



sme<sup>®</sup>

2023

AM Summit Discussions  
& Recommendations Recap

# AGENDA

1

**Event Overview & Objective**

2

**Top Barriers & Challenges Identified**

3

**Proposed Ideas for Progress**

4

**Next Steps & Action Plan**

5

**Addendum: SME's Advancing AM Initiatives**

# 2023 AM Summit Overview & Objective

## GOAL:

- To inform the long-term strategy that drives SME & its partners to innovate, remove barriers to AM technology adoption, and attract & develop needed talent

## WHAT WE DID:

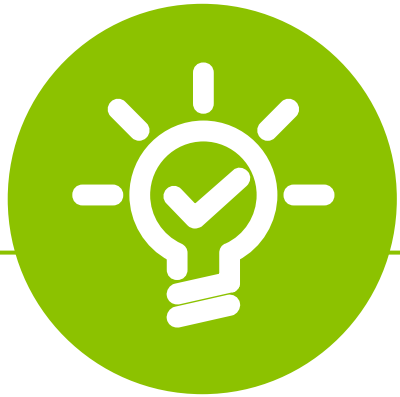
- Organized a two-day event that brought together 78 attendees & facilitated collaboration among stakeholder groups across the additive manufacturing industry
- Day 1: randomly assigned breakout groups engaged in in-depth discussions about the barriers & challenges within AM
- Day 2: SME stakeholder groups convened, informed by Day 1's insights, to formulate their proposed workstreams for the next 12-24 months



# In Good Company: Organization Representation

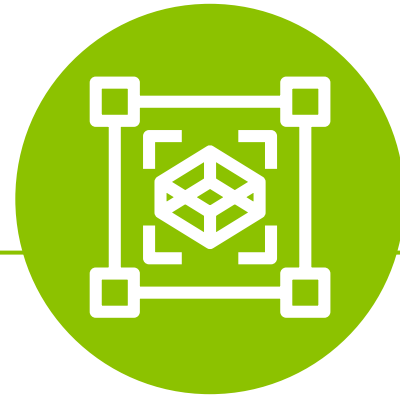
- 3D Metal Konsulting
- 6K
- Additive Manufacturer Green Trade Association (AMGTA)
- Additive Manufacturing Coalition
- America Makes
- AMUG
- ASTM International
- ASTRO Mechanical Testing Laboratory
- Axial3D
- Boeing Global Services
- Booz Allen Hamilton
- Boston Children's Hospital
- Eastpoint
- EOS
- GE Aerospace
- General Motors
- Harrisburg University of Science and Technology
- JuggerBot 3D LLC
- Manufacturing Technology Deployment Group
- Materialise
- Mechnano
- Met-L-Flo, Inc.
- Milwaukee School of Engineering
- Northrop Grumman
- Oak Ridge National Laboratory
- Pinnacle X-Ray Solutions
- Rady Children's Hospital-San Diego
- Ried and Associates, LLC
- Senvol
- Seurat Technologies
- StaceyD Consulting
- State University of New York at Cobleskill
- Stratasys
- Surrexio
- T. A. Grimm & Associates
- T.A.Sorovetz, LLC
- The Barnes Global Advisors
- The Ohio State University
- The University of Texas at Austin
- TRUMPF
- U.S. Army Combat Capabilities Development Command (DEVCOM) Ground Vehicle Systems Center (GVSC)
- University of Michigan
- University of South Florida
- University Of Southern California
- Veeco
- VMMI
- Wohlers Associates
- WRNMMC

# Top Challenges Identified



## Awareness & Education

- Many firms & individuals lack awareness of what AM is & how it can be applied across various manufacturing industries
- Opportunities for AM learning are inadequate at different education & career levels, leading to a potential skill gap in the workforce
- The limited awareness delays the full potential of AM in North America



## Business Case

- Manufacturers struggle to understand & justify the business case for adopting AM technology
- A broader range of use cases beyond prototypes are needed
- Too many unknowns or unresolved factors like material variability, costs, repeatability, reliability, & safety hinder AM adoption
- Integrating AM into business models & supplier relationships poses challenges



## Workforce Development

- The rapid evolution of AM tech requires new skills & abilities, yet awareness of training & credentialing programs is limited
- Competition for AM talent is fierce, need better attraction & retention strategies
- The absence of entry-level & clear career pathways poses a challenge for newcomers seeking to break into the field & receive proper training



## Technology Implementation

- Barriers exist in understanding & implementing AM technology including requirements for design, post-processing, software, materials, & automation
- There are challenges in staying up-to-date with the rapid advances in AM technologies, software, materials, design considerations, & the integration of automation to enhance manufacturing speed



## Standards & Qualification

- The absence of an industry-wide set of standards in AM affects repeatability, reliability, safety measures, & quality assurance
- A significant gap exists in comprehensive qualification & certification processes for machines & materials, which are crucial for enhancing credibility & trustworthiness, resulting in AM adoption hesitancy



## Resistance to Change

- Resistance to change may exist in well-established organizations that have traditionally used conventional manufacturing methods
- There is a need for a cultural shift within organizations & government entities to embrace AM technology, especially to remain competitive on the international stage

# Ideas for Advancing AM Adoption





# Improving Awareness & Education

Improving awareness & education will require a multi-faceted approach that involves partnerships, marketing, & educational initiatives across industry, academia, & organizations supporting AM adoption

## Professional Liaisons & Partnerships

- Leverage & grow formal liaisons with organizations & societies engaged in advancing AM, focusing on collaborative efforts to enhance awareness, education, knowledge sharing, and best practices in AM adoption & talent development

## Better Career Pathways

- Create AM career paths & resources
- Utilize student organizations to create greater awareness of AM
- Standardize AM job descriptions & qualifications

## Promoting AM Careers

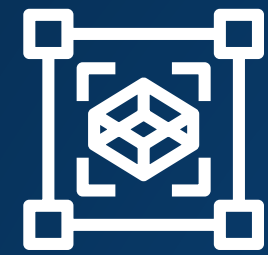
- Launch campaigns to attract talent & raise AM awareness in manufacturing
- Amplify AM professionals' voices via social media
- Share impactful AM case studies across industries

