

AM INTERACTION DAYS

Beatriz Lopez, EWF

Additive Manufacturing Roadmap



EU Industry Week
#EUIndustryWeek
2021



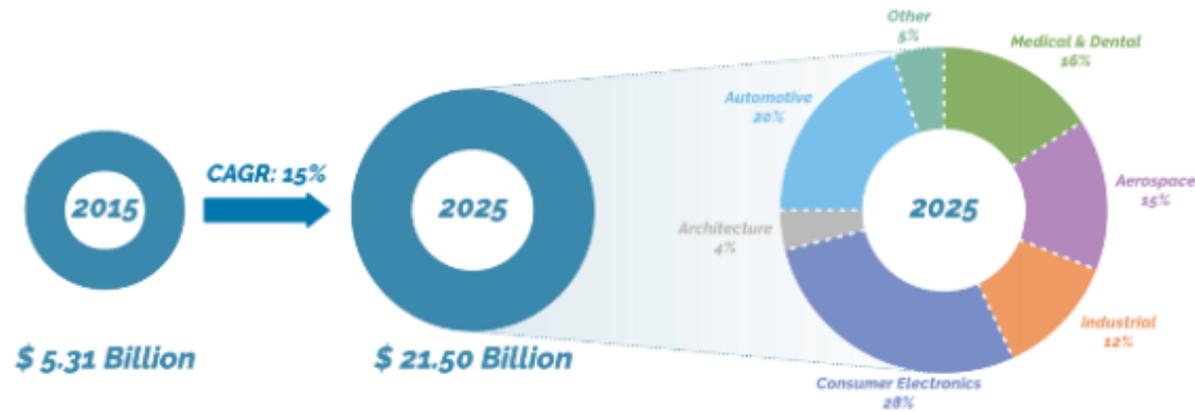


AM Trends

AM Market

ARE YOU—
AM
— READY?

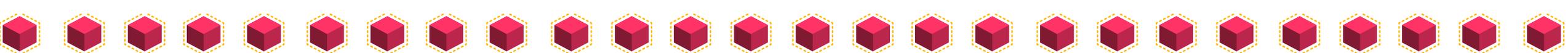
Future of Additive Manufacturing: Schematic of Revenue Generation in Manufacturing Sectors, Global, 2015-2025



Source: Frost & Sullivan



AM-motion vision for 2030 foresees that **Europe will improve its leading role in Additive Manufacturing**, greatly impacting on the competitiveness of European industrial sectors.

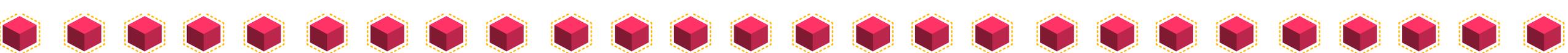


AM Challenges

ARE YOU—
AM
— READY?

Several **technical and non-technical challenges**, which may hinder AM full development and market success must be addressed:

CHALLENGES		
	TECHNOLOGY:	<i>new materials, better material quality and reliability, faster & cost-effective production and cyber implementation</i>
	INDUSTRIAL ACCESS:	<i>to technology at lower cost, in particular for SMEs</i>
	STANDARDISATION:	<i>industry and user engagement and certification</i>
	EDUCATION & TRAINING:	<i>appropriate modules for regular curricula and training on the job</i>
	BUSINESS & FINANCING:	<i>new and successful business models & business collaboration strategies</i>
	IPR:	<i>ensure protection and market opportunities</i>
	SMART SPECIALISATION:	<i>cross-regional and cross-sectorial collaboration in AM</i>



AM Vision for 2030

ARE YOU—
AM
— READY?

