Leveraging the Foundational Role of Scientific and Technological Strategic Intelligence in the Development of High-Level Scientific and Technological Think Tanks (Post-print)

Authors: Liu Qing

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Abstract

The rapid development of think tank construction in China has provided a new development platform for strategic intelligence research, expanding the service objects and task space of intelligence research. Through analyzing the foundational role of scientific and technological strategic intelligence research in the construction of scientific and technological think tanks, as well as the historic development opportunities that national high-end scientific and technological think tank construction presents for scientific and technological strategic intelligence research, this article argues that the Chinese Academy of Sciences, as one of the first batch of pilot units for national high-end think tank construction, needs to further strengthen its scientific and technological strategic intelligence research. Building upon existing research capabilities, conditions, and teams, it should clarify its strategic positioning, scientifically design its basic architecture, rationally layout its task and product system, and innovate its operational model to build a high-level scientific and technological strategic intelligence research system. This will support the pilot construction of national high-end think tanks and contribute to the goal of "taking the lead in building a national high-level scientific and technological think tank."

Full Text

The Fundamental Role of Strategic Science and Technology Intelligence in High-Level Science and Technology Think Tank Construction

Institutes of Science and Development, Chinese Academy of Sciences (Preparatory), Beijing 100190

Abstract

The rapid development of think tank construction in China has provided strategic intelligence research with a new platform for development, expanding both its service objects and task space. By analyzing the fundamental role of strategic science and technology (S&T) intelligence research in the construction of S&T think tanks, as well as the historic development opportunities that national high-end S&T think tank construction has brought to strategic S&T intelligence research, this article argues that the Chinese Academy of Sciences (CAS), as one of the first batch of national high-end think tank pilot units, must further strengthen its strategic S&T intelligence research. Building upon existing research capabilities, conditions, and teams, CAS should establish a high-level strategic S&T intelligence research system by clarifying its strategic positioning, scientifically designing its basic architecture, rationally structuring its task and product systems, and innovating its operational model. This will help fulfill the national high-end think tank construction pilot mission and contribute to the goal of "taking the lead in building a national high-level S&T think tank."

Keywords: National High-End Think Tank, Science and Technology Think Tank, Strategic Science and Technology Intelligence Services
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Since the 18th National Congress of the Communist Party of China, the central government has made a series of deployments to promote scientific decision-making and strengthen the construction of new-type think tanks with Chinese characteristics. General Secretary Xi Jinping has repeatedly given important instructions on strengthening such think tanks, emphasizing the need to "build a batch of high-end think tanks that are urgently needed by the nation, have distinctive features, institutional innovation, and lead development, focusing on forward-looking, targeted, and reserve policy research around major national strategic needs" [1]. China's think tank construction has entered a stage of rapid development. The first batch of national high-end think tanks has been established and is now operating, with their roles in different fields and at different levels becoming increasingly apparent.

In think tank activities, the role of strategic intelligence work has always received significant attention. Many think tanks, especially newly established ones, have incorporated strategic intelligence research into their important work content [2]. In a sense, strategic intelligence research is the foundational work of think tanks, providing comprehensive support such as situation analysis, dynamic monitoring, and forecasting for think tanks' research work that produces ideas, countermeasures, and influence. The rapid development of China's think tank construction has provided strategic intelligence research with a new development platform and expanded its service objects and task space.

CAS is one of the first batch of national high-end think tank construction pilot units. To complete the national high-end think tank construction pilot task and achieve the goal of "taking the lead in building a national high-level S&T

think tank," it is necessary to further strengthen strategic S&T intelligence research, leverage its fundamental role, and promote its collaboration with other units in the CAS National Science Think Tank system to support strategic and consulting research for national high-end S&T think tanks, as well as to support S&T strategic planning and decision-making for relevant national departments in coordination with domestic related institutions.

