



# AM-motion: The common AM vision for Europe

19<sup>th</sup> AM Platform Meeting  
Zurich, 14<sup>th</sup> June 2017





# H2020 Strategic Actions



Industrial and regional valorization of FoF  
Additive Manufacturing Projects

[www.fofamproject.eu](http://www.fofamproject.eu)

- Type: CSA
- Topic: *FoF-07-2014*
- Project started: 1<sup>st</sup> January 2015/  
Duration: 24 months
- Grant agreement n° 636882

SHORT NAME	COUNTRY
PRODINTEC	SPAIN
TNO	THE NETHERLANDS
ERRIN	BELGIUM
TWI	UNITED KINGDOM



A strategic approach to increasing Europe's value proposition  
for Additive Manufacturing technologies and capabilities

[www.am-motion.eu](http://www.am-motion.eu)



- Type: CSA
- Topic: *FoF-05-2016*
- Project start: 1<sup>st</sup> November 2016  
/ Duration: 26 months
- Grant agreement n°723560














# AM-Motion-Supporters



EUROPEAN NETWORKS			
	<b>AM platform:</b> European Technology sub-Platform on Additive Manufacturing		<b>EWF:</b> European Welding Federation for Welding, Joining, and Cutting
	<b>MANUFUTURE:</b> European Technology Platform on competitive and sustainable manufacturing		<b>Vanguard Initiative</b> New growth through smart specialisation
INTERNATIONAL ENTITIES			
	<b>AATiD:</b> Advanced Additive Titanium Development Consortium		<b>MADiT:</b> Mexican National Laboratory of Additive Manufacturing 3D Digitalization and Computed Tomography
NATIONAL OR REGIONAL CLUSTERS AND NETWORKS			
	<b>CRITT-MDTS:</b> Regional Centre for Innovation and Technology Transfer		<b>Ceramic European Cluster</b>
	<b>Federation of Plastics and Composites sector</b>		<b>Matikem:</b> Cluster of materials, innovation and green chemistry
	<b>M2i:</b> Materials Innovation Institute		<b>TCS:</b> Toolmakers clusters of Slovenia

INDUSTRY			
	<b>Aciturri Additive Manufacturing</b>		<b>Alstom Transport</b>
	<b>CRIT</b>		<b>EOS</b>
	<b>ESI Group</b>		<b>Granta Design Limited</b>
	<b>HILTI</b>		<b>MONDRAGON Corporation S. Coop.</b>
	<b>Safran Tech</b>		<b>Schunk</b>
<b>SWAROVSKI</b>		<b>Swarovski</b>	

UNIVERSITIES AND RTDs			
 <p>Technological Institute for children's products &amp; leisure</p>	<a href="#"><u>AIJU: Technological Institute for children's products &amp; leisure</u></a>	 <p>Brunel University London</p>	<a href="#"><u>Brunel University London</u></a>
 <p>CSM Centro Sviluppo Materiali</p> <p>materials, technology &amp; innovation</p>	<a href="#"><u>CSM: Centro Sviluppo Materiali</u></a>	 <p>eurecat</p>	<a href="#"><u>EURECAT</u></a>
 <p>inspire</p>	<a href="#"><u>Inspire icams:</u></a> Innovation Center for Additive Manufacturing Switzerland	 <p>LMS Laboratory for Manufacturing Systems &amp; Automation</p>	<a href="#"><u>Laboratory for Manufacturing Systems &amp; Automation</u></a> – University of Patras
 <p>UNIVERSITY OF BIRMINGHAM</p>	<a href="#"><u>University of Birmingham</u></a>		
OTHER			
 <p>ALEXANDER DANIELS GLOBAL Talent for Emerging Technologies</p>	<a href="#"><u>Alexander Daniels Global</u></a>	 <p>Berenschot</p>	<a href="#"><u>Berenschot</u></a>



<http://www.am-motion.eu/ammotion-team/supporters.html>



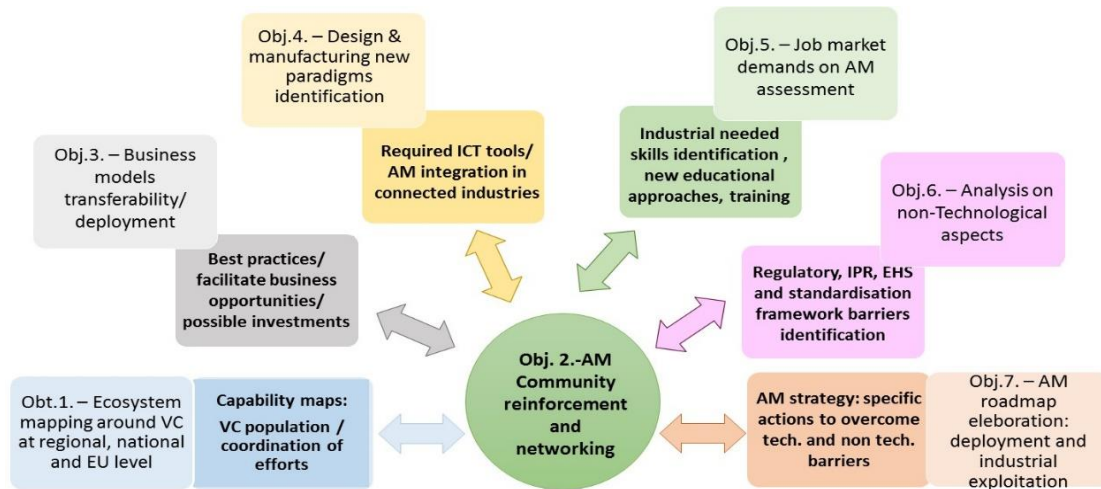
# AM-Motion-Main objective



The **overall objective of the AM-Motion CSA is to contribute to a rapid market uptake of AM technologies across Europe** by connecting and upscaling existing initiatives and efforts, improving the conditions for large-scale, cross-regional demonstration and market deployment, and by involving a large number of key stakeholders, particularly from industry.

