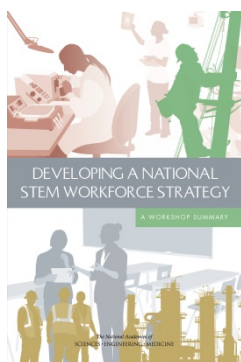


The Fourth Industrial Revolution

OCTOBER 25-26, 2016 | National Academy of Sciences Building, Washington, DC 20418

GOVERNMENT-UNIVERSITY-INDUSTRY RESEARCH ROUNDTABLE POLICY AND GLOBAL AFFAIRS

List of selected reports from the National Academies related to the meeting topic

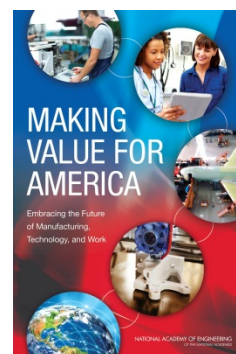


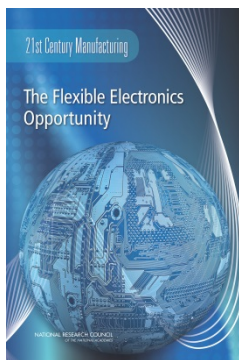
Developing a National STEM Workforce Strategy (PGA, 2016)

The future competitiveness of the United States in an increasingly interconnected global economy depends on the nation fostering a workforce with strong capabilities and skills in science, technology, engineering, and mathematics (STEM). STEM knowledge and skills enable both individual opportunity and national competitiveness, and the nation needs to develop ways of ensuring access to high-quality education and training experiences for all students at all levels and for all workers at all career stages. The National Science Foundation (NSF) holds a primary responsibility for overseeing the federal government's efforts to foster the creation of a STEM-capable workforce. As part of its efforts in this endeavor, NSF's Directorate on Education and Human Resources asked the National Academies of Sciences, Engineering, and Medicine to convene a workshop that would contribute to NSF's preparation of a theoretical and evidence-based STEM Workforce Development R&D Core Framework. Participants discussed research themes, identified gaps and emerging research opportunities, and recommended refinements in the goals of the framework. This report summarizes the presentations and discussions from the workshop.

Making Value for America: Embracing the Future of Manufacturing, Technology, and Work (NAE, 2015)

Globalization, developments in technology, and new business models are transforming the way products and services are conceived, designed, made, and distributed in the U.S. and around the world. These forces present challenges - lower wages and fewer jobs for a growing fraction of middle-class workers - as well as opportunities for "makers" and aspiring entrepreneurs to create entirely new types of businesses and jobs. *Making Value for America* examines these challenges and opportunities and offers recommendations for collaborative actions between government, industry, and education institutions to help ensure that the U.S. thrives amid global economic changes and remains a leading environment for innovation. Filled with real-life examples, *Making Value for America* presents a roadmap to enhance the nation's capacity to pursue opportunities and adapt to transforming value chains by widespread adoption of best practices, a well-prepared and innovative workforce, local innovation networks to support startups and new products, improved flow of capital investments, and infrastructure upgrades.



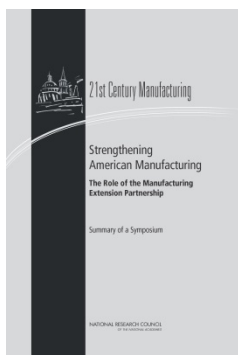
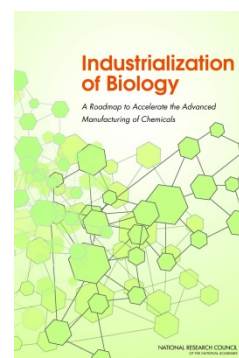


The Flexible Electronics Opportunity (PGA, 2015)

Flexible electronics describes circuits that can bend and stretch, enabling significant versatility in applications and the prospect of low-cost manufacturing processes. They represent an important technological advance, in terms of their performance characteristics and potential range of applications, ranging from medical care, packaging, lighting and signage, consumer electronics and alternative energy (especially solar energy.) What these technologies have in common is a dependence on efficient manufacturing that currently requires improved technology, processes, tooling, and materials, as well as ongoing research. Seeking to capture the global market opportunity in flexible electronics, major U.S. competitors have initiated dedicated programs that are large in scope and supported with significant government funding to develop and acquire these new technologies, refine them, and ultimately manufacture them within their national borders. These national and regional investments are significantly larger than U.S. investment and more weighted toward later stage applied research and development. *The Flexible Electronics Opportunity* examines and compares selected innovation programs both foreign and domestic, and their potential to advance the production of flexible electronics technology in the United States. This report reviews the goals, concept, structure, operation, funding levels, and evaluation of foreign programs similar to major U.S. programs, e.g., innovation awards, S&T parks, and consortia. The report describes the transition of flexible electronics research into products and to makes recommendations to improve and to develop U.S. programs. *The Flexible Electronics Opportunity* makes recommendations for collaboration among industry, universities, and government to achieve the critical levels of investment and the acceleration of new technology development that are needed to catalyze a vibrant flexible electronics industry.