Robert Clark, a senior U.S. intelligence analyst, investigated the extreme importance of intelligence researchers' objective assessment and understanding of clients, their business, or their domain in his book *Intelligence Analysis: A Target-Centric Approach*. He noted that "if intelligence analysis does not address problems of current interest to the user, it becomes less useful for policy formulation" [6]. Although academia has different views on the relationship between intelligence research and users, the basic consensus is that strategic intelligence research must closely align with user needs and make intelligence analysis relevant and pertinent without losing objectivity.

Similarly, strategic S&T intelligence research is foundational work for S&T think tanks. Its focus is to address specific needs such as strategic research and evaluation related to promoting development through S&T and promoting S&T development itself. Based on extensive collection of intelligence regarding S&T strategic trends and developments in various fields, it undergoes research processing including sorting and identification, comprehensive induction, and judgment and reasoning to produce research conclusions and reports with basis, analysis, evaluation, and prediction. S&T think tanks mainly study major issues concerning the overall situation from the perspective of S&T impact and role, think ahead about global S&T development trends from the perspective of S&T laws, conduct scientific assessments and predictive analysis, and put forward forward-looking and constructive suggestions on major issues in economic and social development. They play important roles in national S&T strategy, planning, layout, and policy [7]. Their role positioning includes researchers on major S&T-related policy issues, consultants before important policy introduction, evaluators of policy implementation, interpreters of major S&T policies, researchers on reserve policies, and guides of S&T-related public opinion. To fulfill these roles, they must possess the conditions and capabilities to acquire, research, and analyze S&T intelligence—that is, strategic S&T intelligence research capabilities.

The work of CAS's strategic intelligence system exemplifies its fundamental role in supporting S&T think tanks. Since the implementation of "literature and intelligence integration" in the 1980s, especially since the integrated development of the CAS-level literature and intelligence system in 2005, the CAS strategic intelligence research system has systematically carried out research and analysis on S&T development strategies, hotspots, and frontiers by long-term tracking of the latest international S&T developments and important S&T issues of concern to major countries and international organizations. Through overall planning and systematic layout, it has formed a strategic intelligence research service

system with both division of labor and collaboration, demonstrating strong systematic and professional characteristics. It has produced distinctive products based on S&T intelligence synthesis and analysis (Figure 1 [Figure 1: see original paper]), which have received excellent responses in the industry and become an important force that CAS and China's S&T decision-makers and researchers can rely on, playing a fundamental role in manifesting CAS's functions as a national S&T think tank [8].

1. The Fundamental Role of Strategic S&T Intelligence Research in S&T Think Tanks

There is no doubt that the relationship between strategic intelligence research and think tanks is very close, stemming from the innate connection between intelligence and decision-making. Strategic intelligence is the knowledge that macro decision-making must rely on and an important foundation for scientific decision-making. Decision-making without strategic intelligence is blind decision-making. Whether at the village, community level or at the party or national level, the basic process involves collecting intelligence from different sources, analyzing it to form cognitive understanding at the decision-making level, and then generating decisions. Decision-making activities require independent opinions and suggestions, which is the task of think tanks. However, opinions and suggestions are not generated out of thin air; they require the sorting, synthesis, and analysis of different types and sources of intelligence—this is the work of strategic intelligence research. Some scholars have investigated the general process of research conducted by RAND Corporation, Brookings Institution, and Hoover Institution, and conducted in-depth analysis of their entire process of "transforming knowledge into wisdom," concluding that "the collection, screening, and processing of intelligence are the initial work of think tanks' project research and key links affecting decision-making consultation conclusions" [3].

The Congressional Research Service (CRS) of the U.S. Library of Congress is also very typical, with nearly a thousand people conducting intelligence research and analysis services to provide assistance to members of Congress, cooperate with government agencies or academic groups to conduct project research, and provide decision-making basis for Congress. CRS played a very prominent role in the Watergate investigation [4]. There are also many specialized intelligence research institutions in China that provide intelligence resources and intellectual support for think tanks, forming different types of strategic intelligence research products through specialized intelligence collection, sorting, and analysis, playing an irreplaceable fundamental role at the front end of think tank construction activities [5].

