Reflections and Recommendations on University Think Tank Participation in Defense Science and Technology Development: Postprint

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Abstract

[Purpose/Significance] The national defense technology enterprise has created historic opportunities for university think tanks, and clarifying relevant issues concerning their participation in the construction and development of national defense technology holds significant reference value.

[Method/Process] In response to the new context of in-depth civil-military fusion development and innovation-driven development, this study employs empirical research, comparative research, and other methods to investigate the practical reasons and key dimensions for which deep participation of university think tanks is needed in national defense technology construction and development, analyzes the feasibility of such participation, and finally proposes strategic recommendations for how university think tanks can engage in national defense technology construction and development.

[Results/Conclusion] University think tanks possess inherent advantages and promising prospects in national defense technology construction and development. It is recommended that they strengthen their ideals and convictions, explore channels and platforms, establish policy special zones, cultivate leading figures, enhance research capabilities, aggregate resources from all sectors, build professional forces, develop intelligent tools, strengthen achievement transformation, and emphasize brand promotion.

Full Text

Preamble

Thoughts and Suggestions on the Participation of University-Affiliated Think Tanks in the Development of National Defense Science and Technology

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Abstract

[**Purpose/Significance**] The national defense science and technology (NDST) sector presents a historic opportunity for university-affiliated think tanks (UTTs). Clarifying the relevant issues concerning UTT participation in NDST development holds important reference significance. [**Method/Process**] In light of the new situation characterized by deep civil-military integration and innovation-driven development, this paper employs empirical research, comparative studies, and other methods to explore the practical reasons why NDST development requires deep UTT involvement and the main aspects of such participation. It analyzes the feasibility of UTT engagement in NDST development and finally proposes strategic recommendations for how UTTs can participate. [**Result/Conclusion**] The paper concludes that UTTs possess natural advantages and promising prospects in NDST development. It recommends that UTTs should strengthen their ideals and beliefs, explore channels and platforms, establish policy special zones, forge leading figures, enhance research capabilities, gather resources from all quarters, build professional forces, develop intelligent tools, strengthen 成果转化 (achievement transformation), and emphasize brand building and publicity.

Keywords: university-affiliated think tank; decision-making consultation management and policy; technology-oriented civil-military integration

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University-affiliated think tanks are currently facing a major historical opportunity. At present, the new military revolution, technological revolution, and industrial revolution are in full swing. National defense science and technology is moving from behind the scenes to center stage in military affairs and is gradually becoming a decisive factor in great power competition. Under the new situation, the state has proposed innovation-driven development, civil-military integration, and technology-driven military strengthening strategies. The tide of NDST development is surging, presenting UTTs with unprecedented strategic opportunities and development space where they can accomplish great things and have bright prospects. Based on in-depth investigations of over 50 typical military think tanks, academy think tanks, university think tanks, and civilian think tanks, this paper employs empirical research, comparative studies, and case studies to explore the landscape of NDST development and its intellectual demands on UTTs. It analyzes the advantages, disadvantages, and feasibility of UTT participation in NDST development, and subsequently proposes several strategic recommendations for such participation.

1. NDST Development Calls for Deep UTT Involvement

Historically, major NDST projects such as the "Two Bombs, One Satellite" and the "Yinhe Supercomputer" were inseparable from the support and collaboration of military and civilian universities. Currently, as competition in national defense and military affairs intensifies, the conceptual scope of NDST is rapidly expanding to encompass all important sectors of national development. It has become a leading force in national scientific and technological progress and a strategic high ground in the national innovation system, showing a trend of collaborative R&D and integrated development with universities that urgently requires comprehensive intellectual support from higher education institutions.

1.1 Long-Term Drive from National Macro-Level Science and Technology Policies

The Party and government have always attached great importance to decision-making consultation. Since the 18th Party Congress, they have been committed to promoting scientific, democratic, and law-based decision-making, improving the decision-making support system with Chinese characteristics, supporting scientific decision-making with scientific consultation, and leading scientific development with scientific decision-making [1]. Currently, as an important component of the national innovation-driven development strategy and the strategy for building a strong science and technology nation, macro-level science and technology development has stimulated demand for university think tanks and science and technology think tanks. In January 2015, the General Office of the CPC Central Committee and the State Council issued the "Opinions on Strengthening the Construction of New-Type Think Tanks with Chinese Characteristics" (hereinafter referred to as the "Opinions"), which clearly stated the need to build a group of new-type university think tanks that the Party and government can trust and utilize, and put forward requirements for building high-level science and technology innovation think tanks and promoting the deep integration of scientific and technological innovation with economic and social development [Citation Error]. On May 30, 2016, General Secretary Xi Jinping pointed out at the "Three Science and Technology Conferences" that it is necessary to accelerate the establishment of science and technology decision-making mechanisms, strengthen science and technology decision-making consultation systems, and build high-level science and technology think tanks [2]. On February 6, 2017, the 32nd meeting of the Central Leading Group for Comprehensively Deepening Reform reviewed and approved the "Plan for Building a National Science and Technology Decision-Making Consultation System" [3], emphasizing that the construction of the national science and technology decision-making consultation system should be based on supporting the overall national development and serving the major science and technology decision-making needs of the Party Central Committee, making strategic arrangements for the construction of the science and technology decision-making consultation system. It is evident that national macro-level science and technology policies

guide and promote the development of university think tanks with science and technology decision-support functions, serving as a long-term driving force and traction for their growth.