## High School & College Programs

- Partner with high schools for AM career & technical education
- Industry collaboration with colleges & universities to integrate AM into technical & engineering programs
- Embed hands-on AM experiences in education, linking to manufacturing careers

## Career Forums & Job Fairs

- Enhance career forums & job fairs associated with various AM pathways to offer expanded opportunities for networking, shadowing, & showcasing real-world applications of AM



# Demonstrating Business Cases

Expanding the business cases for additive manufacturing is essential for its broader adoption & integration into production across various industries

## AM Awareness Campaigns

- Create awareness campaigns to inform businesses about the possibilities & applications of AM, educating decision-makers on its utilization in their industries

## Specific Application Focus

- Develop business cases related to specific AM applications across different industries
- Highlight AM value & integration into business processes
- Be transparent when traditional methods are more suitable

## Collaboration with Industry Experts

- Encourage collaboration between industry experts, organizations, associations, academia, & government entities to define & develop use cases for AM
- Promote collaboration to explore new or previously unconsidered AM applications

## Case Studies & Success Stories

- Openly share case studies demonstrating AM's real-world benefits across diverse sectors, showcasing how it has solved specific problems, improved business outcomes, & proven its ROI

## Create Educational Programs

- Develop educational programs, including seminars, webinars, & workshops, to help companies understand the business case for adopting AM
- Cover key aspects such as material cost savings, safety enhancements, & ROI justification





# Developing AM Professional Training

Focus on strengthening workforce development in additive manufacturing through collaborative partnerships to grow adoption & expand AM talent pipelines

## Promote Awareness at an Earlier Age

- Increase awareness of AM technology among students at an early age, from middle school or even earlier
- Use social media, outreach, workshops, & career fairs to attract young students to AM careers

## Curriculum Enhancements

- Industry collaboration with educational institutions to enhance their curriculum by including AM-related programs & courses
- Encourage/help develop specialized AM training programs that cover a breadth of topics, from design & materials to machine operation & post-processing

## More Industry Partnerships

- Foster partnerships between AM industry & educational institutions for collaboration, internship, & co-op opportunities
- Promote real-world AM projects for students through business-educational partnerships

## Apprenticeship Programs & Internships

- Establish AM apprenticeship programs, integrate AM into existing cross-training & apprenticeships, & develop hands-on AM training opportunities
- Encourage student internships to gain AM exposure/experiences & prepare future apprentices

## Certification & Continuing Education

- Form AM professional training & credentialing programs for machine operation, design, materials, & post-processing
- Develop AM talent & provide ongoing education & upskilling with programs that validate competencies & skills



# Solving Tech Implementation Challenges

Working together to solve the technology challenges that companies face when utilizing additive manufacturing is critical for successful adoption

## Collaborative Problem-Solving

- Leverage & grow industry collaborations or forums to share technical solutions, harnessing the collective expertise of AM talent, & fostering more open discussions among companies to address common challenges & share best practices

## Cross-Disciplinary Experiences

- Offer training programs & educational initiatives that cover not only AM technology but also related fields (i.e., design, materials sciences, post-processing)
- Foster cross-disciplinary workforce collaboration to effectively tackle complex technical AM challenges & avoid working in silos

## Machine Learning & Process Control

- Invest in machine learning & AI solutions for real-time AM process control; implement monitoring for parameter optimization & defect detection
- Utilize machine learning to enhance process consistency & mitigate variation

## Transparent OEM Support

- Encourage equipment manufacturers to be more transparent around machine capabilities
- Facilitate knowledge-sharing initiatives for equipment manufacturers to openly share data & experiences about their machines

## Shared R&D Initiatives

- Encourage the creation of regional labs for cost-effective AM research & development, specifically concentrating on addressing technical challenges, especially material development, to gain insights into material behavior during the process



# Establishing Standards & Qualification

Defining qualifications, standards & certifications are important steps for ensuring quality, safety, & reliability of AM technology, while also expediting its adoption across a diverse range of applications in numerous industries

## Standardized Qualification Processes

- Encourage collaboration among organizations, societies, & industries to establish standardized qualification processes
- This includes developing guidelines, testing procedures, & quality controls for the qualification of individual parts, machines, materials, & process parameters

## Industry-Wide Material Standards

- Continue to foster industry stakeholder collaboration to establish consistent material standards for AM, ensuring uniformity & reliability in material properties

## Development of an AM Guide

- Create a standardized guide specifically for additive manufacturing
- The guide should provide information on materials, machine parameters, & quality control practices to assist machinists & AM professionals in achieving consistent results

## Creating an AM Central Resource Hub

- Encourage the development of a centralized online resource hub for AM by collaborating with professional societies, educational institutions, & industry associations
- The hub will list resources, programs, & opportunities for AM knowledge & pathways

## Collaboration with Regulatory Bodies

- Encourage collaboration among industry, regulatory bodies, & standards development organizations (SDOs)
- Accelerate industry & standard development organizations (e.g., ASTM, ANSI, ISO, others) collaborations to advance universally recognized AM standards



# Overcoming Resistance to AM Adoption

Overcoming objections by promoting awareness, demonstrating value, & fostering a collaborative environment for AM integration will help facilitate higher AM adoption rates

## Better Stakeholder Engagement

- Encourage stakeholder engagement, such as industry associations, regulatory bodies, tech providers to collectively understand AM benefits & challenges
- Simplify AM adoption by accelerating the development of standards & regulations to increase the acceptance of AM

## Demonstrate Return on Investment

- Provide clear, data-driven evidence of the return on investment, emphasizing cost savings, efficiency gains, & competitive edges
- Educate stakeholders of AM's tangible benefits with real-world case studies & success stories across various industries

## Change Management Strategies

- Implement change management strategies that address resistance to adopting AM within an organization's culture
- This might involve creating cross-functional teams, promoting open communication, demonstrating the benefits of AM technology

