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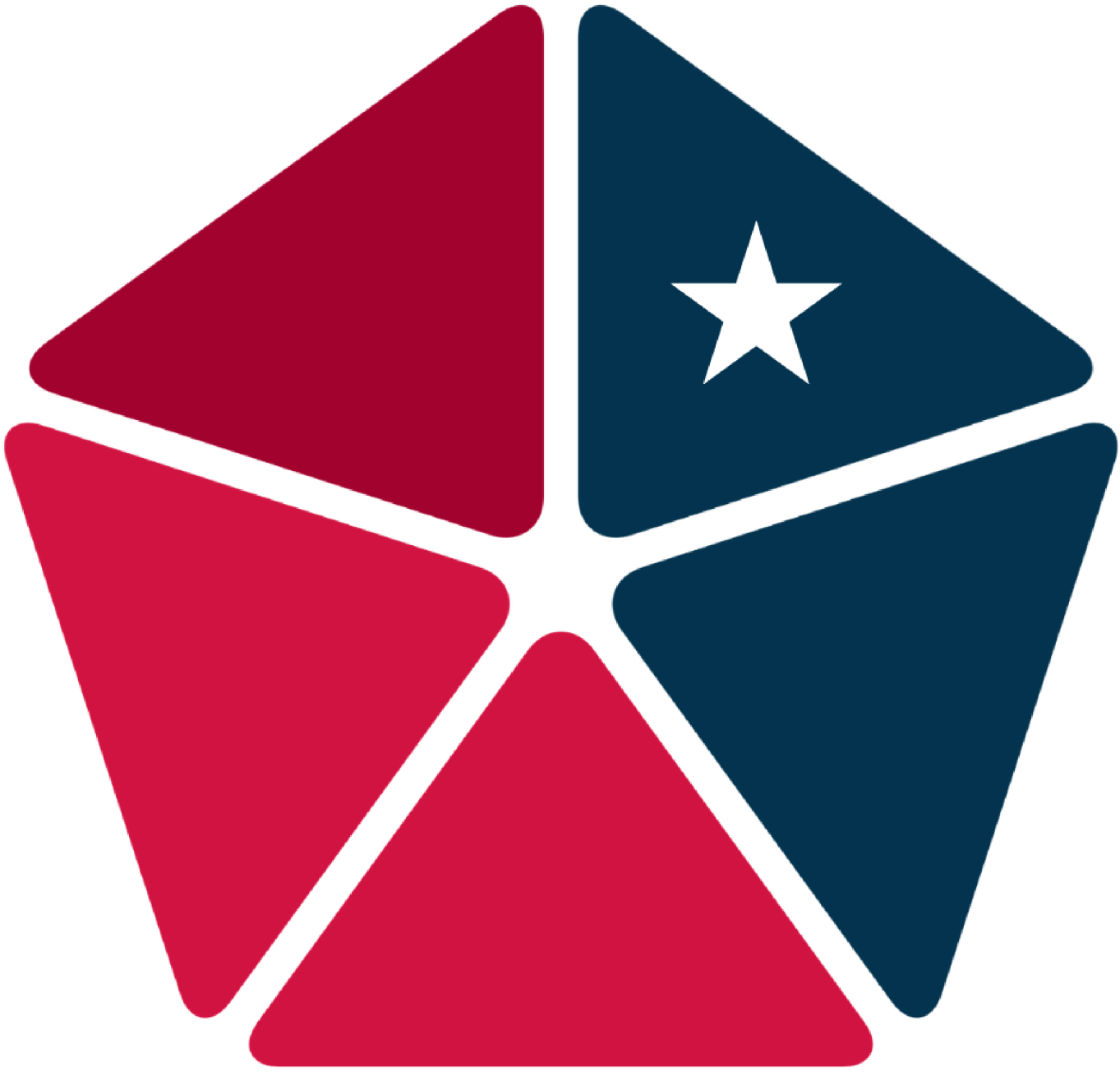
SPECIAL COMPETITIVE STUDIES PROJECT



Tech Scorecard Methodology

The SCSP Tech Scorecard: A Framework for Comparative Analysis

Executive Summary

In an era defined by rapid technological acceleration, understanding the relative overmatch of the United States and China across key technology areas is critical to inform policy recommendations and ensure economic and national security for the future. Such a measurement cannot be limited to traditional stovepiped assessments. It requires a comprehensive, methodical, and nuanced view of the technology landscape.