- *Key technological capabilities and infrastructure (technology development and supply)*
- *Barriers and market failings to industrialisation and deployment (both technological and non-technological)*
- *Key applications and markets*
- *Tools for integration /Models for business collaboration*
- *Links with regional, national, EU, Int. initiatives /policies*

By doing this, the AM-Motion project has the ambition to **develop a strategy and set up the pillars for its efficient implementation** that, ultimately, will contribute to **reinforcing the European ecosystem of AM**.

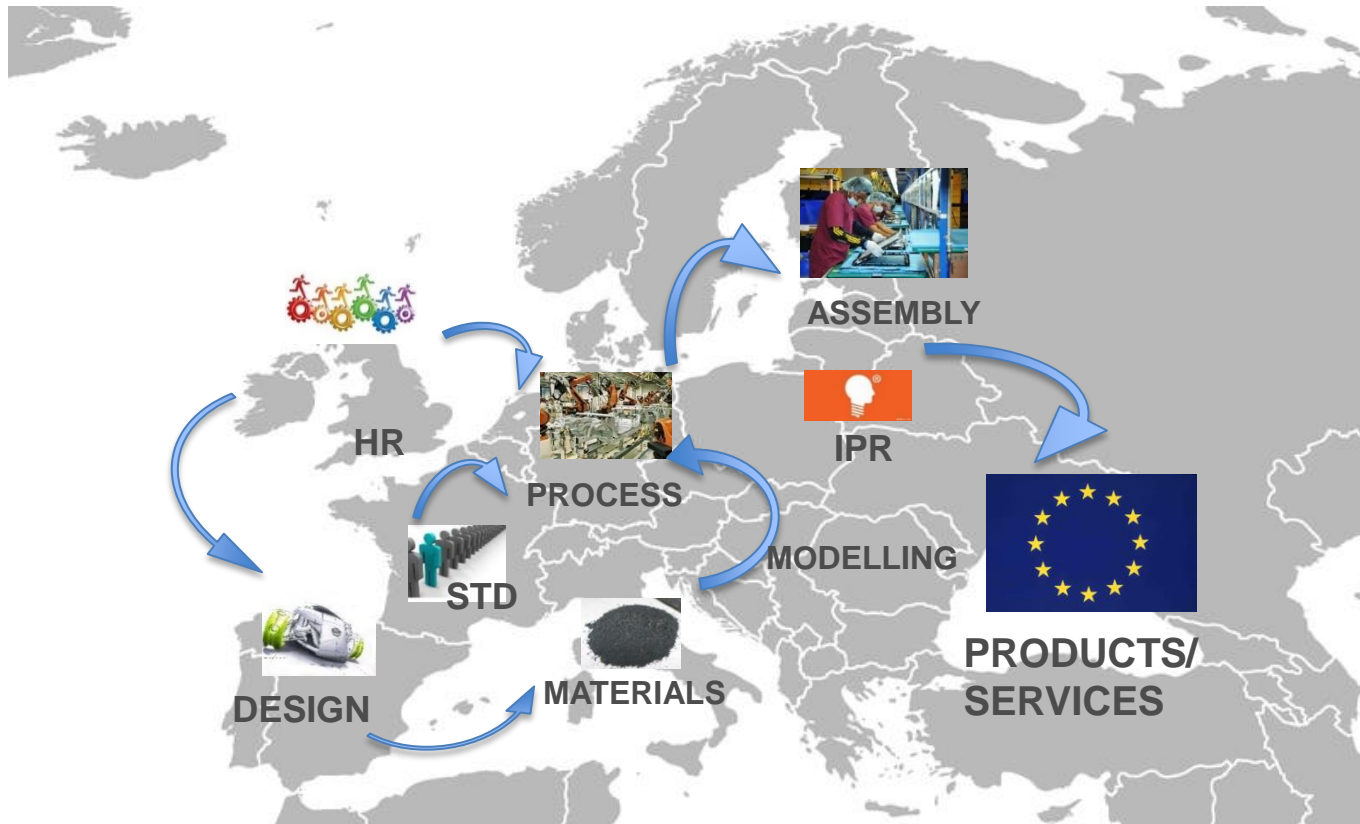




# Scenario

**WE** have Capabilities and Expertise around AM/3DP!

**Europe needs a strategic approach and a common vision for AM that goes beyond technology aspects**



**Industry, academia , EU/MS/local governments and others already engaged in the development of the technologies and its applications**



# Scenario



**RIGHT NOW WE ARE  
MANAGING**  
more than 20 AM projects were  
funded during  
2014-2016, with at least 95 M€ in  
EC funding from different  
Working Programmes.