OPPORTUNITIES	
Automation, digital twins & 4D printing	Industry 4.0
Printing robots, real-time control & predictive maintenance	Artificial Intelligence in AM
Customisation & human-centered approach	Better Quality of Life & Inclusive Societies
Recyclability in AM & resource efficiency	Circular Economy & Better Environment
Addressing specific patient-needs, bioprinting	Personalised Medicine & Sustainable Health
Skilled jobs, increased employment & entrepreneurship	Knowledge-based Economy
Affordable solutions for energy	Green Mobility & Low Carbon Economy



CHALLENGES	
TECHNOLOGY:	new materials, better material quality and reliability, faster & cost-effective production and cyber implementation
INDUSTRIAL ACCESS:	to technology at lower cost, in particular for SMEs
STANDARDISATION:	industry and user engagement and certification
EDUCATION & TRAINING:	appropriate modules for regular curricula and training on the job
BUSINESS & FINANCING:	new and successful business models & business collaboration strategies
IPR:	ensure protection and market opportunities
SMART SPECIALISATION:	cross-regional and cross-sectorial collaboration in AM

AM Roadmap with a common vision for successful European leadership in additive manufacturing is thus required for supporting **the growth, the innovation and competitiveness of the AM sector**



Long-term Technological and Industrial Plan

ARE YOU—
AM
— READY?

Aiming to define a **strategy** for building the fundamental knowledge and actions necessary to **accelerate the design, application and implementation of AM in the market,**

A **long-term technological plan,** which collects the major technological developments foreseen to happen **in the next 10 years** was defined,

By analysing the **common areas/ priorities** of other European initiatives in order to **identify the technological breakthroughs** foreseen to happen until 2030.

