

Trust the Process

National Technology Strategy
Development, Implementation, and
Monitoring and Evaluation

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Security

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About the Report

This report is produced as part of the U.S. National Technology Strategy project at CNAS. The project is developing the intellectual framework for a national technology strategy for the United States that can serve as a road map for successful long-term American innovation and technological leadership. The project focuses on how the government should establish technology policy on key issues such as accelerating American innovation, mitigating risk to U.S. advantages, and contending with the technology strategies of competitors. This report was made possible because of a grant from the U.S. Air Force Office of Commercial and Economic Analysis (OCEA). The views expressed in this report are the authors' own and do not reflect the position of the U.S. Department of Defense or the U.S. government.

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Executive Summary

The United States is navigating a new paradigm of competition, one that centers not merely on traditional measures of military might, but on technology innovation and its contributions to comprehensive national power. Technology and innovation are critical enablers of American military, political, and economic power. To succeed in great-power competition, the United States should adopt a national technology strategy. This report does not offer the content of a strategy—that is outlined in another report in this series, “Taking the Helm: A National Technology Strategy to Meet the China Challenge”—but it offers a framework for the bureaucratic connective tissue necessary to bring a strategy to life.

To effectively execute a national technology strategy, the U.S. government will need to create new processes to develop, implement, and monitor and evaluate the strategy. It will also need to optimize existing processes in new ways, as bureaucratic foundations in this space have so far been uncoordinated, under resourced, and undervalued. Institutions such as the National Security Council (NSC), National Economic Council (NEC), and Office of Science and Technology Policy (OSTP) are, in their current structure and partitions, not fully equipped to meet the challenge of creating and executing a coherent response to this challenge. To support a strategy, this report offers key ingredients for designing processes but does not prescribe detailed action plans; the best design is not the one that is most “right” but the one that leadership will *use*. It does offer sample tactics for policy interventions, using the promote-protect-partner-plan framework proposed in the CNAS report “Taking the Helm” as a foundation.

This report divides recommendations into stages of strategy development, implementation, and monitoring and evaluation. Themes that cut across these stages include ensuring executive attention, facilitating buy-in among internal and external stakeholders, exercising convening powers, inventorying and coordinating policy tools, acquiring talent and expertise, building pipelines for tailored information and analysis, and establishing a means for reviewing and revising the process and strategy. Overall, designing transparency, clarity, and accountability into the process will create one that leadership can both trust and verify.

SUMMARY OF RECOMMENDATIONS

Without dedicated processes to execute a national technology strategy, a strategy may be no more impactful than a “really long speech,” warn Richard Fontaine and Shawn Brimley.¹ This report offers the following recommendations to develop, implement, and monitor and evaluate a strategy:

Strategy Development

The White House and executive departments and agencies will require a focused operating picture, a full inventory of policy tools and capabilities, and a clear spearhead to develop a national technology strategy.

- *Assess capabilities.* The NSC and OSTP should lead a baseline self-assessment of existing policy tools, capabilities, authorities, gaps between them, and resource investments and their interaction with policy guidance and priorities. The Office of Management and Budget (OMB), Department of the Treasury, and Small Business Administration should assess the impact of research and development (R&D) investments and innovation-related business incentives and subsidies.
- *Align leadership.* The Biden administration should set a common vision, develop a common vocabulary and operating picture, define roles for senior leaders, and establish clear information and decision forums. Mechanisms to this effect may include delivery of an early presidential speech or launch of a technology competition analytic product.
- *Appoint a deputy national security advisor (DNSA) for technology competition.* President Joe Biden should appoint a DNSA for technology that is tri-hatted to report to the national security advisor, the director of the NEC, and the director of OSTP (or, at minimum, be closely aligned with those offices). The DNSA should oversee relevant directorates and staff from within each body, lead the process for developing the strategy, and begin to stand up the new policy and analytic bodies necessary to oversee policy implementation. It should be staffed by a Technology Competition Coordination Office.²
- *Acquire talent.* The administration should draw cross-functional experts from diversified talent pools in and out of government; create a temporary task force and permanent analytic hub to support expert needs; and set incentives for recruiting, promoting, and developing an interdisciplinary career workforce.
- *Create infrastructure for credible analysis.* Policy leaders should determine analytic requirements for strategy development and should establish a Technology Analytic Hub to set common analytic standards for technology competition trends, establish an interagency analytic community of interest for technology competition, support processes for resetting intelligence priorities, conduct horizon scanning, and initiate collaborative relationships for academic and private-sector information.
- *Exercise realistic responsibility.* Strategy drafters should closely audit and support implementation plans for clarity of ends, ways, and means, rather than leaving this task to agencies postlaunch, as this strategic process and implementation are new to leaders and agencies alike.

Strategy Implementation

The U.S. government will need to rally a full array of internal and external stakeholders, along with talent and resources, to effect a successful national technology strategy.

- *Exercise executive authority.* The president should make a national technology strategy a regular agenda item in cabinet-level engagements and should make clear he has delegated the process for strategy implementation to his DNSA for technology.

- *Convene a neutral and interdisciplinary policy forum.* The Biden administration should establish a cross-cutting Technology Competition Coordination Office with multidisciplinary staff sourced from a range of agencies and external exchange assignments. This office should include directorates focused on the strategy pillars of promote, protect, and partner, as well as a critical technologies directorate for implementation relevant to priority technology areas, each charged with staffing and coordinating interagency policy processes.
- *Issue implementation guidelines.* The proposed Technology Competition Coordination Office should initiate cross-cutting implementation guidance for each pillar of the strategy, in addition to delegating planning to agencies. This guidance should be monitored and revisited on a cyclical basis by the planning team to ensure appropriate progress.
- *Build capacity and community.* Agencies with equities in technology competition should invest in specialized talent and capacity requirements by building specialized career fields, creating career training and certifications, and developing community-of-interest resources.
- *Engage external stakeholders and align incentives.* The administration should charter multistakeholder processes and initiatives tailored to foster alignment for various strategy objectives—for example, technology-specific forums or an American Innovation Human Capital Council + Collaborative that brings together government, academia, industry associations, private-sector representatives, and professional associations to define and address science, technology, engineering, and math (STEM) human capital needs.
- *Align strategy resources.* The new Technology Competition Coordination Office should work with the OMB and OSTP to set budgetary planning guidance, requirements for evaluating results, and annual budgetary review processes.

Strategy Monitoring and Evaluation

Leadership will need to implement a process for updating the strategy that can flex to the speed and trend lines of technological advancement.

- *Implement a traditional monitoring and evaluation model to determine course corrections to strategy.* The technology strategy process should include a repeatable and transparent means of measuring progress, updating priorities, assessing strategy subcomponents, and updating the strategy.

Introduction

There is strong bipartisan consensus in the national security community behind a new paradigm of great-power competition, that such competition will not be waged predominantly in the military sphere, and that any successful approach will integrate technological, innovation, and economic elements of power. Remarkable intellectual effort has filled this acknowledged gap with ideas and frameworks to place the United States on stronger footing to assert its norms, values, institutions, and innate advantages on a playing field that looks very different from recent decades.³ But the bureaucratic connective tissue necessary to bring new ideas to life—the people, processes, talent, and relationships within and beyond government—remains uncoordinated, under resourced, and undervalued. For the United States to successfully engage in strategic competition with a highly capable and resourceful opponent, this posture must change.

With the strategic foundations of the 2017 National Security Strategy, the 2018 National Defense Strategy, the 2021 Interim National Security Strategic Guidance, growing interest from the Hill, and widespread energy in the national security community, the Biden administration entered office with considerable momentum to reassess the status and foundations of America’s strategic advantage. At the core of such an effort will be more clearly defining the role of technology and innovation as critical enablers of American military, political, and economic power. Today is not the first time the United States has confronted technology’s role in national power; historical analyses, from the Civil War to the Cold War, posit that the United States has a long tradition of national technology initiatives to meet strategic challenges.⁴

But once a given, America’s technological leadership is today at risk, which weakens strategic pillars American policymakers have long relied on to secure America’s standing and influence. This project presumes that the Biden administration will act on this urgent requirement by pursuing a national technology strategy: a comprehensive framework to plan, execute, and update its technology policies. In January 2021, then-President-elect Joe Biden signaled this intention by elevating his science advisor to the cabinet level and issuing to him a letter on this topic: “My hope is that you ... will make recommendations to our administration on the **general strategies, specific actions, and new structures** that the federal government should adopt to ensure that our nation can continue to harness the full power of science and technology on behalf of the American people [emphasis added].”⁵ The goal for such a strategy, and for the institutions that support it, would be to maintain the United States’ standing as the world’s premier technology power such that it can empower its citizens, compete economically, and secure its national interests without having to compromise its values or sovereignty.⁶

But the key policymaking apparatus that should guide, implement, and evaluate any national technology strategy effort is woefully behind or simply does not exist. The last two administrations have made some progress in evolving bodies such as the National Security Council (NSC) toward this end, but its central structures and battle rhythms still “reflect an anachronistic picture,” according to a Stanford University report.⁷ For a national technology strategy to shape and incentivize the whole-of-nation approach necessary to preserve technology advantages and create new ones, the Biden administration must be willing to envision and invest in revised bureaucratic structures, foundational processes, talent, institutions, and information.

The purpose of the report is to describe the bureaucratic elements necessary to effectively execute a national technology strategy. It does not offer the intellectual framework of such a strategy itself; these elements are outlined in “Taking the Helm: A National Technology Strategy to Meet the China Challenge,” another report in this series.⁸ However, it makes the case that in the absence of these elements, even the

strongest and most comprehensive national technology strategy will gather dust on a shelf. This report assesses existing modalities and structures, then breaks up process recommendations for new national technology strategy into three overlapping phases: strategy development, strategy implementation, and strategy monitoring and evaluation.