FP7 (2007-2013), 60 AM projects -total  
budget of around €225 million

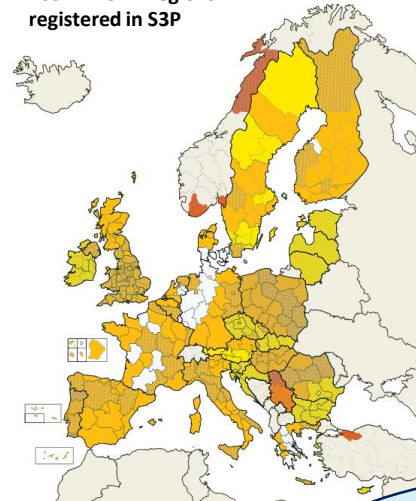
## **\*R+i developments**

*New materials,  
machines, Pilot lines....*

## **\*Exploitable results**



18 EU countries &  
163 EU regions  
registered in S3P



DG GROW Report on  
database

**Smart specialisation  
strategies :** European  
Structural Investment  
Funds (ESIF) can be used  
**more efficiently and  
synergies** between  
different EU, national and  
regional policies



**High Performance  
Production through 3D-  
Printing**

network of industry-led  
demonstrators across regions in  
Europe to improve the uptake of  
solutions provided by 3DP  
technologies

**\*Capabilities,  
knowledge and  
infrastructure..**

**\*Demands**

**\*Other business and  
funding support**

# AM Matters!

*Big challenges .....enormous potential*



**How to better use the available knowledge?**

**How to keep on going from technology to manufacturing?**

**How to capture the value and gain competitiveness/leadership?**

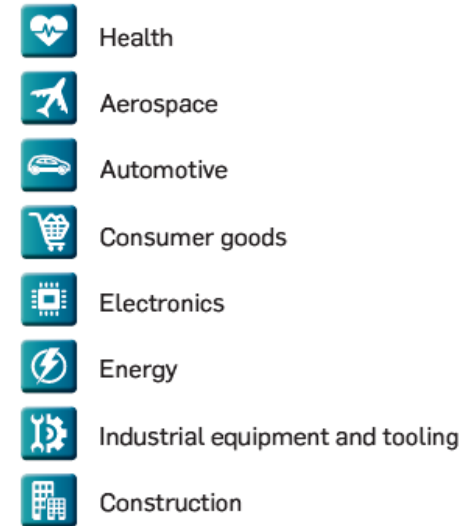
- \* COMMON VISION/CLEAR DIRECTION/GOALS**
- \* “SMART” NETWORKING AND COOPERATION**





# Value chain approach

1.-Selection of **key sectors** where the implementation of AM technologies have great potential for major economic impact in EUROPE



2.-Capabilities (**database**) and gaps/actions (**roadmap**) along the value chain (VC) segments for each sectors