The Special Competitive Studies Project (SCSP) has developed the Tech Scorecard, a novel, comprehensive framework designed to measure positional advantage across critical technology sectors in an era of strategic technology competition. The Tech Scorecard builds on SCSP's prior use of "gaps analysis"[1] to comparatively assess technology leadership, refining that approach with a standardized and repeatable framework, methodology, and data architecture, as described in this paper.

[1]In 2022, SCSP conducted a "gaps analysis" of twelve technology areas that we believed would drive the competition between the United States and China from 2025 to 2030. In 2025, three years after our initial analysis, we completed a comprehensive update of that analysis ("Gaps 2.0"). *See* Who's Ahead, Who's Behind, and Where We Are Headed Next in the U.S.-China Technology Competition, Special Competitive Studies Project (2025).

The Strategic Imperative

Historical Precedent

The need for objective, authoritative analysis of complex technical issues is not new. In 1972, Congress authorized the Office of Technology Assessment (OTA) to provide such insight during the technological competitions of the late 20th century.[2] Today, a similar, updated capacity is required to navigate the U.S.–China rivalry. Beyond benchmarking current standings, this framework serves as a proof-of-concept for the analytical output of a potential U.S. Technology Competitiveness Council (TCC), a White House convening body focused on technology policy, first proposed by the National Security Commission on Artificial Intelligence and echoed by SCSP.[3]

Bridging the Analytical Gap

Existing resources to measure where the United States and China stand today and the relative trends across various technologies are insufficient, often lacking the direct comparison, comprehensive nuance, or technological specificity that SCSP believes is necessary to equip policymakers for decision-making.

Within the government, policymakers often rely on the U.S. Intelligence Community (IC) for assessments of the impact of key technological developments. However, IC analysis is only able to focus on China's capabilities without the mandate to offer a perspective on how the United States fits into the picture.

Within the open-source world, there are many measures and indices offered by research organizations; however, these are insufficient for policy decision-making because they often focus only on one piece of the puzzle, such as investment or research, without taking a holistic view of the technology sector.

The SCSP Tech Scorecard fills these gaps to provide the crucial diagnosis of the state of competition as the backbone for policy and industry to position the United States for success.

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[2] The Office of Technology Assessment: History, Authorities, Issues, and Options, Congressional Research Service (2020).

[3] The National Security Commission on Artificial Intelligence (NSCAI) in 2021 proposed the establishment of a Technology Competition Council (TCC) to empower a single entity to coordinate the approach to technology competition. SCSP has proposed that a TCC conduct regular comparative analysis of U.S. and adversarial capabilities to better inform policymakers on prioritizing resources and policy agendas. *See* Final Report, National Security Commission on Artificial Intelligence at 166 (2021); Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 49 (2022); and Memos to the President: Future Tech Transition, Special Competitive Studies Project (2025).

