sector skill needs are considered to set the priorities in terms of the new skills to be developed and or revised. **WP4. Observatory in Additive Manufacturing** • Specific sectoral questions in surveys to capture the needs of specific sectors **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • A new CU was developed to address a specific application within the aerospace Sector: AM for Aerospace & Part Quality Control;			
A4.4: Implement International Qualifications that are recognised by different sectors supported by a Quality Assurance System	**WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Participants in the pilot courses belong to industry (employed participants) in the 1st stage of Real case Scenarios as well as on the 2nd stage of real case scenarios. • A specific training session was conducted in the 3rd stage of pilots named "AM Course "Through AM Industrial Sectors Certification, Standardization, Qualification" targeting participants from aerospace, automotive, health, maritime and construction. • The use of case studies were used to ensure a more practical and sectorial focus to the training **WP6. Implementation of SAM's final methodology for developing Professional Profiles**			

GAP DRIVER 4	STRATEGIC OBJECTIVE	SUPPORTING ACTIONS (SA)	Impact & Results

Sector and process specific requirements for AM, that are also reflected on the qualifications of professionals	**4: Tackle the diversity of sectors and applications of AM**	**SA4.1: Ensure the involvement of different sectoral stakeholders in the identification and validation of necessary skills/qualifications**
		
		 SA4.2: Ensure that sector and/or AM process specific skills/qualifications are identified and addressed
		
		 SA4.3: Ensure a common base for the Qualifications to allow mobility of the workers between sectors and countries
		
		 SA4.4: Support the creation of International Qualifications/modules focused on a specific industrial sector
			Wider pool of qualified personnel that can "move" between different countries and industrial sectors, namely:
			 • Over 900 participants involved in training
			 • A total of 34 courses were conducted
			   o 29 Online Courses
			   o 5 face to face Courses
			 Targeted Proficiency level:
			 • 28 Courses - Advanced proficiency level (Aligned with EQF6)
			 • 5 courses - Independent proficiency level (Aligned with EQF4)
			 • 1 course – Basic proficiency level (Aligned with EQF3)
			 • Diversity of topics addressed in training:
			   o 7 AM processes in the overall courses
			   o transversal skills development
			   o Material coverage: metal and polymers applications

IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
	• The use of case studies to ensure a more practical and sectorial focus to the training • SAM courses implementation always considered Quality Assurance System Rules related to the assessment (e.g approval of exams questions, supervision by an independent / external organization.		

Gap Driver 5	Strategy Objectives	Supporting actions (SA)	Impact & Results
Fast evolving technology and industry	**5: Constant update of the AM European workforce**	**SA5.1: Ensure the identification of new trends in AM**	**Improved foresight of skills needs for the AM Sector, namely:**
		SA5.2: Continued monitoring of AM technology developments	• Real Case Scenarios data addressing the skills needs to be deployed in less than 1 year
		SA5.3: Investing in the continuing professional development of teachers and trainers	• Short Term Scenarios data addressing the skills needs to be deployed in 3 years
		SA5.4: Training provision for continuous professional development of the AM European workforce	• Foresight Scenarios data addressing the skills needs to be deployed within 10 years
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
A5.1: Develop and promote skills mapping mechanisms and anticipation tools	**WP2. Forecast Methodology for the assessment of current and future skills needs** • A set of 5 Kits were developed and fined tune to ensure the assessment of current and future needs (D2.1 Surveys and Interviews kit; D2.2 Real Case Scenario kit; D2.3 Short Term Scenario; D2.4 Foresight Scenario and D2.8 Workshops and working sessions kit) • The tools applied for this purpose vary according to the scenario and refer to surveys, interviews, literature review and explanatory methods (e.g., world cafe, brainstorming and analysis and validation workshops) This activity will be kept updated after project end through the Observatory • **WP4. Observatory in Additive Manufacturing** • 4 Rounds of auscultations for Analysis and Validation of skills needs during the project lifetime. • 4 Reports on the Analysis and Validation of Needs were developed, which include D4.5 1st/2nd /3rd and 4th Report on the Analysis of Needs • One Foresight report and future trends; **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Implementation of SAM Final Methodology for Creating Professional Profiles, through several working sessions to develop new qualifications.		
A5.2: Develop and update, in a continuous way, modules related to new advances in AM	**WP3. Methodology for developing and revising professional profiles and skills** • Implementation of methodology for design and review of professional profiles, qualifications and units of learning outcomes • Update of the methodology and kits for PBF-LB Process and Polymer AM designer • Development of RPL scheme and kits of template for implementation **WP4. Observatory in Additive Manufacturing** • 3 Reports gathering the feedback on the piloted qualifications and CUs, which include D4.6 1st/2nd and 3rd Overall Reports about the pilots events **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Implementation of the revised PBF-LB Process Engineer Qualification (D5.3 1st Stage Piloting Event of the Real Case Scenarios) • Development of the Professional Profile of Polymer AM Designer (D5.4 2nd stage of the Real Case Scenarios – PP/Qualifications and Competence Units /Training Modules)		