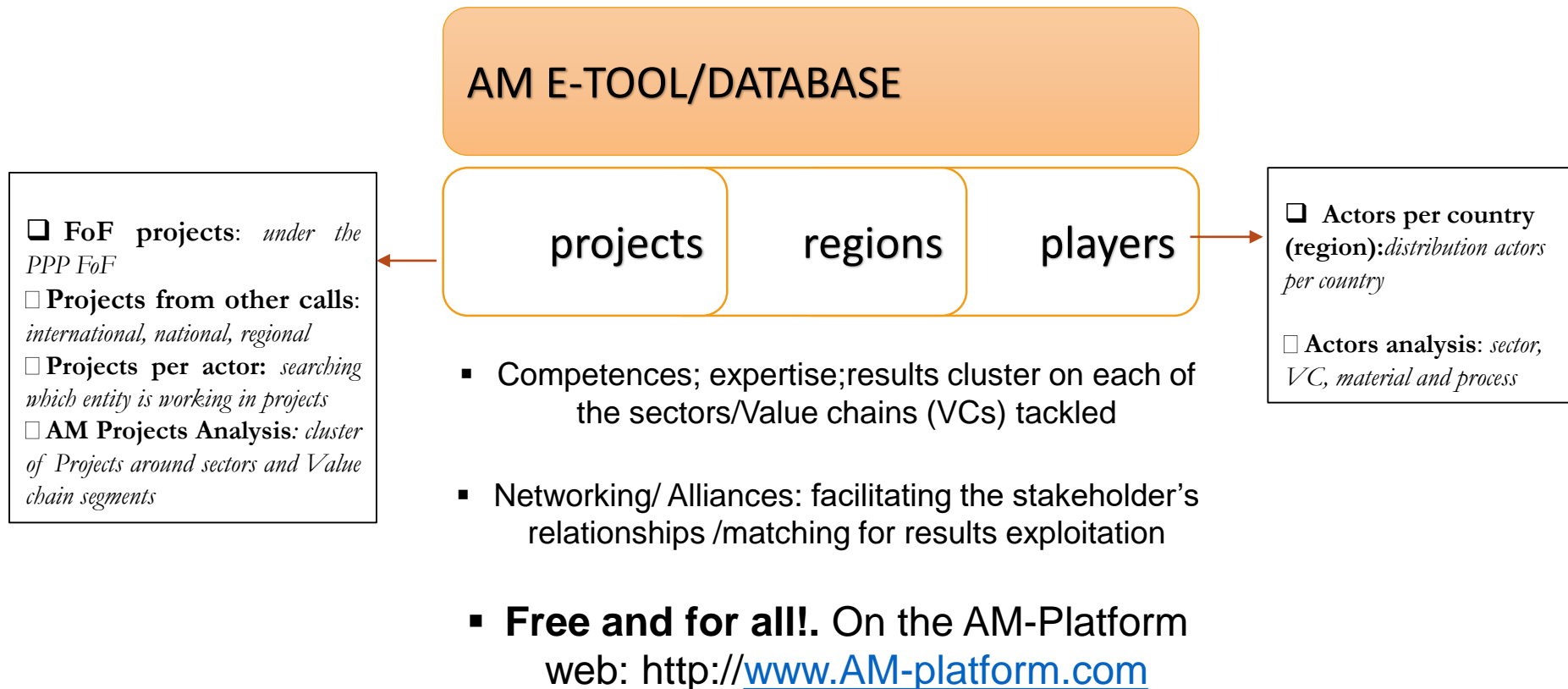


# AM E-TOOL/DATABASE

To facilitate collaboration along the value chains an AM e-tool was created.

The tool combines a project, stakeholders and regions database with cluster functions along sectors, value chain segments, AM process and materials.

A one-stop shop for mapping the AM ecosystem, promoting projects and its results, actors' profiles, fabrication, support capabilities & services, and regional interests, needs and available knowledge and infrastructure.





# AM E-TOOL/DATABASE-projects

A	B	C	D
Vol	Funding	Project	Title
		<a href="#">AMCOR</a>	Additive Manufacturing for Wear and Corrosion Applications
		<a href="#">ArtiVasc 3D</a>	Artificial vascularised scaffolds for 3D-tissue-regeneration
		<a href="#">Bio-Scaffolds</a>	Natural inorganic polymers and smart functionalized micro-units applied in customized rapid prototyping of bioactive scaffolds
		<a href="#">CassaMobile</a>	Flexible Mini-Factory for local and customized production in a container
		<a href="#">COMPOLIGHT</a>	CompoLight: Rapid Manufacturing of lightweight metal components
		<a href="#">DirectSpare</a>	Strengthening the industries' competitive position by the development of a logistical and technological system for "spare parts" that is based on on-demand
		<a href="#">EVOBLISS</a>	Natural inorganic polymers and smart functionalized micro-units applied in customized rapid prototyping of bioactive scaffolds
		<a href="#">FaBiMed</a>	Fabrication and Functionalization of BioMedical Microdevices
		<a href="#">FABULOUS</a>	FDMA Access By Using Low-cost Optical Network Units in Silicon Photonics
		<a href="#">FACTORY-IN-A-DAY</a>	Factory-in-a-day
		<a href="#">HI-MICRO</a>	High Precision Micro Production Technologies
		<a href="#">HIPR</a>	High-Precision micro-forming of complex 3D parts
		<a href="#">HydroZones</a>	Bioactivated hierarchical hydrogels as zonal implants for articular cartilage regeneration
		<a href="#">Hyproline</a>	High performance Production line for Small Series Metal Parts
		<a href="#">IC2</a>	Intelligent and Customized Tooling
		<a href="#">IMPALA</a>	Intelligent Manufacture from Powder by Advanced Laser Assimilation
		<a href="#">Light-Rolls</a>	High-throughput production platform for the manufacture of light emitting components
		<a href="#">MANSYS</a>	MANufacturing decision and supply chain management SYStem for additive manufacturing
		<a href="#">MEGAFIT</a>	Manufacturing Error-free Goods at First Time
		<a href="#">MERLIN</a>	Development of Aero Engine Component Manufacture using Laser Additive Manufacturing
		<a href="#">MULTI LAYER</a>	Rolled multi material layered 3D shaping technology
		<a href="#">NANOMASTER</a>	Graphene based thermoplastic masterbatches for conventional and additive manufacturing processes
		<a href="#">NextFactory</a>	All-in-one manufacturing platform for system in package and micromechatronic systems
		<a href="#">OPTICIAN2020</a>	Flexible and on-demand manufacturing of customised spectacles by close-to-optician production clusters
		<a href="#">OXIGEN</a>	Oxide Dispersion Strengthened Materials for the Additive Manufacture of High Temperature Components in Power Generation
		<a href="#">PHOCAM</a>	Photopolymer based customized additive manufacturing technologies
		<a href="#">PILOT MANU</a>	Pilot manufacturing line for production of highly innovative materials
		<a href="#">PLASMAS</a>	Printed Logic for Applications of Screen Matrix Activation Systems
		<a href="#">PLAST4FUTURE</a>	Injection Moulding Production Technology for Multi-functional Nano-structured Plastic Components enabled by NanoImprint Lithography
		<a href="#">REPAIR</a>	Future RepAIR and Maintenance for Aerospace industry
		<a href="#">SMART LAM</a>	Smart production of Microsystems based on laminated polymer films
		<a href="#">Stellar</a>	Selective Tape-Laying for Cost-Effective Manufacturing of Optimised Multi-Material Components
		<a href="#">STEPUP</a>	STEP UP IN POLYMER BASED RM PROCESSES
	IA	<a href="#">HyproCell</a>	Development and validation of integrated multiprocess HYbrid PROduction CELLS for rapid individualized laser-based production
		<a href="#">iBUS</a>	iBUS – an integrated business model for customer driven custom product supply chains
		<a href="#">ModuLase</a>	Development and Pilot Line Validation of a Modular re-configurable Laser Process Head
		<a href="#">Z-FactOr</a>	Zero-defect manufacturing strategies towards on-line production management for European factories
		<a href="#">4D hybrid</a>	Novel ALL-IN-ONE machines, robots and systems for affordable, worldwide and lifetime Distributed 3D hybrid manufacturing and repair operations

