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From Strategy Consulting Research to Science of Think Tank

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Abstract

Think tank researches are the main element to advance the modernization of China's capacity for governance, and they are multidisciplinary related to many research areas. The suggestions of think tank researches may have massive influences as long as they are adapted. In this study, we recommend that the think tank researches should be advanced to the science of think tank. The think tank researches should follow the widely recognized scientific research character-falsifiability. Based on solid data and evidences, think tank researches build objective models, develop qualitative methods and quantitative tools, and generate objective strategic consulting proposals with predictive ability. By controllable error correction and falsification process, we gradually eliminate the concurrence of causes and the plurality of causes in the models and methods, get the general conclusion and then the models and methods will be verified when applied.

Keywords

strategy consulting; science of think tank; falsifiability

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From Strategy Consulting Research to Science of Think Tank

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Abstract: Think tank research is the main element to advance the modernization of China's capacity for governance. It is multidisciplinary and involves many research areas. The suggestions of think tank research may have massive influences as long as they are adapted. In this study, we recommend that the think tank research should be advanced to the science of think tank. That is, the think tank research should follow the widely recognized scientific research character—falsifiability. Based on solid data and evidence, think tank research builds objective models, develops qualitative methods and quantitative tools, and generates objective strategy consulting proposals with predictive ability. By controllable error correction and falsification process, we gradually eliminate the concurrence and plurality of causes in the models and methods, get the general conclusion, and then verify the models and methods during application. **DOI:** 10.16418/j.issn.1000-3045.20210323002-en

Keywords: strategy consulting; science of think tank; falsifiability

The think tank research on strategy consulting is an important tool for improving the governance capacity of a country. It is multidisciplinary [1] and involves comprehensive application of methods and technical tools from natural sciences, humanities and social sciences, and engineering. The results generally have a large social impact once being adopted to formulate policies and development strategies. The success or failure of think tank research depends on the first application of its results. Unlike the long-term effect of natural science research, the overall effect of think tank research depends on that of its most successful application. Historical practice has demonstrated that repeated application of unscientific think tank products brings about huge social costs. In view of this, think tank researchers should be science-oriented and conduct data- and evidence-based studies with rigorous attitudes and scientific approaches. Thus, the think tank research can be advanced to the science of think tank, and a theoretical system and systematic think tank research methods can be formed in line with the laws of think tank research. In this way, think tank research can make great progress in standardization, institutionalization, and scientization so as to better serve the strategies and decisions of national development. Therefore, the science of think tank should have the scientific research character—falsifiability. We should improve the conditions of elements through continuous falsification and refutation to obtain objective and practical results of think tank research.

1 Scientization of think tank research is required by an innovative country

1.1 The role of science and technology (S&T) in think tank research is becoming increasingly important

Think tank research plays an important role in public policy making. As the world today is undergoing profound changes unseen in a century, the influence of think tank research on public policy making has become increasingly significant. For example, think tanks in the United States have played the role of "the fourth branch (after legislation, administration, and judicature)" and "the fifth power (after legislation, administration, judicature, and media)" in government decision-making [2]. After World War II, the United States government further recognized the indispensable role of S&T in social development and strengthened scientific research through developing new public policies. Vannevar Bush's (hereinafter referred to as Bush) think tank strategy report, *Science: The Endless Frontier*, played a key role.

Since the 20th century, scientific theory, technological innovation, and social life have become increasingly close and integrated rapidly [3]. At the same time, the integration of multiple disciplines has become more and more significant. New disciplines are emerging, and the strong coupling between S&T and social economy is increasingly obvious. S&T

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innovation, being critical to social development, has become the main momentum of the current and future development. S&T innovation is important in public policy making of countries. Moreover, its ideology is becoming the logical basis of public policy making [3]. Most laws and policies in the United States have been substantially improved by scientific analysis of data and information [4]. Science, technology, and innovation are related to national development and people's quality of life in many aspects including national security, economic development, international trade, S&T innovation, public health, food and drug safety, environmental protection, and ecological governance [3]. The strategic decisions related to them require scientific and professional think tank research to provide support and solutions. Therefore, the demand for strategy consulting research related to S&T has been increasing, which puts forward higher requirements on the quality of think tank research.

