SKILLS STRATEGY ROADMAP 2023

PROJECT NO. 601217-EPP-1-2018-1-BE-EPPKA2-SSA-B

SHORT VERSION

WWW.SKILLS4AM.EU

PHOTO - COURTESY FROM MATERIALISE

THE SAM PROJECT

Advanced Manufacturing is one of the key enabling industries for sustainable economic growth, being Additive Manufacturing (**AM**), more commonly known as 3D printing, widely used in a wide range of Manufacturing processes or technologies applications.

As Europe seeks to retain its leading position in industrial competitiveness, there is an urgent need to establish a platform for AM skills at European, National and Regional levels. To meet this challenge the project Sector Skills Strategy in Additive Manufacturing (SAM) was undertaken from January 2019 to June 2023.

SAM'S MAIN OBJECTIVES WERE:

A Skills Strategy in Additive Manufacturing providing solutions capable to foster and support the growth, the innovation and competitiveness of the AM sector;

A methodology for a sustainable and continuous assessment of current and future skills needs in AM through the establishment and activity of the Observatory in Additive Manufacturing;

Design, review and deployment of relevant qualifications in the AM sector, built with a learning outcomes approach and linked with EU Frameworks and Tools such as the EQF, e-CF, EntreComp, ECVET and ECTS;

Promotion of the attractiveness of the AM sector as a career choice for primary, general education, Vocational Education and Training (VET) and university's students through a awareness campaign in the field of AM;

One online Qualifications Catalogue to continuously update and enlarge the International Additive Manufacturing Qualification System (IAMQS), integrating all the developed and to be developed sectoral qualifications.

CONTENT

1. INTRODUCTION

Welcome to the updated Additive Manufacturing Strategy Roadmap 2023!

In 2021, a Sector Skills Roadmap was launched to steer the implementation of the activities identified to mitigate a set of 7 Gap Drivers affecting the AM sector.

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 starting point was the identification of 7 challenges faced by the AM sector in the form of "Gap drivers" (challenges) between what the industry needs in terms of educational/training offer and what is currently available, thus placing forward 7 strategic objectives, breakdown into concrete implementation activities to address each strategic objective.

The update of AM Skills Strategy Roadmap involved a series of validation steps focused on assessment of variations regarding the challenges in AM; advancements related with technological trends and monitoring of the skills strategy implementation.

This Roadmap for 2023 includes an updated version of:

• Impact of the strategy & flagship activity

• Skills Strategy Strategic objectives

• Outline of recommendations and possible examples of actions to achieve the objectives until 2030

• Summary conclusion

This is a short version of the Roadmap, the full Skills Strategy Roadmap is available online: **www.skills4am.eu**

2. THE WAY TO… EUROPEAN AM SKILLS STRATEGY ROADMAP 2023

To effectively convey the interaction between the 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 project, with sector professionals and industry representatives, as illustrating the foremost obstacles to the development of the European AM sector.

- **Strategic objectives,** which represent 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**, illustrated the concrete and feasible solutions addressing each gap. For the strategy to succeed, specific Supporting Actions were considered together with support activities helping to maximize the success of the strategy.

- **Impact** represents the expected degree of success at countering each gap driver successfully.

- **Recommendations** 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**, correspond to four main groups of stakeholders (e.g. Education, Industry, EU citizens/workers, legislators and policy makers) responsible for, directly or indirectly, contributing to for the recommendations, as described in table 1(see next page).
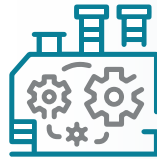
Table 1 - AM Skills Strategy Roadmap Stakeholders

STAKEHOLDERS	TARGET GROUPS

EDUCATION

- VOCATIONAL EDUCATION AND TRAINING ORGANISATIONS
- HIGHER EDUCATION INSTITUTIONS
- ENGINEERING STUDENTS 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

Globally, SAM has contributed for the following impact:

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 of by 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

Review of 2 existing Occupational Profiles - IMAM Engineer for PBF-LB Process & IMAM Coordinator

Development of a new emerging occupational profiles – International Polymers AM Designer

16 competence units (Modules) developed

>900 participants involved in IAMQS education and training activities

17 Funding opportunities identified to support skills and qualifications EU, National and Regional calls

662 hours of training

Collaboration with CEDEFOP research on "The role of microcredentials in facilitating learning for employment"

Reduced skills gaps and ensured alignment between training offers & industry needs

Increased number of AM Qualified personnel, being by re-skilling, up-skilling & by training of "new" workforce

Reference in CEDEFOP Project Fiches

24 candidates enrolled in recognition of prior learning processes

Greater access to funding to support AM-related skills development and sustainment

Annual engagement in spin-off proposals

IMPACT

IMPACT

Strengthen the collaboration between industry and training organizations

Leverage on existing funding programs and mechanisms

Tackle the lack of AM personnel at the European level

Strategic Objectives

SAM

Strategic Objectives

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

Prepare the AM Future Workforce

7 countries of implementation (IT, ES, DE, PT, TR, IR, EN, FR)

Increased number of organizations delivering IAMQS training in several countries

4315 children & youngsters **>80 schools** involved in TECH4KiDS activities

Increased number of people trained in AM in the short and long term across Europe

Constant update of the AM European workforce

Tackle the diversity of sectors and applications of AM

IMPACT

IMPACT

17 training organisations authorized for the IAMQS implementation

3453 participants in SAM open days **>980 participants** in RAC webinars

IMPACT

IMPACT

Improved foresight of skills needs for the AM Sector

Wider pool of qualified personnel that can "move" between different countries and industrial sectors

Material coverage: metal and polymer applications

Real Case Scenarios addressing skills needs to be deployed in less than 1 year

Diversity of topics: AM processes, Transversal skills, Technological skills

Short term Scenarios addressing skills needs to be deployed in 3 years

>900 participants involved in training **662 hours of training**

34 courses 29 online & 5 face to face

Foresight Scenarios addressing skills needs to be deployed within 10 years

Qualification proficiency levels: 26 Courses - Advanced level (EQF6); 6 courses - Independent level (EQF4); 2 course - Basic level (EQF3);

16 Training modules developed

24 Upskilling pathway for **24 candidates**

+450 Record of Achievements issued

64 Trainers in Train the T...

FEEDING PACT FOR SKILLS: Transfer of SAM results to Automotive, Aerospace, Defence and Energy Intensive Industries Ecosystems

1 New Profile **AM DESIGNER FOR POLYMERS**

CEDEFOP European Centre for the Development of Vocational Training

Collaboration with study on "The role of Micro credentials in facilitating learning for employment" *Reference in Project Fiches*

662 hours of training delivered to participants

930

4 Round... pilot c...

4 FORECAST: Methodology supported by 4 foresight kits and 3 Kits to collect feedback on training and impact assessment

2 Revised Occupations: **QUALIFICATIONS AND CUs...** Metal AM Process Engineer PBF... & Metal AM coordinator

7 SUSTAINABILITY ACTION PLAN exploitable results;

OBSERVATORY PLATFORM
- 1 Online skills needs self-assessment tool "FIND YOUR PATH"
- **Open call** for experts
- Information **calls for funding**

2 BOOKLETS:
- SAM " The new era of Skills in AM "
- 13 Original articles on AM Skills

EDUCA... & TRA...