More than 100 EU projects mapped!  
H2020, Erasmus, Interreg ,...  
Contacts are being made to invite them to the e-database



E.g. Aerospace VC

[illegible]



# AM E-TOOL/DATABASE

NAME	SUPPLY CHAIN	WEBSITE	COUNTRY/ Region	Sectors	VC segments	AM processes	AM Materials	Non technology activities
Industry								
+80	R&D, Services Bureau, OEMs, Design, End User	www.arti90.com	TURKEY	All	D, M, P, PP, PR	PBF, M, J, ME	Polymer	STD
AIM Sweden	R&D, Services Bureau, OEMs, Design	www.aimsweden.com	SWEDEN/ Mellersta Norrland	M&D, AE, AU, O. Industrial	M&S, D, M, P, PP, PR	PBF, electron beam melting	Metal	EDU, IE, TT
AIRBUS	R&D, Design, End user	www.airbus.com	SPAIN	AE	M&S, D, M, PP, PR	PBF, M, J, DED	Metal, polymer	STD, LE, EDU, IE, IPR, TT
ALTRAN Deutschland	R&D, OEM, Software provider, design	www.altran.com	GERMANY/ Hamburg	All	All	PBF, ME	Metal, Polymer, Biomaterials	STD, EDU, IE, IPR, TT
ATLAS COPCO	OEMs	www.atlascopco.com	BELGIUM/ Antwerpen	O (industrial applications)	M&S, D, P, PP, PR	PBF, ME, BJ	Metal, polymer	L, EDU
CRIT	R&D	www.crit-research.it	ITALY/ Emilia-Romagna	AE, AU, E	D, M, P	PBF	Metal, polymer	EDU, IE, TT
D'Appolonia	R&D Engineering consultancy Operation and maintenance	www.dappolonia.it	ITALY/Lazio	All	All	All	Metal, polymer	STD, EDU, IE, IPR, TT, roadmapping, safety
EOS	R&D OEMs Materials & software provider End user	www.eos.info	GERMANY/ Oberbayern	All	All	PBF	Metal, polymer	STD, IE, IPR
ESI Group	R&D Software provider Design	www.esi-group.com	FRANCE/Ile de France	All	M&S, D	PBF, DED	Metal	STD, EDU, TT, IPR, IE
Kiwa	R&D	www.swerea.se/kiwab	SWEDEN	All	M&S, M, P	BPF	Metal	EDU, TT
LCV	R&D Services Bureau Design	www.lcv.be	BELGIUM/ Antwerpen	All	D, M, P, PR	DED	Metal	STD, TT
LINDE France	Materials provider Process gases for AM + powder production + post-treatment	www.linde-gas.fr	FRANCE/ Rhône-Alpes	All	M, P, PP, PR	PBF, M, J, SL, DED, BJ, cladding, metal deposition (by laser or arc)	Metal	-

## VC segment:

M&S=Modelling and simulation;  
D=design; M=materials;  
P=process; PP=Post-processing;  
PR=product; EL= end of life

## Type of Process :

PBF=Powder Bed Fusion; VP=Vat jetting;  
Photopolymerization; MJ=Material jetting;  
ME=Material extrusion; SL=Sheet lamination;  
DED=Direct energy deposition; BJ=Binder Jetting; O=Other

## Type of material :

Metal, polymer, ceramic...

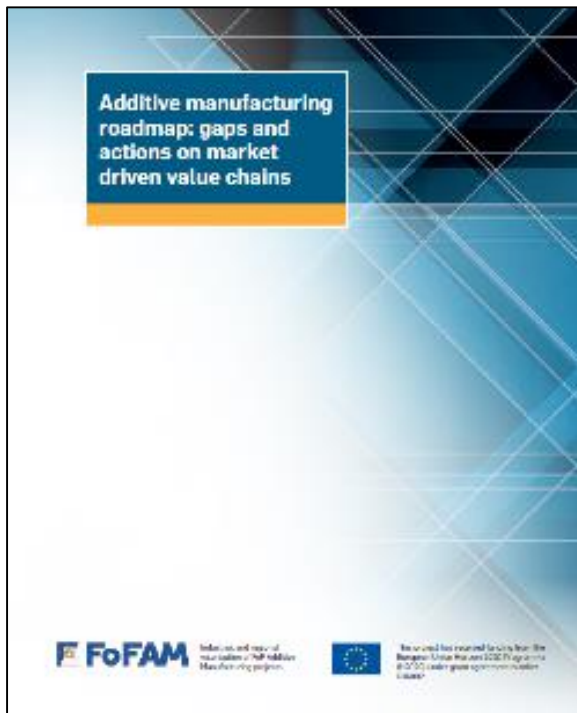
## Non-tech. activities:

STD=standardisation; L=Legislation;  
EDU=Education/training;  
IE=Business, commercialisation, industrial exploitation;  
IPR=intellectual property rights;  
TT=Technology Transfer



# AM ROADMAPPING

**Current Additive Manufacturing Roadmap (2016):** developed together with industry, technology and academia stakeholders, key European project's representatives, regional experts, identifying meaningful challenges around the value chains, and proposing specific actions to tackle them.