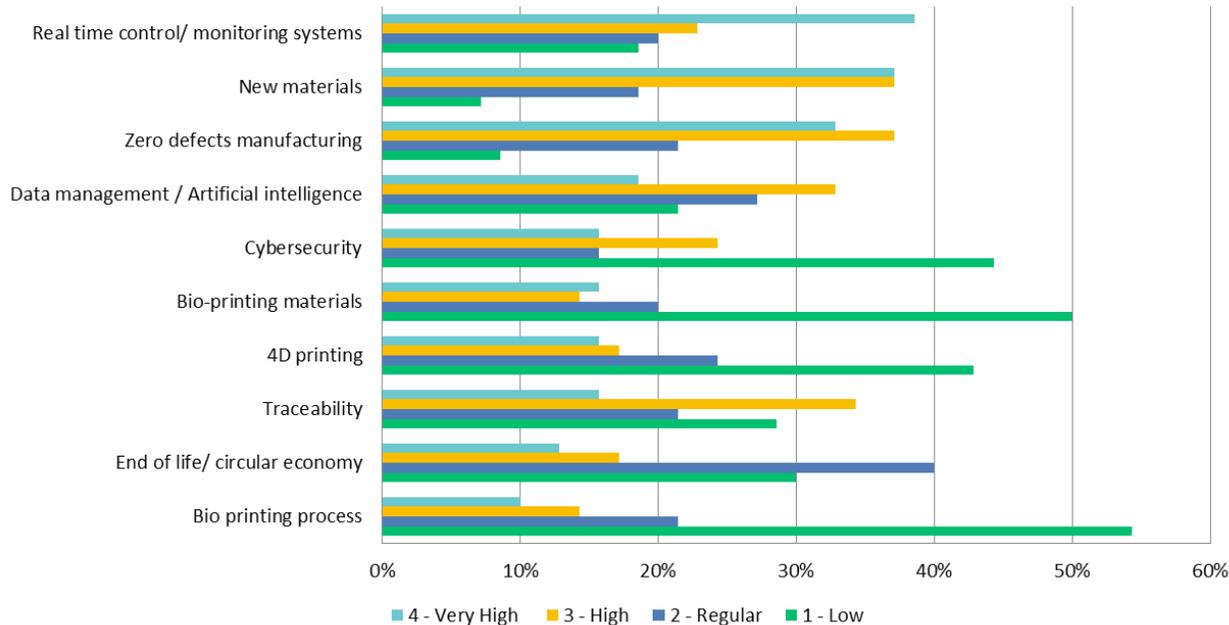


RTD Identified Needs

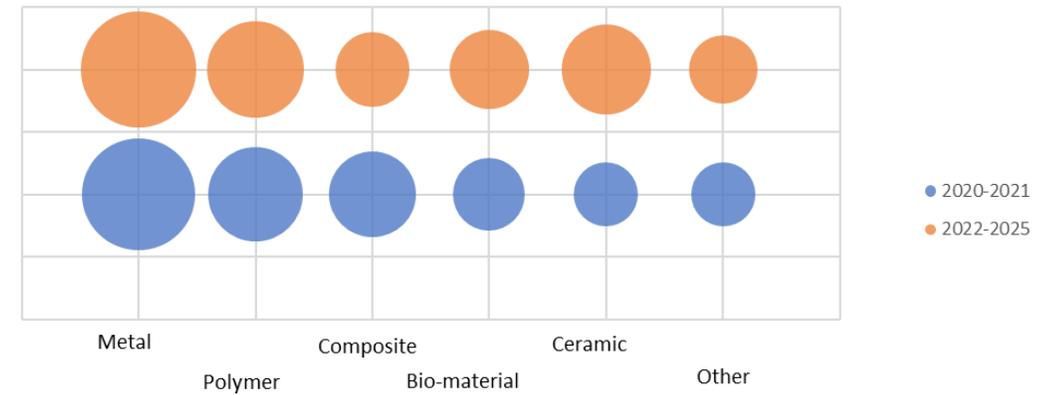
ARE YOU—
AM
— READY?