For each, the report outlines what elements are needed to support the phase, suggests approaches to achieve those objectives, and offers sample tactics to support those approaches. The report does not suggest a detailed wiring diagram for each element, but instead emphasizes the ingredients necessary to achieve success. Process starts at the top and should be adjusted to the preferences of individuals who will utilize it. There is no singular best way of executing a policy process; the best process for any president is the one that he or she puts into practice to achieve policy objectives. The worst outcome of this report would be to initiate some or all of the recommendations, at great resource, time, and human capital expense, and allow them to languish without executive or principal attention. A positive outcome of this report would be for many of the ideas to be energetically adopted and tailored to various agencies with diverse staffing and alignment models.

Background and Methodology

This paper is part of the Center for a New American Security's (CNAS) overarching U.S. National Technology Strategy project, which is developing the intellectual framework for a national technology strategy for the United States that can serve as a roadmap for successful, long-term American innovation and technological leadership. In support of this project, this report explores the institutional and bureaucratic processes through which the government should develop and execute an effective national approach to reinvigorating American technological competitiveness. Though the recommendations this paper offers may be applied to support a range of technology strategy frameworks, it uses as its point of reference the approach presented in "Taking the Helm." Findings and analysis in the present report derive from an extensive literature review, targeted interviews with current and former officials from the Department of Defense, Department of the Treasury, Department of Commerce, White House National Security and Economic Councils, and other agencies, as well as two workshops among policy practitioners, private-sector representatives, and academic experts.

Excerpt from "Taking the Helm: A National Technology Strategy to Meet the China Challenge"⁹

The U.S. government must craft a national technology strategy for an era of sustained competition with a highly capable contender: a comprehensive framework to plan, execute, and update its technology policies. The strategy is a whole-of-nation approach—including human capital, infrastructure, investments, tax and regulatory policies, and institutional and bureaucratic processes—to preserve its current advantages and to create new ones. To be effective, creating and executing the strategy must involve stakeholders from federal and state governments, private industry, academia, and civil society. The overarching goal is to maintain the United States' standing as the world's premier technology power so that it can empower its citizens, compete economically, and secure its national interests without having to compromise its values or sovereignty.

[...]

[Taking the Helm] offers an initial framework for action to achieve the vision and goals of a new American national technology strategy. It comprises four pillars. They are to promote America's ability to compete; protect key U.S. technological advantages; partner with allies to maximize success; and plan to reevaluate and adjust the strategy as needed. Together they provide the foundation for long-term American economic strength and improved U.S. national security.

The Case for Prioritizing Process

If the Biden administration dedicates the intellectual effort to initiate a strategy aimed at maintaining the United States' standing as the premier technology power, it will have made an important step in establishing a vision that key stakeholders can observe and work toward. But decisions and policy priorities of senior policymakers, even those at the top, can be made irrelevant by policy planning and implementation processes. Absent newly dedicated processes, a national technology strategy may be no more impactful than a “really long speech,” the generic format for most published national strategies.¹⁰ Senior leaders are naturally attracted to creating content for policy, but an executive's objectives also require connective tissue to the decisions, people, tools, audiences, and information needed to achieve them. Policymakers can and should exercise agency in shaping the processes for policy formulation and implementation, based on their preferences and design, to maximize impact potential.

Experienced policymakers may be tempted to rely on existing national policy institutions and structures to enhance America's technological competitiveness, but these will need to be optimized to bring national security, economic, and technology issues together in a productive format before a decision reaches the president, and to provide the tailored analysis of trends and complex tradeoffs such decisions require.¹¹ Analysts from the Center for Strategic and International Studies describe this component of strategy formulation as “which issues will be raised for decision, how issues are elevated to senior levels, what options are presented, who participates in the decisionmaking, and how the results are communicated both internally and externally.”¹² These matters may appear as lesser details to policymakers, and overgeneralized perceptions of process and the fact that some process happens, whether optimized or not, contributes to its lack of attention. Thoughtful integration of interdisciplinary decision-making will be critical to optimizing the outcomes of strategy execution.

Crossing the streams of domestic, economic, national security, trade, and emerging technology policies will pose significant challenges to strategy development and execution but is especially critical for confronting today's “strategic terrain.” The National Security Commission on Artificial Intelligence (NSCAI) describes it as the first time the United States “faces a rival with the economic scale and technological prowess to challenge U.S. leadership and ambition across military and economic spheres. For the first time ever, it must manage a competition with a strategic rival enmeshed in its domestic economy and research and development enterprises.”¹³ Unfortunately for the United States, even purposeful intersection of these multifaceted policy considerations may result in habitual bureaucratic resistance, as leaders, agencies, and staff have historically been discouraged from crossing such streams, even in their graduate educations.¹⁴ A reset of structures, systems, and talent in multiple phases of the policy process will be necessary for success in this competition, if only to instill a permissive environment for cross-disciplinary integration.

An Assessment of Current Structures

When confronted with policy process challenges, many bureaucratic warriors map organizational structures to assess the range and limits of what is possible. Experts, including a range of current and former defense, national security, and economic officials and the National Security Commission on Artificial Intelligence, have studied barriers to the efficacy of current structures.¹⁵ Though several different solutions emerge, their concern with the separated economic statecraft and national security bodies in the current system is consistent, as described by an Atlantic Council report: “The bureaucratic separation between them is an impediment to developing national priorities or presidential decisions on innovation,

economic statecraft, and related issues with implications for both economics and national security.”¹⁶ These offices and councils hold responsibility for the national security, economic statecraft, and science and technology policy portfolios:

- **The National Security Council**, charged with overseeing national security and foreign policy, is arguably the most mature policymaking apparatus at the executive level and is capable of convening decision makers, synchronizing strategies, and overseeing policy implementation during both crises and steady state. But it is “over-indexed towards military and diplomatic tools of statecraft” in membership, staffing, and even more administrative elements, such as meeting agendas.¹⁷ At best, technology, economic, and trade concerns tend to be asides or stovepipes in its system.
- **The National Economic Council (NEC)** is charged with integration of domestic and international economic policy, and its membership contains much of the toolkit necessary for economic and trade elements of competition. But its iterative policy development process is immature, as is its ability to effectively oversee implementation of clear policy decisions. Moreover, it has historically supported a strategic free-market approach at odds with any shift toward a whole-of-nation competitive approach with industrial policy components.¹⁸
- **The Office of Science and Technology Policy (OSTP)** describes itself as responsible for providing “advice on the scientific, engineering, and technological aspects of the economy, national security” and coordinates the priorities and funding of the federal scientific and technological research and development (R&D) enterprise.¹⁹ Traditionally, however, OSTP does not use its convening authorities, dedicates more of its bureaucratic energy to R&D than day-to-day policy coordination, drives regulation and private-sector partnership in narrow ways, and acts more as a technical advisor than strategic lead.

A national technology strategy would require national security, trade and economics, and science and technology elements to be deployed in concert. Adjusting any one of these policy councils’ mandates, staff, or membership would only be a small step in introducing the necessary process ingredients to effectively implement a national technology strategy. The same is true of introducing new organizations, senior leaders, or guidance documents. The policy process is an ecosystem demanding signaling, incentive changes, talent, and accountability to ensure the tools and analytic engines of government move together. Organizational chart reform should be perceived as only a first step in this direction.

Principles

The premise for government process is that it works for senior leadership, for the participants that drive it, and ultimately for the American people. These principles undergird the recommendations for processes to support the development, implementation, and monitoring and evaluation of a national technology strategy:

- **Democratic values must be integral to process development.** Within American government institutions, these may manifest as practicing transparency and building in accountability so that stakeholders can meaningfully engage. Open communication with Congress in particular is essential to align resources and authorities with strategy objectives and to clear legislative roadblocks. Moreover, decisions built on principled process and designed for public accountability may have more stability across political transitions and changes in leadership.
- **Strong process is no substitute for clear vision, priorities, and policy.** The content and process of strategy are mutually reinforcing; one cannot happen without the other. Without a clear vision,

leadership would risk whipsawing participants of the process between erratic priorities or lead institutions entirely adrift. Directionless processes could produce inconclusive iteration—contrary to their purpose—rather than meaningful action (or intentional inaction).

- **Process is only valuable insofar as it is understood.** Part of processes' function is to delegate responsibilities and channel information to maximize outcomes for decision makers. Where and how issues find venues for debate and decision should not be a mystery. Process should build a common language and intellectual framework among participants upon which to build these venues.
- **Dual tracks of formal and informal process waste time and resources.** While back-channel discussions are sometimes valuable, overreliance may indicate a lack of functional formal channels to share information, negotiate tradeoffs, and account for diverse stakeholder interests. Delineating formal processes would decrease the time and effort that policymakers spend looking to fill gaps in expertise or hunting for the right people to convene.
- **Process works best when it is multidisciplinary from birth.** Technology competition lies at the nexus of economic, national security, and foreign and domestic interests and disciplines; to use a stovepiped approach or to neglect any component would be to miss opportunities or to work at cross-purposes between elements. Moreover, the U.S. government has an entire arsenal of policy tools at its disposal. This arsenal will only be useful for a strategy if its diversity is accounted for and used to advantage.
- **Process must keep pace with technology innovation.** The U.S. government is no longer the locus of American technology innovation; it will need agility in its processes to exercise relevance vis-à-vis private-sector developments.²⁰ Agility may take the form of access to cutting-edge analysis, readily accessible policy tools, or flexible cycles for strategy revisions.

Strategy Development

Purposeful design of the strategy development process will balance decisionmaking agility with stakeholder buy-in, and it will need to reconcile multiple intersecting and sometimes conflicting subprocesses—internal, external, technical, and political.²¹ A brilliant strategy written by a small group of smart people, then shared via top-down directive, risks not connecting with the leaders, agencies, and toolkits necessary to bring it to life. But an over-deliberative and over-inclusive process, bringing in the full range of stakeholders, risks watering down the results to the lowest common denominator or getting stuck in endless deliberation.