## AM ROADMAP

Market  
sectors

Value  
chains

Specific  
actions

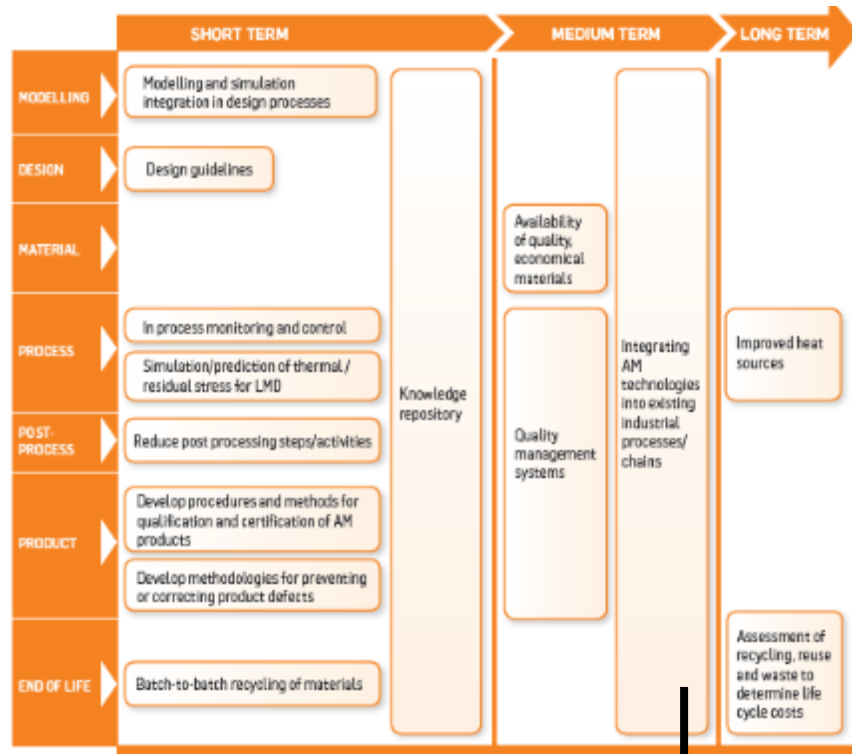
- Specific Tech. & Non-Tech actions for AM implementation (common vision, alignment, market focus) cross-cutting/ per sector
  - Avoid fragmentation/ duplication of actions
- To drive the stakeholders /Partnership's Time terms R&I Strategy





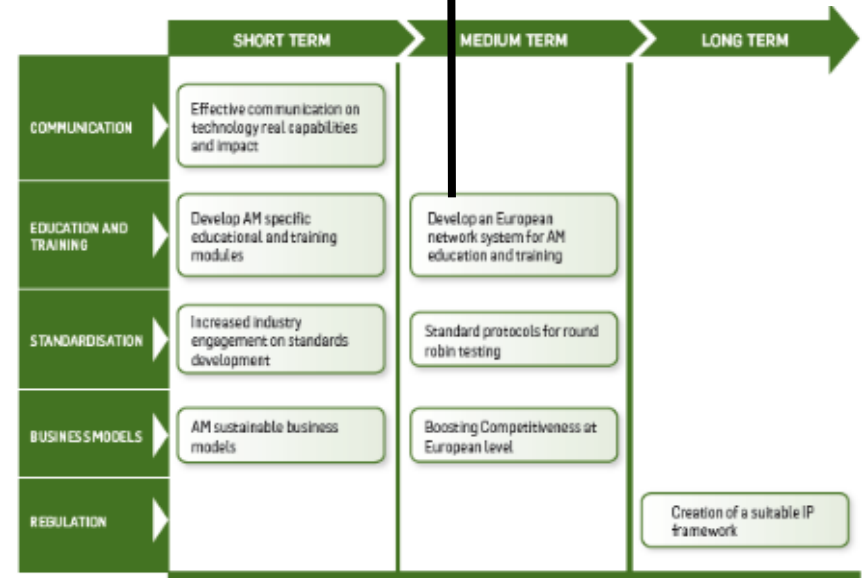
# AM ROADMAPPING

E.g. Cross-cutting gaps, for all VCs



TOPIC	GAP NAME	CONTEXT	ACTION	CURRENT TRL
Complete VC	Integrating AM technologies into existing industrial processes/chains	Integration in the shop floor requires attention as AM machines do not stand alone in factories. Combination with other machinery (subtractive, metalization, inspection, assembly) allows complex process chains and highly functional products, thus higher value and possible sale prices.	<ul style="list-style-type: none"> <li>Integration of entire process chains, data management (single source)</li> <li>Interfaces development</li> <li>Evaluate/reconfigure CAD/CAM systems. CAD-CAM Platforms to support the integration of AM processes and equipment</li> <li>Fully automated AM processes connected via ERP and with the other machines in the production lines, to produce single parts in continuous production flow</li> </ul>	4-6