## Sharing Adoption Best Practices

- Encourage collaboration among organizations, industries, & educational institutions to share AM adoption best practices & experiences
- Leverage knowledge-sharing community can address doubts & offer guidance for successful AM implementation

## Incentives & Support Programs

- Inform government for the creation of incentives & support programs aimed at promoting AM adoption, including grants, subsidies, or tax incentives
- Encourage development of these incentives to alleviate financial barriers for smaller manufacturers & inspire broader investment in AM technology

# Converging Ideas Help Accelerate AM Adoption

## Better Workforce Development

Improved AM awareness & education foster a skilled workforce, attracting, educating, & preparing individuals for careers in AM to meet the industry's growing talent demand

## More Awareness & Education

Increasing AM awareness & education facilitates AM adoption, ensuring businesses & individuals have the knowledge to embrace additive manufacturing

## Proving Business Cases

Boosting AM awareness, education, & establishing industry standards strengthens the business case for adoption. Providing evidence of AM's value ensures more compelling justifications for its incorporation

## Solving Technology Challenges

Enhancing & accelerating workforce development helps address challenges in technology adoption & implementation

## Overcoming Resistance

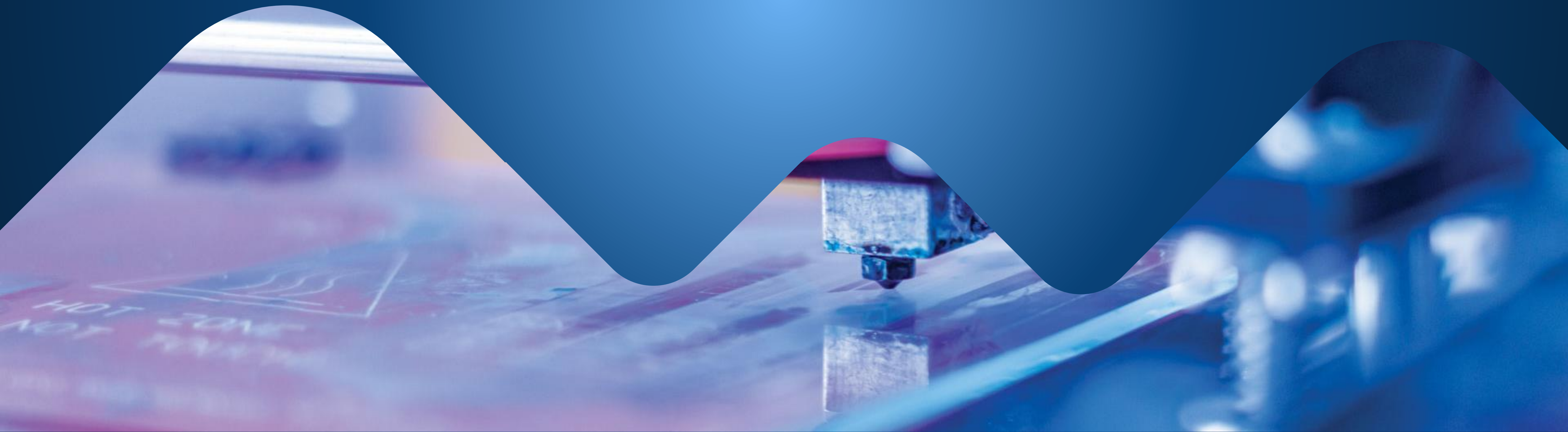
Improving workforce development & establishing industry-wide standards & qualifications alleviates resistance to AM adoption within established organizations, thereby facilitating the integration of AM with traditional methods

## Setting Standards & Qualifications

Industry standards, qualifications, & certifications boost AM adoption by providing a clear & trusted framework for technology evaluation & implementation, promoting confidence & consistency for businesses



# Building on the 2023 AM Summit Momentum



## Action Items for AM Stakeholders

1

**Engage key stakeholders & partners to advance ideas & assess progress**

2

**SME stakeholder groups to build & execute work plans to address SME-relevant ideas**

3

**Track progress & impact on the AM Industry**

# Addendum: SME's Initiatives Advancing AM



Improving  
Awareness  
& Education



Demonstrating  
Business Case



Accelerating  
Workforce  
Development



Solving Tech  
Implementation  
Challenges



Establishing  
Standards &  
Qualifications



Overcoming  
AM Resistance



# SME Impacts Manufacturing

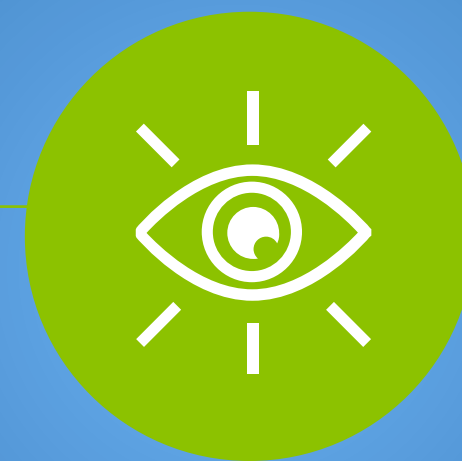
*Manufacturing holds the key to economic growth & prosperity. **SME helps unlock the full promise of manufacturing** as an engine of commerce, progress, & human potential. SME believes in technology's power & humanity's ability to innovate to solve North American challenges.*



## Our Purpose

### WHY WE EXIST:

Advance manufacturing to drive competitiveness, resiliency, & national security



## Our Vision

### WHAT WE AIM TO ACHIEVE:

Ensure manufacturing is a diverse, thriving, & valued ecosystem



## Our Mission

### HOW WE WILL ACHIEVE IT:

Accelerate widespread adoption of manufacturing technologies & build North America's talent & capabilities

# SME Platforms Advance Additive Manufacturing Technologies & Talent

EXAMPLES INCLUDE (but are not limited to):