1.2 Mission Requirements of the Technology-Driven Military Strengthening Strategy

Scientific and technological progress has profoundly changed human production and lifestyle, and has also deeply influenced the direction of world military development. Currently, China' s economic and scientific-technological strength have significantly improved, with some important scientific and technological fields ranking among the world' s advanced ranks, providing a solid foundation for technology-driven military strengthening [4]. On March 12, 2017, General Secretary Xi pointed out that the Party Central Committee has made strategic decisions to deeply implement the national innovation-driven development strategy and the civil-military integration development strategy, and formulated a series of plans, providing important guidance for technology-driven military strengthening [Citation Error]. Among them, the field of NDST and weapons and equipment is the focus of civil-military integration development. It is necessary to actively discover, cultivate, and apply cutting-edge technologies that can be endowed to national defense and military construction, capture potential growth points for military capability development, strengthen military demand traction, maximize the military use of civilian technologies, and form a multi-dimensional, collaborative, and leapfrog development layout for emerging fields [4]. General Secretary Xi particularly emphasized the need to "focus on the decision-making needs of the Party Central Committee and the Central Military Commission, concentrate on major issues such as national security, national defense, and military construction, conduct policy research, and propose countermeasures and suggestions" and to "apply advanced concepts, methods, and means, give play to the role of the expert think tank system, and improve the level of strategic planning" [4-5]. University think tanks have a solid scientific research foundation in emerging technology fields, inherent disciplinary advantages in supporting advanced concepts, methods, and means, and rich intellectual resources in terms of experts and scholars. Therefore, comprehensively and deeply participating in the civil-military integration development in the field of NDST and weapons and equipment, and participating in the great cause of technology-driven military strengthening, should be regarded as a historical mission for UTTs in the new era.

1.3 Decision-Making Needs of NDST Top-Level Institutions

Since the 18th Party Congress, national defense and military construction has entered a new stage of comprehensive deepening reform. The central government has successively established a number of top-level management, coordination, and decision-making institutions in NDST and related fields, generating huge demand for research and consulting services from think tanks.

In January 2016, the Central Military Commission restructured and established 15 organs including the Joint Staff Department and the Logistic Support Department. Among them, the Equipment Development Department is mainly responsible for the development planning, R&D testing and evaluation, and procurement management of military equipment; the Science and Technology Commission mainly strengthens NDST strategic management, promotes independent innovation in NDST, and coordinates the advancement of civil-military integration development in the science and technology field; the Strategic Planning Office mainly aims to improve the institutional mechanisms for military strategic planning, which is conducive to strengthening the strategic management functions of the Central Military Commission and enhancing centralized management of military strategic planning [6-7]. On January 22, 2017, the Central Committee decided to establish the Civil-Military Integration Development Committee as a decision-making and deliberative body at the central level for major issues concerning civil-military integration development, providing unified leadership for civil-military integration development [8]. The establishment of the above institutions by the Party Central Committee and the Central Military Commission strengthens the leadership system with Comrade Xi Jinping at the core and the chairman responsibility system of the Central Military Commission, representing strategic measures to promote scientific, democratic, and law-based decision-making in national defense and military construction. For think tanks, especially university think tanks closely connected with national defense and military construction, this will be a major historical opportunity.

2. Main Aspects Urgently Requiring UTT Participation in NDST Development

[Figure 1: see original paper] Ten main aspects of university-affiliated think tanks participating in the development of national defense science and technology

For ease of understanding and grasping, analyzed from three perspectives—decision-making institution needs, think tank self-construction and development, and social environment—NDST development urgently requires UTTs to provide comprehensive intellectual support in three dimensions and ten directions: policy support and assistance, independent innovation, and environment building, as shown in Figure 1.

2.1 Policy Support and Assistance

This dimension mainly considers think tanks' role in providing advice and suggestions for decision-makers and support for decision implementation. The NDST cause requires UTTs to provide research and consulting services in major decision-making consultation, policy and regulation system building, NDST strategic management, and civil-military integration development in science and technology.