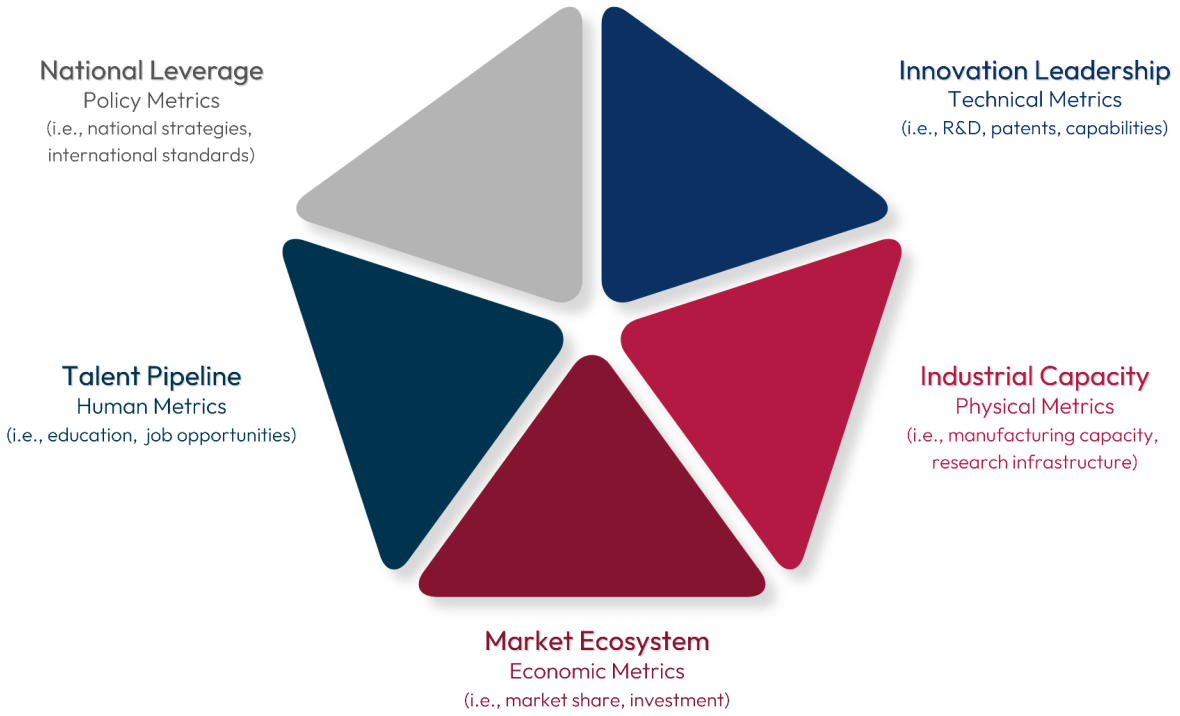
Technology Prioritization

Comparative analysis to understand leadership in a technology is most vital for technologies where a country's positional advantage has significant national implications. For some core technologies, such as semiconductors and robotics, there is a national security imperative for indigenous development and production to bolster U.S. economic or military power. For other emerging technologies, this imperative comes from a first-mover advantage, where the first country to achieve dominance in a technology will have an enduring market or military advantage. Determining which technologies fall into these categories and therefore demand whole-of-nation attention requires assessing technology dynamics, competitive factors with China, and the strength of the domestic innovation base.[4]

[4] Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 34 (2022)

The Framework: Five Dimensions of Technological Power

To move beyond narrow binary comparisons, the Tech Scorecard evaluates national competitiveness through a framework composed of five distinct categories. Each category represents a dimension of technological power needed to hold a positional advantage in any given technology. The categories are interconnected, with a nation's strengths or weaknesses in any given category impacting the other dimensions. Securing a truly dominant position would require leading across the categories of this framework.



Innovation Leadership

| Who is pushing the envelope of what is possible?

This category measures the ability to invent and refine technologies at the cutting edge. Research and achievements in system performance, efficiency, scientific breakthroughs, and standard-setting are the engine of technological advantage. A nation that leads here is the first to unlock and benefit from new capabilities and is able to dictate the future trajectory of the technology.

Industrial Capacity

| Who has the infrastructure and inputs to produce the technology at scale?

Innovation without production is a strategic vulnerability. Industrial capacity ensures a nation can translate R&D into deployed assets, control critical supply chain inputs, and scale production to meet national needs without reliance on foreign adversaries.

Market Ecosystem

| Who has the economic backing for sustained leadership?

This category evaluates commercial viability and economic backing. From commercialization to scaling to global dominance–and how long it takes to do so–a thriving market ecosystem provides the capital and market necessary to sustain innovation over the long term.

Talent Pipeline

| Who trains, attracts, and retains the human capital behind the technologies?

Technology is ultimately a human endeavor. The nation that attracts and retains the world's top minds and trains the most capable workforce secures the raw material for future dominance. A pipeline advantage ensures a continuous flow of creativity and technical skill, preventing stagnation.