1.2 Innovative development in the new era requires scientific think tank research

It is necessary to advance think tank research to science of think tank to achieve scientific national governance. In 2016, General Secretary Xi Jinping pointed out in his speech at the symposium on philosophy and social sciences that think tank construction should focus on research quality and content innovation [5]. This put forward new requirements for the development of think tanks in China. The Opinions on Strengthening the Construction of New Types of Think Tanks with Chinese Characteristics ① (hereinafter referred to as the Opinions) issued by the General Office of the Central Committee of the CPC and the General Office of the State Council requires making efforts to build think tanks to support decision-making with scientific consultation and lead the development with scientific decision-making, and giving full play of think tanks in national governance. The Opinions put forward a high scientific requirement for think tanks and elevated the role of think tanks to a new level, so as to improve the think tank research to the science of think tank. The results of science of think tank are likely to be falsified over time while will be optimized in the process of falsification. The following examples support this view.

In 2002, the State Council issued Several Opinions of the State Council on Strengthening Grassland Protection and Construction ②. To strengthen grassland protection and construction, China has implemented the restoration project of grassland from grazing land since 2003 ③. Subsequently, relevant ministries and commissions issued the Measures for the Balance of Fodder and Livestock ④ and the subsidy and reward policy for grassland conservation ⑤. These policies and measures have prevented the environment deterioration and greatly improved the ecology of grassland. In addition, farmers and herdsmen have gradually formed the concept of grassland protection. However, the implementation of the restoration project has brought new problems. The new problems of grassland degradation have emerged. For this reason, the Academic Divisions of the Chinese Academy of Sciences (CAS) has funded a research project "Research on the adjustment of grassland utilization and the grazing prohibition policy in farming-pastoral ecotone of northern China" ⑥, aiming to provide suggestions on the adjustment of grazing prohibition policy. Previously good policies are falsified because of the changes in conditions. Therefore, we must optimize previous research results in response to changing conditions, which is the reflection of scientific decision-making.

2 Think tank research should be advanced to science of think tank

2.1 Scientificity is the development trend and necessity of think tank research

(1) In terms of the basic principle, scientificity is an inevitable trend in the development of think tank research. In

① Xinhua News Agency. Notice of the General Office of the Central Committee of the CPC and the General Office of the State Council on Issuing the Opinions on Strengthening the Construction of New Types of Think Tanks with Chinese Characteristics. (2015–01–20)[2020–11–23]. http://www.gov.cn/xinwen/2015–01/20/content_2807126.htm.

② The State Council of the People's Republic of China. Opinions of the State Council on Strengthening Grassland Protection and Development. (2002–09–16)[2021–06–29]. http://www.gov.cn/gongbao/content/2002/content_61781.htm

③ Ministry of Agriculture and Rural Affairs. Notice on further implementing the restoration project of grassland from grazing land. (2003–10–14)[2021–06–29]. http://www.moa.gov.cn/nybgb/2003/snqi/201711/t20171126_5919574.htm.

④ Ministry of Agriculture and Rural Affairs. Measures for the Balance of Fodder and Livestock. (2005–01–01)[2021–06–29]. http://www.moa.gov.cn/govpublic/XMYS/201006/t20100606_1534904.htm.

⑤Ministry of Agriculture and Rural Affairs. Notice of the Ministry of Agriculture and Rural Affairs and the Ministry of Finance on Issuing the Guidance on Implementing the Subsidy and Reward Policy for Grassland Conservation in 2011. (2011–07–20)[2021–06–29]. http://www.moa.gov.cn/nybgb/2011/dqq/201805/t20180522_6142764.htm.