2.1.1 Major Decision-Making Consultation Commissioned by NDST management agencies, UTTs conduct targeted and professional research, evaluation, and consultation on major issues, key difficulties, and hot trends in NDST and related fields, providing independent and objective scientific basis and consulting advice. Consultation forms include temporary commissioned tasks, research projects, expert symposiums, consulting reports, and special reports, covering NDST and related political, economic, diplomatic, security, and military fields. For example, the China Aviation Engineering and Technology Development Strategy Research Institute of Beihang University, a national-level strategic research institution in China' s aviation field, has conducted research on major scientific and technological innovation projects and major consulting projects in areas such as "Made in China 2025" and aero-engines, providing suggestions for building a strong aviation nation [9].

2.1.2 Policy, Regulation, and System Building NDST policy, regulation, and system building has a solid historical foundation. With rapid technological development and continuous emergence of related issues, building a policy, regulation, and system framework adapted to the times is a top priority and the primary issue for law-based decision-making and military governance. Leveraging their professional advantages, UTTs can provide scientific basis and rational suggestions for the formulation or revision of NDST policies, laws, and regulations. Participation methods mainly include legislative demonstration research, research projects, investigation research, and expert consultation, focusing on the research, formulation, evaluation, and dissemination of policies, regulations, rules, normative documents, and measures.

2.1.3 NDST Strategic Management Predicting NDST development trends and conducting forward-looking, holistic, and comprehensive research on NDST development strategies to support the organization, control, and coordination of various elements or resources involved in NDST activities, as well as providing decision-making suggestions for priority area identification, key technology selection, and technology roadmap formulation, all require professional support and intellectual input from think tanks [10]. Participation methods mainly include research projects and consulting services, covering science and technology system reform, technology roadmaps, research layout and organization models, allocation of science and technology resources, science and technology investment and financing, science and technology evaluation, science and technology talent policies, and science and technology security.

2.1.4 Civil-Military Integration Development in Science and Technology Civil-military integration in science and technology opens new windows for UTTs. The deep development of civil-military integration in science and technology provides conditions and environments for think tanks to participate in NDST construction, and also creates task demands for think tanks to provide advice on civil-military integration. UTTs can provide comprehensive support

services in top-level design, overall planning, policy formulation, management coordination, evaluation and supervision, intermediary platforms, achievement transformation, information security and confidentiality, and intellectual property rights during the implementation of the civil-military integration strategy in science and technology [Citation Error]. The Civil-Military Integration Development Research Center of National Defense University and the Civil-Military Integration Development Strategy Research Center of Northwestern Polytechnical University have already conducted extensive work in this field [11-12].

2.2 Independent Innovation

This dimension mainly considers the NDST cause's need for UTTs to strengthen theoretical research and innovation and enhance their own capabilities, including advanced ideological and theoretical innovation, NDST innovation leadership, and decision-support tool R&D.

2.2.1 Advanced Ideological and Theoretical Innovation Ideological and theoretical innovation is the foundation of think tanks' existence. The NDST field has its own consulting service institutions, but they lack sufficient independence, autonomy, and innovation. UTTs can fill this gap by leveraging their unique advantages in disciplinary theories to propose new ideas, concepts, viewpoints, and methods in research on major issues concerning national security, military strength, and scientific and technological development, providing scientific, non-profit, independent consulting advice for decision-making. For example, the concepts of "unrestricted warfare," "asymmetric warfare," and "new terrorist warfare" proposed in *Unrestricted Warfare* have subverted traditional military understanding of war at home and abroad and accurately predicted the 9/11 attacks, representing a classic case of advanced ideological and theoretical innovation [13].

2.2.2 Frontier Technology Innovation Leadership How to accurately grasp development directions, make scientific strategic predictions, actively explore models and means, and particularly achieve breakthroughs and development in major forward-looking, pioneering, exploratory, and disruptive technologies and new concept research (referred to as "four characteristics and two research areas") to provide basic support for actively seeking scientific and technological competitive advantages urgently requires strong support from think tanks [Citation Error]. With their laboratory facilities and talent foundation in advanced technology R&D and new concept research, UTTs can focus on major issues of the innovation-driven development strategy, conduct scientific evaluation and technology forecasting around domestic and international science and technology development trends, lead the direction and trend of scientific and technological innovation, and help the nation seize the commanding heights of scientific and technological competition. Clarivate Analytics, based on SCI, Web of Science, and other databases, conducts frontier technology scanning and evaluation, scientific and technological innovation assessment, and other research.

Its series of reports such as "2016 Top 100 Global Innovators" have achieved remarkable results and are worth learning from for UTTs [14].