Leaders should be thoughtful in their choices around strategy design, understanding the implications for content and implementation. Some of these choices are summarized in the excellent Center for Strategic and International Studies report on “National Security Strategy Formulation” as speed, strategy alignment, staffing composition, process leadership, issue and time scope, relevance of resources, place for analysis, role for outsiders, dissemination, and iteration.²² But any strategy development process has critical ingredients that cut across most models. These include clear-eyed self-assessment of existing tools, authorities, and their gaps; purposeful leadership alignment to a strategic vision with commitment to follow through; assembly of the right talent to evaluate priorities and tradeoffs; credible information to support analysis of trends, challenges, threats, and opportunities; and a clear delegation of responsibility for strategic elements. These are detailed in the subsections that follow.

SELF-ASSESSMENT

A productive strategy development process must include a baseline assessment of existing capabilities, authorities, gaps between them, and resource investments. The scope of a national technology strategy necessitates using current tools and policies toward new or maximal ends; however, most U.S. government actors are not prepared to view these tools as a suite, nor are strategy processes optimized to coordinate authorities and levers in concert as they might for a defense strategy.

For example, for the protection of key technologies, industries, and broader economic statecraft, U.S. policymakers have applied an otherwise strong body of authorities in a desultory and ad hoc manner. To demonstrate the breadth of the toolkit, the government can promote technology innovation—despite surface-level aversion to executive-led industrial policy—by implementing tax incentives, infrastructure investment, research and development funding, and immigration policy. Yet, experts believe that tools such as export controls are not executed to their full potential, as in the case of the Department of Commerce’s slow execution of the Export Control Reform Act of 2018, which intended to emphasize “emerging” and “foundational” technologies that are “essential to the national security of the United States.”²³ The capacity to work with allies and partners further expands the government’s toolkit, but the recent CNAS report “Common Code” critiques “technology policy coordination [as] largely ad hoc, stovepiped, and disjointed,” due to an “underappreciation of how intricately linked the technology futures of the world’s liberal democracies are.”²⁴ Where positive momentum exists, it is scattershot across multiple agencies and generally lacks a common agenda. Policymakers will need to inventory these bodies of authorities through the lens of global competition to align them into action levers of a strategy.

A first-order task in the development of a national technology strategy is baselining the suite of tools available to the U.S. government within the pillars of promote, protect, partner, and plan. This assessment should identify how they are currently executed and staffed, how they are authorized, and where there are gaps or missed opportunities. In this assessment:

- The NSC and OSTP should lead a study of how policy guidance and priorities drive various tools aligned with each strategy pillar, the forums wherein they are brought together for alignment and deconfliction, their talent and analytic foundations and requirements, and whether there are gaps between authority and utilization.
- The Office of Management and Budget (OMB) should coordinate with OSTP to present a full picture of research and development investments in a range of critical technology areas across the federal government.
- The Department of the Treasury and the Small Business Administration should comprehensively assess the suite of innovation-related business incentives and subsidies and authority gaps in how they may be applied in support of a technology strategy.

Sample Tools for Pillars Proposed in “Taking the Helm”²⁵

Pillar	Tool	Potential Utilization
Promote	Immigration policy	Modify high-skilled-immigration policies to draw from international talent pipelines
	Infrastructure funding	Fund expansion of digital infrastructure to expand Americans’ access to economic development opportunities
Protect	Export controls	Refocus export controls on adversaries’ industrial indigenization efforts to preempt their weaponization of mercantilist practices
	Consular authorities	Authorize consular officials to deny visas based on risk indicators for economic and industrial espionage
Partner	Multilateral agreements	Negotiate interoperable high-skilled-immigration policies to create a human capital network and boost collaboration
	Convening activities	Convene domestic and international stakeholders to build consensus on standards-setting
Plan	Establish processes	Create a repeatable and transparent process for reviewing/updating objectives and assumptions of a national technology strategy
	Establish entities	Establish an analytic capability for technology horizon-scanning to inform the development, implementation, and evaluation of a national technology strategy

A first-order task in the development of a national technology strategy is baselining the suite of tools available to the U.S. government within the pillars of promote, protect, partner, and plan. Despite surface-level aversion to industrial policy, the U.S. government has a vast diversity of policy tools it can employ toward technology-related objectives.

LEADERSHIP ALIGNMENT

Strong vision and common understanding can facilitate consistent, credible, and genuine buy-in from senior leaders and steer their direction. Buy-in is necessary for the success of any new strategy, but particularly when introducing a major change in priorities, resourcing, or risk. When debating the critical elements of a national technology strategy process, project participants offered a point of consistent agreement on the importance of executive leadership in this space: the president must spearhead all elements of the strategy’s development, implementation, and communication. An effective national technology strategy would, at minimum, demand the use of existing ways toward new ends, imbue existing ends with new levels of risk, and rearrange means toward purposes once viewed as off-limits in American political life. These adjustments mean crossing streams of domestic and foreign policy advice and intervention historically treated as off-limits. Only a strong presidential vision with both cabinet-level buy-in *and* purposeful coordination with private-sector counterparts would make these shifts possible. Such a vision requires a clear understanding of each leader’s role, a common vocabulary, an understanding of the scope of risks and tradeoffs, comparable assumptions on the strengths and

limitations of government's role in the competition strategic environment, and a clear forum for resolving questions and tradeoffs.

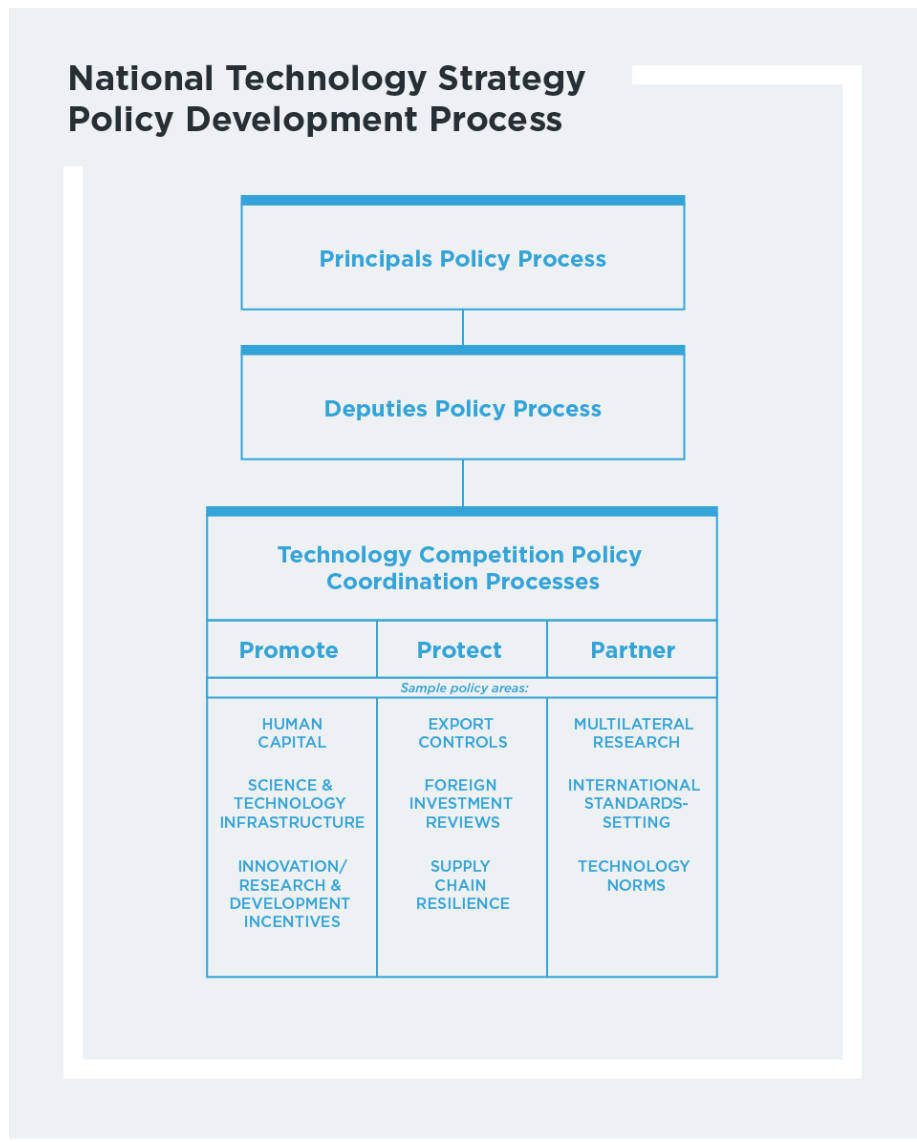
These requirements appear obvious in black and white, but the only other area of consistent agreement among project participants was the absence of such a consistent vision, common vocabulary, or sense of tradeoffs at the senior leader level—across parties and branches of government. Many senior leaders habitually view American power through the lens of its past military, diplomatic, and economic advantages, or do not yet see that the nature of “long-term, multifaceted geostrategic competition with China ... has technology at its core,” as “Taking the Helm” describes it.²⁶ Long-standing habits, education, and norms have guarded against the intermingling of foreign and domestic policy tools that are necessary for a comprehensive technology strategy. There remains widespread doubt among policy elites that the government has more than a token role to play in such a competition, given long-standing aversion to industrial policy. And as a rule, government actors struggle to understand private-sector incentives such that they can cultivate efforts toward mutual interests.