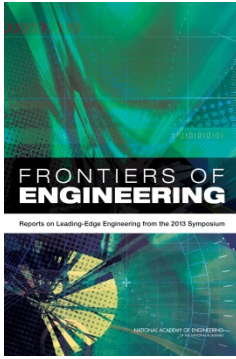
The Industrialization of Biology: A Roadmap to Accelerate the Advanced Manufacturing of Chemicals (DELS, 2015)

The tremendous progress in biology over the last half century - from Watson and Crick's elucidation of the structure of DNA to today's astonishing, rapid progress in the field of synthetic biology - has positioned us for significant innovation in chemical production. New bio-based chemicals, improved public health through improved drugs and diagnostics, and biofuels that reduce our dependency on oil are all results of research and innovation in the biological sciences. In the past decade, we have witnessed major advances made possible by biotechnology in areas such as rapid, low-cost DNA sequencing, metabolic engineering, and high-throughput screening. The manufacturing of chemicals using biological synthesis and engineering could expand even faster. A proactive strategy - implemented through the development of a technical roadmap similar to those that enabled sustained growth in the semiconductor industry and our explorations of space - is needed if we are to realize the widespread benefits of accelerating the industrialization of biology. *Industrialization of Biology* presents such a roadmap to achieve key technical milestones for chemical manufacturing through biological routes. This report examines the technical, economic, and societal factors that limit the adoption of bioprocessing in the chemical industry today and which, if surmounted, would markedly accelerate the advanced manufacturing of chemicals via industrial biotechnology.



Strengthening American Manufacturing: The Role of the Manufacturing Extension Partnership: Summary of a Symposium (PGA, 2013)

The Manufacturing Extension Partnership (MEP)--a program of the U.S. Department of Commerce's National Institute of Standards and Technology (NIST)--has sought for more than two decades to strengthen American manufacturing. It is a national network of affiliated manufacturing extension centers and field offices located throughout all fifty states and Puerto Rico. Qualified MEP Centers work directly with small and medium manufacturing firms in their state or sub-state region, providing expertise, services and assistance directed to foster growth, improve supply chain positioning, leverage emerging technologies, upgrade manufacturing processes, develop work force training, and apply and implement new information. *Strengthening American Manufacturing: The Role of the Manufacturing Extension Partnership* is the summary of a symposium convened to review current operations and some of the recent MEP initiatives in the broader context of global manufacturing trends and the opportunities for high-value manufacturing companies. Business leaders, academic experts, and state and federal officials addressed the metrics and impacts of MEP and identified potential areas of improvement. The meeting drew attention to the scale and focuses of MEP, and highlighted the role it plays in supporting and enabling U.S. manufacturers to compete more effectively in the global marketplace. This report includes an overview of key issues raised at this workshop and a detailed summary of the conference presentations.



Frontiers of Engineering: Reports on Leading-Edge Engineering from the 2013 Symposium (NAE, 2014)

This volume presents papers on the topics covered at the National Academy of Engineering's 2013 US Frontiers of Engineering Symposium. Every year the symposium brings together 100 outstanding young leaders in engineering to share their cutting-edge research and innovations in selected areas. The 2013 symposium was held September 19-21 and was hosted by DuPont in Wilmington, Delaware. The topics covered at the 2013 symposium were: designing and analyzing societal networks; cognitive manufacturing; energy; reducing our dependence on fossil fuels; and flexible electronics. The intent of this book is to convey the excitement of this unique meeting and to highlight innovative developments in engineering research and technical work.

About the Government-University-Industry Research Roundtable (GUIRR)

GUIRR's mission is to convene senior-most representatives from government, universities, and industry to define and explore critical issues related to the national and global science and technology agenda that are of shared interest; to frame the next critical question stemming from current debate and analysis; and to incubate activities of on-going value to the stakeholders. The forum is designed to facilitate candid dialogue among participants, to foster self-implementing activities, and, where appropriate, to carry awareness of consequences to the wider public.



For more information about GUIRR, visit our web site at www.nas.edu/guiirr
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