## SME EDUCATION



## SME EVENTS

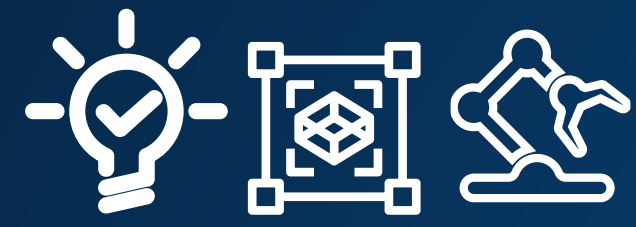


## SME MEDIA



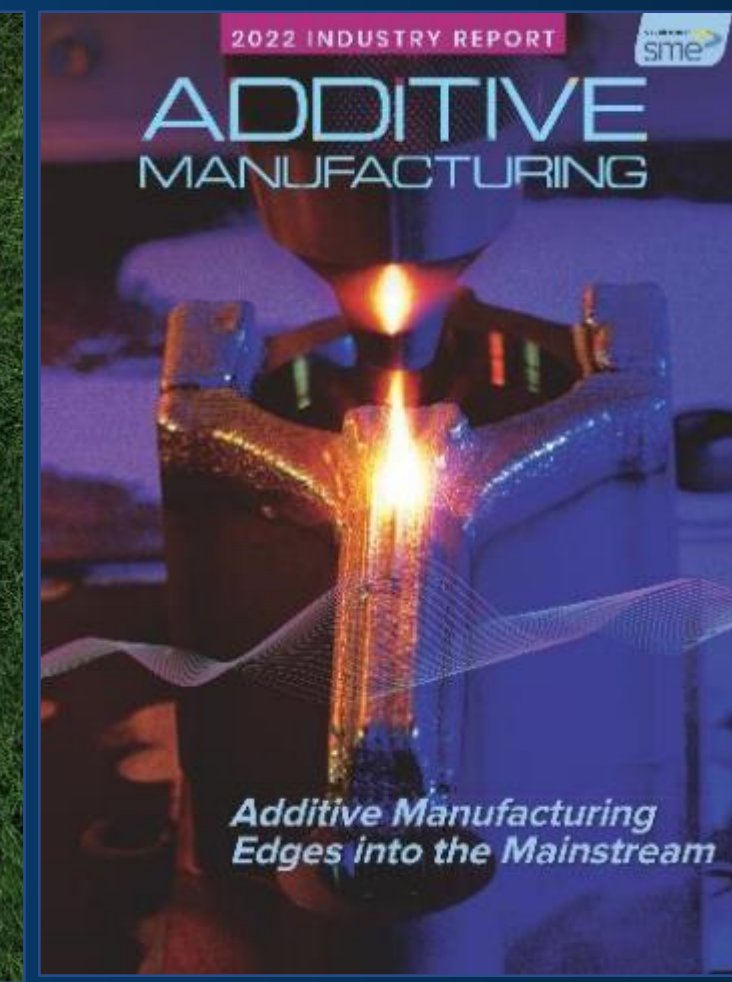
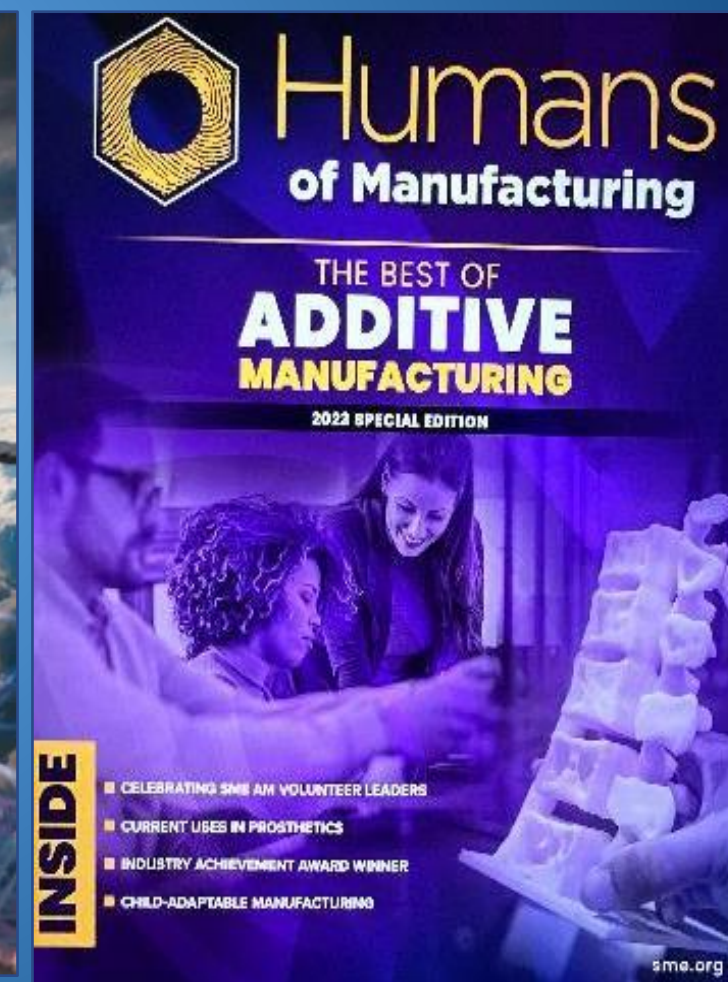