Relevance of different AM technology trends for R&D&I activities for 2020-2021

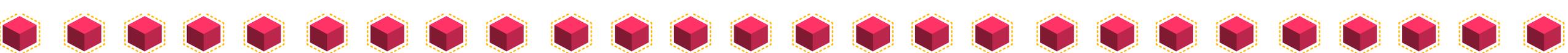


Relevance of materials in R&D&I activities: 2020-2021 vs. 2022-2025



Metal will continue in top of RTD activities until 2025 followed by polymers

Real time control, new materials, zero defects manufacturing

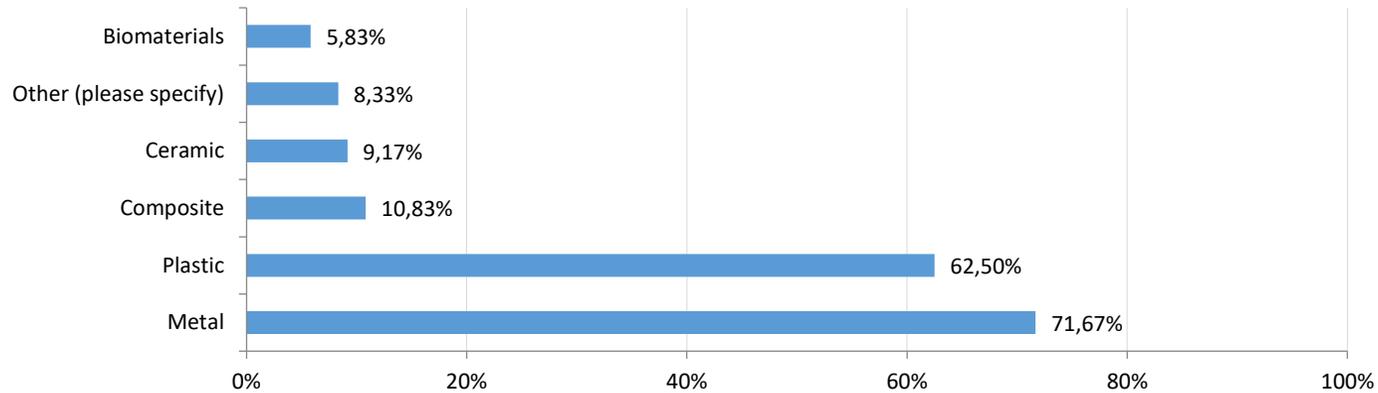


Industry Validation

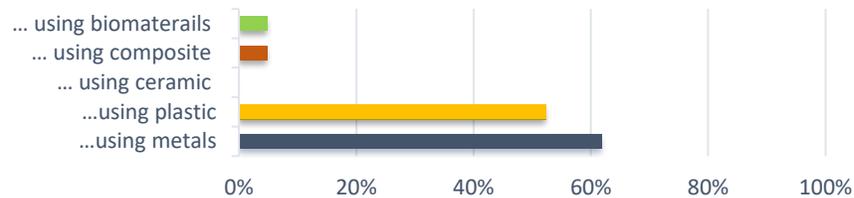
ARE YOU—
AM
— READY?



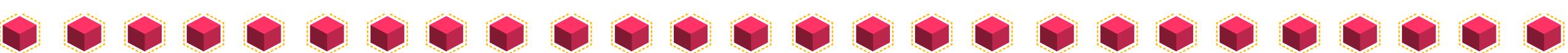
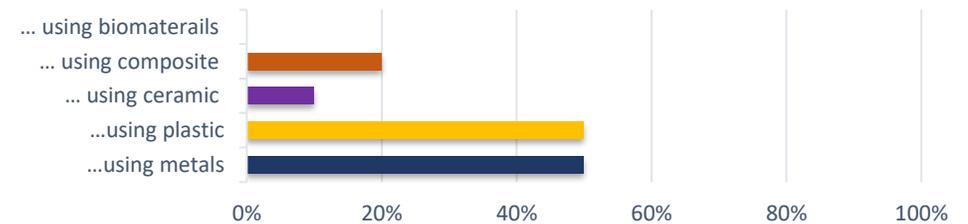
Main AM material used by industrial organisations



