



SUPPLY CHAIN TECHNOLOGY

Advanced Manufacturing Tech Emerges as Silver Lining to Supply Chain's COVID-19 Cloud

By Mark Cotteler and John Wilczynski

By the time the World Health Organization declared the COVID-19 outbreak to be an official “global pandemic” in early March 2020, demand for critical goods, including personal protective equipment (PPE), medical devices and diagnostic testing equipment, was already skyrocketing. Consumers ranging from governments to hospital systems and even individual citizens were urgently stockpiling emergency provisions, including unexpectedly scarce commodities like toilet tissue.

At the same time, rolling stay-at-home orders, spiking infection rates and widespread fear left manufacturers, distributors, and retailers significantly understaffed, hampering their ability to keep up with surging demand. As a result, store shelves were laid bare and many frontline and other essential workers were forced to ration the equipment and supplies they needed to carry out their duties without undue risk to their personal health and safety. While struggling to keep their own operations afloat, the enormity of the pandemic crisis inspired a heightened sense of solidarity among stakeholders throughout both local and global supply chains. While the call to duty was clear for many, the means to do so was less apparent. The question we often heard was “What can I do and where do I go to help?”

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In the early days of the pandemic outbreak, America Makes, a public-private partnership and national accelerator for additive manufacturing (aka 3D printing), and Deloitte Consulting LLP (Deloitte) were given the opportunity to answer that question. Recognizing the critical role advanced manufacturing could play in the broader U.S. response to this growing medical and economic crisis, the U.S. Department of Defense (DoD) reached out to America Makes for help in mobilizing the additive manufacturing ecosystem in response to COVID-19.

Clearly, there was no precedent for this effort, so it was up to America Makes, with Deloitte's support, to quickly build a program that could unleash the power of digitally distributed manufacturing and begin delivering results almost immediately, while having the flexibility to adapt with the evolving path of the virus and its impacts. The result of some intense brainstorming was the aptly named “Advanced Manufacturing Crisis Production Response” (AMCPR) initiative.

Lessons Learned

The learnings from efforts like AMCPR are clearly generalizable to the efforts of private sector entities that are interested in managing and promoting digitally distributed manufacturing across their own supply networks. These lessons will not simply contribute just to the health and military security of the United States, but also to the economic security of the companies that call it home.

AMCPR leverages America Makes' well-earned position as a trusted voice to convene, coordinate and catalyze the additive manufacturing community. Deloitte's brings its world-class supply chain, smart factory and digital practices to help shape strategy and the resources to get the job done. Together, the AMCPR team is designing and delivering the business and technical processes that have enabled the AM community to safely create, validate, and distribute designs, models, and other technical data needed to produce additively manufactured products in response to COVID.

To reduce the chance that health and safety and regulatory requirements went unmet and to assure the latest research and technology was applied, America Makes also collaborated closely with the U.S. Veteran's Administration, as the most extensive health system in the

U.S.; the Food and Drug Administration, as an authoritative voice around regulatory requirements; and the National Institutes of Health (NIH), as a leader in cutting edge research. This inter-agency partnership leveraged the technological infrastructure previously offered by the NIH to support the manufacturer submissions of PPE designs and needs community engagement. America Makes also developed and deployed the AMCPR portal on its website to serve as a repository for the initiative's information and resources.

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America Makes reports that 496 manufacturers have engaged with the AMCPR online portal; the AMCPR partnership has reviewed over 700 designs for face shields, masks, and other PPE, including more than 34 reviewed and approved for clinical use. The top 10 designs on the NIH repository have been downloaded more than 80,000 times since the start of the pandemic.

The COVID-19 pandemic has exposed the tradeoffs that organizations, and countries, make when they fail to attend to the need for flexibility *and* agility in their supply chains. The success of the AMCPR initiative demonstrates the power of digitally distributed production to mobilize conventional and unconventional capacity and facilitate the delivery of productive capacity to the point of demand, at the time of need. It has not only shown what is possible when we properly balance all aspects of supply chain performance, but also leaves behind an enduring infrastructure that can house critical designs for innumerable other products or components that might be needed in future crises.

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The AMCPR initiative has now entered “Phase 2” and is currently relying on funding from the DoD, US Department of Commerce (NIST) and the FDA. This phase will see the development of a new centralized digital warehouse to hold additive manufacturing designs and related

technical data for a broad range of components (beyond healthcare) that might conceivably be needed for future crises – be they pandemics, earthquakes, hurricanes, or others that might come along.

In early 2021, the AMCPR team will deploy and test this “Model Repository and Platform,” executing a series of scenarios that will bring together members of the needs, design, regulatory, and supplier communities to exercise the processes that have been developed, assess lessons learned, develop playbooks and refine roadmaps for future development. The ultimate goal is to provide a secure and trusted “digital stockpile” that can sit alongside the physical stockpiles that defend and sustain the United States in times of crisis. In more settled times, the AMCPR will provide critical lessons learned for companies and agencies as they contemplate their own forays into digitally distributed manufacturing.

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America Makes will also continue to play a central role in articulating the value of additive manufacturing in building resiliency and adaptability into our domestic supply chains. Further, additive manufacturing in supply chains allow manufacturing organizations to establish production sites even closer to the point of consumption, in a cost-effective manner. Embracing the concept of distributed capacity, in conjunction with additive manufacturing, will equip countries to most effectively manage regional, national, and global crises of now and the future.

Related Resources:

- [Forbes Article:](https://www.forbes.com/sites/jimvinoski/2020/07/29/the-big-technology-winner-from-the-covid-crisis-is-3-d-printing/?sh=10971b39700f) The Big Technology Winner from the Covid Crisis is 3-D Printing
- [Deloitte Video:](https://www2.deloitte.com/global/en/pages/about-deloitte/articles/covid-19/3d-printing-for-the-frontlines.html) 3D Printing for the frontlines
- [NIH:](https://3dprint.nih.gov/collections/covid-19-response) 3D Print Exchange – Open Source 3D Print Designs
- [Article:](https://static.asminternational.org/amp/202007/22/) Using Digitally Distributed Manufacturing to Address Critical Needs
- [BBC.COM:](https://www.bbc.com/news/technology-51911070) 3D Printers Save Hospital with Valves



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Mark Cotteleer is Managing Director, Supply Chain and Operations Consulting at Deloitte Consulting. Prior to joining Deloitte, Mark was an Associate Professor of Management at Marquette University and a Visiting Associate Professor of Operations Management at the University of Chicago, Booth School of Business. He twice received the “Educator of the Year” award for his work at Marquette University’s Executive MBA program; in 2012, he was honored with the John P. Raynor Award for Teaching Excellence; and was a postdoctoral research fellow at Harvard Business School.



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John Wilczynski is Executive Director of America Makes, part of the National Center for Defense Manufacturing & Machining (NCDMM), which assists in the ongoing identification and implementation of, and transition to, state-of-the-art manufacturing and technology solutions by current and future, U.S.-based producers of Department of Defense (DoD) systems. Prior to this role, John was Technology Director responsible for the facilitation of the National Additive Manufacturing / 3D Printing Roadmap, the development of an Intellectual Property (IP) Management Plan, the execution of the Project Call Process for Agency-Driven and Cooperative Agreement Driven project solicitations, and program management of the America Makes project portfolio. John graduated from Pennsylvania State University with a bachelor's degree in Mechanical Engineering Technology.



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