METHODOLOGY FOR IAMQS UPDATE
- Operational guideline for AM context and training tools

IAMQS NETWORK
- 17 Authorised Training Centres
- 9 Nominated Bodies
- 8 Countries of implementation

IAMQS

EUROPEAN AM COMMUNITY NETWORK
- 17 Full Partners
- 38 Associated Partners
- 9 AM ANBs • 17 AM ATBs
- Working groups of IAMQC

LEGACY

S4... SECTOR SKILLS IN ADDITIVE MANU...

INTEGRATION IN ESCO METAL AM OPERATOR

OBSERVATORY
- 2 Councils, one for education and industry
- 82 organizations in the IAMQC
- 35 companies involved in the IAMIC

HAPP...

More than **110 stakeholders** involved in the Strategy Definition

Engagement with **5 blueprints**: MATES, DRIVES, ESSA, ASSETs+, Construction

220 followers with over **10K** impressions X

LinkedIn 1...

+49.756 views **www.** 12.250 users **PROJECT WEBSITE**

8... E-NEW...

3 Comic Series and **2** basic quizzes: **SAM DAM & SAMANTHA**

+3700 WORKERS/PROFESSIONALS reached with the RAC activities

+98... participants in **15 V...**

8 **PODCASTS** +450 views

6 RAISE AWARENESS Posters and videos

8 WORKSHOPS for analysis and validation of Skills needs with **266 participants** in total

1... even... 41...

SKILLS STRATEGY ROADMAP 2023

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38

Issuing of **1st International Metal AM Coordinators diplomas**, joined collaboration among 24 trainers from 8 education providers (both VET and HE) in Europe

IAMQS

+20

More than **20 training resources** developed, including case studies and assessment questions

17

AM **ATBs** (authorized training centres)

...volved in ...rainers

...ds of ...ourses

MARKET WORLD

38 MILESTONES IDENTIFIED

by the Global and Societal Milestones reports

Mapping of 84

AM Initiatives in the Observatory

1 FORESIGHT REPORT

30 STRATEGIC RECOMMENDATIONS

for stakeholders to implement until 2030
- **7 Gap drivers** linked with **7 strategic objectives**
- **29 implemented actions**

+100 PROJECTS IDENTIFIED IN THE OBSERVATORY

ENGAGMENT WITH National Initiatives:
- DFAM Network
- CAAR
- NiedersachsenADDITIV

1 GLOSSARY with educational and pedagocial terms

+8 European Initiatives:
- AM Platform
- DIGITAL SKILLS & JOBS PLATFORM
- VANGUARD initiative
- EIT RAW Materials
- EIT Manufacturing
- ASA
- World Manufacturing Forum
- EDA

+8 International Initiatives:
- MIT
- Innovation America Makes
- 3D Printing Industry
- ASME
- ISO
- CEN
- NADCAP/PRI
- Baker Huge

10 AM PROFESSIONAL PROFILES addressed by the Skills Professional / Skills' Roadmap

66 videos on **YouTube**

167 ...embers in combined ...AM LinkedIn groups

+80 Schools involved in Tech4Kids Activities

...WSLETTERS

3453 Participants in AM Open days events
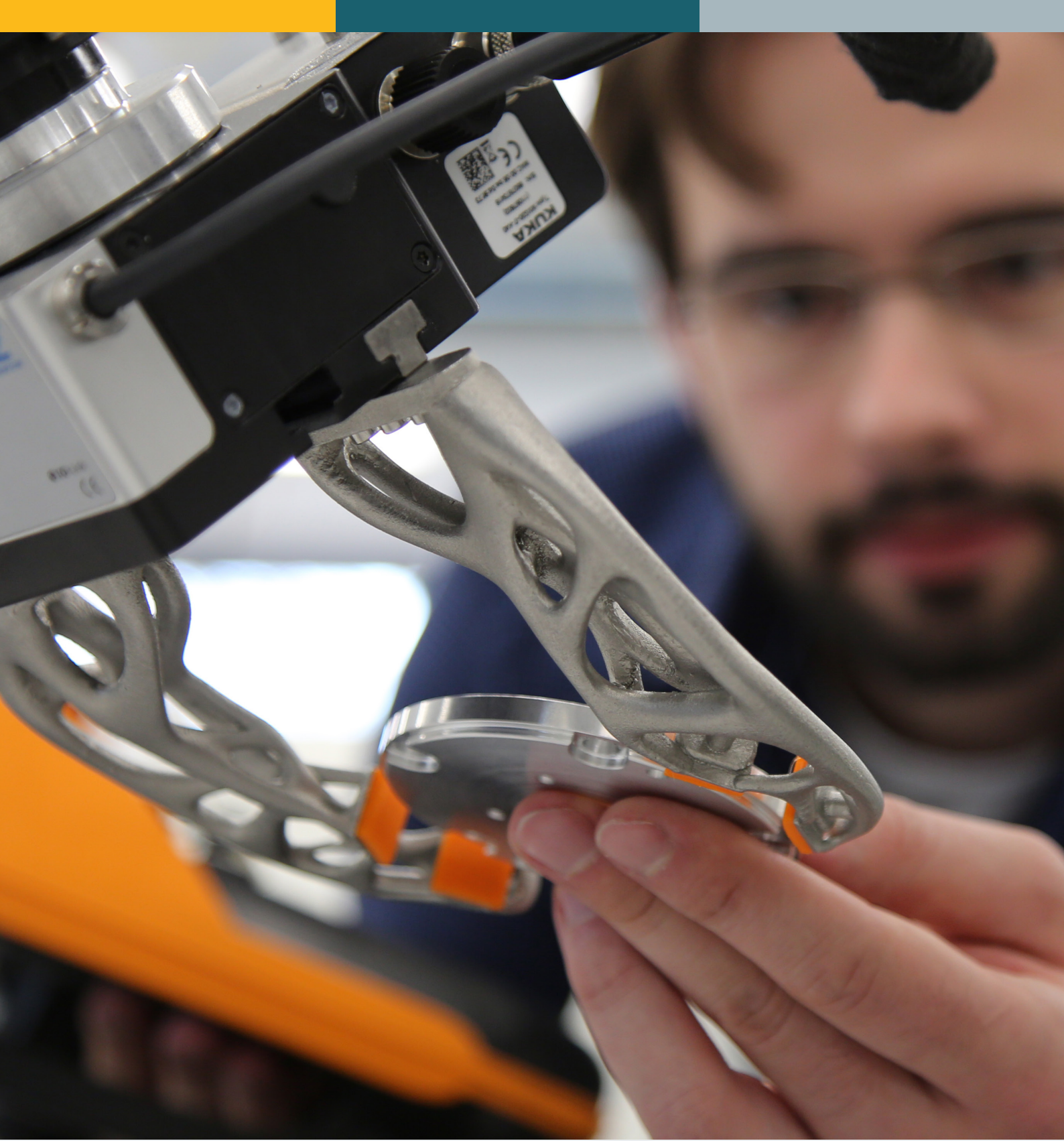
0 ...WEBINARS

38 TECHNOLOGICAL TRENDS

promising challenges linked to materials, process / manufacturing, post-processing, ICT and quality segments

4 Reports on Skills Needs

9 National Roll out ...ts conducted in 9 countries with ...8 participants in total

4315 Children and youngsters involved in Tech4Kids Activities

SKILLS STRATEGY ROADMAP 2023

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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 below).

