

TOWARD RESILIENCY IN U.S. CRITICAL SUPPLY CHAINS

The United States needs resilient supply chains to ensure our enduring economic prosperity, health, and national security.

Resilient supply chains secure key industries against disruptive system shocks and recover quickly and fully when shocks occur. The combination of extended and fragile global supply chains and strategic cross-industry threats requires a whole-of-nation focus on resiliency to better safeguard against future challenges and maintain our national competitive edge.

Building resiliency in such complex systems will require embracing a new supply chain role for government: prioritizing strong partnerships among government, industry, and international partners; aligning to prioritized outcomes such as supply chain diversity; and increasing visibility of supply chain operations and participants.

The next administration has the opportunity to develop our supply chain strategy and build the partnerships and data infrastructure that will focus supply chain investments and policy toward resiliency.

The Case for Action

The global COVID-19 pandemic fundamentally changed most Americans' perception of supply chain risks. In the years since, increasing strategic threats such as nation-state strategic competition, fragile trade routes impacted by territorial disputes, and regional conflicts have underscored the importance of prioritizing supply chain resiliency.

For years, firms leveraged emerging data technology and business structures to optimize their supply chains for efficiency and profitability to compete in an increasingly competitive and global marketplace. During that time, supply chains grew in volume, variety, and complexity, and began to include embedded software in a growing number of produced goods. Supply chain management focused on individual firm optimization and maximizing firm profit margins and cash flow to ensure customer access to products at the lowest possible cost.

Across a range of key sectors, like software and batteries, the United States grew dependent on international supply chains. These complex and extended supply chains brought increased risks and vulnerabilities. Understanding, "seeing," and addressing these vulnerabilities became and remains increasingly difficult.

Supply chains now face increasingly strategic and macro-level risks that a single company's actions alone cannot mitigate. Disruptions in the availability of critical products and services due to geopolitical and environmental threats pose a significant risk to continued supply chain access. Nation-state criminal and nationalistic threat

The persistent challenge facing the U.S. supply chain system is developing a shared vision and commitment to resiliency enabled by new data solutions that align diverse public and private sector stakeholders.

MITRE's mission-driven teams are dedicated to solving problems for a safer world. Through our public-private partnerships and federally funded R&D centers, we work across government and in partnership with industry to tackle challenges to the safety, stability, and well-being of our nation.

actors are manipulating goods, including software-based products. Consolidation in critical markets has limited the diversity of suppliers, with critical resources being controlled by monopolistic powers. In addition, absent or inconsistent industrial investment and sustainment strategies from the government feed economic uncertainty and facilitate foreign investments, thereby creating additional risks.

While discussion about the need and desire for increased resiliency has been promoted at the highest levels of government, the challenge of how to best enable resiliency persists. Going beyond initial supply chain actions, the next administration will be challenged to develop a shared vision and commitment to resiliency enabled by new data solutions that align diverse public and private sector stakeholders. This vision will require partners across government, industry, and allies to navigate the difficult trade-offs between resiliency and profit optimization, speed and security, and protective trade regulations and open competition.

In summary, the United States faces a number of obstacles in building greater resiliency:

- **No holistic national supply chain strategy exists that prioritizes critical dependencies and establishes proactive mitigation efforts.**

Most initiatives to improve supply chain resiliency began in reaction to supply chain challenges that grew out of the global pandemic. The United States needs to embrace proactive initiatives to improve the diversity of supply chains and balance the trade-offs between individual firm profitability and national security concerns. Additionally, there are no interagency, industry, and international partnership forums for developing shared understanding and action planning on these issues to create a forward-leaning supply chain resiliency strategy.

- **Complexity exceeds the capabilities of models and traditional data and leads to an inconsistent awareness of supply chain risk and a lack of visibility throughout the life cycle.**

End-to-end supply chain data—from critical resources to finished goods—requires inputs from multiple tiers of suppliers. It is a challenging data-science problem to combine these disparate data sets into a comprehensive digital model of a supply chain. This is due in part to the inflexibility of current data set segmentations, missing data, noisy data, and unreliable and/or limited collection methods.

- **The role of the U.S. government in enabling supply chain resiliency is siloed and reactive.**

Since the pandemic, executive orders and legislation such as the CHIPS and Science Act and the Inflation Reduction Act have been enacted to encourage U.S. supply chain resiliency. These initial efforts to break down silos and create holistic national policies, however, have yet to develop into an approach that defines the government's role as partner with industry and allies.

Strategy

The absence of national-level priorities and consensus on desired supply chain characteristics leads to missed opportunities and a suboptimal approach to sector-level initiatives.

Recognize the complex, global, interdependent system-of-systems nature of supply chains.

Any national resiliency strategy would need to span across industries, just as supply chains do. Likewise, a strategy needs to recognize the global nature of supply chains and multinational firms. A global focus will create a strategy that accounts for the complex realities of supply chain relationships and operations. This includes accounting for software as a component with its own supply chain complexities, risks, and opportunities.

Develop a national strategy for supply chain resilience and continuity of the economy.