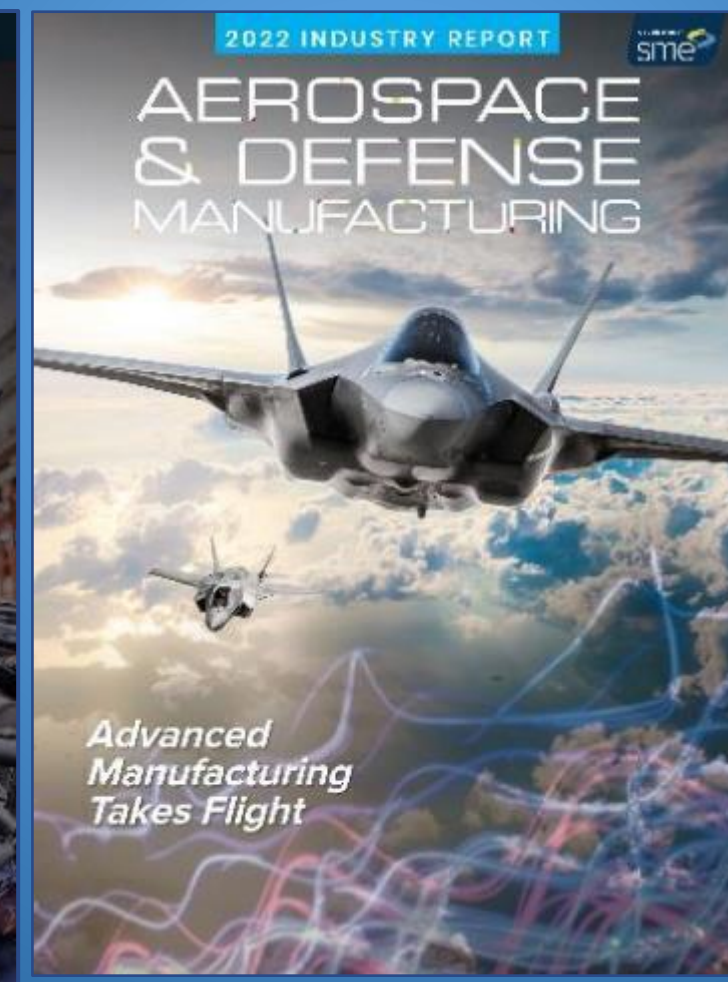
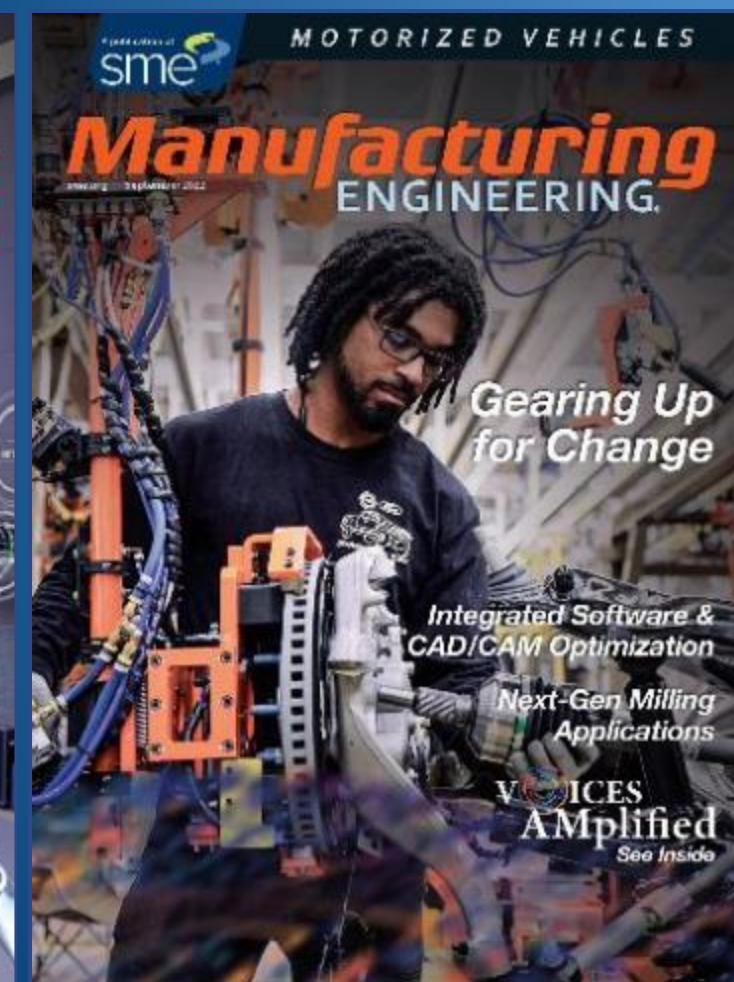
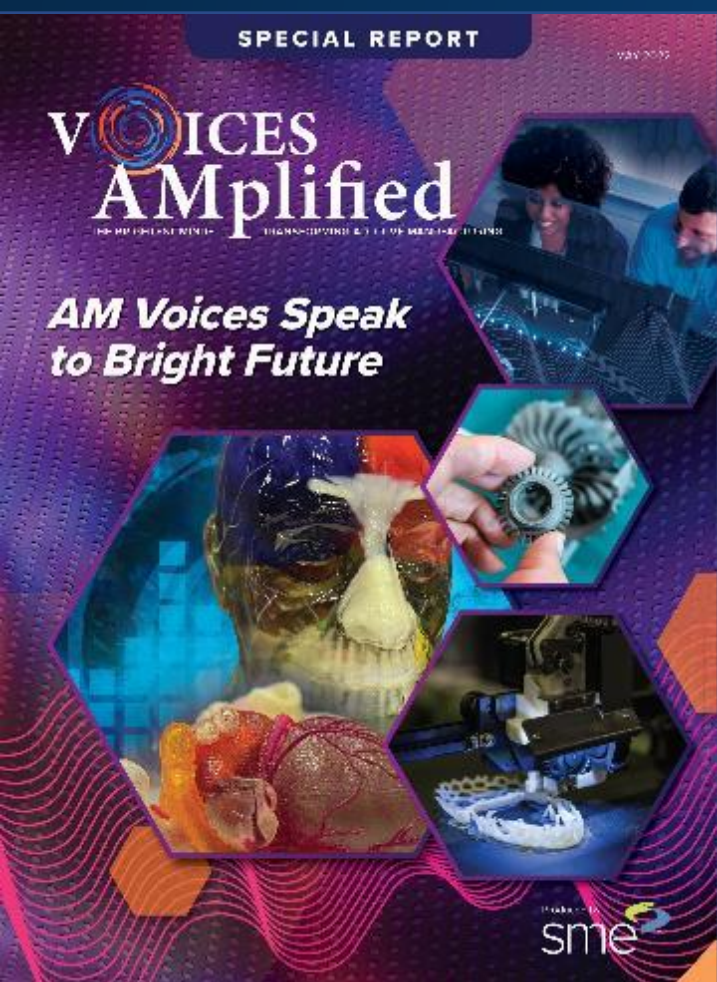
## SME PARTNERSHIPS