European Network of Training Centres using the IAMQS

Creation of the European AM Observatory

IAMQS

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.
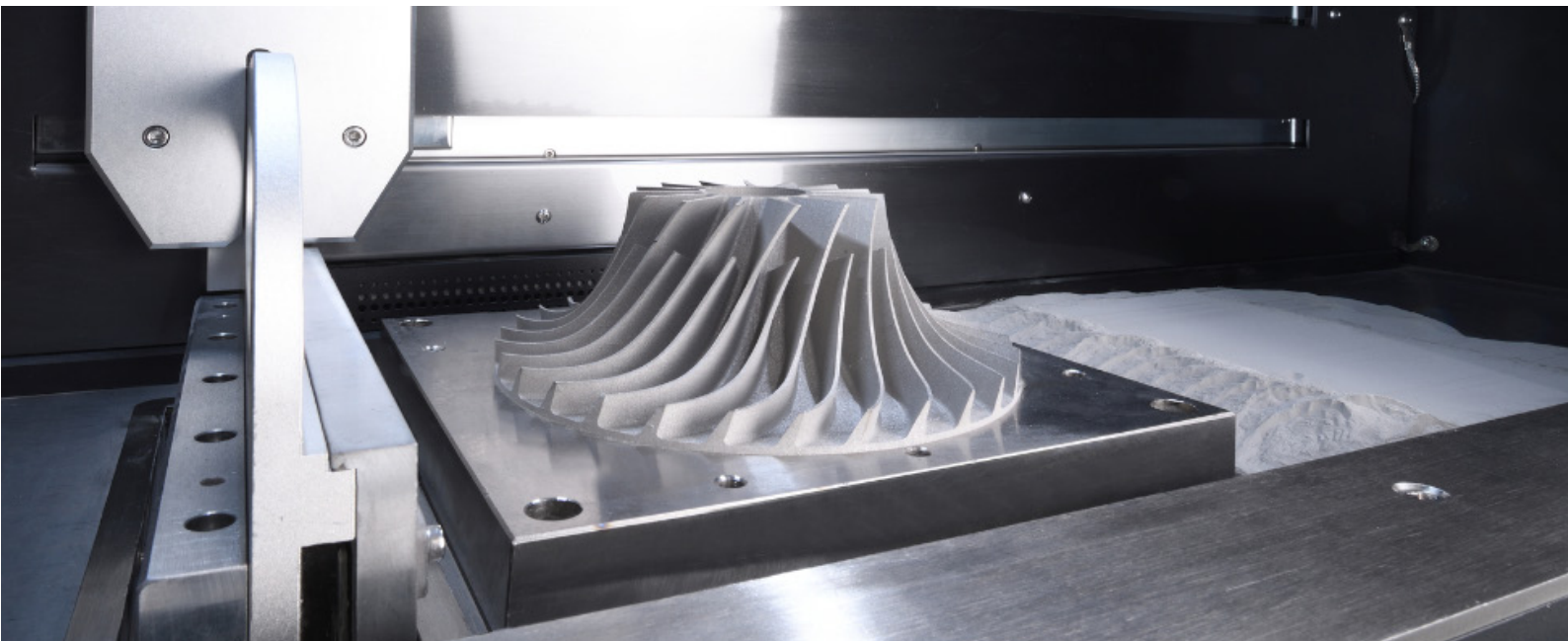
3. STRATEGIC RECOMMENDATIONS FOR THE AM SECTOR

SAM Sector Skills Strategy Roadmap outlines the 30 recommendations to support and guide SAM stakeholders, including partners and associated partners, in carrying out future actions for AM competitiveness and growth until 2030.

