

CHALLENGES AND SOLUTIONS FOR THE NEXT PRESIDENT AND CONGRESS

COMPETING TO WIN

RESEARCH, INNOVATION AND TECHNOLOGY **IN FOCUS**

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Introduction

Manufacturers are leading a global technology revolution. From smart factories to connected cars, our industry is on the leading edge of innovation. Technology is now infused throughout our products and our shop floors. Manufacturers have made investments in hardware and software because they know this is what it takes to compete. They know that if the right decisions are not made to advance their technology leadership, they will not survive. This strategic foresight has resulted in unprecedented growth—and potential—for all segments of the manufacturing economy.

Innovation in manufacturing is not a new trend. For decades, the technological advancements made by manufacturers have improved the quality of life of their employees and their customers.

We are standing on the cusp of a new frontier. The technologies embraced by manufacturers in the 21st century are disrupting business models and customer relationships. This disruption is forcing change while also creating significant opportunities. While disruptive, many of these technologies, such as autonomous vehicles, have yet to be widely deployed. Policymakers in Washington now must decide on the role they are going to play in this innovation revolution: enabler or spoiler.

The National Association of Manufacturers (NAM) strongly supports a clear and effective federal partnership to further enable and drive technology adoption across the manufacturing sector. Policies that restrict the proliferation of innovation, such as unnecessary or ill-advised regulatory actions or a failure to vigorously protect valuable intellectual property (IP) rights, will negatively impact the ability of manufacturers to grow. Coordination on research, innovation and technology policy will only benefit the entire private and public sectors.

If policymakers and businesses get it right, linking the physical and digital worlds could generate up to \$11.1 trillion a year in economic value by 2025.
– McKinsey & Company

Three Big Trends Shaping, Changing or Challenging the Innovation Engine

Trend 1: Innovation Creates Convergence of Different Industry Sectors

Gone are the days when a company can be branded as belonging to just one industry segment. Heavy equipment manufacturers are writing software code to move earth and rock. Vehicle manufacturers are developing groundbreaking safety measures not just with new high-tech tires but with new telematics. These and other industries are no longer constrained by the labels of a single sector. Manufacturers are technology leaders. Software developers are manufacturers. Any policy decisions made moving forward must account for this convergence among all sectors.

Trend 2: Manufacturing Is a Data-Driven Industry

The infinite amount of information being created by our products and processes has become the new currency in manufacturing. If a company can effectively use and leverage data to better serve their customers and employees, they will quickly become market leaders. Manufacturers are now leveraging the cloud, writing software code and managing elaborate digital strategies to grow their businesses.

Trend 3: Innovation Is Creating Disruption

Disruption is a term used quite extensively in the technology sector. The on-demand gig economy has upended traditional business models that have existed for generations. Manufacturers are now being disrupted as innovators in our sector leverage technology in different ways. Just like in the technology sector, this disruption has been an added benefit for manufacturing because it is creating new business models, opening new markets outside the United States, revamping the supply chain dynamic, transforming our workforce and creating new challenges for managing IP. Manufacturers have embraced and driven change throughout their existence and continue to do so today.

DISRUPTIVE TECHNOLOGIES ARE **TRANSFORMING** MANUFACTURING

Manufacturers are exploring a wide variety of disruptive technologies. These include additive manufacturing, the cloud, drones, advanced materials and, of course, internet-connected products and processes also known as the Internet of Things (IoT). The NAM asked our members what impact these new technologies were having on their business. We found out that technology-driven disruption in the manufacturing sector is having a positive impact on our business and our products.

SHOP FLOOR EFFICIENCY



67%

of manufacturers are making investments in disruptive technologies to drive efficiencies in production.

PRODUCTS



61%

of manufacturers are investing in disruptive technologies to differentiate products/service offerings.

CHALLENGES THAT LIMIT INVESTMENT IN DISRUPTIVE TECHNOLOGIES:

SKILLS



Almost 40% of manufacturers cite a skills mismatch.

UNNECESSARY REGULATION



30% cite current or proposed government regulations.

TIME TO MARKET



60%

of manufacturers are investing in disruptive technologies to speed up and improve development.

REVENUE STREAMS



1 out of every 2

manufacturers are using disruptive technologies to enable new business models/new revenue streams.

CUSTOMER RELATIONSHIPS



More than 1/3

of manufacturers have used disruptive technologies to move into completely different markets/product lines.