2. National High-End Think Tank Construction Provides Historic Opportunities for Strategic S&T Intelligence Work

CAS is an important force in building new-type think tanks with Chinese characteristics. The Institutes of Science and Development of CAS (hereinafter referred to as "ISD") is the core carrier and comprehensive integration platform for CAS to take the lead in building a national high-level S&T think tank. The *Opinions on Strengthening the Construction of New-Type Think Tanks with Chinese Characteristics* clearly proposes to leverage the advantages of CAS and other institutions in promoting S&T innovation, play a supporting role in national S&T strategic planning, layout, and policy, and make them innovation-leading, nationally relied upon, socially trusted, and internationally renowned S&T think tanks. On November 9, 2015, the Central Leading Group for Comprehensively Deepening Reform reviewed and approved the *National High-End Think Tank Construction Plan*, and CAS was identified as one of the first batch of 10 Category I high-end think tank pilot units directly under the Party Central Committee, the State Council, and the Central Military Commission, with ISD clearly designated as the pilot task.

Since 2015, the construction of ISD has been advancing in a meticulous manner, with the integration and establishment of strategic S&T intelligence work taking the lead. It is worth noting that strategic S&T intelligence research has always been placed in a very important position, from the research and formation of ISD's establishment plan to the actual advancement of its establishment work. In early 2016, the CAS Party Group approved the ISD establishment plan, which clearly designated strategic S&T intelligence work as part of its research 板块 and strategic intelligence research teams as part of its core teams. The plan requires comprehensive tracking of international S&T strategies and dynamics, assessment of S&T development trends and frontiers, revelation of international S&T strategy and policy development trends and transformation trends, support for important S&T strategic planning, policy, and evaluation, and construction of shared data platforms and monitoring and analysis platforms. This reflects not only the long-term accumulation, actual role, and influence of CAS's strategic S&T intelligence research work, but also the understanding, recognition, and consensus of all levels and aspects regarding the important role of strategic S&T intelligence work. In the development history of CAS's literature and intelligence work, this is another landmark event of great significance following "literature and intelligence integration" and the digital transformation of literature and intelligence services. It plays an extremely crucial role in enabling strategic intelligence research to achieve stable transformation under the new development background. It can be said that the national high-end think tank construction pilot has brought new historic development opportunities for CAS's strategic S&T intelligence work.

However, from the perspective of business layout and work models, the phenomenon of dispersed, overlapping, and redundant forces in CAS's strategic S&T intelligence system is still relatively prominent, and internal disorderly

competition still occurs occasionally. In terms of work content and product quality, there are problems to varying degrees in methodological innovation, broad thinking, research depth, and accuracy in grasping S&T frontiers, hotspots, difficulties, and priorities, with insufficient systematic and comprehensive analysis capabilities. Mr. Song Dawei, former Director of the Social Development Research Department of the State Council Research Office, believes that strategic S&T consulting research should adhere to five elements: "high, new, deep, practical, and accurate." "High" means standing high, seeing far, and thinking deeply, highlighting overall, strategic, and forward-looking perspectives. "New" means boldly proposing new viewpoints, new insights, and new countermeasures. "Deep" means enhancing acuity, foresight, and discernment, and improving the depth of ideological theory, logical judgment, and strategic research. "Practical" means seeking truth and being pragmatic, investigating actual situations, speaking truthfully, doing practical work, seeking practical strategies, and producing practical measures, without avoiding problems, covering up contradictions, or telling lies. "Accurate" means accurate concepts, appropriate judgments, and logical reasoning using concepts and judgments [9]. To a certain extent, these are also the five elements for measuring the quality of strategic intelligence research work and should be implemented in all aspects of strategic S&T intelligence research products, methods, and related organizational activities.

To play its fundamental role in S&T think tank construction and embody the value of a "think tank for think tanks," ISD's strategic S&T intelligence research must firmly grasp the historic opportunities brought by national high-end think tank construction, transform these opportunities into internal driving forces, and use mechanism innovation and force integration as drivers. With methodological innovation, content innovation, and product innovation as breakthrough points, it must pool efforts, achieve smooth transformation, and attain long-term development.