National Leverage

| Which country effectively utilizes its collective power to advantage its tech sector?

Government policy acts as a force multiplier. Through visionary strategy, coordinated regulations, and alliance building, a state can accelerate development, protect critical advantages, and leverage technology for geopolitical gain.

The Methodology: A Standardized Process for Specialized Analysis

The Tech Scorecard translates the framework into concrete scores using a methodology to identify, collect, and normalize the most important quantitative and qualitative data. The six-step methodology is designed to give decision-makers a clear upfront view of the state of play while ensuring both consistency and tailored technology-specific accuracy for analysis across sectors from AI to Quantum.

Step 1: Metric Selection

Metrics are not one-size-fits-all. Analysts select quantitative and qualitative metrics tailored to the specific lifecycle stage and material requirements of the technology being studied. Varying metrics between different technologies improves accuracy compared to a fully standardized index because it allows the Tech Scorecard to be more closely fit to the technology itself.

Metrics Vary Across Tech Readiness Levels (TRLs)

	Emerging Technologies	Evolving Technologies	Established Technologies
Innovation Leadership	BREAKTHROUGHS Scientific Milestones, R&D, Academic Output	SYSTEM PERFORMANCE Qualitative Capabilities, Speed, Reliability	NEXT-GEN DEVELOPMENT Novel Patents, Efficiency Improvements
Industrial Capacity	RESEARCH HARDWARE Number of Labs, Access to Specialized Equipment	INFRASTRUCTURE BUILDOUT Enabling Hardware Capacity, Manufacturing Facilities	SUPPLY CHAIN CONTROL Manufacturing Capacity, Control of Inputs
Market Ecosystem	COMMERCIALIZATION Number of Startups, Private Investment	SCALING Company Size, Investment, User Base, Cost Curves	GLOBAL DOMINANCE Domestic Adoption, Global Market Share, Top Companies
Talent Pipeline	GENIUS ATTRACTION PhD Graduates, Competition and Conference Participants	WORKFORCE FORMATION Education Programs, Job Availability and Pay	SOCIETAL BUY-IN Job Training Programs, Public Awareness
National Leverage	VISIONARY STRATEGY National Lists, Defense Strategies, Government Spending	COORDINATED EMPOWERMENT Regulations, Standards	GEOPOLITICAL STRENGTH Government Focus, Allies, Chokepoint Control

Step 2: Importance Assignment

Not all metrics carry equal weight. Each metric is assigned an importance level—High, Medium, or Low—based on expert judgement of its diagnosticity, or how well it measures the state of play in the category at hand. We reduce a metric's weight if it is less relevant, functions as a redundant proxy, or relies on low-confidence data (such as dated or incomplete sets). High importance metrics, on the other hand, are central to the understanding of the given category for the selected technology, such as robot manufacturing output, to judge the industrial capacity in robotics.

Step 3: Data Collection

The Tech Scorecard both syntheses existing industry analyses and generates novel insights by combining research, open-source data, subscriptions, and expert input. The gold standard for this assessment is timely, objective data that is consistent for the United States and China. However, this type of data is notoriously difficult to collect, and the scorecard enables flexibility to use proxies, multiple sources, and qualitative judgments to fill in data gaps.

Step 4: Metric Scoring

Using the collected data, SCSP rates both the United States and China on a scale of 1 to 5 for each metric. The scores are based on a structured analytic technique using a clear rubric (below) to generate grounded assessments at the individual metric level. This approach enables standardization of a wide variety of data while maintaining the flexibility that makes this assessment uniquely valuable.

