The AM-Motion project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 723560.
The Additive Manufacturing Forum - AMEF2018 was held in Brussels on 23 and 24 October 2018, bringing together a range of stakeholders, from industrialists to policy makers, to discuss and learn about the importance of additive manufacturing (AM) technologies and what is needed to accelerate its uptake.

AMEF2018 described the broader picture on the status and the development of AM from not only the European and international perspectives but also at the regional level. The gaps and barriers to the further development and adoption of the technology were highlighted including important matters surrounding policy, business opportunities and options for the integration of AM into the production environment. For these reasons, it is important to continue to support the growth of the technology by improving the European market’s ecosystem conditions at both technological and non-technological levels.

There was **154 participants from across 24 different countries** that attended AMEF2018. The geographical distribution is shown in Figure 1.

![Geographical distribution of participants](image)

**Fig. 1: Geographical distribution of participants**

The distribution of participants per type of entity is shown in Figure 2. The category "RTOs" includes Research & Technology Centres and universities. The category "Others" includes regional and European public administration representatives, clusters and networks.
The international event programme was organised over two days and covered key areas that aligned with the activities undertaken by the AM-motion project:

**Section 1: An innovative industrial and social renaissance for Europe**

The event commenced with a Keynote addressed by Dr. Peter Dröll, Director Industrial Technologies, DG for Research and Innovation, who highlighted key points on European economy and R&I policies. A key message from Dr. Dröll: “Europe is not just an observer; it can be a very active architect in the world of tomorrow”. On AM, he pointed out the EC has funded many projects involved in the development of the technology with the aim for Europe to be a key driver for employment and prosperity particularly moving forward into the new Framework Programme - Horizon Europe. He re-affirmed the importance of addressing technology and non-technology areas in parallel, such as the AM-motion project, and its development of a roadmap.

On behalf of AM-motion, the project coordinator Dr. Paula Queipo from PRODINTEC explained the key aims of this strategic action. Highlighting how it looks to contribute to the direction of the AM technology market uptake and support the foundations for a common strategy across Europe.

The session continued with presentations on the next EU research & innovation Programme, Horizon Europe (2021-2027) by Dr. Jan Ramboer from the EC. Mr. Bernard Lagerfeld from Roland Berger provided an overview of the AM technology and possible areas of impact, highlighting the evolution of the technology, the opportunities it offers and the market development and key technological trends along the value creation system for 3D-printed products. To conclude, Dr. Alireza Parandian from Materialise explained how 3D printing is leading digital transformation for mass customisation and its influence on customer experience, product differentiation, operations and business model.

**Section 2: AM industrial challenges**

This section focussed on trends in AM at the industrial level, including new sectors that are beginning to adopt this technology. Recently, ArcelorMittal announced their interest and current investments to bring the AM technology to the heavy industry. As a newcomer to the AM ecosystem, Mr. Virgilio Garcia, presented the landscape of AM in the steel industry and highlighted some of the success cases of using AM for spare parts production.
Ms. Stephanie Brickwede from Deutsche Bahn presented various success stories concerning the implementation on AM in the railroad sector, an example of this was the reproduction of old spare parts for applications in trains.

Mr. Vukile Dumani from Oerlikon AM GmbH focused his presentation on the qualification approach for manufacturing processes, in particularly in the aerospace sector and how this process is universal regardless of the manufacturing process.

Dr. Margherita Cioffi from RINA-C presented the launch of the AM-motion vision and roadmap. Here the uptake of industrial AM needs a more efficient approach and coordinated actions. AM-MOTION's vision for 2030 foresees that Europe will improve its leading role in AM, greatly impacting the competitiveness of European industrial sectors and improving the quality of life of European citizens in terms of retention of high quality jobs, availability of customised, cleaner, safer and affordable products, and increased access to cleaner energy, mobility and effective and personalised medicine.

Section 3: Beyond the technological aspects

This section focussed on the key challenges and opportunities that can become a barrier in AM deployment. For example, availability of an operational workforce, standardisation and certification and concerns about managing, protecting, and transferring IP.

Dr. Eurico Assuncao from EWF highlighted that the non-technological aspects can also constitute as barriers for AM industrial implementation. In this sense, education and training to provide AM skills and to re-focus those of existing workers are crucial aspects.