2.2.3 Decision-Support Tool R&D The RAND Corporation in the United States has always been a benchmark for defense think tanks. One of its notable advantages and contributions is the creation and application of many advanced research, evaluation, and consulting methods, tools, and systems to ensure scientific rigor and credibility of its results. China' s NDST decision-making consultation is now moving away from the past research model that emphasized qualitative analysis over quantitative analysis and requires modern, intelligent research methods and means that combine human and machine capabilities to support decision-making. UTTs are fully equipped with the conditions and foundation for decision-support tool R&D. The CTTI (China Think Tank Index), developed jointly by the China Think Tank Research and Evaluation Center of Nanjing University and the Think Tank Research and Release Center of Guangming Daily, provides data and service support for developing decision-support tools based on think tank index information and represents one of the major R&D achievements of UTTs in recent years [15].

2.3 Environment Building

This dimension mainly considers the need for think tanks to strengthen social environment building. The NDST cause requires UTTs to focus on promoting military-science and technology track II diplomacy, NDST talent cultivation, and social public opinion guidance.

2.3.1 Military-Science and Technology Track II Diplomacy Currently, to meet the requirements and trends of international military exchanges and enhance the international discourse power and influence of NDST, it is necessary to establish a high-level foreign exchange platform focusing on NDST innovation development and application as soon as possible, and to open track II channels for international exchanges in advanced technology fields. Through international exchanges by UTTs, they can drive and assist official formal strategic and technical international exchanges. For example, the Institute of International and Strategic Studies of Peking University directly participates in research on national foreign policy and preparations for foreign affairs activities of national leaders. Its annual "Bei Ge Dialogue" invites former foreign ministers from major countries and is comparable in level to the Xiangshan Forum [16].

2.3.2 NDST Talent Cultivation The NDST cause is in a transition from catching up to taking the lead, urgently requiring fresh blood with solid scientific literacy. At the same time, the current NDST talent pool has certain lags in knowledge reserves, thinking vitality, and innovation capabilities, requiring high-level academic platforms like UTTs to provide top talent. RAND Corporation is known as a "super military academy," which is inseparable from its

top policy analysis talent cultivation institution—the Pardee RAND Graduate School [17]. However, UTTs not only cultivate policy analysis and consulting service talents but also gather experts and scholars from various fields, levels, and types at home and abroad to participate in the NDST cause. The scientific research management and talent cultivation models of the Advanced Technology Research Institutes of Peking University and Zhejiang University are worth referencing [18-19].

2.3.3 Social Public Opinion Guidance Under the new situation, the NDST field urgently needs to enhance its ability to guide social public opinion and popularize knowledge. As a non-profit independent third party and an important representative of public interests, UTTs can play important roles in publicizing NDST policies and regulations, disseminating concepts of scientific and technological innovation, popularizing NDST knowledge, and correctly guiding public opinion on NDST. Their effects and influence can better demonstrate fairness and justice than other think tanks with certain positions or interests, and are more conducive to creating a favorable environment for NDST development. The Qian Xuesen Library of Shanghai Jiao Tong University, which integrates library, memorial hall, academic research center, and patriotic education base, popularizes NDST knowledge by commemorating Qian Xuesen and conducting related research, making it highly distinctive [20].

3. Feasibility Analysis of UTT Participation in NDST Development

Among the more than 50 think tanks investigated, 12 are university-affiliated, spread across military and civilian sectors, and covering civil-military integration, defense strategy, and science and technology development. The investigation found that UTTs have incomparable advantages in NDST development, but currently also face many problems that need to be resolved. Based on these advantages and problems, this section analyzes their actual feasibility and concludes that the current period and the foreseeable future represent the optimal time for UTTs to gradually and deeply participate in NDST development.

3.1 Natural Advantages of UTTs in NDST Development

The origin of modern universities lies in cultivating talent, producing and disseminating scientific knowledge, and promoting technological progress, representing an institutional guarantee for free academia [21]. It can be said that universities are the embodiment of science and technology and the natural matrix of think tanks. Therefore, in the face of comprehensive, diversified, and professional demands of NDST, UTTs have unique advantages compared with other think tanks: they represent a concentration of university resources, play the role of a non-profit third party, have relatively advanced and standardized operations and management, and possess excellent genes for decision-making consultation

as well as NDST research foundations and capabilities, as shown in Figure 2 [Figure 2: see original paper].

[Figure 2: see original paper] Five outstanding characteristics and advantages of university-affiliated think tanks participating in the development of national defense science and technology

3.1.1 UTTs as a Concentration and Outlet of University Advantages Universities are important components of China' s NDST innovation system, serving as the main force in theoretical, basic, and frontier research, with advantages including a complete disciplinary system, dense talent concentration, strong knowledge reserves, and a solid foundation in innovative research [22-23], playing an important role in NDST development. Relying on universities' high-quality resources and capabilities, UTTs have strong backing in talent resources, research foundations, theoretical and policy reserves, and ideological innovation. Whether adopting Nanjing University' s "N" structure (multiple field-specific think tanks under the university), National University of Defense Technology' s "1+N" structure (one comprehensive think tank and N field-specific think tanks under the university) [24], or Zhejiang University' s "1+X+Y" structure (one comprehensive think tank, X field-specific think tanks, and Y distributed talent teams under the university) [25], they all represent a concentrated display of the university' s comprehensive strength or resources in several disciplinary fields. They also serve as important outlets for university intellectual resources to be applied, transformed, and disseminated to the government and the public, with obvious spillover effects that can provide strong support for the NDST cause.