Gap Driver 5	Strategy Objectives	Supporting actions (SA)	Impact & Results
Fast evolving technology and industry	**5: Constant update of the AM European workforce**	**SA5.1: Ensure the identification of new trends in AM**	**Improved foresight of skills needs for the AM Sector, namely:**
		SA5.2: Continued monitoring of AM technology developments	• Real Case Scenarios data addressing the skills needs to be deployed in less than 1 year
		SA5.3: Investing in the continuing professional development of teachers and trainers	• Short Term Scenarios data addressing the skills needs to be deployed in 3 years
		SA5.4: Training provision for continuous professional development of the AM European workforce	• Foresight Scenarios data addressing the skills needs to be deployed within 10 years

IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**
	• Implementation of Polymer AM Designer Profile (D5.5 2nd stage Piloting Event of the Real Case Scenarios) • Development of new CUs for MBJ and Sustainability for AM (D5.6 Short-term Scenarios – New PP/ PP/Qualifications and Competence Units /Training Modules) • Implementation of the new CUs for MBJ and Sustainability for AM (D5.7 Piloting Event of the Short Case Scenarios) **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Implementation of SAM Final Methodology for Creating Professional Profiles, through the delivery of several working sessions to develop new qualifications (D6.6) • Implementation of the 1st European Advance course for Metal AM Coordinators (D6.3-part 2 Short-term review of Professional Profiles/qualifications and Competence Units/ Training Modules),
A5.3: Carry out market searches, with a focus on Research Organizations, to identify new trends in AM	**WP2 & WP4 & WP8** • Establishment of procedures for feedback loops between forecast (all 3 scenarios) & AM Observatory publication of data related with trends
A5.4: Development of knowledge and skills in AM to keep up with the fast-evolving technology	**WP2. Forecast Methodology: Assessment of current and future skills in AM** • Implementation of Kit for tracking students (D2.6 Kit for tracking students, future employees and job seekers in AM) • Implement of Kit for collecting feedback about the implemented training (D2.7 Kit to collect feedback on the qualifications and training modules) **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Implementation of pilot's courses within IAMQS - 33 courses in total for continuous VET **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Implementation of SAM Final Methodology for Creating Professional Profiles, through the delivery of several working sessions to develop new qualifications

Co-funded by the
Erasmus+ Programme
of the European Union

SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING

Gap Driver 5	Strategy Objectives	Supporting actions (SA)	Impact & Results
Fast evolving technology and industry	5: Constant update of the AM European workforce	SA5.1: Ensure the identification of new trends in AM	**Improved foresight of skills needs for the AM Sector, namely:**
		SA5.2: Continued monitoring of AM technology developments	• Real Case Scenarios data addressing the skills needs to be deployed in less than 1 year
		SA5.3: Investing in the continuing professional development of teachers and trainers	• Short Term Scenarios data addressing the skills needs to be deployed in 3 years
		SA5.4: Training provision for continuous professional development of the AM European workforce	• Foresight Scenarios data addressing the skills needs to be deployed within 10 years
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
	• Implementation of the 1st European Advance course for Metal AM Coordinators		