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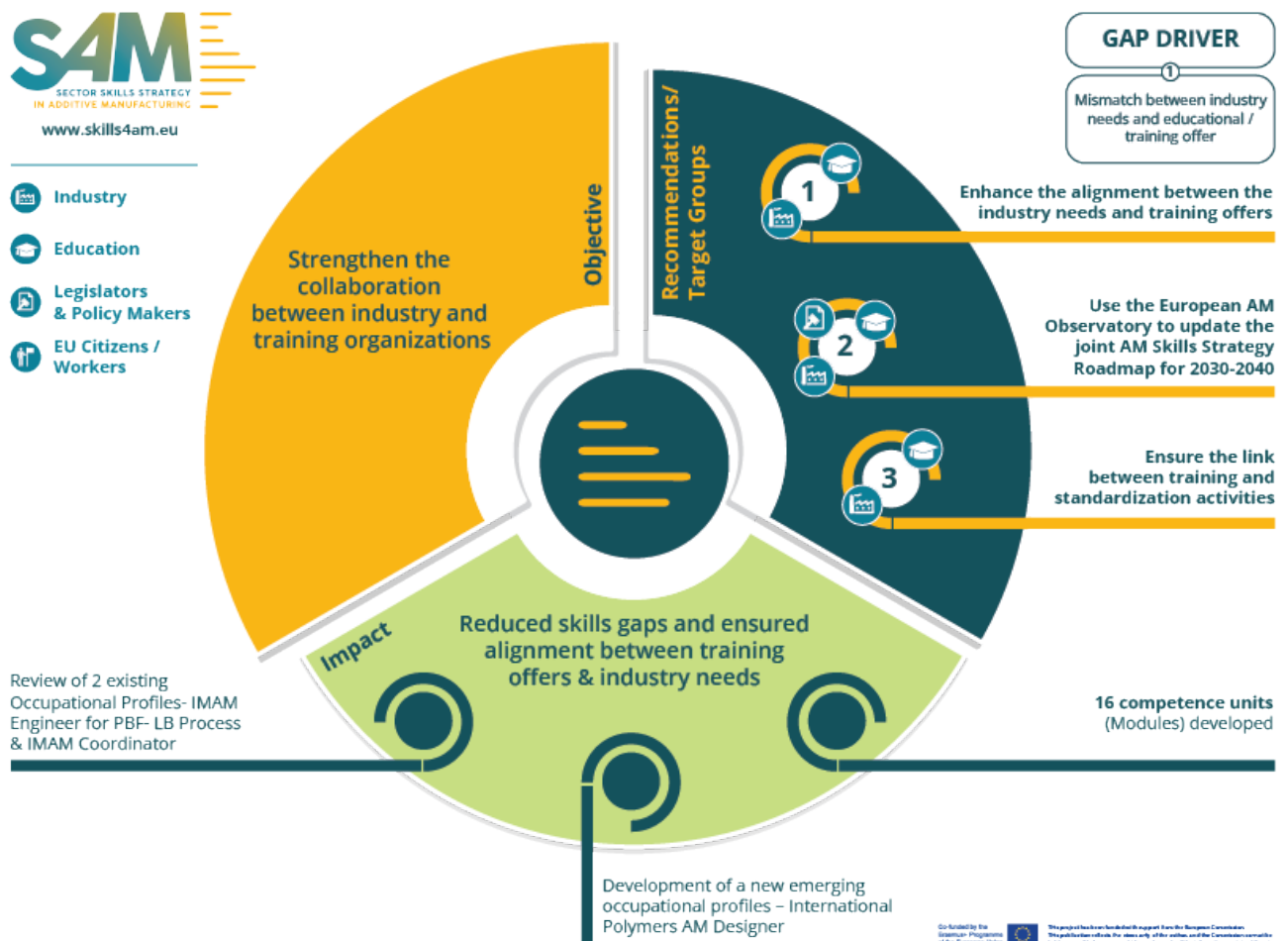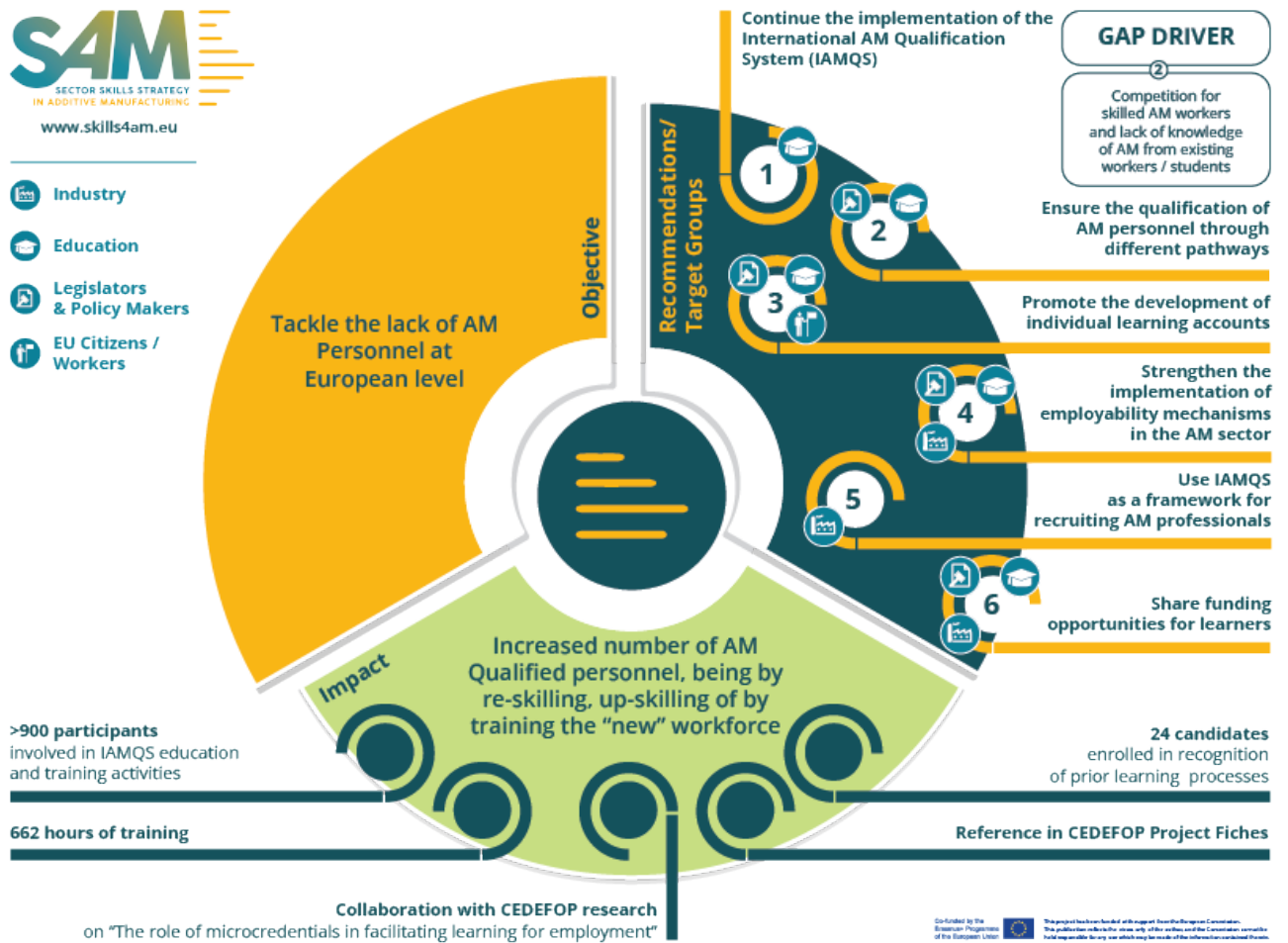
To continue **strengthen the collaboration between industry and training organizations**, it is recommended that the different target groups follow three recommendations:

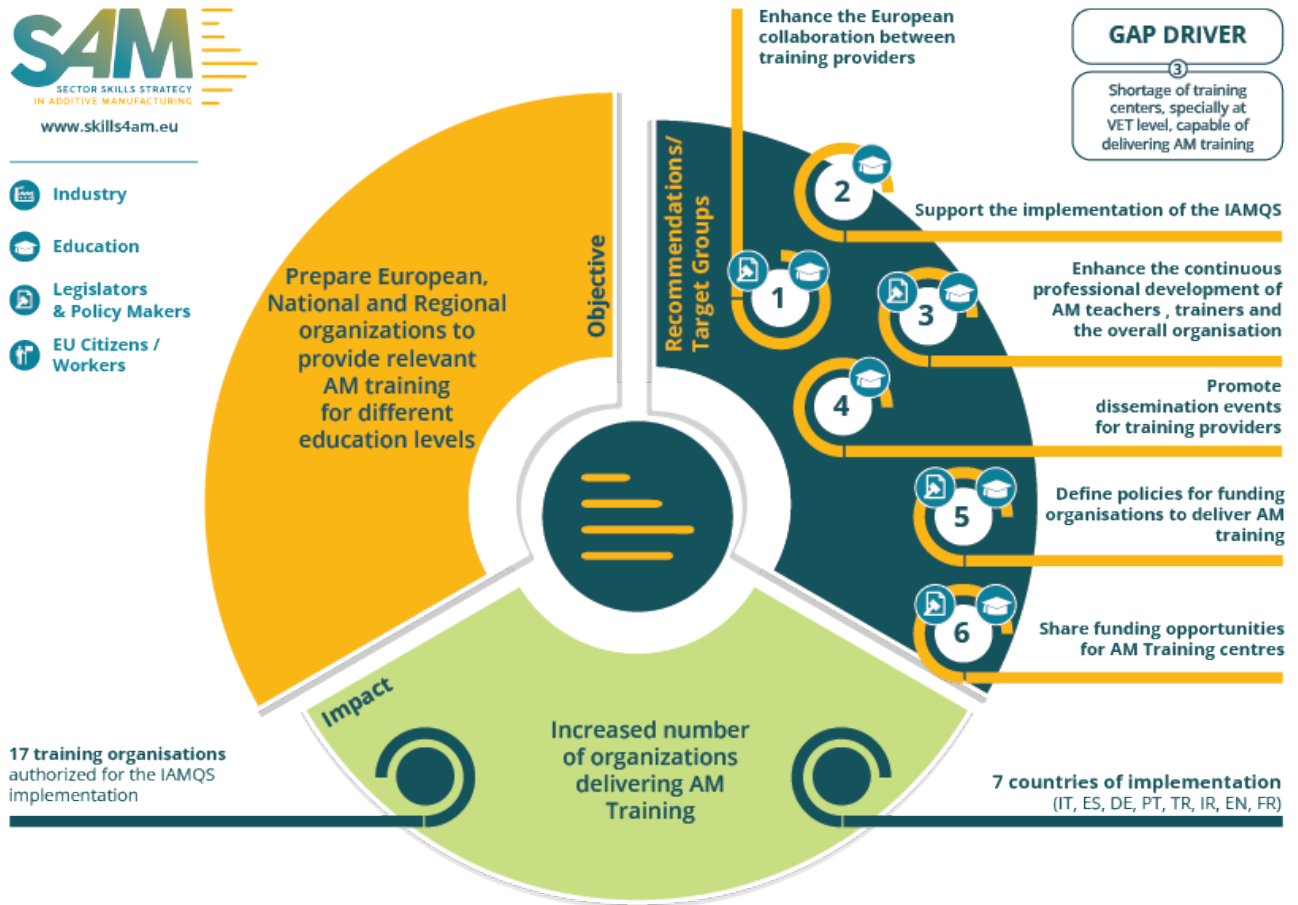| RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
ENHANCE THE ALIGNMENT BETWEEN THE INDUSTRY NEEDS AND TRAINING OFFERS	EDUCATION / INDUSTRY	• BY CONTINUING THE IMPLEMENTATION OF THE FORECAST METHODOLOGY FOR THE AM SECTOR • BY MOBILIZING THE ENGAGEMENT OF INDUSTRIAL ORGANISATIONS IN THE IDENTIFICATION OF SKILLS AND VALIDATION OF TRAINING PROGRAMMES, THROUGH THE AM OBSERVATORY INDUSTRIAL COUNCILS
USE THE EUROPEAN AM OBSERVATORY TO UPDATE THE JOINT AM SKILLS STRATEGY ROADMAP FOR 2030 -2040	EDUCATION / INDUSTRY / WORKERS/EU CITIZENS / LEGISLATORS & POLICY MAKERS	• BY PROMOTING FORECAST WORKSHOPS WITH INDUSTRIAL ORGANISATIONS • BY IMPLEMENTING FORESIGHT SCENARIOS AUSCULTATION WITH INDUSTRIAL EXPERTS • BY ADDRESSING THE LITERATURE REVIEW AS METHOD FOR FORECAST • BY UPDATING OF THE OBSERVATORY DATA ON SKILLS NEEDS
ENSURE THE LINK BETWEEN TRAINING AND STANDARDIZATION ACTIVITIES (CEN, ISO)	EDUCATION / INDUSTRY	• BY IDENTIFYING THE RELEVANT STANDARDS IMPACTING THE AM TRAINING • BY WORKING AND APPROVING ON THE DEVELOPMENT OF STANDARDS FOR THE QUALIFICATION OF AM PERSONNEL

