



Memos to the
PRESIDENT

Advanced
Manufacturing

Special Competitive Studies Project



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Subject: Revitalizing U.S. Advanced Manufacturing Capabilities

Purpose: Outline a strategy to reestablish U.S. leadership in advanced manufacturing through targeted technology development, organizational reforms, and national policy interventions.

Objectives:

1. *Drive* AI-Enabled Innovation in Advanced Manufacturing
2. *Reorganize* and Scale the Manufacturing Policy Ecosystem
3. *Forge* National Policies to Drive Technology Adoption

Background

China's most significant advantage over the United States is its position as the world's sole manufacturing superpower. By 2030, China's share of global manufacturing output is projected to rise to 45 percent, while America's share will decline to just 11 percent.¹ This shift resulted from China's aggressive combination of industrial policies and brute force economic tactics to dominate key sectors like 5G components, critical mineral processing, and shipbuilding. Beijing has made manufacturing central to its strategy, launching multiple plans and initiatives while using subsidized exports and other unfair trade practices to dominate markets and build economic leverage over other nations. This manufacturing strategy now poses both economic and strategic challenges. China has created industrial dependencies it wields to threaten and coerce other nations while building production capacity that could enable it to prevail over the United States and its allies in a protracted conflict.

The application of AI and other emerging technologies to the manufacturing sector has created an opportunity for the United States to chip away at China's manufacturing advantage. This new

¹ [The Future of Industrialization: Building Future-Ready Industries to Turn Challenges into Sustainable Solutions](#), United Nations Industrial Development Organization at 17 (2024).

battleground, often referred to as advanced manufacturing, is defined by three major trends. First, manufacturing is becoming increasingly software-defined. Factories are becoming connected and software-driven, using digital tools and sensors to make production more efficient and flexible. Second, the rise of industrial AI and general purpose robotics marks a leap forward in manufacturing automation, with systems that can learn new tasks, work alongside humans, and adapt to different processes with minimal reprogramming. Finally, process innovation—new ways to model, mold, and shape material—allows manufacturers to reimagine entire production workflows using advanced simulation tools and flexible systems that can quickly switch between products.

Recommendations

Objective 1: Drive AI-Enabled Innovation in Advanced Manufacturing

- **Build Factories of the Future.** A small number of cutting-edge facilities operated by large manufacturers and startups already demonstrate the power of software-defined, highly autonomous, and flexible factories. The United States needs to dramatically scale up this capability to compete with China's manufacturing dominance. To achieve this goal, the National Institute of Standards and Technology (NIST) should oversee an incentive program—similar to CHIPS Act incentives—supporting construction, retrofitting, and equipment purchases, while in parallel tax credits could be offered to incentive construction.
- **Scale the Materials Genome Initiative (MGI).** Launched in 2011 as a moonshot program to provide infrastructure for advanced materials innovation, the MGI stands at a critical juncture as rapid AI developments accelerate materials science. Advances in AI and robotics are unlocking automated materials synthesis and testing processes in the form of self-driving labs. The next step is to create an advantage for U.S. companies by bolstering MGI's collaboration with industry, accelerating the transition of newly discovered materials towards commercialization.
- **Increase Manufacturing-Related R&D Funding.** While manufacturing R&D receives \$200 billion in public funding annually, manufacturing makes up a tiny portion of the United States' portfolio.² The United States spends about 10 times less than Germany, Japan, and South Korea on manufacturing-related R&D as a percentage of

² Sridhar Kota & Tom Mahoney, [Manufacturing Prosperity: A Bold Strategy for National Wealth and Security](#), MForesight (2018).

GDP.³ To address this gap, the United States should increase its federal R&D budget allocation to manufacturing-related research.