Still, rhetorical inroads toward these ends flourished throughout the 2020 presidential election cycle, with several candidates integrating foreign policy platforms with domestic policy priorities,²⁷ reflective wonks studying foreign policies that work for the American people, and emerging strategies featuring this demand signal.²⁸ To move beyond rhetoric and reports, the president needs to launch an effort to get his team's “head in the game” of a thorough and credible technology strategy development process, as one interviewee put it. Such an effort could take multiple forms, including:

- Vision-setting and senior team commitment
 - Deliver an early presidential speech and consistently reference the stakes and requirements of American competitiveness, with regular supplementary communication by key senior cabinet officials, e.g., secretary of commerce.
 - Launch a Presidential Study Directive directing the assessments and analysis necessary to develop a national technology strategy at a public cabinet meeting.
- Development of a common vocabulary and operating picture
 - Host a series of tabletop exercises designed to educate incoming agency leaders (cabinet and subcabinet) as well as expert career leaders on likely steady state and crisis challenges, tools, authorities, risks, and tradeoffs of technology competition, using past, current, and likely future examples. These might include a series on 5G, a series on semiconductors, a series on biotechnology, or a series on data governance. Such events should include private-sector representation in some form.
 - Launch a tailored technology competition analytic product for senior leaders, to be distributed with the President's Daily Brief, with inputs from the intelligence community, a new technology analysis hub described later in this report, and other nonintelligence commercial and technology analytic centers in government.
- Establishment of accountable roles and leadership
 - Discuss and set roles for incoming agency leadership, including specific elements of technology competition, early and transparently.
 - Appoint a deputy national security advisor (DNSA) for technology competition, tri-hatted to report to the national security advisor, the director of the NEC, and the director of OSTP, to lead the strategy development process. The DNSA should be staffed by a Technology Competition Coordination Office, to be described in a later section. Notably, the Biden administration has

appointed a deputy assistant to the president for technology and national security who will concurrently serve as deputy director for national security at OSTP and coordinator for technology and national security at NSC.²⁹ The position’s specific responsibilities have not yet been detailed but ought to integrate economic security considerations.

- Implementation of information and decision forums
 - Establish a hierarchical policymaking and convening process based on high-level strategy pillars (promote, protect, partner, and plan), led by leaders from the NSC, NEC, and OSTP. These leaders should oversee strategy development, provide guidance, and receive briefings on supporting strategy development, setting priorities, and resolving tradeoffs. (Such forums can evolve into the long-term technology policy strategy policy process.) The convening process should include the Departments of Commerce, Defense, Education, Energy, Homeland Security, Justice, Labor, State, and Treasury; the intelligence community; Council of Economic Advisors; Domestic Policy Council; Federal Communications Commission; National Science Foundation; OMB; the Securities and Exchange Commission; and Small Business Administration.



Leaders from the National Security Council, National Economic Council, and Office of Science and Technology Policy should oversee national technology strategy policy development. Convening processes should include interagency representatives and support from various offices within the Executive Office of the President to coordinate strategy pillars such as promote, protect, and partner.

TALENT

Development of a national technology strategy requires cross-functional expertise in personnel across seniority levels. National strategies are generally guided by senior administration officials, written by staff in the Executive Office of the President (EOP) who incorporate expert input from agencies, and influenced by advice and consultation from outside experts. Competent, collaborative, and cross-functional personnel are a necessary element of each of these inputs in any strategy development process, but particularly so for a national technology strategy, which demands not only higher-end expertise in emerging technologies and markets, but “a mix of technical and soft skills, often with non-traditional backgrounds.”³⁰ Challenges in recruiting, developing, or retaining such talent in government, particularly in the national security space, are well-documented, whether due to inflexible government career models, larger private-sector pay, slow-to-adapt higher education programs, or narrow recruitment pools for senior leadership roles.³¹ But many successful inroads of hosting technology talent—such as the U.S. Digital Service—and incentivizing cross-functional perspectives and careers—such as “jointness” requirements for senior military officers—have proved that these hurdles can be overcome when mission and executive motivation align.³²

A national technology strategy development process will create talent demands in four different areas, some of which may be difficult to source permanently within government resources or at the outset of an administration. These include:

- Credible leadership for the strategy development process, which will require individuals capable of speaking for and advising the president, creating a fair and transparent process for stakeholder views, and asserting bureaucratic control over diverse resources and processes that are not typically in coordination or alignment
- Cross-functional expert political appointees with a diverse mix of experiences touching security, technology, and economics
- Domain expertise in technology sectors and markets, use cases, futures, and competition dynamics to generate credible and consistent analytic baselines
- Career government personnel with interdisciplinary experience and expertise bridging defense, diplomacy, economic statecraft, and technology

Prior reports have offered a range of recommendations to support these demands, and it bears repeating that the best solution to this talent requirement is the one that is used.³³ Extrastructural task forces, talent exchanges, contracted analytic talent, term appointments, and czars of the highest caliber will make little difference if underutilized or poorly heard. This report offers the following recommendations to place and utilize talent for strategy development in the abovementioned areas:

Credible Leadership for Strategy Development

Credibly assign the DNSA for technology or equivalent with strategy development, implementation policy, coordination, and resource authority to lead the strategy development process. The DNSA or director reports should have the pen on the strategy and should have the charge for coordinating its development and approval. He or she should oversee relevant directorates and staff from within each body, lead the process for developing the strategy, and begin to stand up the new policy and analytic bodies necessary to oversee policy implementation.³⁴ The DNSA should at minimum be staffed by a Technology Competition Coordination Office. Regardless of reporting structure, to further facilitate cross-functionality, an Executive Secretariat that coordinates across the NSC, NEC, and OSTP should be established (rather than the one that only supports the NSC). To mitigate potential bureaucratic friction, the president should

commit to consistent messaging and support to ensure that the DNSA is elevated as a necessary collaborator on key issues.

Cross-Functional Expert Appointees

*Draw from a diversified talent pool of both experienced civil servants and people with successful performance histories in innovation sectors of the economy for appointments to critical roles across government.*³⁵ Interviewees pointed out, for example, the need to bring in experience outside the finance sector in key economic statecraft roles, or to recruit leaders with experience in commercial supply chains to defense industrial policy and innovation roles. Such appointments will require grappling with formal and informal barriers to political service, to include management of conflicts of interest, compensation and divestment policies, and the demands of the confirmation process, none of which are insurmountable but will require purposeful review and well-staffed ethical and risk assessments.³⁶

Domain Expertise in U.S. and Competitor Technology Sectors and Market Advantages, Vulnerabilities, and Futures

Initiate two parallel structures to support strategy development talent needs, both of which might evolve in the strategy implementation process. While such expertise exists in pockets across government—in the intelligence community, several hubs within the Department of Commerce, the Department of Defense, the Department of Energy, and OSTP—project participants generally agreed that these personnel are not organized or empowered to support the analytic needs of a national technology strategy, and that consistent access to private-sector information and more advanced interagency data analytics capabilities would be necessary to execute such a strategy.³⁷ Given this status, a strategy development process could initiate two parallel structures to support its talent needs, both of which might evolve in the strategy implementation process. It should:

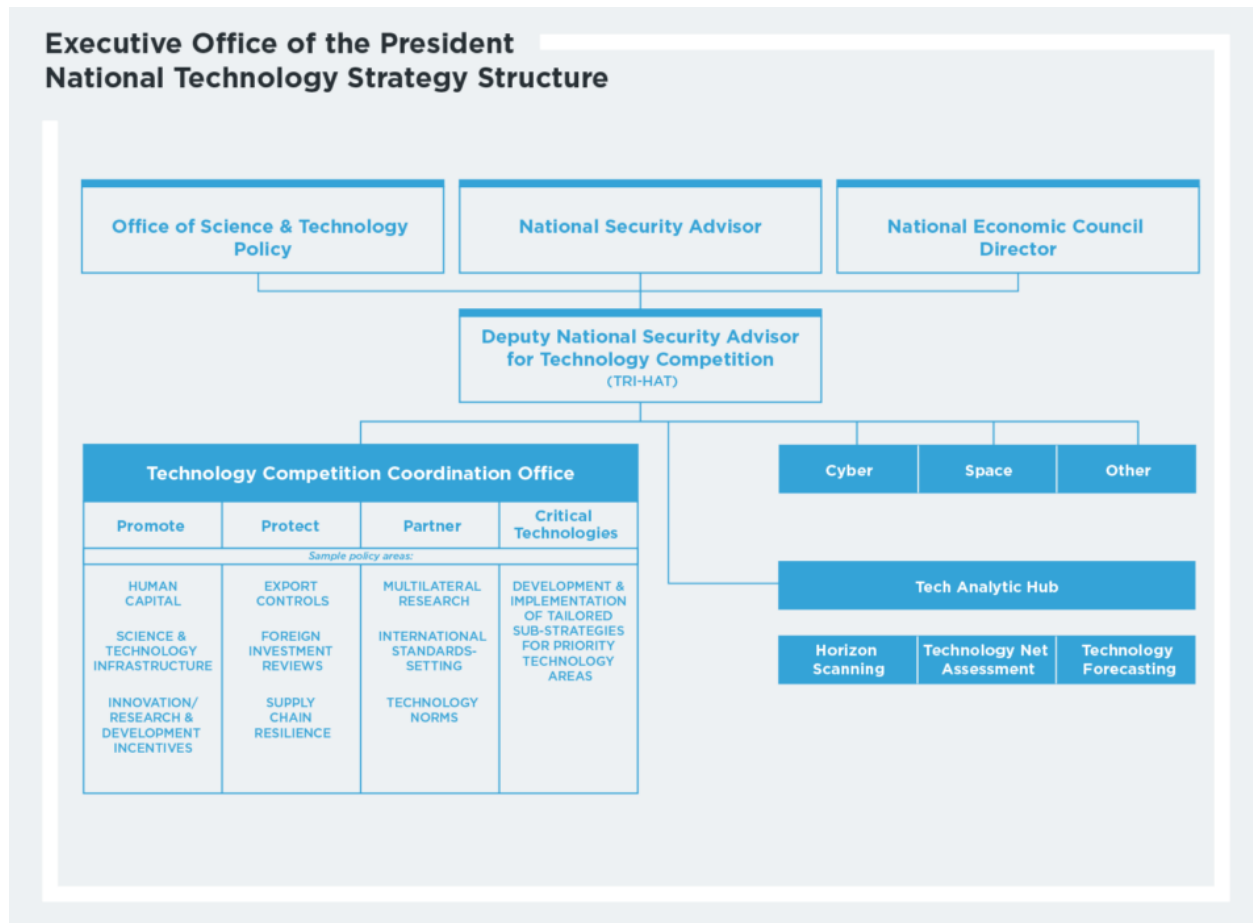
- Establish a one-year Technology Competition Task Force, a multisector leadership task force with a temporary staff of detailed government, academic, and private-sector experts to conduct stakeholder consultation and provide analytic expertise for strategy development. The task force could also support and establish the requirements for a new Technology Analytic Hub.
- Develop a Technology Analytic Hub that temporarily reports to the DNSA for technology, is staffed by interagency detailees from across government and one- to two-year exchange personnel from outside government, and is analytically supported by the Science and Technology Policy Institute, which is a federally funded research and development center that provides analytical support to OSTP. The mission of this hub is described later in the report.