3. Building a High-Level Strategic S&T Intelligence System to Support National High-End S&T Think Tank Construction

Sherman Kent, a pioneer in U.S. strategic intelligence analysis, stated in his classic work *Strategic Intelligence: For American World Policy* that intelligence is knowledge, intelligence is organization, and intelligence is activity. "The amount of knowledge produced by strategic intelligence is so vast that it requires collective effort with complex and careful division of labor" [10]. For strategic S&T intelligence research work to play a high-level role, it similarly requires a high-level strategic intelligence work organization and scientific design and planning of strategic intelligence activities. The author believes this mainly involves five requirements: (1) Build a strong research team and consolidate the foundation. Individual capabilities require specialized knowledge backgrounds, policy analysis capabilities, resource grasping capabilities, and information retrieval

capabilities. Researchers must stand at a macro level and think deeply, collectively forming team capability characteristics and multiplying team strength. Organizationally, there must be reasonable personnel allocation, reasonable task division, and reasonable module integration. In action, there must be rapid response, timeliness, agility, and proactivity. (2) For specific tasks or projects, there must be accurate understanding of requirements, clear positioning, clear objectives, reasonable research framework design, and dynamic adjustment in actual operation. (3) Research and utilize reliable methodological tools with appropriate forms that meet needs, achieving proficient use of classic methods and scientific use of innovative means. (4) Establish reliable standards and norms to ensure capabilities. (5) Design reasonable product services to produce results with independent judgment and innovative viewpoints that provide adequate support (Figure 2 [Figure 2: see original paper]).

ISD's strategic S&T intelligence research 板块 aims at high-level goals. Based on existing research capabilities, conditions, and teams, it will reorganize, upgrade, and reengineer according to different circumstances. By clarifying its strategic positioning, scientifically designing its basic architecture, rationally structuring its task and product systems, and innovating its operational model, it will support the national high-end S&T think tank construction pilot and help achieve the goal of "taking the lead in building a national high-level S&T think tank."

3.1 Clarifying Strategic Positioning and Development Goals

ISD's strategic S&T intelligence research work is a basic component of national high-end S&T think tank construction. It closely focuses on major issues in national economic construction, social development, national security, and S&T progress, as well as major national strategic needs. It provides high-level strategic S&T intelligence research services, supports CAS departments, CAS organs, and ISD units in conducting and undertaking national and CAS strategic and consulting research and related tasks, and coordinates with domestic related institutions to support S&T strategic planning and decision-making for relevant national departments.

ISD's strategic intelligence research is committed to comprehensively and systematically tracking international S&T strategies and dynamics, grasping global S&T development trends, hotspots, and frontiers, studying international S&T strategy and policy development trends and transformation trends, and summarizing and analyzing China's S&T strategies and policies in response to international development and major issues. It produces high-quality strategic intelligence research products such as dynamic monitoring, situation research, competitiveness analysis, and science structure maps. It focuses on serving important macro S&T decisions for the nation and CAS, providing consulting and analysis services on international S&T strategies and policies and international S&T competitiveness.

Its overall development goal is to become a domestically leading and interna-

tionally first-class strategic S&T intelligence research and consulting institution, a core department for national-level strategic S&T intelligence research and decision-making consulting services, continuously producing strategic S&T intelligence research products with important influence, becoming one of the main forces representing CAS and China in exchanges and cooperation with important international strategic intelligence research institutions, and becoming a renowned institution for international intelligence graduate education.

3.2 Scientifically Designing the Basic Architecture

Facing the needs of national and CAS S&T strategy and consulting research and tasks, and following the principles of "overall planning, systematic layout, collaborative service, and integrated integration," ISD will integrate CAS-level strategic intelligence research forces. It will form a "core + network" model with Beijing's strategic intelligence research forces as the core and strategic intelligence research forces in Lanzhou, Chengdu, Wuhan, Shanghai, and other places as the network team. It will build a strategic S&T intelligence research service system of "division of labor and responsibility, long-term accumulation, in-depth analysis, and decision-making support," working around the core goal of building a high-level S&T think tank.