TOPIC	GAP NAME	CONTEXT (GAP)	ACTION PROPOSED
Education and training	Development of a European network system for AM education and training	AM is a fast developing technology constantly changing, and educational contents and training guidelines need to be updated at the same speed and in a sustainable way to ensure the system tackles immediate and future needs. Moreover, a broad topic tackling a wide sector spectrum should be able to cover all aspects and increase dedicated resources, establish new educational partnerships to deliver broad education.	<ul style="list-style-type: none"> <li>Creation of a European network for AM education as a central reference hub for training and educational purposes, covering VET, HE etc.</li> <li>Development of harmonized qualification and certification system for AM, covering all European Qualifications Framework (EQF) levels. The system would address the needs for training and qualification (and re-qualification) of personnel at all levels. Consideration also of different training needs of the different end-users sectors industrial, educational and consumers in order to generate suitable support material</li> <li>Quality assurance system to guarantee the quality of the training provided along with standard best practices</li> <li>Resource and facilities sharing, good quality course materials and other contents provided to create and sustain AM education across Europe</li> <li>Promote students/workers/teachers exchange among educational establishments and practices in companies/R&amp;D centres</li> <li>Coordination with local industrial chambers and organisation of training days/seminars and practical workshops</li> </ul>



For each gap a future action is foreseen

Future topics?



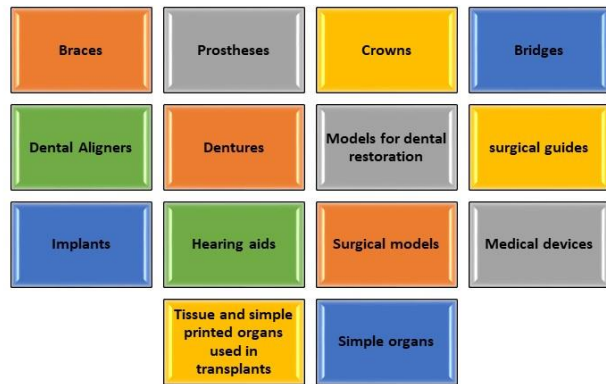


# AM ROADMAPPING

- Number of sectors addressed extended (4 to 7), target products to be considered
- Gap analysis to be further developed: *which gap have been addressed by the ongoing research projects? Which are the new ones? Which are the linked target products? Which is not only the initial but also the target TRL?*
- Need for taking into account the regional smart specialisation.
- Integration of economic feasibility/business models to be developed.
- At last, create one summary visual image for the roadmap with the sectors and the target products.

## Main AM European projects with applications/relation to the Health sector

### Health: key innovative AM products



VC Segment	Modelling & simulation	Design	Materials	Process, equipment, ITC	Post-processing	Product	End of life
Project acronym	ADDFACTOR			3D HIPMAS			
	BAMOS	ADDFACTOR		ADDFACTOR		3D HIPMAS	
	BOREALIS	BAMOS	3D HIPMAS	BOREALIS		ADDFACTOR	
	DREAM	BOREALIS	ADDFACTOR	CASSAMOBILE		BOREALIS	
	CAXMAN	CAXMAN	BAMOS	CAXMAN	ADDFACTOR	CAXMAN	
	ENCOMPASS	DREAM	BOREALIS	DREAM	BOREALIS	DREAM	
	HI-MICRO	ENCOMPASS	DREAM	ENCOMPASS	CAXMAN	ENCOMPASS	BOREALIS
	HYPROLINE	HI-MICRO	ENCOMPASS	FAST	DREAM	FAST	DREAM
	MANSYS	HYPROLINE	FAST	HI-MICRO	ENCOMPASS	HI-MICRO	MANSYS
	NEXTFACORY	MANSYS	HYPROLINE	HYPROLINE	HYPROLINE	HYPROLINE	
	SMARTLAM	SMARTLAM	MANSYS	MANSYS	MANSYS	MANSYS	
	SYMBIONICA	SYMBIONICA	TOMAX	PHOCAM		NEXTFACORY	
				SMARTLAM		SMARTLAM	
				SYMBIONICA		SYMBIONICA	
				TOMAX			



courtesy of Materialise

### Regional capabilities (connection to local actors: database)

For instance Bavaria, Baden-Württemberg, Flanders, Asturias, Denmark, Emilia Romagna, are shown to be key regions in the area of surgical planning, while a region such as Flanders gathers an ecosystem of service providers research and technological entities, Printer Manufacturers, hospitals and medical companies

The United Kingdom, the Netherlands and France are strong when considering areas such as implants printing.

# ENGAGEMENT

## THERE ARE DIFFERENT WAYS TO BE ENGAGED WITH THIS INITIATIVE



- ☐ **Supporter:** Following our activities, outcomes /sharing your interests, developments...

- ☐ **Member of our Expert groups:** Industrial, Materials & process, Non technological aspects, Regional Development, Financial



- ☐ **Member of our Project's cluster:** Showcase your project, results, events...