Interdisciplinary Career Government Policy Personnel

Set an early demand signal and leadership-driven incentives for recruiting, promoting, and developing an interdisciplinary career workforce. Though more formal and tailored recommendations are offered later in the report, several early steps can support both strategy development and later implementation:

- Place a cross-functional pool of detailees in the DNSA's supporting directorates.
- Place personnel with cross-agency experience or diverse experiences in strategy development roles at the EOP or within agencies.
- Introduce robust professional development programs aimed at broadening interdisciplinary acumen in technology and economic statecraft across federal agencies, with resourcing support from OMB.

- Encourage and reward talent exchanges within government and between government and outside entities.



The bureaucratic connective tissue necessary to bring new ideas for technology competition to life remains uncoordinated, under resourced, and undervalued. A deputy national security advisor for technology competition should lead the process for developing a national technology strategy and should begin to stand up new policy and analytic bodies necessary to oversee policy implementation.

CREDIBLE INFORMATION AND ANALYTIC AGENDA

The policymaking adage that “some numbers beat no numbers every time” does not always stop either pundits or policymakers from developing priorities and strategies by instinct rather than facts. However, by launching a new strategy and policy process, developers of a future national technology strategy have the opportunity to establish a credible, repeatable, and adaptable analytic agenda to support strategy initiation, evaluation, and evolution. As previously highlighted, much of the analytic muscle required to support the range of technical, sectoral, futures, and threat analysis necessary for a national technology strategy is scattered across government or primarily resident in the private sector. As a rule, this body of analysis does not begin with common assumptions, is not easily integrated, and does not allow for broad collaboration or tailored application in specific policy matters. The development of a Technology Analytic Hub at the outset of strategy development could shift this dynamic, both in establishing a centralized resource for common analytic standards and work and creating a hub for an interagency process supporting tailored agency and subagency needs. Policy leaders should work with analysts to formulate an analytic agenda in this initial stage of strategy development. Policy leaders should:

- Identify and prioritize initial analytic and technical information requirements for strategy development, such as:
 - Horizon scanning of U.S. technology trends, competitiveness, and supply chain vulnerabilities in key sectors;
 - Comparative industrial policies and capabilities of U.S. partners and competitors;
 - U.S. innovation ecosystem advantages, risks, and vulnerabilities;
 - U.S. innovation human capital pools and pipelines;
 - Net assessment of U.S., partner, and competitor technology advantages and risks; and
 - Forecasting of emerging technology use cases, challenges and opportunities.
- Identify and prioritize the scope and timing of analytic requirements for strategy evaluation, such as:
 - Return on investment for specific policy interventions; and
 - Resilience of domestic critical technology industries under protection.
- Identify and prioritize the scope and pace of repeat assessments necessary for strategy evolution, such as:
 - Shifts in priority technologies' advantages or vulnerabilities;
 - Emergence of future tech opportunities or threats (horizon scanning); and
 - Shifts in private R&D investments.

To create a central node for specialized analysis, the Biden administration should also establish a Technology Analytic Hub, a centralized resource for common analytic standards and hub for an interagency process to support tailored agency and subagency needs. This permanent analytic capacity could be established initially within the EOP and staffed by agency detailees and academic and private-sector exchange personnel. Once established, the hub could be transferred to an agency as necessary. In addition to pursuing a broader analytic mission of horizon scanning, net assessments, and technology forecasting, the hub should bear responsibility to:

- Establish an interagency analytic community of interest for technology competition;
- Create common assumptions, rule sets, data sets, and methodological baselines for community analytic needs (within the hub and among the interagency analytic community);
- Convey information requirements to the broader analytic community;
- Develop recommendations for agencies to invest in or expand analysis functions (specialized horizon scanning, forecasting, net assessment, market-share analysis);
- Support a process of resetting intelligence priorities to align with strategy and deconflict with commercial analysis;
- Design continuous and collaborative process for analytic requirements, to include analytic roles across government and rule sets/division of labor with the intelligence community;
- Develop training and development opportunities for the analytic community; and
- Initiate collaborative relationships and contract vehicles for academic and private-sector information.

REALISTIC RESPONSIBILITY

The initial stages of strategy development typically do not include the introduction of detailed implementation plans but leave such tasks for agencies postlaunch. However, because this strategic process and implementation are new to leaders and agencies alike, strategy drafters should closely audit their text for clarity of ends, ways, and means. Simply offering a short list of priority technologies, as previous leadership has done,³⁸ with no sense of practical implication for protection (how should the Committee on Foreign Investment in the United States process change?), promotion (at what level of investment should U.S. R&D lie?), or partnership (what critical technologies lend themselves toward joint development?) is no service to national interests. Nor is suggesting a new approach to innovation promotion incentives without the understanding and close collaboration of government entities unused to participation in the national security process, such as the Small Business Administration. The strategy should be purposeful in its words to ensure intent, level of effort, and accountability are clear, if not explicit, and its coordination process should require deliberate review by all responsible agencies toward this end. Though implementation policies may lag, agency leaders should be prepared to formally or informally update their own goals, agency missions, and personnel performance objectives in line with this strategy at the outset.

An Example National Technology Strategy Development Process³⁹

Phase One: Groundwork

- Vision articulation: Where the United States wishes to be as world technology leader in 20 years
- Connection to national interests and values: How the United States will remain the world's premier technology power such that it can empower its citizens, compete economically, and secure its national interests without having to compromise its values or sovereignty
- Leadership alignment: Establishment of common operating picture understanding of roles and responsibilities among key agency officials
- Assessment of U.S. policy intervention tools
- Assessment of U.S. technology and innovation sectors' advantages and vulnerabilities
- Assessment of the technology competition environment
- Forecasting of future challenges of the technology competition environment
- Cyclical updates to agency deputies and principals led by DNSA for technology

Phase Two: Strategy Drafting

- Game plan for encouraging innovation environment
- Human capital strategy for technology competition
- Implementation of technology priority schema for resource and policy prioritization
 - **Leading-edge:** The technology areas where the United States must strive to have the most advanced capabilities in the world
 - **World-class:** The technology areas where the United States should strive to be among the world's best
 - **Fast follower:** The technology areas where the United States retains strong capabilities but can afford to not be among the world's best at the outset
 - **Over-the-horizon:** This category comprises R&D investments, primarily in basic research, spanning the spectrum of technological disciplines
- Building out of the four pillars of policy intervention
 - Promote America's capacity to compete
 - Protect U.S. critical technology advantages
 - Partner with U.S. allies and partners to maximize success
 - Plan for regular strategy revisions
- Development of resource planning guidance for agency budget implementation
- Cyclical updates to agency deputies and principals led by DNSA for technology
- Deputy and principal strategy review and coordination
- President-led NSC meeting for strategy finalization and approval

Phase Three: Strategy Launch

- Speech from the president
- Tailored events by key agency leaders to launch the strategy to specific stakeholders
- Congressional briefings
- Engagement with allies at near-term events, e.g., NATO summit

Concurrently throughout these phases: Engagement with stakeholders, including the private sector, Congress, academia, and other interest groups

Strategy Implementation

In addition to building on those elements of strategy development above, this section assumes a national technology strategy has been developed along the pillars proposed in “Taking the Helm”: promote America’s capacity to compete, protect U.S. critical technology advantages, partner with U.S. allies and partners to maximize success, and plan for regular updates to the strategy. This strategy will likely offer a game plan to encourage the American innovation environment; prioritize critical technologies to structure resource allocations, policy interventions, market incentives, protective measures, and partnership opportunities; offer resource planning guidance for implementation; and introduce substrategies, such as a human capital strategy encompassing education, upskilling, and immigration policy initiatives.