Mr. Andrew Imrie from Lloyds Register, stressed that it is not only the manufacturing of the product that should be considered, but also to important aspects such as intellectual property rights, product liability, compliance etc. Standards are also another key area that can facilitate the route to market for industry.

Prof. Dinusha Mendis from Bournemouth University introduced a European project, which aims to formulate a clear picture on the Intellectual Property framework that could enhance the competitiveness of the AM sector in Europe, drafting recommendations to avoid legal issues and analysing new business models in the intellectual property framework.

Section 4: The international dimension

This section focussed on the initiatives that have been launched including the investments made around the world to promote/deploy AM.

Europe has deep expertise in AM; however, new initiatives and investments are emerging on an international level. The strategies from Japan, USA, Singapore and South Africa, which are all supporting AM development, were introduced during this section.

Section 5: The regional dimension:

This section focussed on know-how regarding EU-regions that have placed AM as one of the key priorities within the regional specialization strategy actions, initiatives and innovation policies.

Mr. Laurent de Mercy, DG Regional and Urban Policy, explained further about the smart
specialisation strategy and the thematic S3 platforms, which were put in place based on the spirit of the Vanguard Initiative. The thematic S3 platforms represent three themes: Industrial Modernization (where 3D printing is included), agrifood and energy.

The presentation was followed by two examples of regional approaches. The first was presented by Mr. Franck Simon from Viameca Pole de competitive with more than 4000 companies and 2500 involved and that coordinates the regional actions in AM from the development of tools for industrialists to training and communications. A second example by Mr. Coen de Graaf showed an example of strategic (inter-)regional collaboration on AM and integration of the AM value chain in the Province of Noord-Brabant, Netherlands. Cross-regional access to shared facilities for 3D Printing has been created. He stated that instead of talking about the AM ‘supply chain’ we should rather think in terms of ‘supply network’.

Section 6: Key AM projects

This section consisted of various presentations of key project’s results dealing with AM development, including those probing the benefit for society.

- SUPREME - Sustainable and flexible powder metallurgy processes optimization by a holistic reduction of raw material resources and energy consumption, an innovation action under Spire, presented by Mr. Sebastian Bluemer, from GKN Sinter Metals.
- MAESTRO - Modular laser based additive manufacturing platform for largescale industrial applications by Dr. Julien Bajolet, IPC.
- Moreover, the recent approved projects from the topic FoF-04-2018 - “Pilots lines for metal Additive Manufacturing” were introduce for the first time to the public:
- INTEGRADDE - Pilot lines for Additive Manufacturing of metal components by Mr. Félix Vidal; AIMEN
- MANUELA - Additive manufacturing using metal pilot line, by Prof. Lars Nyborg, Chalmers University of Technology

Mr. Jurgen Tiedje, EC, finalized the conference explaining the importance of inter-regional collaborations and building the AM value chain. He states that we are currently at a critical junction and there is a large role for the regions in moving AM up to the highest TRLs and sustainability of the infrastructures/pilot lines. The outcome of AM-motion is going to be used for further debate and for establishing next steps.
Forum takeaways

AM is seen as a technology that can revolutionise existing production methods and boost the competitiveness, innovation and sustainability of the European industrial base. With AM on its way to industrialisation, companies need to understand the complexity of the AM value chain and all the segments involved. It is not just about 3D printing alone; there is software, materials, manufacturing, know-how etc. Moreover, companies need to monitor both established and new technologies and to determine what and where to apply AM whilst considering the targeted sector in order to establish their market strategy and target future AM investments.

One key advantage of AM lies in its ability to add value to the existing portfolio of products or services of the company. For example, creating lightweight and/or complex geometries by redesigning parts remains one of the most crucial benefits of this technology. Thus, more awareness is required around the possibilities and technical advantages offered by AM as well as the current existing disadvantages.

The industrial use of AM varies from prototyping and low-volume production using individual machines to fully industrialized series production. Important factors are productivity, process stability, seamless data chains, speed, quality, and IT security. Nowadays, different partners provide the material, the printers, and the software: without cooperation, the AM process chain would breakdown. In this sense, the cooperation should be even more effective.