Companies dedicated to Aerospace only applying AM

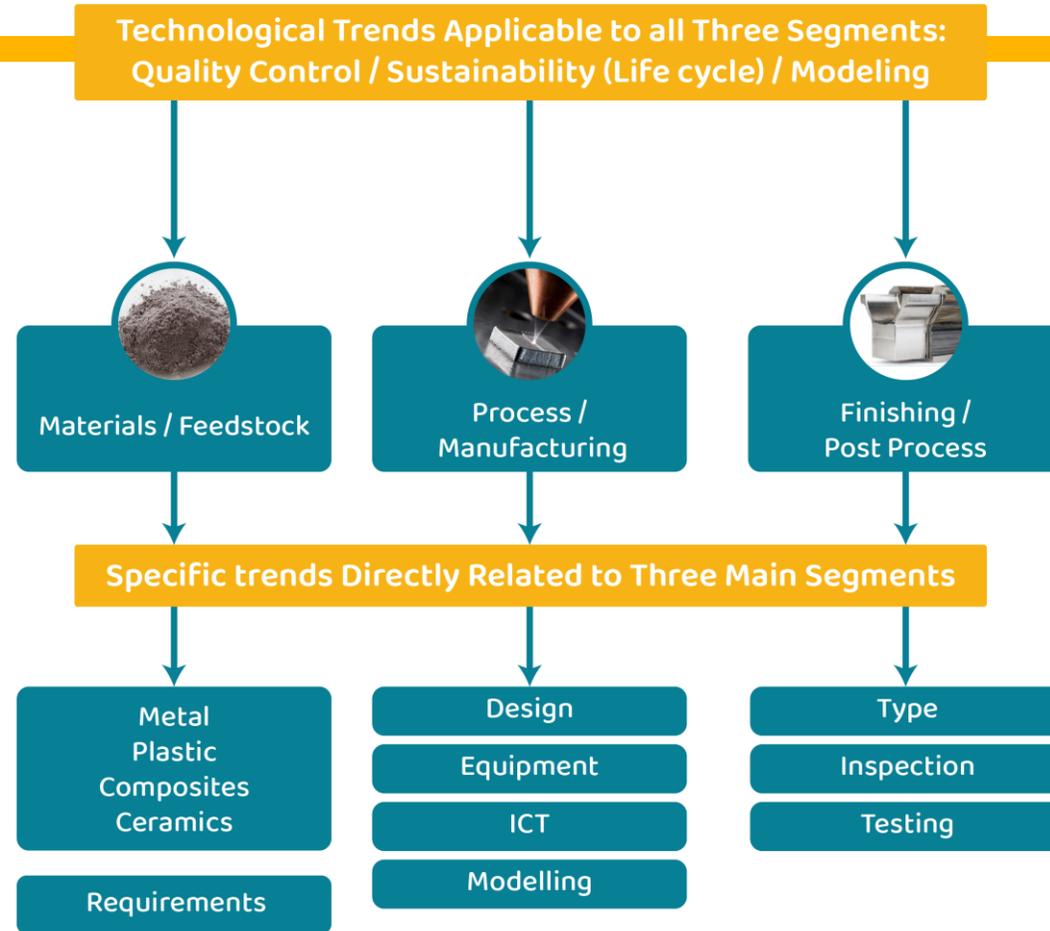


Companies dedicated to Automotive only applying AM



Industry Validation

ARE YOU—
AM
— READY?

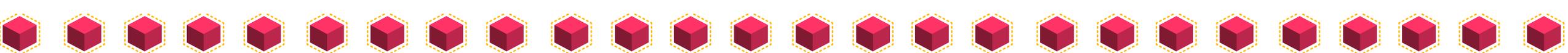


Technological Trends

ARE YOU—
AM
— READY?



		Short term 2020 - 2021				Foresight term 2022 - 2030			
MATERIALS	M1 Implementation to new applications and products (polymers, metals, composites and ceramics)								
	M2 Development and standardisation of new materials								
	M3 Conventional materials (wires, pellets, sand, wax) for AM applications								
	M4 Thermo-mechanical modelling for validation of the mechanical and thermal properties of existing materials and AM technologies								
	M5 LCA and circular economy								
	M6 Fit-for-purpose materials								
	M7 Multi-material parts								
	M8 Bioprinting (tissue printing)								
	M9 Materials for 4D printing (incl. memory shape alloys)								



Technological Trends

ARE YOU—
AM
— READY?



PROCESSING	PR1 Software interoperability (all-in-one SW)	Short term 2020 - 2021				Foresight term 2022 - 2030			
	PR1 Software interoperability (all-in-one SW)								
	PR2 More agile DfAM development frameworks								
	PR3 Multiscale and multiphysics AM modelling								
	PR4 Massive use of desktop and benchtop AM machines								
	PR5 Faster metal AM machines								
	PR6 New automation concepts at machine level								
	PR7 Hybrid machines								
	PR8 AM machines for multi-materials								
	PR9 Multi-functional parts including parts with embedded sensors								
	PR10 Connected modular printers operated by robots								
	PR11 Market uptake of new AM technologies and downfall of existing AM technologies								



Technological Trends

ARE YOU—
AM
— READY?