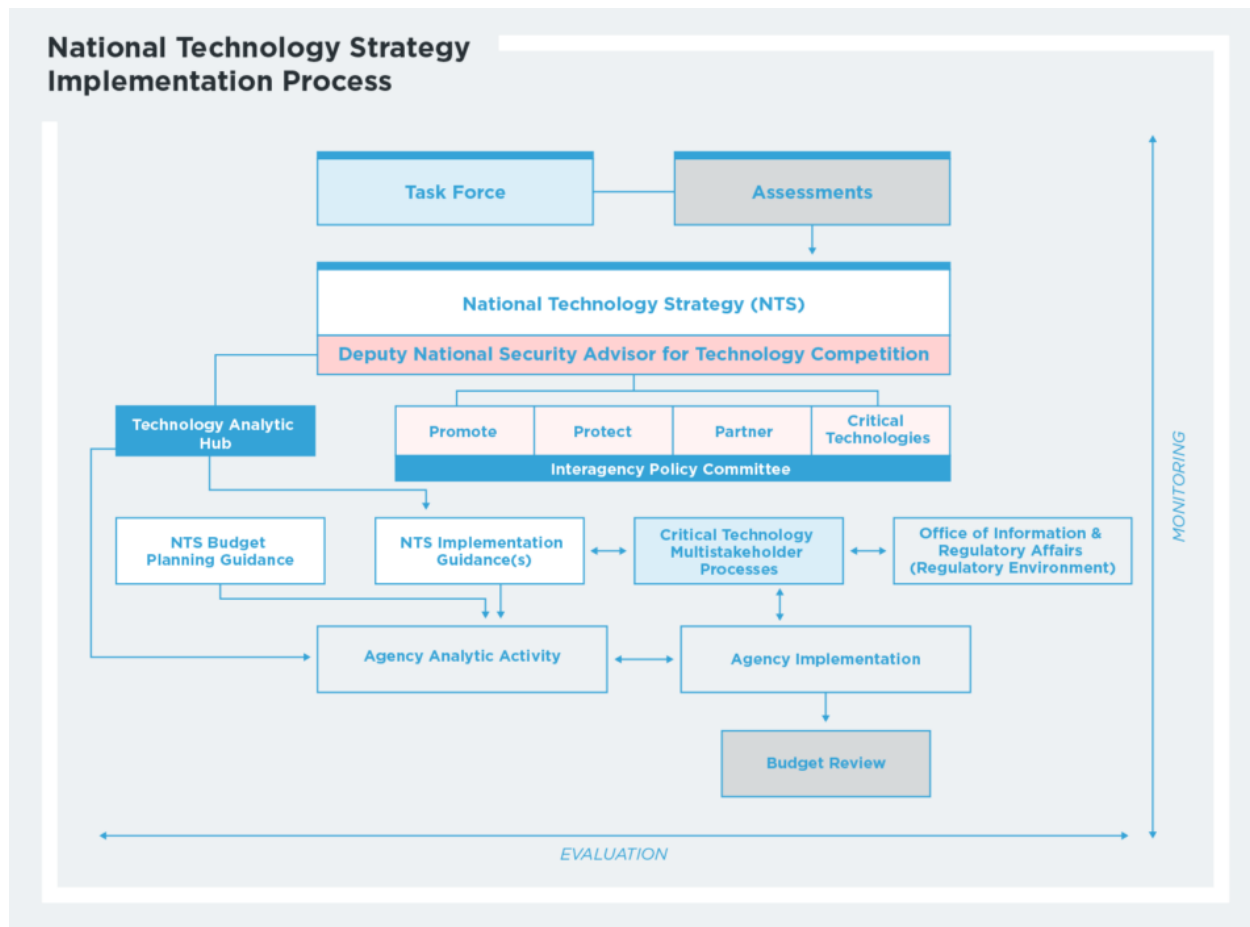
The strategy development steps discussed in the previous section will go a long way toward ensuring proper implementation of a new national technology strategy, particularly by generating support and alignment among key stakeholders leading and staffing agencies throughout all stages of development.⁴⁰ Still, many political leaders have been surprised by agency distraction, ignorance, bureaucratic inertia, and even intransigence in pursuing national strategies to their fullest intent, particularly when they involve reprioritizing agency personnel or resources. The president may be the senior-most executive, but agencies have a wide range of internal stakeholders with various equities and external stakeholders seeking to influence their activities and investments—Congress, lobbyists, industries, think tanks, allies, and adversaries. A thorough national technology strategy development process would be most effective if followed by a purposeful, well-resourced, and collaborative strategy implementation process.

Depending on executive preference, strategy implementation mechanisms may be closely managed by the president or his appointee, flexibly delegated to responsible agencies, or somewhere in between. As in the prior section, this report will not specify an action plan, but rather recommend a series of ingredients for operable strategy implementation that may apply in a range of models. The elements include executive authority for policy choices, neutral and interdisciplinary process forums, strategy implementation guidance, capacity- and community-building, external stakeholder engagement and incentive alignment, and strategy-resource alignment.

EXECUTIVE AUTHORITY FOR POLICY CHOICES

In its interim report, the NSCAI sets up a central requirement for an effective technology competition policy process: “Only the President ... can reconcile interests across domestic and international concerns while balancing the economic and security concerns emanating from technology policy, and then exercise the authority to decide an issue.”⁴¹ It is at the executive level that political and policy tradeoffs face off, that priorities and resource requirements must align or be reset, and that challenging messages to competitors and allies alike should be guided. But while the president must be the driver and the chief cheerleader of the technology strategy to a range of audiences, it is impossible for him or her to be the chief implementer, or even the chief arbiter, on an ongoing basis. In the president’s absence, as the commission goes on to say, “the government will require a center of power that can exert gravitational pull on economic, national security, and science and technology policies.”⁴² This pull does not come about simply by issuing a strategy or appointing a czar; the president will need to be committed and consistent in communicating priorities and delegating authority. He or she can do so through presidential messaging and transparent, consistent, and empowered delegation. Starting with the launch of the national technology strategy, the president should regularly lift up the key priorities, pillars, and successes of the strategy in messaging to the public, to American industry leaders, to Congress, to academia, and to international allies and partners. The president should likewise make the technology strategy a regular agenda item in updates with cabinet officials and in cabinet meetings. And the president should encourage comparable communication from agency leaders. Additionally, the president should make clear that he or she has delegated the process for strategy implementation—whether oversight, policy

dispute resolution, or coordination—to the DNSA for technology and should cultivate a trusted relationship with this individual such that the DNSA is seen as a credible representative of the president’s convening, policy, and accountability authority.



This process should include interdisciplinary policy forums, implementation guidelines, stakeholder engagement, and resource alignment.

NEUTRAL AND INTERDISCIPLINARY POLICY FORUM

National technology strategy implementation will require the ability to convene relevant agencies at appropriate levels for policymaking, coordination, oversight, dispute resolution, and crisis response, a model most effectively demonstrated among the EOP policy councils by the National Security Council. The NSC has an effective structure and process in place to host, prepare materials for, staff, structure, follow up on, and create records for interagency convenings. That said, many elements of technology competition are outside the purview of the NSC—both deep technology expertise and economic policy—and by consequence the strategy implementation process should not be assigned to its staff alone or to member agencies. To support this requirement, the Biden administration should build on the strategy development interagency structures and:

- Continue and bolster a permanent cross-cutting Technology Competition Coordination Office within the EOP. This office would continue to report to the DNSA for technology and, like this role, be tri-hatted in support of the NSC, the NEC, and OSTP. Staff for the office should be multidisciplinary and sourced from a range of agencies and external exchange assignments, to include existing teams within OSTP, NEC, and NSC as needed. Within the office, the planning directorate should be charged

with leading planning evaluation, evolution, and overall oversight, to include revision of critical technology priorities.

- Establish directorates, focused on the pillars of promote, protect, and partner, within the Technology Competition Coordination Office to launch the interagency policy processes for coordination, oversight, management of policy disputes, and management of crises for respective policy areas. Like other NSC offices, directorates would maintain the authority to raise interagency decisions to agency deputies, convened by the DNSA for technology, who could in turn lead a decision and implementation process or elevate issues for review by principals or the president on a timely basis. While the primary principals forum should largely remain the NSC, the DNSA for technology should maintain the option to isolate issues for OSTP or NEC decision space.
- Establish a critical technologies directorate within the Technology Competition Coordination Office to coordinate and oversee policy processes for specific critical technologies if they are identified as priorities in the strategy. As previously discussed, technology areas will vary in terms of timeline and action requirements; a dedicated directorate can oversee and evaluate implementation across discrete technology areas.

Technology Priority Schema for Resource and Policy Prioritization



Leading-edge

The technology areas where the United States must strive to have the most advanced capabilities in the world



World-class

The technology areas where the United States should strive to be among the world's best



Fast follower

The technology areas where the United States retains strong capabilities but can afford to not be among the world's best at the outset



Over-the-horizon

This category comprises research and development investments, primarily in basic research, spanning the spectrum of technological disciplines

Though intended to be inclusive, these structures risk hiving off technology competition as its own isolated policy arena with its own community of interest and narrow set of stakeholders. To combat this instinct, the full array of the EOP's new and existing policy councils should deliberately be more inclusive of technology, economic statecraft, trade, or security matters in their policymaking processes from the beginning, not only as a final approval measure. Historically, despite its legislative mandates, the National Security Council includes Treasury, OSTP, or Commerce in its regional policymaking inconsistently, or it does so only as a last-minute measure in principals' review. Trade policy is likewise generally distanced from regional policymaking and domestic economic impact. Meeting inclusion cultures need to change to make such participation habitual. While simply attending meetings does not create interagency harmony, it is a start.

A Competition Daily Brief⁴³



The President's Daily Brief (PDB) is a high-level, all-source, interagency brief on national security issues and is a key source of feedback for the intelligence community. Establishing an equivalent for technology-based competition, a Competition Daily Brief (CDB), led by the Technology Analytic Hub, would provide a tailored source of information and analysis for top-level decisionmakers. Information and analysis may include responses to questions, new analysis, or new reporting. Daily briefs are reflective of and responsive to an administration's priorities; the processes of compiling the brief, presenting it, and receiving feedback not only informs policymakers but sharpens the focus and priorities of the analytical community.

A CDB can pair with but should not be fully integrated into the PDB due to its broader orientation and institutional sourcing. Examples of topics could include China's foray into internet standards-setting, emerging sources of rare earths, trends in foreign industrial policies, or forecasts on policy intervention's potential impact to American green energy innovation—depending on the administration's priorities.