3.2 Tackle the lack of AM Personnel at European level

SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING
www.skills4am.eu

- Industry
- Education
- Legislators & Policy Makers
- EU Citizens / Workers

Objective
Tackle the lack of AM Personnel at European level

Recommendations/ Target Groups

Continue the implementation of the International AM Qualification System (IAMQS)

GAP DRIVER 2
Competition for skilled AM workers and lack of knowledge of AM from existing workers / students

1

2 Ensure the qualification of AM personnel through different pathways

3 Promote the development of individual learning accounts

4 Strengthen the implementation of employability mechanisms in the AM sector

5 Use IAMQS as a framework for recruiting AM professionals

6 Share funding opportunities for learners

Impact
Increased number of AM Qualified personnel, being by re-skilling, up-skilling of by training the "new" workforce

>900 participants involved in IAMQS education and training activities

662 hours of training

Collaboration with CEDEFOP research on "The role of microcredentials in facilitating learning for employment"

24 candidates enrolled in recognition of prior learning processes

Reference in CEDEFOP Project Fiches

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

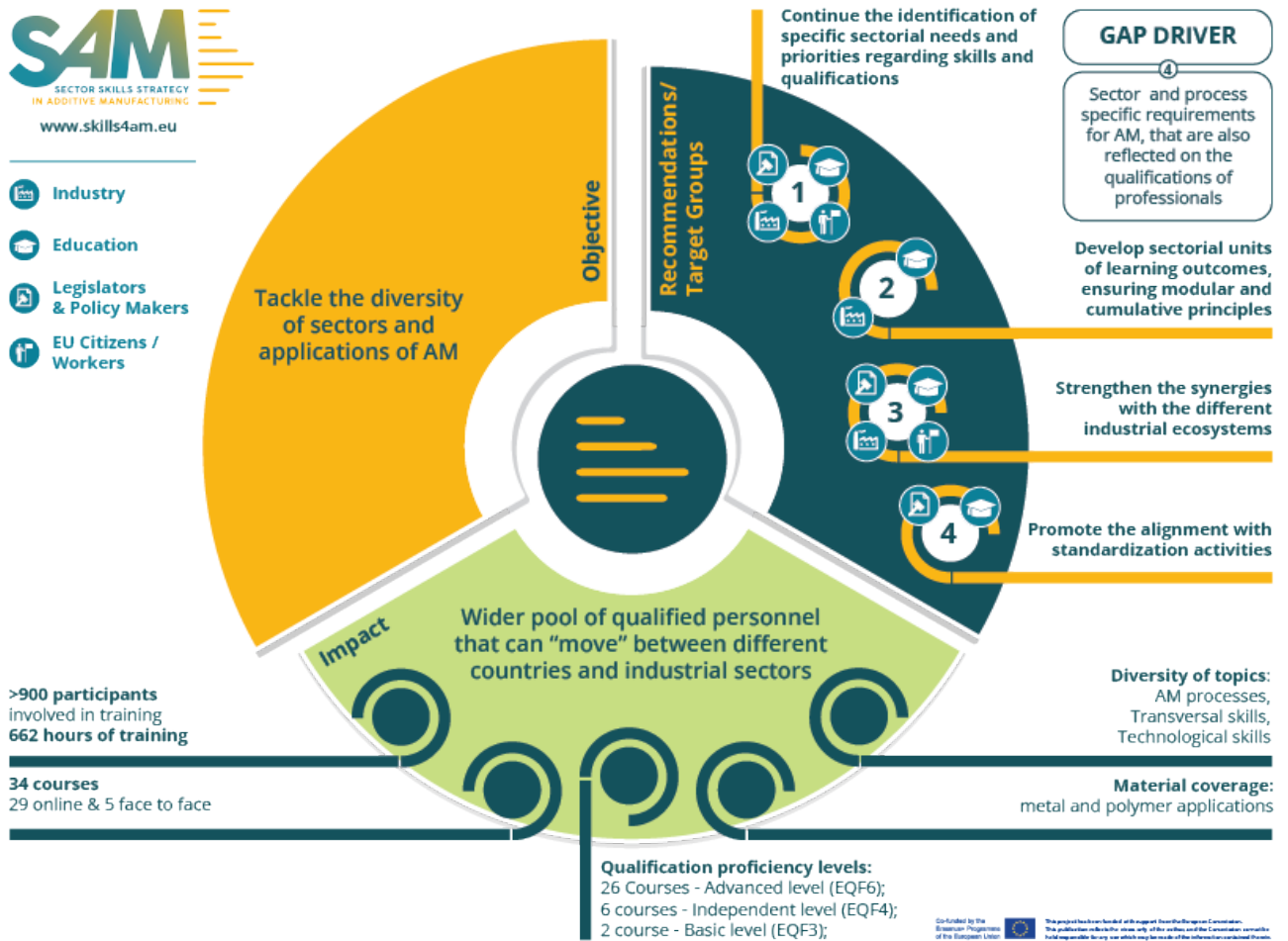| RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
CONTINUE THE IMPLEMENTATION OF THE INTERNATIONAL AM QUALIFICATION SYSTEM (IAMQS)	EDUCATION	• BY CONTINUING TO INCREASE THE NETWORK OF AM ANBS/ATBS • BY EXPANDING AM ATBS TRAINING OFFERS • BY CONTINUING TO DEVELOP/UPDATE AM QUALIFICATIONS BASED ON 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 • 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 / LEGISLATORS & POLICY MAKERS / INDUSTRY	• 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

