

# The Mask Challenge: Lessons from the Pandemic's PPE Shortage

**Date :** April 27, 2020

Throughout this global COVID-19 pandemic, we have all been introduced to a new acronym: PPE or personal protective equipment. Hospitals and health care centers have struggled over the past few months to keep pace with the surge in demand for PPE. The World Health Organization has said, “shortages are leaving doctors, nurses and other frontline workers dangerously ill-equipped to care for COVID-19 patients, due to limited access to supplies such as gloves, medical masks, respirators, goggles, face shields, gowns, and aprons.”

While we’ve seen businesses and individuals rise up to address this problem, stitching masks at basement sewing machines and using manufacturing equipment typically earmarked for entirely different products to produce PPE for the market, the PPE shortage has led to lots of business questions. How did we fall so short, especially in the U.S.? And how can we better prepare for PPE demands in the future?

PPE has been a hot topic of discussion during Wharton Global Youth’s [Comment and Win contest](#) for high school students. Round 2 runner-up Abby C. [responded](#) to commenter Lucy C. with this perspective: “While I agree with your main point that the U.S. needs to have enough masks for all Americans in case of another event like COVID-19, I do not agree that the U.S. becoming “more self-sustainable” for masks is the solution. The cost of producing our own masks in the U.S. is far more expensive than the cost of importing masks. Compared to “supplier countries,” the U.S. simply does not have competitive manpower, number of factories, or cheap resources. Instead, I propose that the U.S. should invest in more masks from diverse sources to create a readily available surplus for Americans when another global pandemic hits.”

“If you are interested in learning more about 3D printing and/or joining a PPE manufacturing initiative, the barrier to entry is fairly low.” — Taylor Caputo, Wharton Lecturer

The Wharton and University of Pennsylvania community can help us understand some of the lessons that have emerged about PPE during the COVID-19 crisis. Michael Ferrari, a senior fellow at Wharton, and Raghu Iyengar, a professor of marketing at Wharton and faculty director of Wharton Customer Analytics, put it like this in an opinion piece for Knowledge@Wharton: “The current crisis...provides an opportunity to learn how best we can prepare ourselves for the next time such a global event occurs.”

**Global supply chain management.** Serguei Netessine, the Dhirubhai Ambani professor of entrepreneurship and [innovation](#) at the Wharton School and vice dean for Global Initiatives, regularly researches global supply chain management, which involves the business of moving goods from their point of origin to their destination anywhere on earth. He has extended his analysis of late to the PPE shortage. At the end of March, Netessine reached out to the New York branch of China Merchants Bank, a company that works regularly with the University of Pennsylvania, to ask for PPE. Within hours, the bank delivered 6,000 masks and 100 goggles to the U Penn Health System.

“I don’t think there was a global shortage of PPE,” said Netessine during an [airing of Wharton Business Daily](#) on SiriusXM. “Most of it is manufactured in China and in China there is a pretty significant stockpile. There was more of a failure of organizing an efficient way to transport all of this equipment in advance to the U.S. Going forward, we need to think about stockpiling a significant amount of this kind of equipment for future pandemics in the United States. During this pandemic, governments are very quick to shut down the borders, which makes it very hard to do anything related to global commerce, which would otherwise allow us to just transport next-day material from other countries. Stockpiling is the answer, and another answer might be developing some of our own products and capabilities.”

**3D Innovation.** During his radio interview, Netessine championed the “interesting innovations” that have emerged during the coronavirus pandemic. He pointed out that 3D printing — where designs are created using specialized computer software and sent to a high-tech printer, but instead of printing in ink, they print in plastic (and sometimes in metal) — is an “important piece to responding quickly to whatever comes, a pandemic or something else.”

Taylor Caputo, a lecturer at Wharton and the Integrated Product Design Program at U Penn’s School of Engineering and Applied Sciences and a specialist in fine arts and product design, has worked in 3D printing for about 10 years. During the COVID-19 crisis, Caputo has been using her 3D expertise to manufacture face shields for the Penn medical community. “The 3D Printing community at Penn is made up of faculty, students, and staff from around the university who utilize the technology for all types of applications,” explains Caputo, who is also a program leader for the [Wharton Global Youth Summer Programs](#). “We are always in communication and collaborating with each other, so we immediately pulled together our resources when Penn Health-Tech created an initiative to manufacture face shields using 3D printing and laser cutting.” In the past few months, Caputo and her 3D-printing team have delivered more than 7,000 face shields to the Hospital of the University of Pennsylvania, Penn Presbyterian Hospital and other health facilities.

Caputo stresses that this kind of on-demand 3-D printing is part of a broader trend known as decentralized manufacturing, or making products in multiple places and distributing them broadly. “3D printers are more accessible and affordable than ever, but it’s important to see the technology as more than a novelty or a hobby,” says Caputo. “The power of this decentralization is personified by this initiative here at Penn and similar ones around the world. One of my printers I purchased on Amazon for about \$200, so if you are interested in learning more about 3D printing and/or joining a PPE manufacturing initiative, the barrier to entry is fairly low. There are groups all around the world printing PPE that you can connect with online via Reddit and 3D printing forums.” Caputo adds: “It’s been extremely rewarding and comforting to do my part through creating PPE for my local community.”

**Managing risk.** Globalization can bring numerous benefits, but these come with risks, note Ferrari and Iyengar in their K@W piece (*see related links with this article*). They consider other technologies as critical ways to be better prepared for the next pandemic. “The tools and techniques...of decision sciences and analytics can have enormous impact,” they write. “Making use of blockchain and location intelligence technologies will allow managers to better identify risk and respond early when a pending supply disruption arises.” In basic terms, they explain that these high-tech solutions will help businesses know where goods and raw materials are and quickly respond to ensure that the right materials arrive at the right places.