STRATEGY IMPLEMENTATION GUIDANCE AND SUBSTRATEGIES

A technology strategy may necessitate implementation guidelines because it will likely require agencies to plan, act, take risks, and manage relationships in wholly new ways. Think tank reports frequently cite implementation policies, action plans, and guidance as necessary measures for strategy follow-up—tailored, specific policy documents by agencies or by issue areas to drive follow-up action, spending, or analysis from strategies—but they are rarely introduced in the real world. This absence might be manageable for strategies with well-understood ends, ways, and means and consistent worldviews. But for this new strategy, Technology Competition Coordination Office staff should initiate cross-cutting implementation guidance for each pillar, in addition to delegating implementation plans to agencies. These should be monitored and revisited on a cyclical basis by the planning team to ensure appropriate progress. Regardless of their scope and intent, such cross-cutting guidance should include an oversight agent (either an agency lead or an NSC staff lead); clear action and timelines; commonly understood metrics for success; alignment with existing agency and interagency processes (budget, legislative, audit, etc.); and specific agents for action. This cross-cutting guidance might include such areas as:

Promotion of America's capacity to compete

- Clarify guidance for prioritizing, tracking, and evaluating government research and development funding in alignment with critical technologies and gaps in private-sector investment, building on existing OSTP processes within the National Science and Technology Council.
- Issue policy guidelines for prioritizing business tax breaks, subsidies, or other incentives in alignment priorities for growth in critical technology areas.
- Launch a national science, technology, engineering, and math (STEM) human capital strategy that cuts across education, training, business incentives, and immigration.
- Introduce competition reviews into regulatory introduction and review processes, led by the Office of Information and Regulatory Affairs.
- Implement procurement, certification, or other government acquisition incentives for critical technology-relevant companies or supply chains.

Protection of U.S. critical technology advantages

- Clarify guidance to align risk criteria for export controls and foreign investment review, domestically and with allies.
- Relaunch forums for information sharing and collaboration between counterintelligence experts, academia, and industry.

Partnerships with U.S. allies and partners to maximize success

- Establish a clear bilateral strategy and relationship management roles and responsibilities across the full suite of economic statecraft, commerce, security and technology functions.
- Introduce requirements for a technology competition section in the State Department-led Integrated Country Strategy development process.

Within the Technology Competition Coordination Office, a critical technologies directorate should also establish its own tailored policy and strategy process, in coordination with agency experts, appropriate to the categories and individual requirements for any critical technologies identified as priorities. As each technology area will likely be highly distinct in its maturity, use cases, investment demands, security risks, or readiness for government vs. private action, there can be no one-size-fits-all approach to developing

substrategies or policies attached to each policy area. Directorate and agency staff should tailor their work in terms of:

- **Scope:** from general statement of policy and objectives to detailed action plan;
- **Balance:** technology areas will be at varying levels of readiness for intensive protection intervention versus government-led and incentivized promotion, for example;
- **Risk and vulnerability:** use cases and net assessment will demand differing levels of policy and resource attention;
- **Standards- and norm-setting:** technology areas will demand varying roles in national use principles and global standards-setting; and
- **Oversight and evaluation timelines:** technology areas will move at varying speeds of maturity, investment, utilization, or partnered investment.

As part of the strategy development process, gaps between agency tools and authorities should have been identified. For a successful implementation process, the Technology Competition Coordination Office should also collaborate with OMB to launch and oversee “get well plans” with agencies where authority exceeds execution and performance, such as export controls. These may include infusion of talent, resources, or legislative authority. For agencies where existing tools will be used for new purposes, such as small-business incentives, “sprint” approaches for short-term shifts in strategy, approach, or metrics would be useful substrategies.

CAPACITY- AND COMMUNITY-BUILDING

Beyond the talent requirements outlined earlier in the report, national technology strategy implementation will require more specialized capacity investments, to include growth in high-demand technical mission areas, introduction of new competencies for established career fields, and new collaborative communities of interest. Agencies will have tried-and-true methods for accommodating these demands that manage their culture, personnel authorities, professional development approaches, and career incentives, but some successful models bear repeating:

- *Build specialized career fields.* The Defense Acquisition Workforce Growth Initiative,⁴⁴ supported by the Defense Acquisition Workforce Development Fund, underwrote a massive shift at the Department of Defense to insource and hire thousands of acquisition personnel and generate a high-performing, specialized career track for them. The initiative funded not only recruitment and hiring but the development of programs for training and education, career management, and retention. Such a model could be utilized on a smaller scale to support growth of technical and specialized career fields that may be in higher demand under such a new strategy, such as export control specialists, or experts with deeper understandings of private-sector incentives for innovation investment to staff strategy pillar initiatives.
- *Create career training and certifications for established career fields.* The Defense Security Cooperation University was established to offer training and education, to include certification, to both the security cooperation workforce and those outside the field across the U.S. government and defense industry.⁴⁵ Such a model, or comparable courses at the Foreign Service Institute and other agency educational institutions, could be used to offer specialized coursework and certification to diplomatic, commercial, intelligence, defense, or other personnel whose responsibilities intersect with technology competition. One particular growth area may be international forums and negotiations for technology standards-setting.
- *Develop community-of-interest resources.* As a lower level of investment, much of the derivative activity of technology competition does not or should not require referring to strategic directives or

interagency policymaking on a regular basis or accessing Interagency Policy Committee processes. Export control decisions are made daily; bilateral meetings take place every minute across the globe. Relevant communities of interest could generate references for ongoing implementation—e.g., toolkit of technology competition partnership resources such as foreign aid or infrastructure investment for bilateral interlocutors.

EXTERNAL STAKEHOLDER ENGAGEMENT AND INCENTIVE ALIGNMENT

Any national technology strategy will challenge the limits of government power and influence: the private sector is as important an actor—and often more important—in shaping current and future technology competition dynamics.⁴⁶ While the government can direct action and force outcomes in technology sectors in some places—such as by shaping regulatory environments, injecting R&D funding, or implementing export controls—much of the success of a technology strategy will emerge from aligning vision and incentives with the private sector. Project participants regularly bemoaned the government's frequent lack of understanding of private-sector incentives and absence of common vision or vocabulary in national security matters. In the absence of improved alignment, government actors will find themselves at odds with the very industries they are seeking to sustain, grow, and protect.

Multiple approaches could build such alignment, from regular executive and cabinet leader engagement with private-sector stakeholders to a deliberate series of listening sessions across the country as part of the strategy launch. A higher-end, more complex option, demanding longer-term investment and staffing, would be establishment of a series of government-led multistakeholder processes centering on specific critical technology areas, bringing together government personnel, industry leaders, academics and the research community, trade associations, and other communities of interest.

Multistakeholder processes have been successfully applied in a range of issues crossing technology, political, and legal lines. These forums tailor their models to address different problems, and they establish common operation pictures and language where decisions will impact a variety of players, where a range of technical and policy expertise is needed, where there are overlapping jurisdictions and areas of control, and where the legitimacy of the process depends on wide-ranging buy-in.⁴⁷ Though they should not be approached as one-size-fits-all, such processes could be applied to furthering administration objectives in specific technology sectors, starting conversations with stakeholders on common visions and goals, common vocabulary, barriers to innovation or investment, the regulatory environment for specific industries, standards, norms, and use cases, future risks and opportunities, human capital needs, or other areas for policy intervention. As part of the critical technology strategy process, or to inform it, the DNSA for technology should publicly charter such initiatives with specifically tailored guidance relevant to the sector and policy demands and should establish transparent, inclusive, and credible forums to meet these charters. The objectives would vary by effort but should inform policy, regulation, government R&D investment, human capital incentives, business incentives, or resource alignment as required within government—but also other stakeholder approaches, investments, priorities, talent management, and standards.

Such forums are not the only option for government-external stakeholder strategic alignment and collaboration for the national technology strategy. Other initiatives toward this end might include:

- Rechartering the President's Council of Advisors on Science and Technology to support the DNSA for technology and NSC-NEC-OSTP initiatives for technology competition;
- Reestablishing the National Security Higher Education Advisory Board, bringing together academia and counterintelligence experts on human capital risks; and

- Establishing an American Innovation Human Capital Council + Collaborative, bringing together government, academia, industry associations, private-sector representatives, and professional associations to define and address STEM human capital needs.

STRATEGY-RESOURCE ALIGNMENT

As a multiagency, cross-functional issue, one of the greatest risks of failure to a national technology strategy is lack of resources. While some investment needs will be obvious, such as increases in R&D spending, others will emerge as agencies develop implementation plans and the requirements for specific critical technology priorities emerge across a range of investment, procurement, standards-setting, or monitoring functions. Setting the requirements for monitoring and evaluating the success for such investments will be no easy task. The Technology Competition Coordination Office should:

- Establish an annual national technology strategy budgetary planning guidance, co-developed by OMB and the Technology Competition Coordination Office, and co-signed by the DNSA for technology and the director of OMB, to guide agency budget development over the course of a year. Such policy guidance would include existing R&D guidelines set by OSTP.
- Launch a task force across OMB's resource management offices, OSTP's R&D oversight functions, and the Office of Personnel Management to provide regular planning guidance, program examination support, talent management and requirement analysis, and evaluation of agency technology strategy investments.
- Introduce an annual budgetary review process co-led by the DNSA for technology and OMB to review agency budget proposals against planning guidance.