Identify industries, capabilities, and materials critical to national, health, and economic security, and develop an industrial strategy to protect and grow those industries and capabilities while adhering to American free-market principles. Counter the national industrial strategies of our adversaries with a range of national-level tools and authorities to protect our strategic industries as well as the assets developed through our strong innovation ecosystems. Balance diversity with supply chain complexity and resource availability to build and execute on multilateral technical treaties targeting critical technology sectors and reciprocal partnerships with allies. Within the strategy development process, there is an opportunity to understand the tensions and trade-offs inherent in building greater resiliency in supply chains, resources that should be considered critical, and synergy among the roles and authorities of stakeholders. This strategy should be driven by the White House and developed with input and guidance from key stakeholders, including relevant government agencies, industry manufacturers, retailers, innovators, recyclers, customer representatives, and global partners.

Partnerships

The complexity and multidisciplinary nature of competition in global supply chains necessitate involvement across government, allies, industry, and academia to characterize the challenges, explore potential solutions, and enact shared solutions to address holistic supply chain risks.

Invest in collaborative efforts with industry, allies, and academia.

The government should ensure that national interests and geopolitical concerns are represented in decision making across diverse supply chain stakeholders. The government also plays a critical role in structuring incentives and equalizing regulations across industries. Interagency partnerships are needed to harmonize government capabilities, resources, and authorities toward enacting supply chain solutions. Coordination of acquisition and procurement decisions is needed to facilitate supply chain stability.

Encourage new and novel ways to share classified and proprietary information among partners.

Supply chain complexity will also necessitate novel ways to share classified risk information with non-cleared industry, government, and academic partners as well as mechanisms that safeguard proprietary industry data so that it can be shared in aggregate with these partners. Of immediate need is a structure to share export control data with allied partners to encourage supply sources for dual-use technology. Shared information is a catalyst for effective harmonized action to reduce and respond to risks.

Foster global partnerships balanced with a regional or bilateral focus to promote resiliency.

While supply chains are inherently global, there are significant strengths and opportunities for a U.S. focus on regional or market-specific partnerships and agreements. Alternative sourcing from friendly allied partners or bilateral investments in supply chain capacity may increase national resiliency for all stakeholders. Partnerships that provide deliberate horizontal integration across regions or technology sectors also need to be bolstered by leveraging organizations with horizontal reach such as multinational or multisector corporations and universities. Global partnerships provide an opportunity for the United States to continue its global leadership through economic strength.

Data

Government and industry currently face difficulty in assessing and measuring risks, predicting shocks, and optimizing investment due to the lack of quality and comprehensive supply chain data.

Develop publicly available data sets to inform supply chain resiliency policy decisions.

Most supply chain data is siloed behind company barriers due to competitive interests and contract privacy concerns. The government can collect and connect data across government while encouraging the private sector to supplement government data sets voluntarily. Creating these data sets should involve an expanded economic census to better map the flow of goods within the United States as well as exploring new ways to collect data about goods and materials flowing through supply chains, with flexible data segmentation that highlights characteristics of goods and services. In addition, the United States should coordinate with partner countries to create more detailed and up-to-date input-output tables, which are critical to understanding how disruptions propagate across industries and countries.

Embrace rapidly evolving tools to analyze data and model supply chains.

A whole-of-government effort is needed to evaluate the applications of artificial intelligence and machine learning, including digital supply chain twins, to evaluate the multiple data sets currently available and more accurately predict supply chain threats, vulnerabilities, decisions, impacts, and operations.

MITRE Resources and Support

MITRE's System of Trust Framework¹ aims to provide a comprehensive, consistent, and repeatable supply chain security risk assessment process that is customizable, evidence-based, and scalable, and it will enable all organizations within the supply chain to have confidence in each other, service offerings, and the supplies being delivered.

The MITRE document *Deliver Uncompromised: Security Critical Software Supply Chains*² recommends establishing an end-to-end framework for software supply chain integrity.

The MITRE AssembleTM³ capability supports management and governance, multipartner engagement, coalition building, and operations for a complex, whole-of-nation initiative. MITRE Assemble is not a specific technology, tool, or solution. Rather, it is an integrated framework that is tailorable and applicable to any complex, at-scale initiative that achieves maximum impact only through collaboration among applicable partners from different domains.

About the Center for Data-Driven Policy

The Center for Data-Driven Policy, bolstered by the extensive expertise of MITRE's approximately 10,000 employees, provides impartial, evidence-based, and nonpartisan insights to inform government policy decisions. MITRE, which operates several federally funded research and development centers, is prohibited from lobbying. Furthermore, we do not develop products, have no owners or shareholders, and do not compete with industry. This unique position, combined with MITRE's unwavering commitment to scientific integrity and to work in the public interest, empowers the Center to conduct thorough policy analyses free from political or commercial pressures that could influence our decision-making process, technical findings, or policy recommendations. This ensures our approach and recommendations remain genuinely objective and data-driven.

Connect with us at policy@mitre.org.

Endnotes

¹ [System of TrustTM](#)

² [Deliver Uncompromised: Securing Critical Software Supply Chains | MITRE](#)

³ [MITRE AssembleTM](#)