As for many other industries, the target is to achieve processes which are robust, economically viable and suitable for relatively high production rates. For certain industries it is key to demonstrate the reproducibility of the results based on traceable materials and process parameters, thus leading to process qualification rather than using part qualification. Currently, this entails performing a significant number of additional tests, which at the end may even double the total industrial cost of the AM part. Thus, quality assurance is a major area where AM has to catch up. The degree to which industry-wide standards are used in current AM processes is low. This negatively impacts the ability to guarantee an end-to-end quality assured, standardized process, making the certification path of AM-fabricated parts in the industrial environment more tortuous, especially in the aerospace and medical sectors.

Some generic standards are available for use in the market along with company specific standards from larger OEM’s. However, it is not possible today to pick up any commercial standard and find a section on AM, which makes bringing compliant products onto the market both challenging and time consuming. To boost further standardisation in AM as a route to market all relevant parties along the value chain need to boost cooperation and come together to tackle in a joint fashion standard development within the context of this technology. This approach requires time and the necessary knowledge through extensive research and testing. Authorities should support this process carefully. Certify-as-you-build concepts represent the future of AM.

AM is taking benefit of an increasing materials portfolio. However, there is still work be done in this area, especially for the high-end industrial use cases. More intensive materials research and development is needed. The material volumes in AM have always been marginal compared to more traditional manufacturing. This has led to a situation where there are only few materials
available because there are not so many applications and vice versa. In the past few years, this is fortunately changing, but still, the availability of materials at reasonable prices and the assurance of enough AM material types and volumes are needed for rapid growth of the AM business.

Regarding **AM educational & training aspects**, adopting AM requires a highly skilled workforce, with a substantially different skillset from those of the more conventional manufacturing techniques. A challenge that remains is qualified professionals capable of taking advantage of this technology and bridging the gap between job offers and job seekers. Currently, there is a fragmentation of the EU landscape in the provision of training in AM and absence of a common curricula, both for qualification of young people and the requalification of the existing workforce. This has resulted in many companies providing in-house training, which is a big investment that is not easy to do for SMEs and leading to even more fragmentation.

AM-MOTION considers all the points raised above. The vision for AM in 2030, includes the envisaged **opportunities and challenges** as well as the areas of intervention which are **covered by the roadmap** (i.e. technologies, standardisation, certification, skills and education, financing, intellectual properties, safety, communication and cross-regional). Based on the identified challenges and opportunities, **AM-MOTION roadmap** proposes future actions for the AM development and successful market uptake in seven key target sectors. The roadmap includes also cross-cutting actions (technical and non-technical) covering several sectors.

The type of actions presented and the amount of sectors they tackled, ask for **stronger links between the different initiatives, policies and framework actions** around AM coming from the different DGs (RTD, Connect, Grow, Regional...). This is required for improved coordination of actions/events/calls and exploitation tools created/available: e.g. integration and sustainability of maps/databases containing info on projects, exploitable results, regional capabilities, existing innovation hubs, etc.

Moreover, **Regions and Member States** with capabilities and/or interests in implementing AM technologies should try to coordinate their strategies, plans and actions between them and with the European Commission. The **lack of coordination** can dilute public and private investments making Europe in a weaker position regarding international AM initiatives and competitors. The increased coherence and alignment between initiatives, policies and instruments between European, national and regional entities is highly encouraged. One possible way to align and concentrate efforts could be prioritising actions that address key gaps expressed by industry gathered on the expert-driven roadmaps, like the AM-motion one.

**Inter-regional collaborations and AM value chain building is key.** There is a large role for the regions in moving AM up to the highest TRLs and the role of the regions concerning the implementation of the actions in the AM-motion roadmap needs to be explored. This role could concern AM as a model for synergizing regional funds and Horizon Europe. Besides, the regions are encouraged to create bottom-up inter-regional partnerships for the launch of co-investment projects.
Forum pictures

Fig. 3: Dr. Peter Dröll and Dr. Jan Ramboer from the European Commission during AMEF2018 opening.

Fig. 4: General overviews of the conference room during different presentations

Fig. 5: Some of the posters exhibited
Fig. 6: Poster session networking coffee