# SME Media Driving AM Conversations

SME Media **brings stories of** technology, innovation, adoption, & the individuals propelling **Additive Manufacturing** onward to the forefront of conversation



by Informing an **audience of 1.5 million+ industry professionals** annually via magazines, journals, industry reports, & digital media

# 💡 **Voices AMplified: Shining a Spotlight on the People Accelerating AM Adoption**

- Launched in 2022
- *Your Voice, Your Experience* – Real stories of the people impacting the AM ecosystem
- Over 70+ pieces of AM content created, including articles, webinars, & podcasts



62 Articles  
Published



6 Webinars  
Produced



11 Podcasts  
Posted



# Manufacturing USA & SME's Modern Makers AM-related Collaboration Propelling AM Forward

Partnerships, like the Manufacturing USA Modern Makers program, promote attraction & technological advancement in Additive Manufacturing, including related areas such as Cybersecurity, Smart technologies, materials, and more that impact its use & adoption



**Ashley Totin**

**ASHLEY TOTIN**

ADDITIVE MANUFACTURING FORCE, TV HOST, LEGO ENTHUSIAST



**Kim Lemay**

**KIM LEMAY**

OPERATIONS SPECIALIST, SAFETY GURU, SOCCER MOM



**John Louka**

**JOHN LOUKA**

APPLICATION ENGINEER, PUZZLE SOLVER, TINKERER



**Tymeeka Middleton**

**TYMEEKA MIDDLETON**

BUILDER OF CYBER CAREERS, VETERAN TRANSITIONS, AND DECADENT DESSERTS

Examples of AM-related collaborations include work with America Makes, ARMII BioFab USA, CESMII, CYMANII

# SME Membership Brings Awareness & Attraction to AM

SME Membership brings together a diverse & engaged community that represents all voices in the manufacturing industry, including those focused on additive manufacturing

## **ADDITIVE MANUFACTURING COFFEE CHATS (AMCC)**

- Launched in November 2023, the new series educates & connects individuals interested in the applications, innovations, challenges, & future of additive manufacturing
- AMCC unites enthusiasts, professionals, & curious minds to explore cutting-edge developments & real-world applications of additive manufacturing

## **BRIGHT MINDS COLLEGE EXPERIENCES**

- Providing students with the opportunity to explore additive manufacturing, complemented by a program focused on guiding students toward prospective careers within manufacturing, including additive manufacturing





# SME Events Showcase AM Possibilities

**100,000+**  
TOTAL PARTICIPANTS

**4,000+**  
EXHIBITING COMPANIES

SME produces premier manufacturing events across North America to help companies showcase their capabilities & connect customers to solutions, including additive technologies

- RAPID + TCT is centered around AM innovations, raising awareness, fostering adoption, & offering professional development
- NAMRC includes an AM track, bridging fundamental research to commercial opportunities
- Other SME events also feature AM content, such as FABTECH & AeroDef, both of which showcase AM companies & programming

rapid + tct

houstex

eastec

southtec

westec

AeroDef  
Manufacturing

FABTECH

FABTECH

FABTECH

WMTS  
WESTERN MANUFACTURING  
TECHNOLOGY SHOW

CMTS  
CANADIAN MANUFACTURING  
TECHNOLOGY SHOW

MMTS  
MONTREAL MANUFACTURING  
TECHNOLOGY SHOW

SMART MANUFACTURING  
EXPERIENCE

namrc 51  
North American Manufacturing Research Conference



# RAPID + TCT

## Amplifies the AM Community



Your Event  
Your Community  
Your Platform

*Advancing technology adoption & talent development*

### WHERE THE AM COMMUNITY COMES TOGETHER — YEAR 'ROUND

- 400+ exhibits
- 10,000 attendees
- 100's of new products
- 30+ years of innovation
- 200+ thought leading speakers
- Bright Minds Student Summit
- 365 Day Access: Event Live





# SME Workforce & Tooling U-SME Building Better AM Talent Pipelines

- Through innovative partnerships, Tooling U-SME is providing additive training to thousands of individuals, from high school students to industry-leading company employees
- Curriculum & credentials for Additive Manufacturing, such as the Certified in Additive-Fundamentals & Certified in Additive-Technician
- Half of the Fortune 500 manufacturers already turn to Tooling U-SME for cutting-edge workforce development solutions, including two industry driven additive certifications

**5000+**

Companies  
Engaging

**DOZENS**

of Workforce &  
Community-based  
Organizations



**1000+**

Educational  
Institutions  
Participating



**100+**

Online Additive,  
Smart & Automation  
classes

# SME Education Foundation: Attracts & Develops Future Talent

## SCHOLARSHIPS

- \$18 million since 2005 – attracting & supporting new manufacturing talent

## STUDENT SUMMITS

- 12,000 students impacted
- AM related student engagement, including the Bright Minds Student Summit, Skills USA Additive Manufacturing Competition, & the IMTS SmartForce Student Summit, powered by AMT & SME

## SME PRIME (Partnership Response in Manufacturing Education)

- 100+ High Schools & 8,000+ students impacted annually
- SME PRIME schools with AM pathways receive Tooling U-SME AM & other manufacturing curriculum, which supports earning the industry-recognized Certified in Additive Manufacturing-Fundamentals (CAM-F)
- SME PRIME may also include curriculum developed by Stratasys, which is approved by NOCTI for the NOCTI certification in AM