3.1.2 UTTs as Non-Profit Independent Third Parties Party, government, and military think tanks are closely connected with decision-making institutions, even forming important components of the decision-making system and chain, exerting important influence on decision-making. However, they also face problems such as the official color of being "advisors within the system," the role positioning of "where you sit determines what you think," and complex relationships with decision-making institutions. As for social think tanks, judging from the current development trend, their strength in participating in and influencing decision-making is still insufficient, leaving much room for development. In comparison, the relationship and distance between UTTs and decision-making are in a relatively independent and moderate position [Citation Error], representing objective, scientific, and fair policy suggestions and the general interests of the public. Whether providing advice or publicizing and popularizing knowledge, the role positioning of UTTs gives them stronger credibility. As mentioned above, this non-profit independent third-party think tank may be exactly what decision-making institutions prefer and favor.

3.1.3 Advanced and Standardized Operations and Management of UTTs Constrained by institutional mechanisms, party, government, and military think tanks find it difficult to fully apply advanced concepts and methods

to improve their governance structures and operational management models. Although social think tanks have advantages in management mechanisms, governance structures, and public opinion influence, they may also have problems such as chaotic capital backgrounds and loose, non-standardized management. Universities are relatively complex yet flexible systems that can accommodate the coexistence and development of different types of institutions, creating more suitable and powerful policy and institutional environments for new-type think tanks [Citation Error]. With universities' resource advantages, standardized management, and advanced concepts, UTTs often actively seek innovations in operational mechanisms, governance structures, talent teams, and technology platforms to expand their living space. At the same time, they are guided and constrained by universities, combining both advancement and standardization, which can bring fresh air to the internal and external environment of the NDST cause.

3.1.4 Excellent Genes for Decision-Making Consultation in UTTs Scientific research has always been the core capability of universities and an important focus of their construction and development. Moreover, scientific research itself contains much think tank work. Engaging in scientific research, especially highly innovative work, requires full investigation of domestic and international status, mastery of the latest progress in the field, and forming judgments on specific issues through comparison, analysis, induction, and reflection. This process highly overlaps with the main process of think tank research and consultation. In reality, many important science and technology decision-making suggestions themselves originate from the preliminary preparation process of large-scale scientific research activities. Under the premise of high consistency between the two work processes, leveraging universities' high maturity in scientific research institutional mechanisms to play the think tank role not only utilizes university advantages but also reduces think tank construction costs, showing obvious advantages.

3.1.5 NDST Research Foundation and Capabilities of UTTs NDST is an open complex giant system engineering project that requires interdisciplinary integration, research methods and means combining qualitative and quantitative approaches, and technological innovation and transformation channels combining basic and applied research. Historically, universities themselves were major participants in large-scale scientific projects such as the "Two Bombs, One Satellite" and have a strong NDST research foundation. Currently, with their traditional advantages in advanced technology research, UTTs not only have the conditions and foundation for "four characteristics and two research areas" but are also continuously strengthening their capacity building in concepts, theories, and technological innovation based on big data and intelligent technologies such as data analysis, model reasoning, simulation, and policy deduction, which is unmatched by other types of think tanks. With these advantages, UTTs can form three spirally ascending closed-loop curves: first, a knowledge transfor-

mation curve, i.e., researching and learning, innovating knowledge, generating new knowledge and ideas, disseminating knowledge and ideas to serve society, and finally generating new knowledge and ideas in the process of application and dissemination; second, a technological innovation curve, i.e., proposing basic concepts and theories, to proposing and innovating new technologies, to applying new technologies, and finally promoting more advanced and sophisticated new concepts, theories, and technologies; third, a talent rotation curve, i.e., from university teachers and students, to UTT researchers or managers, to organizational managers in decision-making departments, and finally back to universities to engage in scientific research or think tank work. The three curves of knowledge, technology, and talent are closely coupled and mutually influential, representing the internal characteristics of UTTs' unique natural advantages.

3.2 Problems in UTT Participation in NDST Development

Although UTTs have many advantages, they currently cannot smoothly participate in NDST development. They face difficulties in task acquisition, reporting channels, decision-making influence, research capacity, and ideological understanding, as shown in Figure 3 [Figure 3: see original paper].