Objective 2: Reorganize and Scale the Manufacturing Policy Ecosystem

- **Create an Assistant Secretary of Commerce for Manufacturing and Industrial Strategy.** Today, key manufacturing and supply chain-related offices are scattered across the Department of Commerce. The new position of Assistant Secretary of Commerce for Manufacturing and Industrial Strategy would reduce redundancy by uniting three critical offices—NIST’s Office of Advanced Manufacturing, the Manufacturing Extension Partnership program at NIST, and the International Trade Administration’s Supply Chain Office—under one authority to boost resilience and accelerate the adoption of advanced manufacturing technologies. By consolidating these currently scattered offices under a single Assistant Secretary, the Department could help modernize U.S. manufacturing capabilities, strengthen domestic supply chains, and incorporate AI and automation.
- **Upgrade the Manufacturing USA Program.** The Manufacturing USA program is a network of 17 public-private partnership institutes focused on advancing production of critical technologies like robotics, biomanufacturing, and microelectronics, but the program currently suffers from severe funding and structural limitations. To unlock the program's full potential, the United States should eliminate restrictive five-year term limits for institutes, encourage institutes to network and develop integrated technology packages, and increase federal base funding by \$500 million annually.⁴ By adopting these strategies, the program can help companies adopt cutting-edge technologies and create a robust ecosystem for manufacturing innovation.
- **Retool the Manufacturing Extension Partnership (MEP) Program to Accelerate Technology Adoption.** Currently operating in all 50 states through a NIST-led public-private partnership, the MEP program has seen its budget shrink by 13 percent in real terms since 1998 and remains focused on outdated goals.⁵ To address this challenge, the United States should transform MEP into a dynamic program that helps small and medium-sized manufacturers to rapidly integrate cutting-edge digital and advanced manufacturing technologies. By updating the program's mission, funding approach, and performance metrics, as well as strategically aligning MEP centers with

³ Based on most recent available estimates. [National Action Plan for United States Leadership in Advanced Manufacturing](#), Special Competitive Studies Project at 22-23 (2024).

⁴ William B. Bonvillian, [Ensuring Manufacturing USA Reaches Its Potential](#), Federation of American Scientists (2021).

⁵ [National Action Plan for United States Leadership in Advanced Manufacturing](#), Special Competitive Studies Project at 25 (2024).

regional innovation ecosystems, the initiative can become a critical catalyst for technological advancement in American manufacturing.

Objective 3: Forge National Policies to Drive Technology Adoption

- **Create New Financing Mechanisms for Advanced Manufacturing.** The United States needs a comprehensive financing strategy to help innovative manufacturers scale up their production domestically. Despite increased public funding and emerging private-sector investments in manufacturing, companies still struggle to secure adequate growth capital. To address this challenge, the United States should establish public-private scale-up vehicles that are capable of providing capital-intensive industrial enterprises operating in the United States with sustainable sources of growth capital.⁶ This multi-pronged approach would provide the longer-term, larger-scale capital that manufacturing companies need, help them compete with foreign incentives, and ultimately strengthen domestic production capacity while ensuring critical manufacturing capabilities remain in the United States.
- **Establish Testbeds for AI Agents to Defend Manufacturing Systems.** The National Security Commission on Artificial Intelligence highlighted that advanced forms of AI will be used to launch cyberattacks, creating a need for “instrumented and realistic” evaluations for cyber defense agents that can withstand adversarial attacks.⁷ To achieve this objective, key actions should include modernizing and scaling testbeds for industrial control systems and Industrial Internet of Things (IIoT) through NIST. Creating Autonomous Cyber Operations gyms can accelerate AI training and defense against adversarial systems.
- **Launch a Package to Help Small- and Medium-Sized Manufacturers (SMMs) Adopt Technology.** Despite representing 98 percent of U.S. manufacturers—numbering approximately 300,000 firms—SMMs lag behind in adopting advanced manufacturing technology.⁸ To help these companies escape "pilot purgatory" and modernize their operations, the United States must improve SMMs' access to capital through a comprehensive approach combining existing financing programs—such as the SBA's 7(a) Loan program and the State Small Business Credit Initiative—with new tax policies. This could also include an investment tax credit on qualifying capital expenditures and permanent restoration of first-year expensing on equipment and software to accelerate technology adoption and increase U.S. manufacturing competitiveness.

⁶ Previous legislation has been introduced in the U.S. Congress that would create such vehicles. See, for example, S.2662, [Industrial Finance Corporation Act](#) (2021); S. 3483, [Scale-Up Manufacturing Investment Company Act of 2020](#) (2020).

⁷ [Final Report](#), National Security Commission on Artificial Intelligence at 51 (2021).

⁸ Elisabeth Reynolds, et al., [Digital Technology and Supply Chain Resilience: A Call to Action to Accelerate U.S. Manufacturing Competitiveness](#), Massachusetts Business Roundtable & Manufacturing @ MIT at 2 (2023).

Conclusion

While China's manufacturing dominance presents serious economic and national security challenges, emerging technologies like industrial AI and advanced robotics offer a unique opportunity to revitalize American industrial leadership. The new administration must make advanced manufacturing a national priority. The recommendations outlined in this memo—from building next-generation factories and strengthening R&D investments to reorganizing our manufacturing policy infrastructure and creating new financing mechanisms—form a comprehensive strategy to seize this opportunity. By acting decisively to implement these reforms, the United States can rebuild its manufacturing capabilities, secure critical supply chains, and ensure that the factories of the future are built on American soil.