**70%**

of **PRIME** schools have an Additive Manufacturing curriculum & equipment

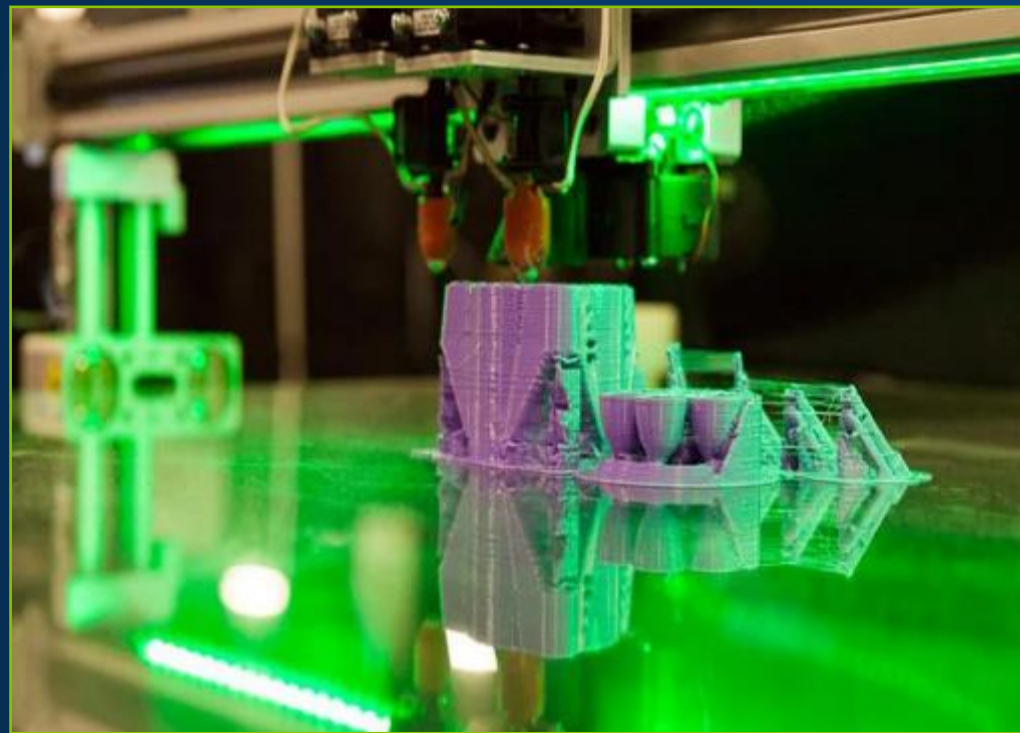
**91%**

of **PRIME** students pursue careers in manufacturing or post-secondary engineering/manufacturing education



# **SME AM Technical Communities Drive Collaboration, Expertise, & Innovation Success**

## **AM Technical Community Leadership Committee**



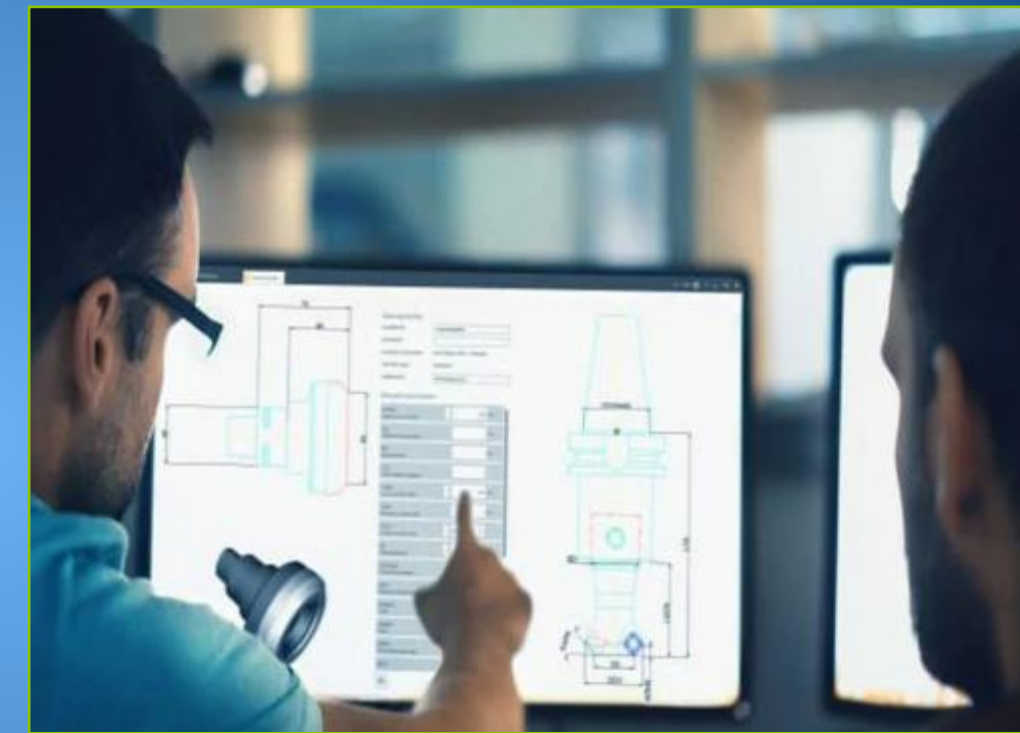
The AM Technical Community Leadership Committee guides SME & the AM Community on materials, processes, workforce, & outreach. Comprising experts from various sectors, it shapes SME's AM activities, fostering industry knowledge & growth

## **Healthcare AM Technical Advisory Team**



This advisory team addresses challenges, supporting medical technology users & enhancing resources. Representing diverse perspectives, including medical device manufacturers, clinicians, & technology providers, they collaborate to improve medical/ biomedical AM applications

## **Direct Digital Manufacturing Advisory Team**



The DDM Advisory Team, comprised of technical experts, collaborates closely with the AM Community. They meet monthly, overseeing the Digital Manufacturing Challenge for high school & university students & managing the Additive Manufacturing Webinar series

## **North American Mfg. Research Institute (NAMRI)**



NAMRI | SME advances manufacturing through research. NAMRI produces the North American Manufacturing Research Conference (NAMRC) which features an AM track that fosters innovation & facilitates knowledge exchange within the additive manufacturing community