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

SAM
SECTOR SKILLS STRATEGY IN ADDITIVE MANUFACTURING
www.skills4am.eu

- Industry
- Education
- Legislators & Policy Makers
- EU Citizens / Workers

Objective
Prepare European, National and Regional organizations to provide relevant AM training for different education levels

Recommendations/ Target Groups

Enhance the European collaboration between training providers

GAP DRIVER
③
Shortage of training centers, specially at VET level, capable of delivering AM training

2 — Support the implementation of the IAMQS

3 — Enhance the continuous professional development of AM teachers, trainers and the overall organisation

4 — Promote dissemination events for training providers

5 — Define policies for funding organisations to deliver AM training

6 — Share funding opportunities for AM Training centres

Impact
Increased number of organizations delivering AM Training

17 training organisations authorized for the IAMQS implementation

7 countries of implementation (IT, ES, DE, PT, TR, IR, EN, FR)

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:

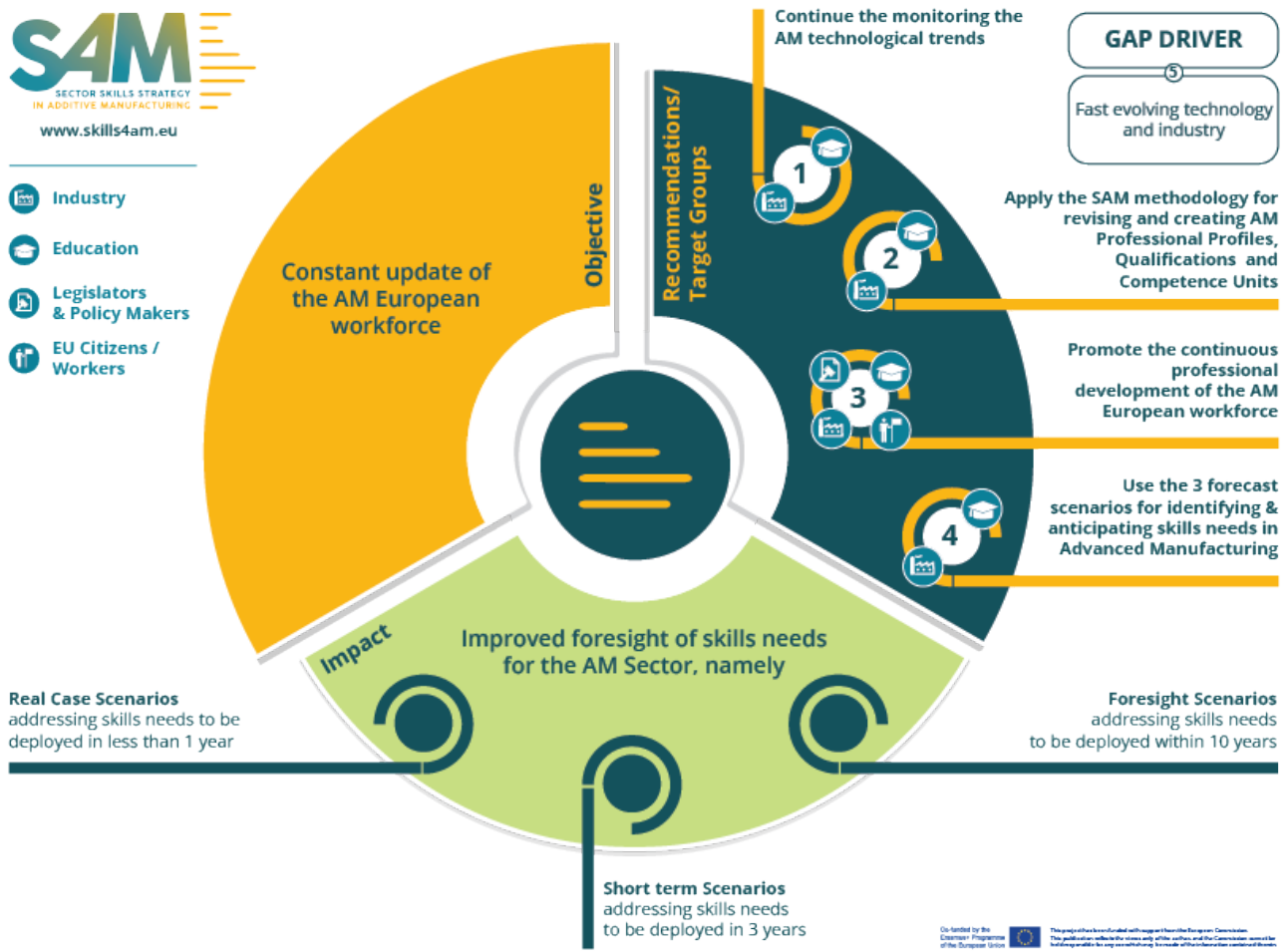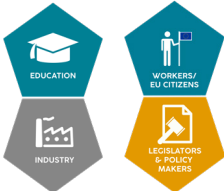| RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
ENHANCE THE EUROPEAN COLLABORATION BETWEEN TRAINING PROVIDERS	EDUCATION / LEGISLATORS & POLICY MAKERS	• BY CONTINUING TO DEVELOP NATIONAL COOPERATION NETWORKS OF AUTHORIZED TRAINING CENTRES IN AM (AM ATBS)
SUPPORT THE IMPLEMENTATION OF THE IAMQS	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 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

3.4   Tackle the diversity of sectors and applications of AM

S4M — SECTOR SKILLS STRATEGY IN ADDITIVE MANUFACTURING

www.skills4am.eu

- Industry
- Education
- Legislators & Policy Makers
- EU Citizens / Workers

Objective

Tackle the diversity of sectors and applications of AM

Recommendations/ Target Groups

Continue the identification of specific sectorial needs and priorities regarding skills and qualifications

GAP DRIVER ④
Sector and process specific requirements for AM, that are also reflected on the qualifications of professionals

2. Develop sectorial units of learning outcomes, ensuring modular and cumulative principles

3. Strengthen the synergies with the different industrial ecosystems

4. Promote the alignment with standardization activities

Impact

Wider pool of qualified personnel that can "move" between different countries and industrial sectors

>900 participants involved in training
662 hours of training

34 courses
29 online & 5 face to face

Diversity of topics: AM processes, Transversal skills, Technological skills

Material coverage: metal and polymer applications

Qualification proficiency levels:
26 Courses - Advanced level (EQF6);
6 courses - Independent level (EQF4);
2 course - Basic level (EQF3);

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

RECOMMENDATION	TARGET GROUP	EXAMPLES OF FUTURE ACTIONS
CONTINUE THE IDENTIFICATION OF SPECIFIC SECTORIAL NEEDS AND PRIORITIES REGARDING SKILLS AND QUALIFICATIONS.	EDUCATION / WORKERS/EU CITIZENS / INDUSTRY / LEGISLATORS & POLICY MAKERS	• 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 / WORKERS/EU CITIZENS / INDUSTRY / LEGISLATORS & POLICY MAKERS	• BY IMPLEMENTING IAMQS TRAINING SUPPORTED BY A QUALITY ASSURANCE SYSTEM AND RECOGNISED BY DIFFERENT SECTORS • BY ORGANISING EVENTS AND DISSEMINATE 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