[Figure 3: see original paper] Five problems and difficulties of university-affiliated think tanks participating in the development of national defense science and technology

3.2.1 Difficulty in Obtaining NDST Intellectual Demand Information There is a lack of effective demand docking between UTTs and the NDST system. Especially for UTTs without planned channels, it is difficult to obtain effective information, mainly reflected in difficulties in acquiring demand information, unclear demands, few communication channels, and poor supply-demand docking. This prevents UTTs from grasping the priorities and directions of decision-making needs and from obtaining data and resources to support research, resulting in a serious disconnect between UTT supply and decision-making institution demand and making it difficult for them to integrate into the NDST research system.

3.2.2 Lack of Participation Channels and Platforms Traditional NDST work is conducted within a relatively closed system. UTTs and NDST institutions lack effective channels and platforms for achievement exchange, application, and transformation. Even with good results and suggestions, they have "no way to serve the country" and cannot even find the "gate" to knock on. Naturally, the NDST system has not established specialized achievement reporting channels and application platforms for think tanks outside the system.

3.2.3 Decision-Making Influence to Be Enhanced UTT researchers usually have to balance teaching and research tasks, resulting in insufficient energy

and "involuntary" constraints in research and consulting services. At the same time, their academic research paths and methods often start from academic and theoretical perspectives, lacking strategic and policy research thinking, lacking problem-solving orientation, and lacking the discourse style of the NDST field. Consequently, their achievements become "self-entertainment" and hardly meet the requirements and preferences of NDST decision-making departments.

3.2.4 Lack of Professional NDST Research Forces NDST development is holistic, strategic, forward-looking, and disruptive, requiring comprehensive, full-scope, and all-around support from UTTs. However, currently, many UTTs lack deep understanding of this, have not fully utilized their own advantages to establish professional research forces in NDST and related fields, have not formed advantageous research areas and their own characteristics, and have not obtained corresponding security qualifications. Overall, this has resulted in weak think tank forces in NDST and related fields and has not formed a UTT system with comprehensive coverage, scientific layout, and distinctive features.

3.2.5 Deviation in Understanding Participation in NDST China' s *National Defense Law* stipulates that Chinese citizens and organizations shall fulfill national defense obligations according to law. As high-end think tanks and idea banks established by national higher education and research institutions, UTTs should actively participate in national defense affairs and contribute ideas and efforts to national security and defense construction. In actual work, some UTTs, out of concerns and considerations regarding confidentiality and foreign affairs, lack understanding of national defense and military construction and are not active in NDST development, losing their due historical mission and responsibility, which is truly undesirable.

3.3 Broad Prospects for UTT Participation in NDST Development

In summary, as one of the "five major forces," UTTs indeed have coexisting advantages and disadvantages in participating in NDST development. Their advantages mainly lie in their own characteristics and capabilities, while their disadvantages mainly lie in external policy environments and institutional mechanisms. Currently, several major positive developments are helping UTTs devote themselves to national defense: first, the state has proposed the deep civil-military integration development strategy, the technology-driven military strengthening strategy, and related supporting systems, creating a favorable policy environment and atmosphere from the top-level strategic planning and institutional reform level; second, relevant NDST decision-making institutions are increasingly inviting university scientific research institutions, consulting institutions, and experts and scholars to participate in consultation demonstrations or research projects through traditional planned channels or university scientific research management institutions; third, demand departments are paying more attention to maximizing the adoption of civilian products through market procurement and bidding, and have successively built supply-demand docking and

product transaction platforms such as the Military Procurement Network and the All-Military Weapons and Equipment Procurement Information Network. Many of the product and service procurement contents correspond to university specialties. For example, the "Announcement on the 2017 Guide for the 13th Five-Year Plan Equipment Pre-Research NDST Key Laboratory Fund" released by the All-Military Weapons and Equipment Procurement Information Network in May 2017 attracted a large number of university scientific research institutions to participate [26]. In short, UTT participation in NDST development is feasible and has broad prospects.

4. Recommended Strategies for UTT Participation in NDST Development

Combining the current reality of NDST development and UTT development, the authors propose several recommendations and strategies for UTT participation in NDST affairs from the perspective of UTT self-construction. The main considerations are: first, attaching importance from the ideological and cognitive level to ensure political correctness; second, exploring demand channels from the demand side, which is an important prerequisite for UTT survival; third, establishing special zones in policies to strengthen the survival foundation and environment of UTTs; fourth, in terms of leadership, forging and making good use of leading figures, and under their leadership, strengthening think tank capacity building from four aspects: capability, resources, forces, and tools; fifth, strengthening the application and transformation of achievements to serve decision-making and meet demands; sixth, emphasizing all-media publicity and image building in brand building, which in turn will enhance ideological understanding. As shown in Figure 4 [Figure 4: see original paper].