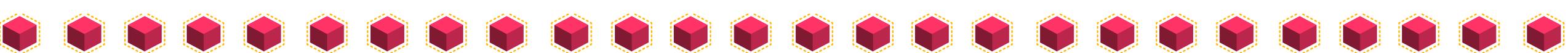
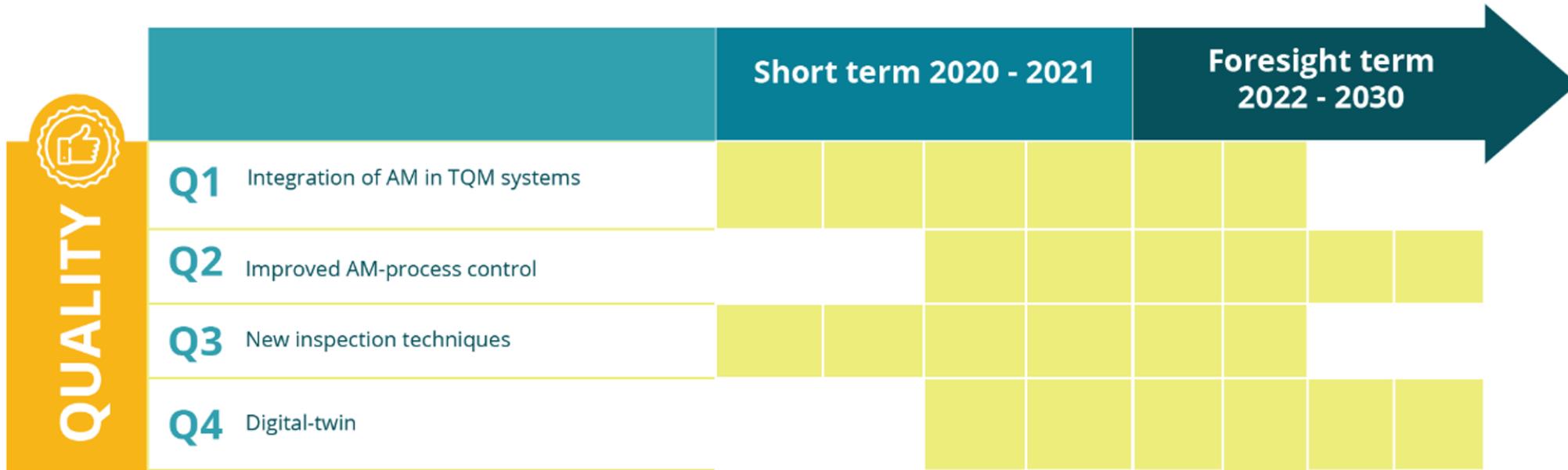
POST PROCESSING

		Short term 2020 - 2021				Foresight term 2022 - 2030			
PP1	Automation of support removal (metal PBF, MEX)								
PP2	Improved and new heat treatments (sintering, HIP, heat treatment)								
PP3	Debinding process								
PP4	Automation of surface finishing								
PP5	New surface finishing treatments								
PP6	Automation of resin removal (VAT)								
PP7	Automation of powder removal (PBF, BJ)								
PP8	New coating and drying treatments								
PP9	Design to minimize post processing								
PP10	New quality standards								



Technological Trends

ARE YOU—
AM
— READY?