3.5 Constant update of the AM European workforce

SAM
SECTOR SKILLS STRATEGY
IN ADDITIVE MANUFACTURING
www.skills4am.eu

- Industry
- Education
- Legislators & Policy Makers
- EU Citizens / Workers

Constant update of the AM European workforce

Objective

Recommendations/ Target Groups

Continue the monitoring the AM technological trends

GAP DRIVER
⑤
Fast evolving technology and industry

1

2 — Apply the SAM methodology for revising and creating AM Professional Profiles, Qualifications and Competence Units

3 — Promote the continuous professional development of the AM European workforce

4 — Use the 3 forecast scenarios for identifying & anticipating skills needs in Advanced Manufacturing

Impact

Improved foresight of skills needs for the AM Sector, namely

Real Case Scenarios
addressing skills needs to be deployed in less than 1 year

Foresight Scenarios
addressing skills needs to be deployed within 10 years

Short term Scenarios
addressing skills needs to be deployed in 3 years

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 THE MONITORING THE AM TECHNOLOGICAL TRENDS	EDUCATION / INDUSTRY	• 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	EDUCATION / INDUSTRY	• 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	EDUCATION / INDUSTRY / WORKERS/EU CITIZENS / LEGISLATORS & POLICY MAKERS	• BY IMPLEMENTING COURSES, WORKSHOPS AND OTHER EDUCATIONAL INITIATIVES TARGETING CURRENT AND FUTURE AM WORKFORCE
USE THE 3 FORECAST SCENARIOS FOR IDENTIFYING & ANTICIPATING SKILLS NEEDS IN ADVANCED MANUFACTURING	EDUCATION / INDUSTRY	• ASSESSING SKILLS NEEDS FOR REAL CASE (LESS THAN 1 YEAR), SHORT TERM (LESS THAN 3 YEARS) AND FORESIGHT SCENARIOS (REQUIRED IN 10 YEARS

3.6 Prepare the AM future workforce
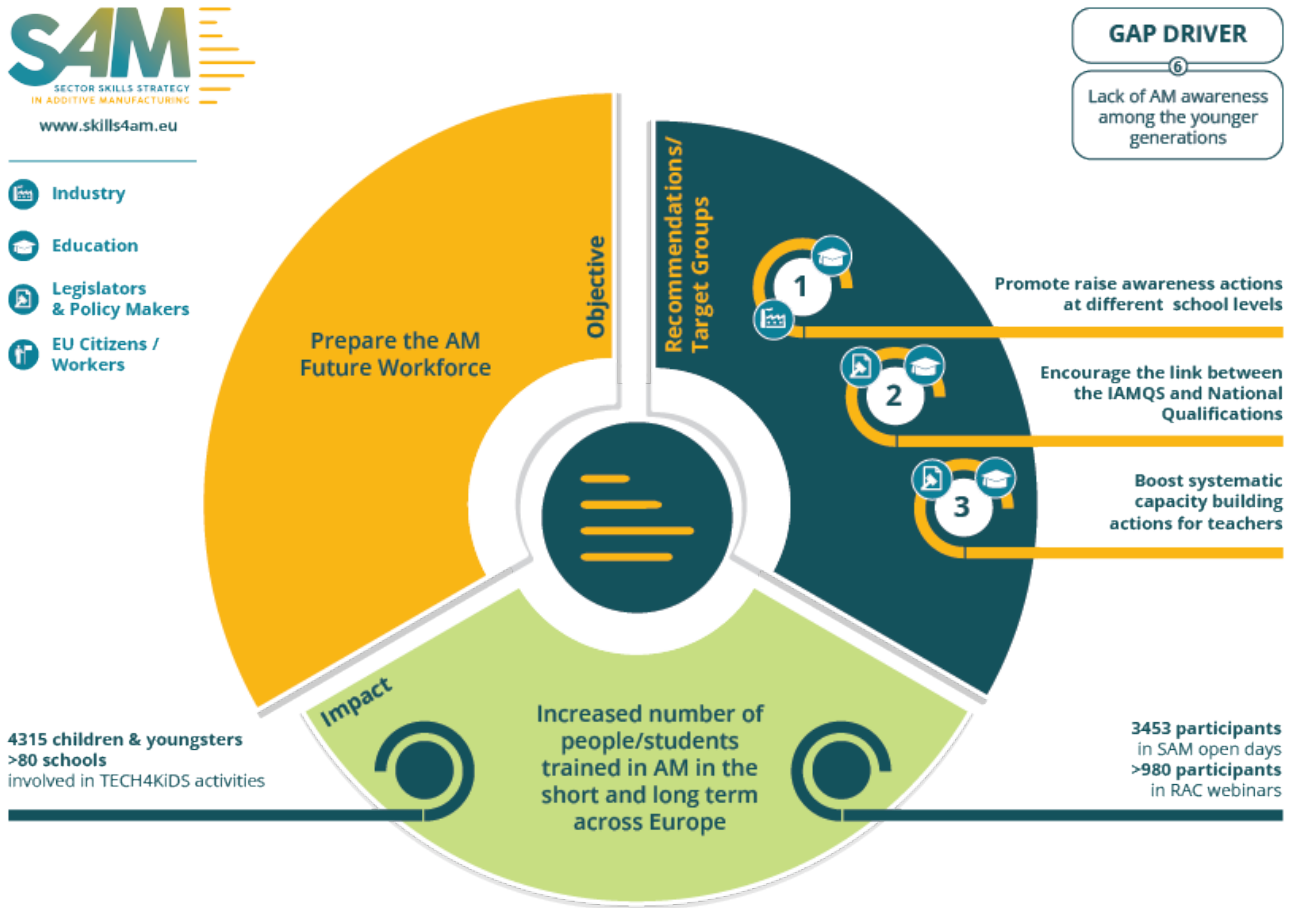
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GAP DRIVER
6
Lack of AM awareness among the younger generations

Objective
Prepare the AM Future Workforce

Recommendations/ Target Groups

1. Promote raise awareness actions at different school levels
2. Encourage the link between the IAMQS and National Qualifications
3. Boost systematic capacity building actions for teachers