[Figure 4: see original paper] Recommended strategy of university-affiliated think tanks participating in the construction and development of national defense science and technology

4.1 Strengthen Ideals and Beliefs for Contributing to NDST

NDST development is not ordinary scientific research innovation or technological development work but a strategic and holistic cause involving national security, economic construction, and social development, characterized by security and confidentiality, relative independence, and a self-contained system. For UTTs to participate in this cause, they must not only possess the academic integrity of scientific truth-seeking, rigorous scholarship, and realistic innovation but also elevate their participation in NDST development to the spiritual realm of patriotic dedication, cultivating ideals and beliefs of dedicating themselves to the country, serving national defense, and benefiting society.

4.2 Explore Channels and Platforms for NDST Participation

UTTs should actively participate in bidding and procurement activities organized by NDST institutions and undertake research projects; hold or participate in academic and technical exchange activities related to NDST, invite personnel from NDST decision-making or research institutions to participate through relevant channels, strengthen supply-demand docking, and influence decision-making; based on global technology development trends, monitor major world technology trends, track and study major programs and projects of major countries, and timely form research reports for decision-making departments; participate in NDST project evaluation work as third-party institutions and conduct independent evaluation research on NDST development strategies, policies and regulations, and technology field development directions [Citation Error]. Currently, the All-Military Weapons and Equipment Procurement Information Network irregularly releases information on many soft research project demands, which is worth continuous attention.

4.3 Establish "Special Zones" and "New Areas" for University NDST Think Tanks

Currently, policy documents such as the "National High-End Think Tank Construction Pilot Work Plan" and the "National Science and Technology Decision-Making Consultation System Construction Plan" have essentially established policy and regulation "special zones," "new areas," and "pilot areas" for soft science research similar to the Shenzhen Special Economic Zone and the Xiong' an New Area. For career development, policies must come first. Universities should learn from this experience of prioritizing policies and regulations, seek innovative breakthroughs in institutional mechanisms, establish high-end NDST soft science research "special zones" within the university oriented toward research, evaluation, and consultation work, and establish and improve a comprehensive, all-disciplinary science and technology innovation policy and regulation system to create a favorable environment for UTT participation in national defense affairs.

4.4 Forge Qian Xuesen- and Zhu Guangya-Style Leading Figures

Strategic talents, science and technology leaders, scientific geniuses, and innovative mavericks are not entirely cultivated but more often tempered, fought, and polished into being. Leader-type figures such as Qian Xuesen, Zhu Guangya, Steve Jobs, Bill Gates, Justin Yifu Lin, Jack Ma, and Elon Musk are all such examples. UTTs are intermediaries that connect universities, governments, scientific research institutions, and companies. Building and operating a UTT is comparable to running a company and requires leading figures like Justin Yifu Lin of Peking University' s National School of Development and Hu Angang of Tsinghua University' s Institute for Contemporary China Studies, who have profound professional backgrounds, strong operational management capabilities, and extensive social influence. They embody the soul, level, and influence of

UTTs and need to be continuously discovered, forged, and well-utilized by universities.

4.5 Enhance NDST Strategy and Policy Analysis Research Capabilities

"One must be strong oneself to forge iron." UTTs should continuously enhance their NDST strategy and policy research capabilities and strengthen comprehensive construction: first, scientifically plan overall think tank construction according to university functional positioning, innovate organizational forms and governance methods, and highlight their own characteristics and advantages; second, strengthen communication and exchanges with relevant institutions, reinforce demand orientation, problem orientation, and application orientation, enhance the ability to research and evaluate actual problems such as strategy and policy, and be able to "the wise hear what is silent, the perceptive see what is formless" to provide scientific, targeted, and professional research results for decision-making; third, strengthen decision-making benefits, not for profit purposes but with market-oriented operations, integrate into the NDST idea market, and become the "unicorn" of the think tank world; fourth, adopt think tank language and the NDST discourse system, strive for concise, refined, and clear content that can reflect independent viewpoints and research analysis capabilities.

4.6 Gather Academic Research Resources and Social Resources Related to NDST

For the complex giant system of NDST, individual think tanks or even joint think tanks cannot meet its demands. There is a need to share resources, conduct joint research, and establish a system: first, strengthen exchanges and cooperation with NDST decision-making institutions and scientific research institutes, and jointly establish relevant professional NDST think tanks or joint research groups for major interdisciplinary, cross-field, and cross-unit projects or strategic, thematic, and comprehensive consulting research needs; second, participate in collaborative organizations, expert organizations, or academic groups related to NDST work, use collaborative platforms for joint research, voice expression, achievement display, and influence expansion; third, explore the establishment of university think tank alliances based on disciplinary advantages and cross-integration fields to share data, technology, platforms, facilities, talent, and other resources; fourth, strengthen communication and integration with government, industry, academia, research, and capital, and strive to attract donations, investment, financing, and other capital support from all parties to guarantee think tank construction, operation, and expansion [Citation Error].