# SME Technical Communities Celebrate AM Advancements with Competitions & Awards



## Digital Manufacturing Challenge

*This competition helps inspire the next generation of innovators utilizing AM. Since 2007, various colleges, universities, & high schools have participated in SME's Additive Manufacturing Community's annual Digital Manufacturing Challenge, which is sponsored by the community's Direct Digital Manufacturing Tech Group*



## AM Industry Achievement Award

*This award recognizes an individual, team or company for outstanding accomplishments that have had significant impact within the additive manufacturing industry or in any industry through the application of additive manufacturing technologies*



## Aubin AM Case Study Award

*This award looks to recognize innovative case studies using AM technologies. The purpose of the award is to recognize outstanding use cases of AM adoption and implementation & to provide inspiration to others in their journey of AM application*



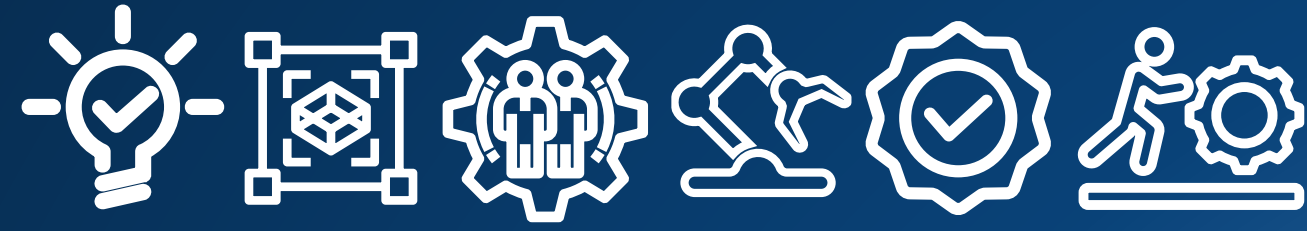
## AM Start-Up Technology Award

*This newly established award recognizes companies that display groundbreaking technologies or applications addressing existing problems or offering unique approaches. The winners will be announced at the next Rapid + TCT event*



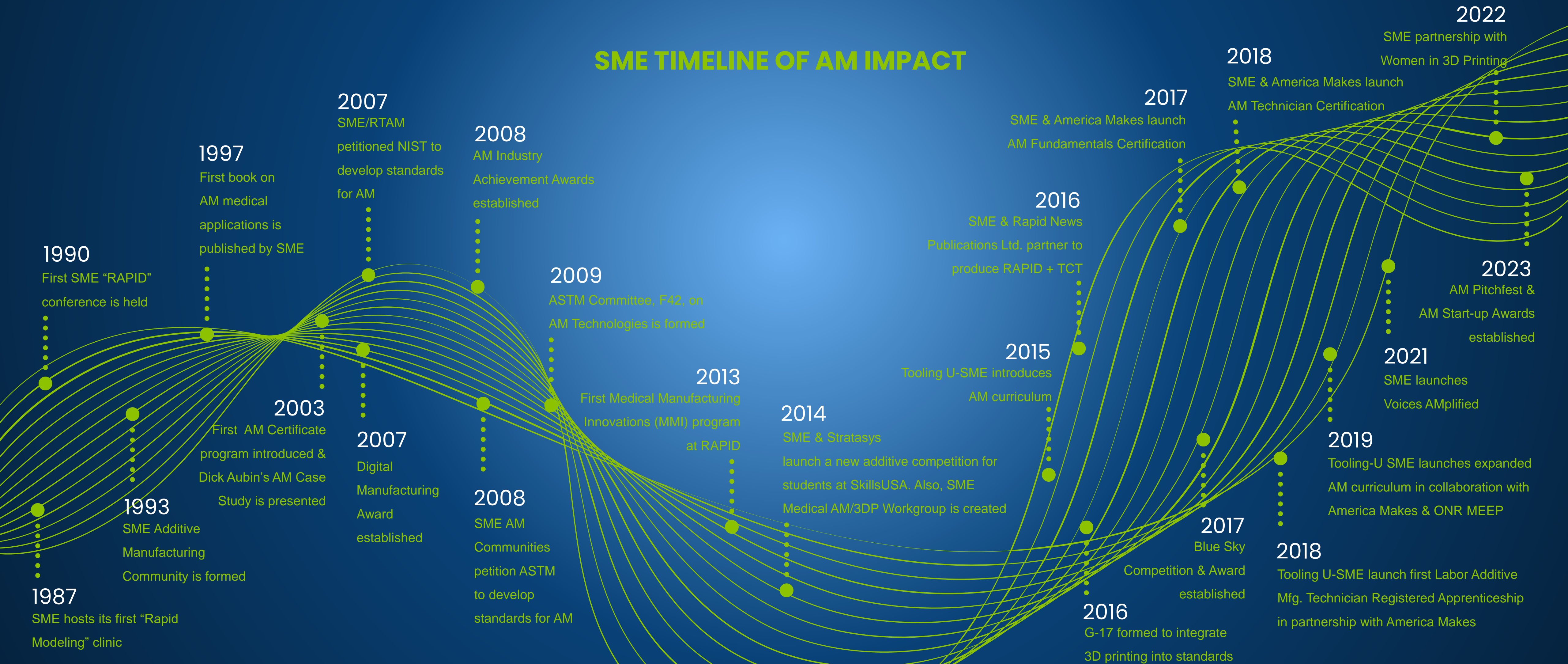
## AM Pitchfest Competition

*This competition provides entrepreneurs, startups, & academic spinoffs with the opportunity to present cutting-edge AM technology & innovation to a panel of industry leaders, media, & the AM community during the Rapid + TCT event*



# SME Has Helped Shape the Future of AM for Over Three Decades

## SME TIMELINE OF AM IMPACT





**THANK YOU!**

**EMPOWERING THE ADDITIVE  
MANUFACTURING COMMUNITY  
FOR OVER 35 YEARS**