

12 September 2016

Dr. Sridhar Kota's testimony

Chairman Burgess, Ranking Member Schakowsky, distinguished Subcommittee Members—thank you for the opportunity to appear before you today to discuss issues of critical importance to American economic competitiveness: robotics, artificial intelligence, and manufacturing.

My name is Sridhar Kota, and I serve as the Herrick Professor of Engineering at the University of Michigan. I also serve as the director of a new think tank called MForesight: The Alliance for Manufacturing Foresight. MForesight works to bring together government, industry, and research institutions to scan the horizon for emerging trends and promising opportunities for American manufacturing. We help to build public-private partnerships related to manufacturing innovation, we respond to long-range technical questions from government and industry, and we work to identify best practices for training the next generation workforce. Our ultimate aim is to enable the US to gain a long-term edge in economic competitiveness by strengthening domestic manufacturing.

Thirty years ago, when I was a graduate student in mechanical engineering, robotics was already a topic on everyone's mind. But, back then, the dominant vision of robotics was of machines replacing human labor— taking over manufacturing tasks like welding and painting. Today, researchers and firms tend to think of robots in a different light: as collaborative tools to enhance the productivity of factory workers, as means to assist soldiers on dangerous missions, as co-drivers to enhance automobile safety and efficiency, and as co-inspectors to enable continuous monitoring and maintenance of high value assets such as bridges and wind turbines. As artificial intelligence matures, there's promise that intelligent machines can augment certain types of human decision-making in fields ranging from medicine to manufacturing.

In short, robotics is now about augmenting and improving human work rather than replacing it.

While robotics and AI innovations hold incredible promise, it's an open question whether the resulting technology products will be *manufactured* in the United States. Despite federal annual investment of over \$140 billion in S&T, America's trade deficits in advanced technology products moved from a surplus in 2001 to a deficit of approximately \$90 billion in 2015.

To strengthen America's competitiveness in the age of advanced robotics and AI, we need to build the knowledge, skills, and infrastructure to anchor production here.

Put concisely, we need to be thinking about *translational research* and *workforce training*.

I'd first like to discuss translational research: how government and industry can ensure that existing investments in basic research turn into useful new products—including robots and AI technologies—that create wealth for Americans and advance our national interests.

What I believe we need right now is a whole-of-government approach that leverages the strengths and missions of different federal science and technology agencies to help ensure that we can *translate* promising discoveries and inventions into successful manufactured products. This need not be costly. A “National Innovation Foundation” could be created by consolidating relevant offices at 12 or more existing agencies. Such an entity could be tasked with identifying the most promising basic research being undertaken across the government and building public-private partnerships to invest in transforming that research into new American-made products. The idea would be to maximize the return on taxpayer’s investments in R&D.

The second policy matter I would like to discuss is education and workforce training: how federal, state, and local governments—working with the employers—can ensure that Americans have the requisite knowledge and skills to build great products in the age of advanced robotics and AI.

In spite of our manufacturing losses in recent decades, there are now large numbers of open positions in manufacturing: as of April, there were about 415,000 unfilled manufacturing jobs in the United States according to SME. I believe the biggest long-term risk to U.S. manufacturing isn’t foreign competition. It’s too little awareness and interest in manufacturing careers, starting at an early age.

While high schools commonly require students to dissect a frog, few require students to disassemble a power tool—let alone a robot. This needs to change. Through programs like FIRST Robotics—an innovative program that challenges students to work together to build game-playing robots in an atmosphere of professionalism—we can give K-12 students meaningful first-hand experience in advanced manufacturing. By integrating such programming into curricula, enabling students to visit factories and meet workers, and restoring shop-class programming geared toward STEM learning and practical problem-solving, we can lay the foundation for an advanced manufacturing economy.

There’s naturally uncertainty around the implications of robotics and AI. But it’s up to us to ensure that their development is managed responsibly. Through smart research investments and sustained focus on education and training, we can help ensure that these innovations truly improve American lives and livelihoods.