Based on the above forces, ISD will form a systematic, hierarchical, and collaborative core task coverage of major aspects and disciplines of S&T innovation, with a clear and efficiently operating research team system. The teams include three major categories: (1) S&T Strategy, Policy, and Competitiveness Research Team. This team systematically monitors and tracks international S&T development strategies, S&T planning, S&T layout, S&T evaluation, and other development dynamics; analyzes and studies the reform trends of S&T management systems and mechanisms in major countries around the world; promptly reveals new trends and measures in international S&T policy and S&T management development; continuously monitors and analyzes important S&T issues of concern to important countries and international organizations; promptly grasps important S&T issues and ideas affecting economic and social development; focuses on and analyzes new S&T trends and S&T transformation trends that guide economic and social development; and conducts in-depth tracking analysis and research on international, regional overall S&T competitiveness, and interdisciplinary, cross-field overall S&T competitiveness. It focuses on serving important macro S&T decisions for the nation and CAS, providing consulting and analysis services on international S&T strategies and policies and international S&T competitiveness. Key research directions include international S&T policy and strategy research, international S&T competitiveness research, world S&T frontier research, and strategic intelligence analysis tools and platform research.

(2) International S&T Frontier Intelligence Analysis Team. This team conducts long-cycle, systematic monitoring and tracking of the latest international S&T R&D progress dynamics, important S&T policies and insti-

tutional situations in relevant fields, the latest scientific discoveries and technological inventions, and other S&T R&D breakthrough situations. It excavates, captures, and focuses on S&T hotspots and frontiers, and promptly assesses and grasps new trends and directions in S&T development and S&T transformation trends. It provides consulting and analysis services on scientific development frontiers and technological development frontiers, provides analysis reports on international scientific development frontiers and international technological development frontiers, and produces international science structure maps and international technology structure maps.

(3) Intelligence Analysis Technology and Platform Team. This team conducts research on theoretical methods and data platform construction for quantitative analysis of strategic S&T intelligence, operates and continuously improves the world S&T development trend monitoring and analysis platform, builds an analysis tool library integrating information collection, information extraction, text mining, bibliometrics, and visualization technologies, builds an open and shared economic and social information integration and service platform, and builds a comprehensive S&T decision-making integration platform integrating think tank results, think tank thematic databases, and "gray materials" and other information. It forms an effective capability system and service support mechanism to support ISD and major projects' S&T strategy research.

3.3 Rationally Structuring the Task and Product System

3.3.1 Task System The task system includes four major categories: routine (long-term) tasks, top-down deployment tasks, external tasks, and self-disciplinary development. (1) Routine (long-term) tasks involve organizing and conducting long-term research support services around needs. (2) Top-down deployment tasks involve undertaking relevant tasks deployed by the nation, CAS, and ISD, supporting relevant tasks undertaken by ISD, focusing on supporting strategic intelligence research needs for national major S&T and innovation development decision-making consultation, supporting national major S&T development strategy research needs around important disciplinary fields or major issues, and supporting needs related to third-party evaluation of major national policy measures. (3) External tasks involve proposing and undertaking projects from the National Natural Science Foundation and Social Science Foundation, and undertaking relevant projects and tasks deployed by units inside and outside CAS, producing customized monitoring bulletins and special research reports. (4) Self-disciplinary development involves conducting theoretical and methodological research on macro trend judgment of S&T field development, discovery of major breakthrough S&T directions, and identification of key technologies driving innovative development; conducting research on ideas, methods, and applications for strategic intelligence analysis tools, platforms, and system development; conducting research on theories, methods, and technologies related

to intelligence studies, scientometrics, domain informatics, and S&T think tank construction; organizing academic exchanges with domestic and international strategic intelligence research institutions and related institutions; and conducting graduate education in intelligence studies.