LONG-TERM OUTLOOK



2/3

of manufacturers say disruptive technologies are increasing their long-term outlook.

America's Challenge: Leading a Research, Innovation and Technology Agenda That Supports Economic Growth

We must adopt policies that will attract and retain investment in activities that drive innovation.

The Challenge

The manufacturing innovation ecosystem is healthy when scientific research is strongly supported, a workforce is highly trained for the technologies driving our shop floors and our regulatory structure is conducive to growth. The public and private sectors have historically partnered together to support industries that rely heavily on innovation to survive—automotive and transportation safety, defense, space exploration and medical research to name a few. Unfortunately, in recent years, the government has failed to uphold its end of the innovation equation. It has dramatically reduced its commitments to invest at the expense of long-term growth of manufacturing and our economy.

The Stakes

The prosperity of America has been built on the ingenuity of our inventions. Many of these inventions, ranging from GPS to the semiconductor, are part of our everyday lives. These developments were funded jointly by the public and private sectors at a time when industry and the government together realized how critical it was for our nation to lead the world in both technology and economic leadership.

The private sector has continued to hold this leadership mantle with manufacturers at the head of the pack, investing more in research and development (R&D) than all other industries combined. Manufacturers from all segments contribute to this investment by taking long-term strategic risks to create breakthrough technologies, lifesaving medicines and product improvements.

On the other hand, federal investment in basic research has stagnated. We are now living off the investments made in basic research 30 years ago. If the federal government and lawmakers do not start thinking strategically and taking action to lead the next generation of investments, there will be little left to fuel future initiatives.

The Solutions

Our country needs to restore its commitment to innovation and invest strategically in programs and policies with a long-term vision that will close the innovation deficit, the gap between actual funding of basic research, and do what is required for the United States to remain the world's innovation leader. This requires the next administration and Congress to do the following:

- Robustly fund basic research accounts in agencies like NASA, the Department of Defense, National Science Foundation, National Institute of Standards and Technology (NIST) and the Department of Energy's Office of Science.
- Continue the National Network for Manufacturing Innovation, now known as Manufacturing USA, and build on its early success of accelerating advanced manufacturing technologies to market.
- Maintain the Manufacturing Extension Partnership as a critical innovation and collaboration space for small and medium-sized manufacturers.
- Adhere to long-term commitments to future strategic plays, such as deep space exploration.

We must vigorously protect all forms of manufacturers' IP.

The Challenge

IP that is protected by tools like patents, trademarks, copyrights and trade secrets is a critical asset of today's manufacturer. It is the envy of the world, creating jobs here in the United States. Unfortunately, enforcement of IP protection rights is not uniform across the globe. Nation-states look the other way when IP theft benefits their economies. An abusive litigation system is a drain on innovation for all manufacturers.

The Stakes

IP drives the U.S. economy by creating jobs around the innovation that results. The theft and misappropriation of that IP leads to those same jobs disappearing and the economic value it generated plummeting. If we do not protect our nation's IP, we threaten to undermine our global leadership and slow our economic growth.

The impact of international IP theft on the American economy: hundreds of billions of dollars per year. The annual losses are likely to be comparable to the current annual level of U.S. exports to Asia—over \$300 billion.

– The IP Commission Report



Trade secret theft is now a national and international epidemic, costing the United States between \$160 billion and \$480 billion a year.
– PricewaterhouseCoopers and the Center for Responsible Enterprise and Trade, “Economic Impact of Trade Secret Theft”

The Solutions

Manufacturers have seen progress in getting new tools to protect their IP with the passage of the Defend Trade Secrets Act signed into law in 2016. Priorities for our industry that will help protect our IP include the following:

- Developing a clear process on how manufacturers can engage the government to leverage the new trade secrets law
- Including strong IP protections in international trade agreements as they are negotiated
- Respecting the IP rights of all industry segments while balancing the recognition that abusive patent lawsuits are a drain on manufacturers’ ability to invest in innovation and R&D

We must include cybersecurity policies that draw on best industry practices and not new mandates.

The Challenge

Manufacturers understand their relationship with the customer and the marketplace is built on trust and therefore place the cybersecurity of their products and their shop floors at the highest priority level. Unfortunately, they are faced with increasing uncertainty in the form of government mandates and burdensome regulations that do everything except what they need most: help secure their enterprise against the constantly evolving and persistent threat to the sensitive data and sophisticated products that are connected electronically.

