



# **Making Value: Integrating Manufacturing, Design, and Innovation to Thrive in the Changing Global Economy**

*Kate S. Whitefoot, Steve Olson, National Academy of Engineering*

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Manufacturing is in a period of dramatic transformation. But in the United States, public and political dialogue is simplistically focused almost entirely on the movement of certain manufacturing jobs overseas to low-wage countries. The true picture is much more complicated, and also more positive, than this dialogue implies.

After years of despair, many observers of US manufacturing are now more optimistic. A recent uptick in manufacturing employment and output in the United States is one factor they cite, but the main reasons for optimism are much more fundamental. Manufacturing is changing in ways that may favor American ingenuity. Rapidly advancing technologies in areas such as biomanufacturing, robotics, smart sensors, cloud-based computing, and nanotechnology have transformed not only the factory floor but also the way products are invented and designed, putting a premium on continual innovation and highly skilled workers. A shift in manufacturing toward smaller runs and custom-designed products is favoring agile and adaptable workplaces, business models, and employees, all of which have become a specialty in the United States. Future manufacturing will involve a global supply web, but the United States has a potentially great advantage because of our tight connections among innovations, design, and manufacturing and also our ability to integrate products and services.

The National Academy of Engineering has been concerned about the issues surrounding manufacturing and is excited by the prospect of dramatic change. On June 11-12, 2012, it hosted a workshop in Washington, DC, to discuss the new world of manufacturing and how to position the United States to thrive in this world. The workshop steering committee focused on two particular goals. First, presenters and participants were to examine not just manufacturing but the broad array of activities that are inherently associated with manufacturing, including innovation and design. Second, the committee wanted to focus not just on making things but on making value, since value is the quality that will underlie high-paying jobs in America's future. *Making Value: Integrating Manufacturing, Design, and Innovation to Thrive in the Changing Global Economy* summarizes the workshop and the topics discussed by participants.

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