3.3.2 Product System ISD will form a strategic intelligence research product sequence with different release cycles, for different users, and adapted to different analysis depth requirements, building a unique and indispensable intelligence product system for the S&T Strategy and Consulting Institute.

(1) Monthly (semi-monthly) dynamic monitoring bulletins, such as *Science and Technology Frontier Express*, *Science and Technology Policy and Consulting Express*, *Science and Technology Internal Reference*, and *Monthly Science and Technology Dynamics*.

(2) Scientific frontier analysis research reports, such as *International Science and Technology Frontier Report* (annual), *Science Structure Map* (biennial), *Technology Structure Map* (biennial), *Annual Analysis Report on Research Frontiers* (annual), and *World Discipline Development Frontiers and Hotspot Research*.

(3) S&T strategy, policy, and competitiveness research reports, such as *Annual Observation Report on Science and Technology Policy and Strategy*, *International Science and Technology Competitiveness Analysis Report*, *Analysis Report on National Science and Technology Innovation Development Trends*, *Evaluation Report on National Innovation System Development Trends*, and *Chinese Academy of Sciences in World Science*.

(4) Decision-making consultation and suggestion reports for senior leadership. These involve conducting special decision-making consultation research around issues entrusted by decision-makers or around important key issues in S&T development, forming fast-response consultation and suggestion reports for specific issues.

(5) Discipline and field development reports. These involve producing annual or biennial discipline and field development reports around major S&T development trends and strategies, international and domestic competitive development situations, and competitive development situations of major frontier issues in specific disciplines or fields, such as *Space Science and Application Development Report*, *Agricultural Science and Technology Field Development Report*, *Resources and Environment Science and Technology Development Report*, *Earth Science Frontier Development Report*, *Information Science and Technology Development Report*, *Materials Development Report*, *Advanced Energy Development Report*, *Biotechnology Field Development Report*, and *Biosecurity Science and Technology Development Report*.

3.4 Innovating the Operational Model

In terms of organizational management methods for business operations, ISD implements a "Strategic Intelligence Coordination Group" approach. According to the overall layout, the group is responsible for overall planning and systematic layout for specific tasks and projects, promoting collaborative services and integrated integration, and adopts a meeting coordination management mechanism.

In the implementation process of specific projects and tasks, ISD implements a matrix work mechanism. Overall responsibility lies with the project leader, who 吸纳 s teams from different units according to task nature and requirements. Project and task assessment and supervision are organized by ISD. Each unit can independently undertake intelligence research and services directly to external parties according to disciplinary division of labor and service positioning, with assessment and supervision organized by the units to which they belong. The coordination group provides coordination support.

An academic consultation mechanism is established, inviting S&T policy experts, S&T experts, and strategic S&T intelligence experts from inside and outside CAS to form an academic consultation committee to guide strategic intelligence research work.

According to the types and characteristics of strategic S&T intelligence research, ISD will formulate and improve a series of quality control systems. It will establish standardized work mechanisms and process control requirements for *Express* work, establish and improve organizational models and research mechanisms for strategic S&T intelligence research such as team matrix work organization mechanisms, topic consultation and demonstration mechanisms, team group exchange and collective research mechanisms, expert consultation and cooperative research mechanisms, to ensure research quality.

ISD will formulate and improve assessment and evaluation mechanisms and incentive mechanisms for strategic intelligence research work, strengthening the formation of a performance evaluation system and incentive policy mechanism combining qualitative and quantitative approaches oriented toward important tasks, important result outputs, and important influence effects of strategic intelligence research. It will increase performance incentives for important strategic research result outputs and decision-making consultation service impacts and effects, promote team capability enhancement, and highlight decision-making consultation effects.

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Liu Qing
Professor, Deputy Director of Institutes of Science and Development, Chinese Academy of Sciences. He has long been engaged in S&T information services and strategic S&T intelligence research, having organized and participated in multiple major strategic research and strategic intelligence research projects, multiple third-party evaluations of major national policy measures, and multiple studies on major national reform issues.
E-mail: liuqing@casipm.ac.cn

Note: Figure translations are in progress. See original paper for figures.