GAP DRIVER 6	STRATEGY OBJECTIVES	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS
Lack of AM awareness among the younger generations	6: Prepare the AM Future Workforce	SA6.1: Formulate strategic and future-oriented visions for AM-related skills and their national roll-out	**Increased number of people/students trained in AM in the short and long term across Europe**
		SA6.2: Link European Qualifications with National Qualifications	• 4315 children and youngsters involved in Tech4Kids Activities
		SA6.3: Develop the use of AM at different school levels	• Over 80 Schools involved in the Tech4Kids Activities
		A6.4: Create AM awareness "activities" that can be used by schools according to the age of the students	• Over 345 Participants in AM Open days events
		A6.5: Funding to equip schools, fab labs or industrial experience accelerators and allow them to do AM related awareness activities	• Over 980 participants in 15 webinars
			• Over 3700 workers/professionals reached with the RAC activities
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
A6.1: Raise Awareness campaign focused on different target groups	**WP7. Awareness Campaign in AM** • Several Activities were conducted for Youngsters and AM Professionals, such as AM Open-days and Webinars (D7.2) as well as 8 thematic podcasts • A total of 13 TECH4Kids activities (D7.6) were performed involving 4315 children and youngsters, from over 80 schools • RAC materials were developed and used, such as AM basic quiz, posters, videos, comic series others. • An Educational kit for teachers (D7.6) was developed to guide schools teachers when implementing AM /3D printing activities.		
A6.2: Organize events to raise awareness of AM	**WP4. Observatory in Additive Manufacturing**		

GAP DRIVER 6	STRATEGY OBJECTIVES	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS
Lack of AM awareness among the younger generations	6: Prepare the AM Future Workforce	**SA6.1: Formulate strategic and future-oriented visions for AM-related skills and their national roll-out**	**Increased number of people/students trained in AM in the short and long term across Europe**
		SA6.2: Link European Qualifications with National Qualifications	• 4315 children and youngsters involved in Tech4Kids Activities
		SA6.3: Develop the use of AM at different school levels	• Over 80 Schools involved in the Tech4Kids Activities
		A6.4: Create AM awareness "activities" that can be used by schools according to the age of the students	• Over 345 Participants in AM Open days events • Over 980 participants in 15 webinars
		A6.5: Funding to equip schools, fab labs or industrial experience accelerators and allow them to do AM related awareness activities	• Over 3700 workers/professionals reached with the RAC activities
IMPLEMENTING ACTIVITIES	**SAM ACTIVITIES**		
and its capabilities, focusing on creativity, for young students	• The Observatory in AM displays AM skills relevant funding opportunities **WP7. Awareness Campaign in AM** • Several Activities were conducted for Youngsters and AM Professionals, such as AM Open-days and Webinars (D7.2) as well as 8 thematic podcasts • A total of 13 TECH4Kids activities (D7.6) were performed involving 4315 children and youngsters, from over 80 schools		
A6.3: Relate European AM Qualifications with NQF using European tools, such as EQF, ECTS, ECVET and EQAVET	**WP3. Methodology for developing and revising professional profiles and skills** • Alignment between European Quality Assurance Reference Framework: Quality Criteria and Indicative Descriptors & European AM System – is described in the methodology (D3.1 Methodological Guideline for creating and revising professional profiles) and tools (D3.2 Kit of templates) • Alignment of AM Framework with EU tools: EQF, ECTS & ECVET - is described in the methodology (D3.1 Methodological Guideline for creating and revising professional profiles) and tools (D3.2 Kit of templates) **WP5. Piloting of the methodology for developing and revising professional profiles and skills** • Alignment of the new Polymers AM Qualification and new CUs for Business, CQS, Binder Jetting and Sustainability for AM with AM Proficiency levels • Alignment work between Metal AM Process Engineer for PBF- LB Profile and with DIGICOMP & ENTRECOMP Frameworks **WP6. Implementation of SAM's final methodology for developing Professional Profiles** • Alignment of the four new CUs AM for: Aerospace & Part Quality Control; Metal AM Sustainability and Circularity; Polymer AM Sustainability and Circularity; Outlook of professional careers in Additive Manufacturing with the AM Proficiency levels (D6.5 New Professional Profiles/Qualifications and Competence Units). **WP8. Dissemination and Exploitation**		