- ☐ **Joining and participating in our events:**

*Summer school*

*Educational needs and opportunities for AM-round table*

*DIY session*

*Final International AM conference...*



# EVENTS

## ❖ **AMEF 2017**

With EC and AM-Platform  
17/10/2017 Brussels

## ❖ **EXPERT'S SESSION**

18/10/2017 Brussels

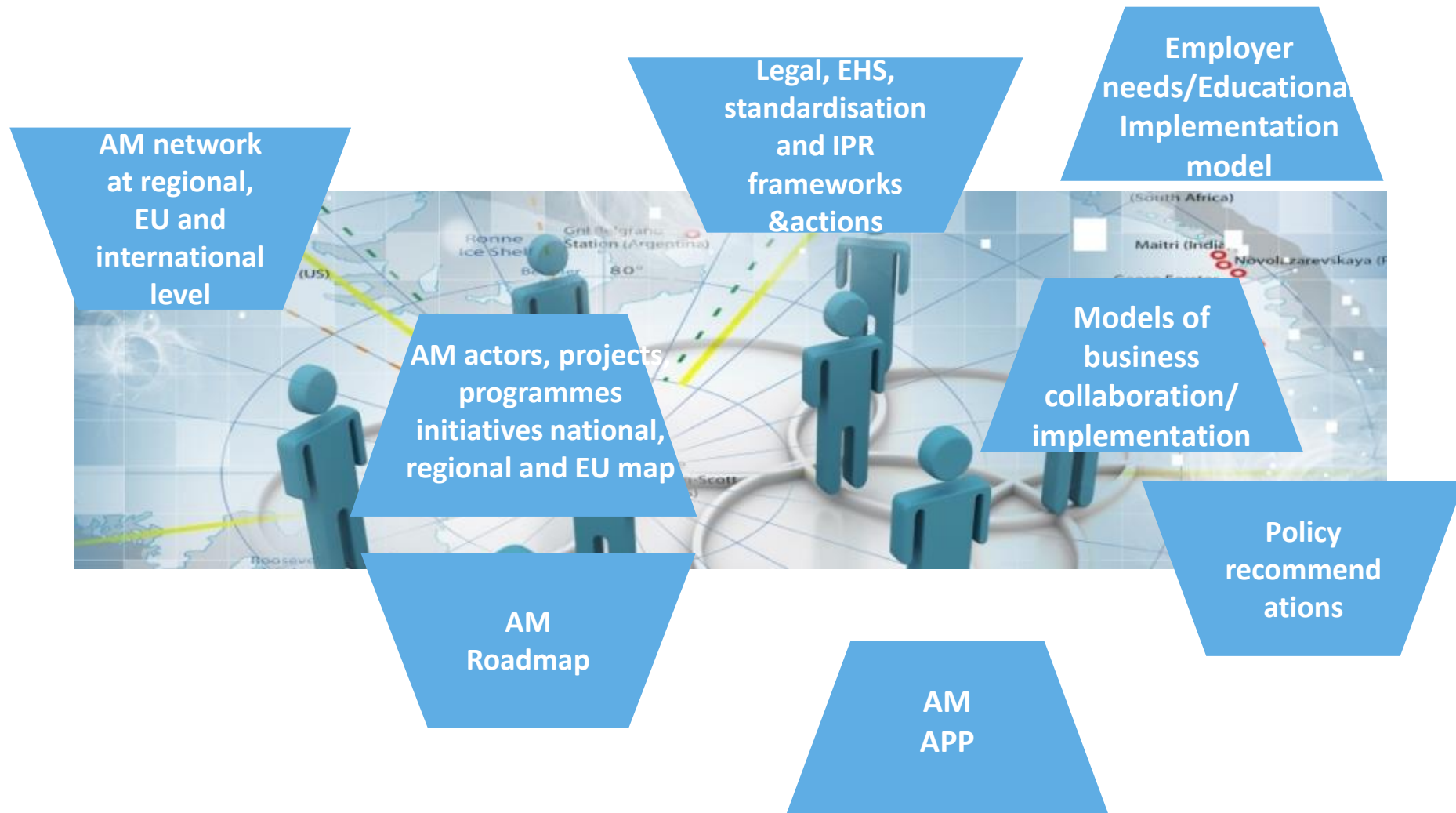
## ❖ **AM PROJECT'S WORKSHOP**

AM Project's presentation.  
Roadmapping and exploitation sessions.  
In collaboration with EWF  
15/11/2017 Lisbon





# MORE TO COME



## In summary

Intermediary connecting an organization with outside solution providers to accelerate the full market uptake and wide adoption

- Bridging complementary capabilities across Europe and beyond (AM mapping on-going by different initiatives)
- Cluster approach around sectorial VCs: entities in diverse VC segments that are often located in different places: Identifying the necessary VC partners to facilitate a quicker implementation. Maximise mutual benefits.
- Integration of “unobvious” actors: from different sectors, domains,....
- Community guiding: Roadmap with clear actions: Technological and non-technological aspects both to be considered
- Collaborative environment that helps to bring technology advancements from the lab to the factory floor,
- Regional, MS and EU policy measures: Alignment of policies, initiatives and funding efforts towards industrialization
- Involvement of key entities: Standardisation bodies, IPRs helpdesk, Invest EU, BICs,...

**WE connect .....BECAUSE....AM Matters!**

**THANK YOU!**

**[www.am-motion.eu](http://www.am-motion.eu)**

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