The Stakes

In today’s connected world, cybersecurity equals economic security. The connected systems throughout all segments of manufacturing place our industry on the front lines of this battle. Cyber theft poses a threat to manufacturers of all sizes. Even the smallest breach can have severe negative financial, legal and reputational impacts. This leads to brand erosion and lost business. Our industry takes these threats very seriously, but without a comprehensive and coordinated approach in the form of a partnership between the public and private sectors, we may be faced with the ultimate consequence: lost manufacturing jobs.

The Solutions

The federal government has access to and awareness of the most sophisticated existing and emerging cyber threats. Manufacturers take the most strategic measures to combat these threats but do not have the same visibility of our nation’s law enforcement and national security agencies. New laws are being implemented that will increase the ability of sharing this threat information in real time, but we must continue to strengthen the public–private partnership. Two leading industry priorities include the following:

- Maintaining the posture of the NIST as a leading federal interlocutor that engages with the private sector by:
 - Taking the next steps from current engagement to explore additional opportunities that will enhance the “Framework for Improving Critical Infrastructure Security,” more commonly referred to as “the Framework”;
 - Continuing outreach to manufacturers of all sizes, with a focus on smaller firms on how best to utilize the Framework;
 - Creating a mechanism that assists manufacturers in understanding the costs and benefits related to leveraging the recommendations outlined in the Framework; and
 - Examining best practices in how to manage global supply chain cyber risk while not undermining industry-led international agreements already in place.
- Reducing the overlap of existing laws and regulations with an eye on regulatory harmony across all agencies

Foster the growth of connected technology across all manufacturing industry segments.

The Challenge

The products of manufacturers and shop floors have become increasingly connected. This constant connectivity is dramatically changing the way manufacturers compete and their relationships with customers. Government policymakers have made note of this impact and are beginning to engage. Unfortunately, the default reaction of some is to attempt to influence the marketplace when no intervention is needed. Ill-advised legislation and regulation can stop the growth of connected technology across every manufacturing sector before it even gets started.

The Stakes

The number of connected devices is increasing exponentially. Billions of devices are already connected, and billions more are coming online every year from our cars to our homes and workplaces. Manufacturers' products use secure network connectivity, wireless technology and cloud infrastructure to connect with one another and the customer. On the shop floor and in the field, manufacturing uses technology to manage production line activities, inventory, raw materials and shipping logistics; safeguard and monitor plant security; enhance product performance and reliability; and satisfy customer needs. All of these opportunities to expand the economic contribution and leadership of manufacturers in the United States would be put at risk if policies are enacted to stunt the growth of this technology.

The Solutions

To continue to unleash the economic growth that connected devices will help create in the manufacturing sector, the government and industry must work collaboratively to develop a strategy that will preserve, sustain and expand the growth generated by this technology trend. This strategy should not include technology mandates and should be industry-driven. Some principles for Congress and the next administration to consider include the following:

- Updating telecommunications laws that reflect the realities of the 21st century, not the structures and technology developed in the 1930s
- A spectrum policy that allows for all sectors to leverage this finite resource without putting any individual industries at a disadvantage
- Avoidance of duplicative and burdensome cybersecurity regulations and more agency focus on funding research to support enhancing IoT security
- Maintaining the privacy of individuals without unnecessarily restricting the free flow of data and information across borders between manufacturers and their customers

COMPETING TO WIN THE UNITED STATES WINS WHEN WE LEAD

Conclusion

Information and communications technology is driving vast changes that are creating significant opportunities for all manufacturing sectors. Technology is now embedded throughout every aspect of the manufacturing process. It is transforming the manufacturing workforce and requires new skills to succeed. Shop floors are driving innovations in how products are developed and made. The technology and connectivity being embedded in new products every day are creating value for customers here and abroad.

When policymakers advance an agenda designed to foster research, innovation and the protection of IP, the possibilities of economic growth based on science and technology leadership will expand and achieve new heights previously not seen in decades. Such focus will enable the manufacturing industry to be a global leader and a major driver of economic growth in the United States.

For more information, contact:

Jay Timmons

President and CEO
(202) 637-3043

jay.w.timmons@nam.org

Aric Newhouse

Senior Vice President, Policy and
Government Relations

(202) 637-3040

anewhouse@nam.org

Robyn Boerstling

Vice President, Infrastructure, Innovation
and Human Resources Policy

(202) 637-3178

rboerstling@nam.org





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