GAP DRIVER 6	STRATEGY OBJECTIVES	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS
Lack of AM awareness among the younger generations	6: Prepare the AM Future Workforce	SA6.1: Formulate strategic and future-oriented visions for AM-related skills and their national roll-out	Increased number of people/students trained in AM in the short and long term across Europe
		SA6.2: Link European Qualifications with National Qualifications	• 4315 children and youngsters involved in Tech4Kids Activities
		SA6.3: Develop the use of AM at different school levels	• Over 80 Schools involved in the Tech4Kids Activities
		A6.4: Create AM awareness "activities" that can be used by schools according to the age of the students	• Over 345 Participants in AM Open days events • Over 980 participants in 15 webinars
		A6.5: Funding to equip schools, fab labs or industrial experience accelerators and allow them to do AM related awareness activities	• Over 3700 workers/professionals reached with the RAC activities

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES
	• Engagement with National/Regional Agencies for VET to integrate AM qualifications in national qualifications (Portugal, Spain, UK, Hungary, Italy , France)
A6.4: Create AM awareness "activities" that can be used by schools according to the age of the students	**WP7. Awareness Campaign in AM** • AM Open days were promoted by universities and Research centres • 13 Tech4Kids were conducted in Germany, France, Portugal, UK, Greece, Italy • Implementation of the Educational kit (D7.6)
A6.5: Funding to equip schools, fab labs or industrial experience accelerators and allow them to do AM related awareness activities	**WP4. Observatory in Additive Manufacturing** • Area in the Observatory publishing relevant funding opportunities related with AM • **WP8. Dissemination and Exploitation** • Action plan to guarantee the sustainability of the Project (D8.10 Action plan)

GAP DRIVER 7	STRATEGY OBJECTIVES	SUPPORTING ACTIONS (SA)	IMPACT & RESULTS

Necessity of more "infrastructures" for AM training	**7: Leverage on existing funding programmes and mechanisms**	**SA7.1: Guide the AM Sector to skills/training/qualification funding opportunities**	**Greater access to funding to support AM-related skills development and sustainment, namely,**
			• Annual engagement in spin-off proposals
			• 17 Funding Opportunities identified for:
			   o Relevant AM skills and qualifications
			   o Equipping training centres and schools with AM equipment and software
			   o Applications calls for AM-specific activities
			• Events to facilitate networking and collaboration in EU and National calls for AM

		SA7.2: Mobilise skills-related programmes at EU and National level for AM specific needs	
		A7.3: Recommend calls for AM-specific activities	
		A7.4: Organise events to facilitate networking and collaboration in EU and National calls for AM	

IMPLEMENTING ACTIVITIES	SAM ACTIVITIES
A7.1: Funding to equip training centres and schools with AM equipment and software	**WP4. Observatory in Additive Manufacturing** • The Observatory provides data on AM skills needs and trends (D4.2 AM Observatory > Market world) that will enable a common understanding for future counselling related to foresight and short term AM training needs • The Observatory displays information on funding opportunities that can support to equip training centres; • The Observatory data can support funding programmes and initiatives related to training • The Sector Skills Strategy Roadmap (D4.10) recommendations can be used to define future funding programmes and mechanisms **WP8. Dissemination and Exploitation** • Dedicated IAMQS national roll out events were conducted from March to June 2023 in the partner countries (France, Portugal, United Kingdom, Republic of Ireland, Italy, Greece, Germany, Spain) and beyond (Hungary, Tunisia) (D8.8 Dissemination and Exploitation Portfolio) • Settlement of the "EU AM Community Network", being composed by SAM partners, Associated partners, AM Authorized Nominated Bodies (ANBs) and AM Authorized Training Bodies ATBs), AM students /graduated students coming from industrial, education, and research organizations in AM. The AM Community network serves as a platform for effective dissemination of project outcomes through activities like events, knowledge exchange, and best practice sharing (D8.9 AM Community Network).
A7.2: Map and promote funding relevant for AM skills and	
A7.3: Recommend calls for AM-specific activities	
A7.4: Organise events to facilitate networking and collaboration in EU and National calls for AM	