4.7 Establish a Civil-Military Integration-Style Revolving Door Mechanism and Professional Forces

From the perspectives of policy environment, organizational structure, and actual effects, UTTs may be the best place to achieve a truly meaningful revolving door and a natural talent pool and transit station to widely attract people from all walks of life to build professional teams. Universities and the NDST field opened the revolving door as early as the 1950s, with strategic scientist Zhu Guangya being a typical representative [27]. In the new era, UTTs should focus on establishing a civil-military integration-style revolving door mechanism and professional forces based on this mechanism: first, universities should combine their own characteristics and advantages to establish special revolving door mechanisms, strengthen job rotation and joint military-civilian talent cultivation, and promote talent exchanges between universities and the NDST field; second, considering that local universities no longer enroll national defense students and the defense field will directly recruit university graduates, UTTs can serve as training grounds for cultivating strategic research talents, policy analysis talents, and scientific and technological innovation talents, not only adding flowers to brocade for national defense construction but also providing charcoal in snowy weather; third, during the military reform period, China will reduce its forces by 300,000, and UTTs can absorb demobilized and retired high-end talents from the military through various forms to participate in think tank construction and related research; fourth, learn from RAND Corporation' s concept of "protecting weird ideas" [28], create an environment and atmosphere for free research, allow maverick and "brain-opening" opinions and suggestions, and provide more decision-making options [29].

4.8 Develop Data-Based Intelligent Analysis and Research Tools

Currently, disruptive technologies such as Internet Plus, big data, the Internet of Things, and artificial intelligence have risen. NDST research and consultation can no longer remain at the original work model. New intelligent research tools should be developed and applied to open new "ways of working" : first, NDST decision-making institutions should support UTTs in developing intelligent big data analysis and research tools and means that meet actual work needs, and achieve collaboration and "crowdsourcing" of consulting work with modern tools; second, UTTs should conduct in-depth cooperation with data software companies and system R&D institutions to carry out research with advanced tools and rich resources; third, UTTs should strengthen empirical investigation research, establish new methods, means, and tools based on data and intelligent technologies, and propose policy recommendations and problem solutions based on facts and data; fourth, as the comprehensive integration research method combining qualitative and quantitative approaches becomes mainstream, UTTs should develop and deploy comprehensive integration seminar hall platforms to achieve an automated, intelligent, and smart decision-support technology system combining human-machine-network as soon as possible [30].

4.9 Strengthen Transformation and Application of Research Results to NDST Decision-Making

In information science, there is the concept of "sleeping beauty literature." The think tank field also has many good research results that are frozen, shelved, or forgotten, mainly due to poor reporting channels, mismatch with decision-making needs, excessive academic and technical content, or lack of incentives for transformation and application, leaving many UTTs "sitting on gold mountains but begging for food." UTTs should walk the "last mile" of achievement transformation and application to maximize the value of their results: first, explore specific or potential needs of NDST decision-making, compile existing results, or regularly print and distribute briefings on the latest results for decision-making reference; second, use opportunities such as conference exchanges, supply-demand docking, and achievement procurement, as well as platforms like the All-Military Weapons and Equipment Procurement Information Network, to publicize and promote research results and capabilities; third, establish rules and regulations suitable for achievement transformation and application, standardize work, and motivate faculty or researchers to provide research results for adoption by UTTs or decision-making institutions; fourth, change the style of 偏重 (overemphasizing) academic and theoretical research, and attach importance to providing targeted, empirical, and feasible suggestions for decision-making needs and practical problems.

4.10 Emphasize All-Media Publicity and Brand Building

The saying goes, "good wine needs no bush," but in today' s complex environment, "good wine really fears deep alleys" because alleys contain all kinds of wine. Universities have always been considered "ivory towers" that are detached from worldly affairs and do not seek fame and fortune, which is good academic style for scientific research. However, UTTs must "enter the world" to teach and solve practical social problems, so they must publicize themselves, cultivate their brands, and gain the trust of decision-making institutions and society; otherwise, they cannot become think tanks. In the NDST field that lacks intellectual brands and social influence, UTTs should do even more: first, use all-media and integrated media to publicize their brand products and renowned experts, emphasizing both "going out" and "bringing in" to establish a good image; second, stimulate and cultivate public interest and hobbies in NDST, deepen society' s understanding of scientific and technological innovation, publicize truth, and oppose pseudoscience; third, correctly guide public opinion, strengthen the popularization of national defense and military knowledge, and enhance NDST soft power; fourth, guard against blind exaggeration and false publicity, as reputation that does not match strength can easily put the cart before the horse and lead to loss of direction.

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