Scoring Rubric

1	NEGLIGIBLE / NASCENT	The country has minimal presence or capability in this metric. The data point is statistically insignificant on a global scale (e.g., negligible market share, zero meaningful export).
2	EMERGING / MINOR	The country is active but below the global average or industry standard. They are followers or niche players. Performance is functional but clearly inferior to top-tier competitors.
3	COMPETITIVE / MAINSTREAM	The country operates at the global industry standard. The metric represents a healthy, functioning ecosystem that meets current market needs but does not differentiate itself as superior.
4	ADVANCED / LEADING	The country is in the top tier globally. The metric shows performance, scale, or quality that exceeds the average and rivals the very best. They are pushing the envelope.
5	STATE-OF-THE-ART / DOMINANT	The country sets the global benchmark. This metric represents the absolute peak of what is currently possible (e.g., the fastest supercomputer, the deepest capital pool, the most efficient supply chain).

Step 5: Trend Assessment

Beyond the static score, analysts assess the directionality of the competition within each metric to determine if it has been trending towards China or towards the United States. The time period of reference for the change is not constant. On some fast-moving metrics, such as research, a year-over-year comparison may be appropriate. On long-term metrics such as national strategies, a holistic view over the past five to ten years may be taken. The trend is ultimately an analytic judgment of its movement over time.

Step 6: Weighting and Normalization

Individual metrics are combined into a weighted score to provide an overall view of the state of competition in each category. Each metric is weighted according to its importance; the weighted scores are summed and normalized back to a 1-to-5 scale. The country with a higher score is determined to be the current leader in that category. The overall trend assessment for each category is calculated with a weighted count of the number of metrics trending towards each country.

Translating Results into Actionable Assessments

The results of the methodology–objective rankings of the United States and China across the five categories of the framework–provide the basis for diagnosing and prescribing the needs for a given technology. The next steps can include determining the overall winner, identifying policy needs, and tracking trends across technologies.

Overall Winner Designations

The topline takeaway will be an analytic interpretation of the number of categories in which a country leads and the breadth of the gap. The Tech Scorecard does not provide a quantitative score for the overall positioning of the United States and China in a given technology because doing so would lose the nuance of the five categories and make assumptions about the importance of each category. Experts reviewing the framework can assess which country may be leading or if the area remains contested.

Policy Recommendations

The comprehensive review of the five categories helps to pinpoint the areas in which changes are needed to overcome weaknesses and which existing policies are crucial to maintain strengths.

Cross-Technology Review

Once this framework is applied consistently to multiple critical technologies, the trends that emerge will identify systematic issues that deserve attention beyond the scope of a single technology. For example, if the United States is found to consistently trail in a certain category, that becomes a key area to elevate in the national conversation.

Limitations of the Tech Scorecard

While we believe that the Tech Scorecard represents the best comparative assessment framework in use, this type of analysis is inherently difficult and has some limitations.

Dynamic Data Environment

The Tech Scorecard relies on data available from open sources, including industry subscriptions, accessible from within the United States. Classified sources may have additional insight into technological capabilities and markets, especially for dual-use technologies. China's firewall and tightly controlled publication of government data mean that data may be missing, incorrect, or estimated. The Tech Scorecard seeks to minimize the impact of this limitation by allowing for the collection of data on China and the United States from different sources so that the most accurate datasets can be used. It is also designed to incorporate new data as it becomes available. The weighting scheme further allows for adjustment for low-confidence data when there is a reasonable suspicion that the data deviates from fact.

Reliance on Expert Judgement

The Tech Scorecard leverages structured expert judgment to navigate data gaps where quantitative metrics alone might be misleading. While the judgment-based approach has many benefits to allow for the measurement of metrics that otherwise would not be included, it introduces subjectivity. Controls against subjective bias include relying on inputs from multiple experts from SCSP, industry, and academia, providing clear rubrics for scoring and weighting, and focusing judgment decisions at the individual metric level, where they are likely to be more grounded.

Conclusion

The SCSP Tech Scorecard provides a rigorous, data-driven alternative to anecdotal or stovepiped assessments of U.S.–China technology competition. By quantifying factors across the five categories of innovation, industry, market, talent, and policy, we generate a high-resolution, nuanced picture of the current landscape.

This methodology will be applied across critical technology sectors, with ongoing updates to ensure policymakers and stakeholders have the most accurate intelligence available. This document serves as the foundational reference for all subsequent technology-specific scorecards produced under this program.