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

4315 children & youngsters
>80 schools
involved in TECH4KiDS activities

3453 participants
in SAM open days
>980 participants
in RAC webinars

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	EDUCATION / INDUSTRY	• 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 OF THE SECTOR AMONG YOUNGSTERS AND KNOWLEDGE ABOUT AM TRAINING OFFERS
ENCOURAGE THE LINK BETWEEN THE IAMQS AND NATIONAL QUALIFICATIONS	EDUCATION / LEGISLATORS & POLICY MAKERS	• 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	EDUCATION / LEGISLATORS & POLICY MAKERS	• BY SHARING THE EDUCATIONAL KIT FOR SCHOOLS • BY IMPLEMENTING SYSTEMATIC PEER-LEARNING ACTIVITIES • BY PROMOTING DISSEMINATION EVENTS WITH TEACHERS
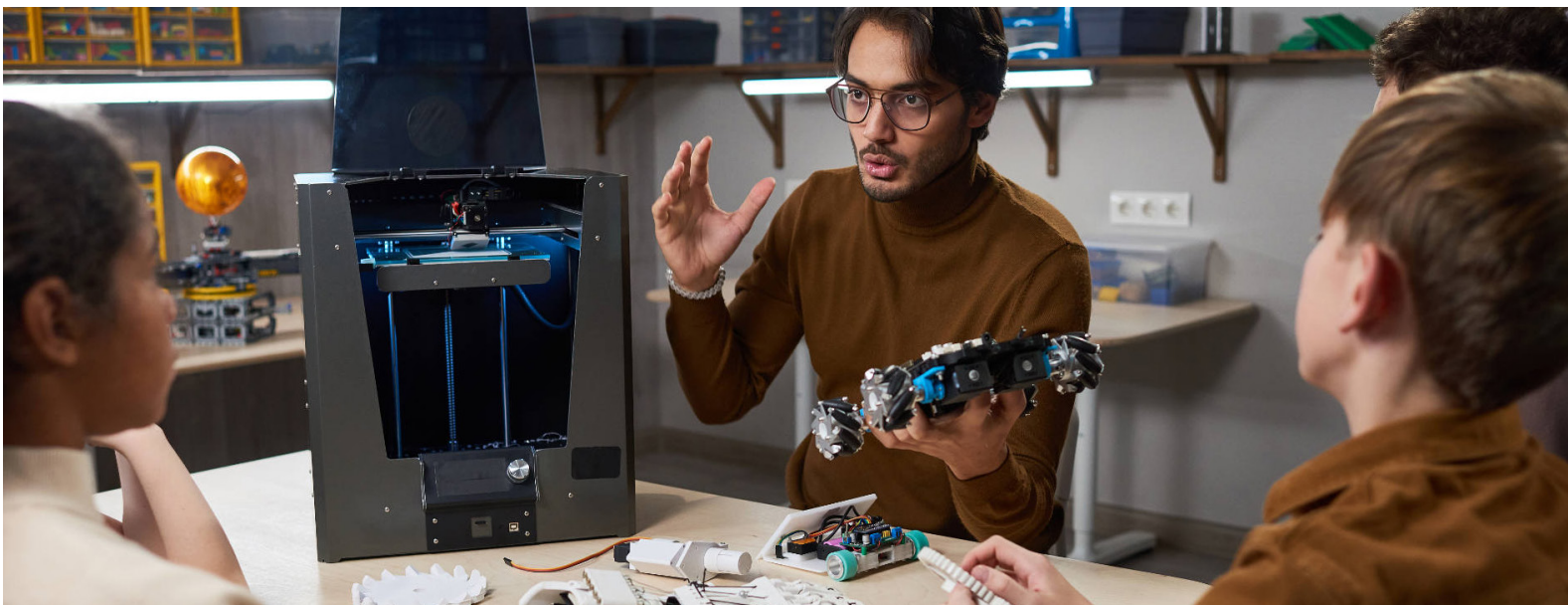
3.7 Leverage on existing funding programs and mechanisms

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Objective

Leverage on existing funding programs and mechanisms

Recommendations/ Target Groups

Guide the AM Sector to skills/training/qualification funding opportunities

GAP DRIVER
⑦
Necessity of more "infrastructures" for AM training

1
2 Mobilise skills-related programmes at EU and National level for AM specific needs

3 Uptake of International AM Qualifications by National Education systems

4 Ensure funding mechanisms for IAMQS national roll out

Impact

Annual engagement in spin-off proposals

Greater access to funding to support AM-related skills development and sustainment

17 Funding opportunities identified to support skills and qualifications
EU, National and Regional calls

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	EDUCATION / INDUSTRY / LEGISLATORS & POLICY MAKERS	• 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	EDUCATION / INDUSTRY / LEGISLATORS & POLICY MAKERS	• BY SHARING INFORMATION ON CALLS FOR AM-SPECIFIC ACTIVITIES
UPTAKE OF INTERNATIONAL AM QUALIFICATIONS BY NATIONAL EDUCATION SYSTEMS	EDUCATION / LEGISLATORS & POLICY MAKERS	• 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	EDUCATION / LEGISLATORS & POLICY MAKERS	• BY OPENING SPECIFIC CALLS FOR SUPPORTING THE IMPLEMENTATION OF AM TRAINING
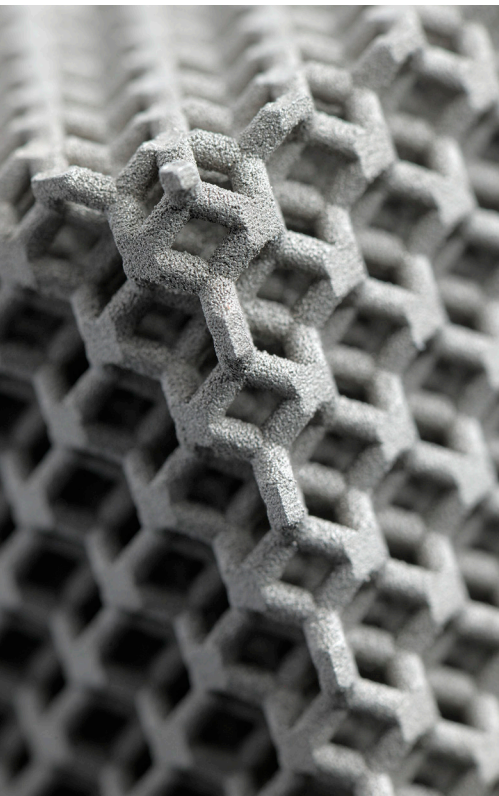
4. CONCLUSIONS

This booklet has provided an overview on the AM Skills strategy update, as well as an analysis on how the SAM project addressed the strategy implementation.

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 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. 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 by 2030..

The **European Additive Manufacturing Skills Strategy** and **Roadmap** is public and open to all organisations wishing to support it.

If you would like to be involved in the **IAMQS** or be part of the **European AM Observatory**, please contact us at **ewf@ewf.be** or follow the SAM Project **www.skills4am.eu**

PROJECT PARTNERS:

SUPPORTING THE AM SKILLS STRATEGY

The European Additive Manufacturing Skills Strategy is supported by:

Associated partners and other supporting entities:

AITA (Italian Association of Additive Technologies), AFPM Alexander Daniels, Global Limited, CESOL, Digital Additive Production DAP - RWTH Aachen University, 3D Printing Industry, 3D System, DVS German Welding Society, Frederik University, FPT VIMAG, Heinz-Piest Institute fur Handwerkstechnik,Hybrid Manufacturing Technologies, IMAPS - Steinbies, IQS School of Engineering, I-Form, Inspire AG – innovation Centre for Additive Manufacturing, Istituto Italiano Della Saldatura (IIS), Joanneum Research Center, Klastr Mechatronika, Laser Zentrum Hannover e., Llyods' Register, MiB - Association of Turkish Machine Manufacturers', Otto Brenner Shule (BBSme), Politecnico Di Torino (PoliTo), Research Center Non-Destructive Testing (RECENDT), Sensima Inspection, SINTEF Raufoss Manufacturing AS (SRM), SLM Solutions, Swiss Additive Manufacturing Group (Swiss MEM), TECNALIA Research and Innovation, The Welding Institute (TWI), The Manufacturing Technologies Association (MTA), VDMA, Vestas.

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