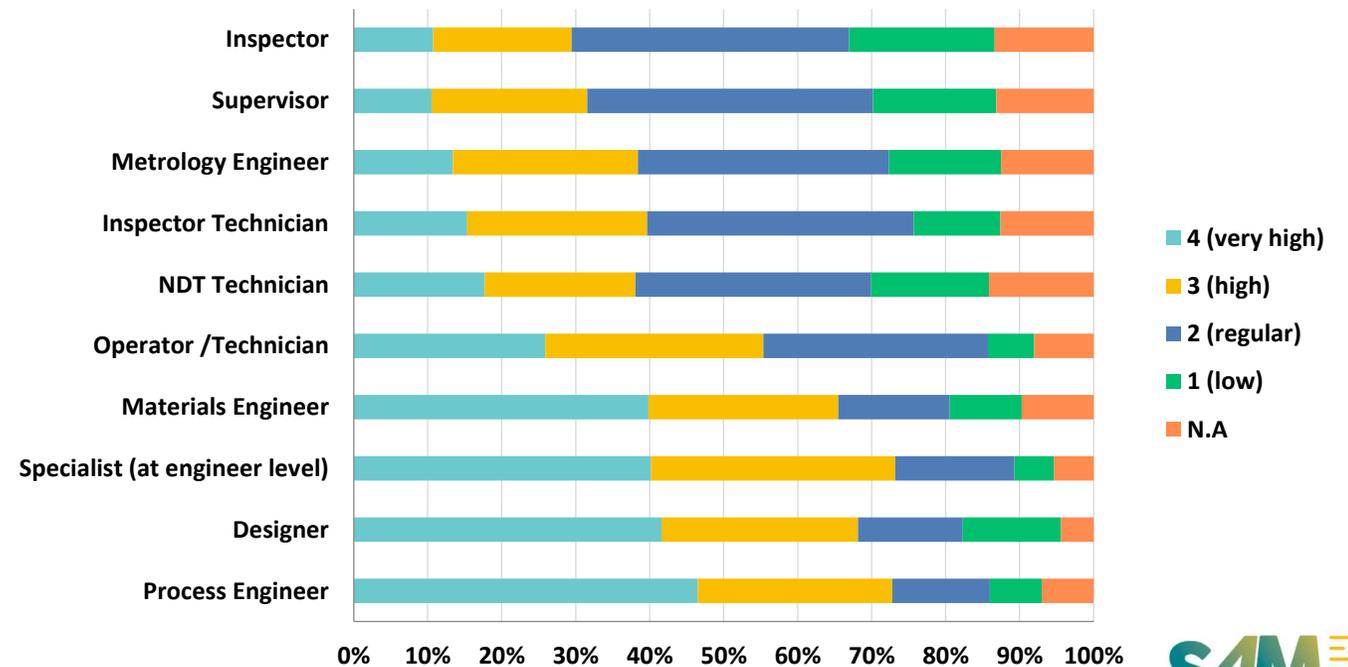
Non-Technological Trends

ARE YOU—
AM
— READY?



	Priority Description
Short Term (2021-2022)	1. Improving SME access to AM technologies and market through cross-regional cooperation, innovative business models and promotion of effective innovation management approaches
	2. Promoting safety in AM: safety assessment, safety management and guidelines and education on EHS challenges.
	3. Development of educational and training modules both through linking with higher education curricula (engineering, business schools, etc.) and on-the-job training approaches.
Med. Term (2023-2027)	4. Developing and promoting effective intellectual properties strategies in AM and better awareness of IP issues. Promoting the creation of a suitable IP framework.

Current relevance of AM professional profiles for industrial organisation activities



Conclusions

ARE YOU—
AM
— READY?

- The identified segments confirmed to be the most required technological breakthroughs at short and long-term;
- Quality in AM appears as the most covered cross-cutting field, indicating the need to address this topic in the future;
- The main future skills defined for AM will be focused on Materials, Processing, Post-processing and Quality;
- The mapping of initiatives in AM are aligned, foreseeing to boost the competitiveness of the manufacturing industry by investing in policies, research and human resources.



The Skills of today ...



... and Skills of the future

AM Roadmap

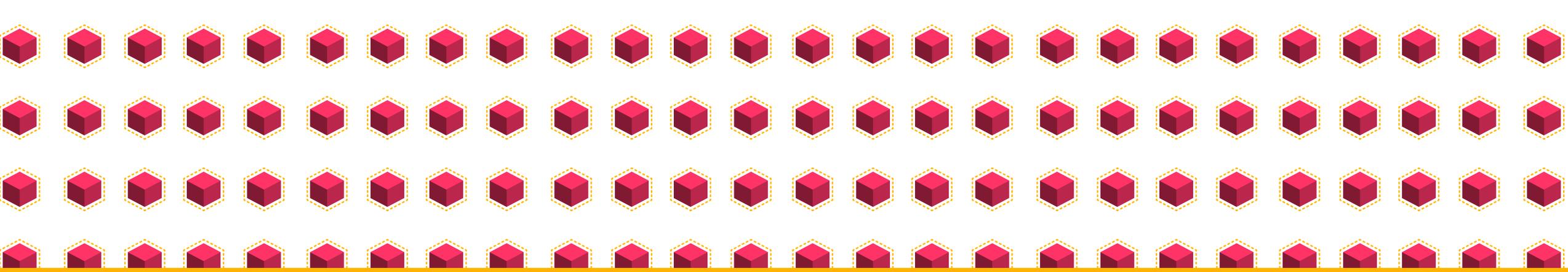
the consequences of a huge technological transformation and continuous evolution ...

AM adoption support

Services



Implementation



Thank you!



EU Industry Week
2021
#EUIndustryWeek