Strategy Communication

Nearly all of the steps and elements outlined in this report will be more successful with tailored communications staff, messages, and outreach plans. In communicating the strategy, policymakers should consider the following stakeholders and principles:

Stakeholders

- Congress
- Private sector
- Representative organizations, such as trade associations
- Advocacy and activist organizations—e.g., civil liberties, tech freedom and governance
- Academia
- U.S. allies and partners
- U.S. competitors

Principles

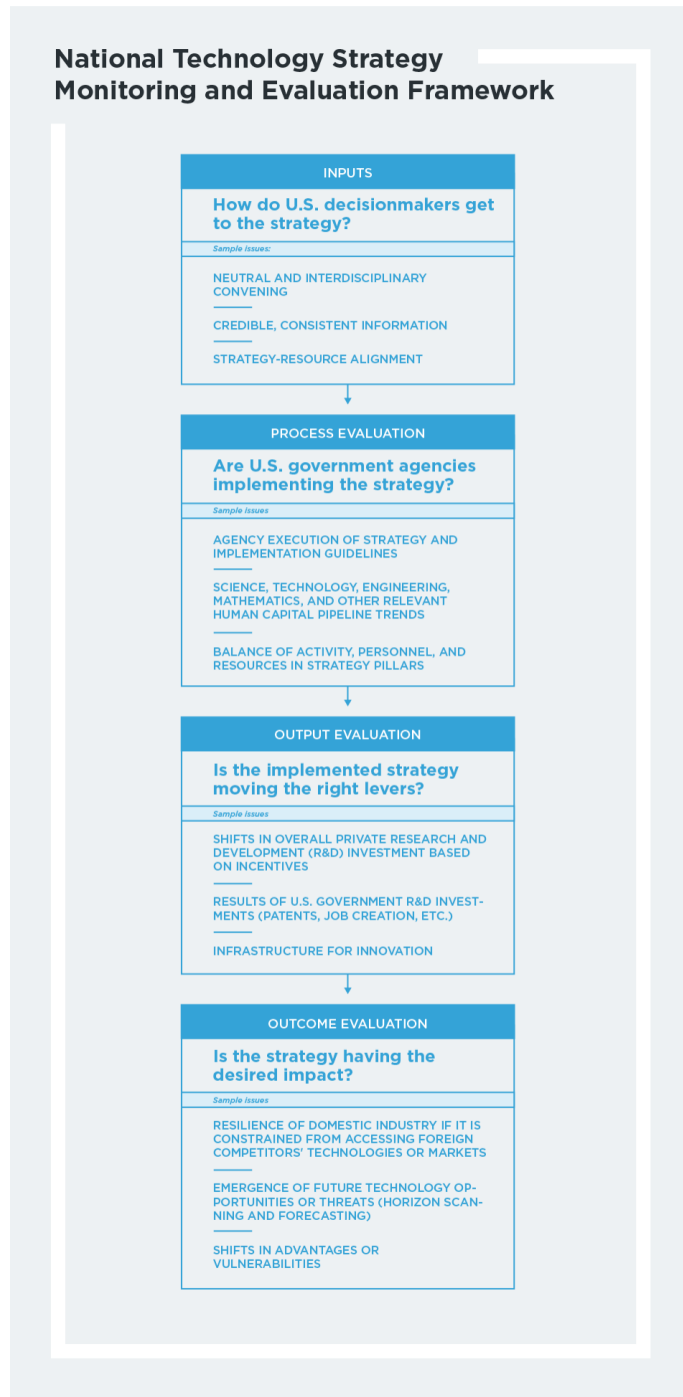
- Establish key thematic messages of national technology strategy aims, values, and vision and interweave with other administration priorities—e.g., jobs, the environment, COVID-19
- Promote early successes to highlight strategy impact
- Prioritize regular collaboration with Congress
- Highlight productive government-nongovernment partnerships across the country and at all levels
- Reset American perceptions of industrial policy
- Recognize roles and impact of nongovernment stakeholders in technology strategy implementation and communication
- Do not shy away from communicating risks and costs of the strategy
- Make an early example of the need to take protective actions, with key linkage to strategic vision
- Communicate in the language of stakeholders while setting common vision; proactively address nonaligned and aligned incentives
- Cross streams to gain stakeholder comfort in traditionally misaligned areas, such as trade and jobs, innovation and government investment, defense budgets, and local economic impact

Strategy Monitoring and Evaluation

As a new initiative, a national technology strategy should demand a more robust monitoring and evaluation process to understand whether the strategic approach and framework were scoped appropriately, when or how adjustments are needed, and with what regularity. This approach contrasts with the tendency of strategy formulation to come on a schedule by administration, generally every four years, or as strategic conditions change. Technology adaptation does not fall on the same timelines as defense threats, and many technology sectors will operate on vastly different trend lines. Thus, more so than other strategies, the technology strategy process requires a repeatable and transparent process to measure progress on and update technology priorities for the national technology strategy and to refresh strategic pillar approaches.

This process should follow a traditional monitoring and evaluation logic model to understand the following:

- Inputs: How do U.S. government decision makers arrive at a strategy/strategy process?
- Process evaluation: Are U.S. government agencies implementing the strategy?
- Output evaluation: Is the implemented strategy moving the right levers?
- Outcome evaluation: Is the strategy having the desired impact?



A national technology strategy should include a robust monitoring and evaluation process to understand whether the strategic approach and framework were scoped appropriately, when or how adjustments are needed, and with what regularity. This monitoring and evaluation process can apply both to an overarching national technology strategy and to specific focus areas within the strategy.⁴⁸

This logic model also scales; it applies to the national technology strategy and can also apply to focus areas within it, such as constituent policy initiatives or selected industries and critical technologies. Project participants lacked consensus on the value of critical technology lists; some criticized them as feckless “laundry lists” while others argued in favor of them as discrete reference points for tailoring policy interventions and monitoring outcomes. A clear monitoring and evaluation framework could assess the relevance of technology foci against broader strategy objectives, efficacy of implementation, and impact. It can also inform adjustments in timelines, approach, and the overall prioritization schema. The model might apply this way for tech priority “X,” for example:

- Inputs: How did U.S. government decision makers arrive at a strategy/technology process? E.g., by which criteria or decision makers did we determine that X satisfies overarching objectives?
- Process evaluation: Are U.S. government agencies implementing the strategy? E.g., have we acquired the right talent, expertise, and stakeholder input for X? Are activities balanced and timely in support of X?
- Output evaluation: Is the implemented strategy moving the right levers? E.g., are R&D investments creating jobs in X field? Are new immigration policies expanding X industry?
- Outcome evaluation: Is the strategy having the desired impact? E.g., is the United States at the leading edge of X? Is the government’s intervention in X growing the economy?

This monitoring and evaluation process of progress toward critical technology goals has to be paired with strong technology horizon scanning, net assessment, and forecasting process to determine how priorities will continue to align with the United States’ strategic vision and what technology milestones match the overall road map. It can also ensure that the process behind and within the strategy is adequately scaled to keep pace with speed of innovation. Such reporting cycles can be tailored to policy leader cycles and demands, but they should also align with stakeholder, regulatory, and budget cycles.

Monitoring and Revision Cycle for Prioritizing Critical Technologies

Priority Levels for Critical Technologies	SAMPLE INPUTS	SAMPLE PROCESS EVALUATION	SAMPLE OUTPUT EVALUATION	SAMPLE OUTCOME EVALUATION
Leading Edge Maintain the world's most advanced capabilities	NEUTRAL POLICY CONVENING FORUMS SUBSTRATEGY AND IMPLEMENTATION POLICIES CREDIBLE, CONSISTENT INFORMATION COMMUNITY BUILDING STAKEHOLDER ENGAGEMENT STRATEGY-RESOURCE ALIGNMENT	BALANCE OF ACTIVITY ACROSS PROTECT/PROMOTE/PARTNER PILLARS PACE OF NORM AND STANDARDS DEVELOPMENT UNITED STATES AND PARTNERS/ALLIES' INFLUENCE ON STANDARDS-SETTING PIPELINE TRENDS FOR SPECIFIC TECHNOLOGY SECTORS MULTISTAKEHOLDER PROCESS PARTICIPATION	SHIFTS IN TECH-SPECIFIC PRIVATE RESEARCH AND DEVELOPMENT (R&D) INVESTMENT RESULTS OF PRIVATE R&D INVESTMENTS CHINA'S ACCESS TO SPECIFIC CONTROLLED TECHNOLOGIES INTRODUCTION OF STANDARDS AND NORMS INDUSTRY STRUCTURE SUPPLY CHAIN SEGMENTS OWNER/INVESTMENT TRENDS	RETURN ON INVESTMENT OF PILLAR APPROACHES SHIFTS IN U.S. TECHNOLOGY SECTOR ADVANTAGES OR VULNERABILITIES SUPPLY CHAIN RESILIENCE INDUSTRY PERFORMANCE TRENDS IN MARKET SHARE
World Class Strive to be among the world's best, remaining globally competitive and with niche leading capabilities				
Fast Follower Retain strong capabilities but can afford not to be among the world's best at the outset				
Over-the-Horizon R&D investments spanning the spectrum of technological disciplines				

The monitoring and revision cycle for determining prioritization or reprioritization of critical technologies should be biannual to keep pace with the speed of innovation. Such reporting cycles should be aligned to policy leader demands and stakeholder, regulatory, and budget cycles.⁴⁹

Conclusion

A whole-of-nation approach to competition cannot succeed without vision, nor can it succeed without the process to realize that vision. The United States cannot afford just to dream; it must apply itself. It can apply itself by implementing processes—and filling the current institutional gap—to design, implement, and monitor and evaluate a national technology strategy. This strategy will cut across disciplines and agencies, and it will require new ways of using policy interventions. To purposefully coordinate the government’s vast policy levers, these processes can incorporate innovative and factual analysis, engage with diverse stakeholders in government and the public, and generate self-awareness within government of its various toolkits. The United States has, in recent years, found a rare moment of bipartisan agreement that facing threats from abroad will require a shoring up of technological, innovation, and economic elements of power. It can do so, but only if it implements a process it can trust to perform.

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⁹ Rasser and Lamberth, “Taking the Helm.”

¹⁰ Fontaine and Brimley, “Don’t Expect Too Much From Obama’s National Security Strategy.”

¹¹ Christopher Kirchoff and Zoe A.Y. Weinberg, “Working Document on Government Redesign.”

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