⑥Academic Divisions of the Chinese Academy of Sciences. The research group focusing on the consulting project of Academic Divisions of the Chinese Academy of Sciences "Research on the adjustment of grassland utilization and the grazing prohibition policy in farming-pastoral ecotone of northern China" carried out field research in Inner Mongolia Autonomous Region. (2017–08–22)[2021–06–29]. http://casad.cas.cn/zkjs/jczx/zxhd/201708/t20170822_4681274.html.

fact, the concept of new public management introduces some of the ideas and approaches of managing private enterprises into public management, which is a new direction of think tank research and puts new requirements on government management activities [6]. Evidence-based policy making has been commonly accepted by countries all over the world [6]. Rush Holt, former CEO of the American Association for the Advancement of Science (AAAS) [4], pointed out that scientific evidence was the starting point for all decisions. With the participation of scientists, think tank research related to S&T strategies is increasingly influenced by scientific research thinking and pays more attention to evidence, data, logic, and falsifiability.

(2) In terms of the results, scientificity is a necessity of think tank research. Think tank research should give solutions regarding the different input initial states on the basis of falsifiability. Think tank research is demand-oriented and problem-oriented. Its research results are oriented toward practical applications in society and may have significant economic and social impacts once being adopted. It should be noted that the success or failure of think tank products depends on their first applications. The practice of unscientific think tank products can lead to severe social problems and huge economic costs. A famous example is the study conclusion about the bovine spongiform encephalopathy (BSE) epidemic in the United Kingdom between the 1980s and the 1990s. The Southwood Working Party of the Spongiform Encephalopathy Advisory Committee (SEAC) concluded incorrectly that BSE was unlikely to affect human health and therefore did not recommend that the government to ban the sale of diseased cattle tissue as human food. This conclusion served as the basis for the United Kingdom government's decision until 1996. The government erroneously adopted the unscientific conclusion, which eventually led to the spread of the BSE epidemic throughout the Europe, causing a global panic [7] and bringing about bad social impacts. Therefore, the scientific nature of think tank products is a necessity to ensure that think tanks play a proper and positive role.

2.2 Technological rationality should be the principle of think tank research

Focusing on the scientific nature of think tank research requires that it should follow the basic principle of technological rationality. Questioning based on rational thinking is an integral part of the scientific spirit [8]. One manifestation of this is technological skepticism, which means to reject to use technology as panacea that can solve all problems [9]. Technological rationality can also be understood as organized skepticism, one of the four norms of science ① summarized by Merton in his article The Normative Structure of Science [10]. Organized skepticism is a common requirement by scientific methodology and institutional order [11]. In particular, skepticism about technological optimism prevents erroneous knowledge from becoming public knowledge. It serves as a mutual monitoring role among scientists, society, and government and is an important part of quality control in the production of scientific knowledge [11].

At the same time, technological rationality is also reflected by its refusal to view S&T as an independent variable alongside society, economy, and politics [12]. S&T is an element in the operation of society. When conducting think tank studies such as S&T strategy consulting, we should view the development of S&T applications while considering the social context as well as political and economic constraints. Therefore, think tank research should pay attention to the impact of S&T development on the society, as well as the counteraction of social development on technology progress, and adopt a basic attitude of abandoning technological optimism or determinism. Therefore, we explore the relationship between S&T development and socio-economic development according to the principle of technological rationality. For example, in response to the question of building hydrogen bombs, scientists of the General Advisory Committee of the United States Atomic Energy Commission (hereinafter referred to as the General Advisory Committee) realized that hydrogen bomb testing and producing was not only a technical issue but also a social, political, and moral issue. In particular, they opposed that the United States tested hydrogen bombs because they believed that the bombs would be used against civilians. This incident is considered to be the germ of the technological skepticism of the General Advisory Committee, which embodies technological rationality [13]. The General Advisory Committee held reservations about hydrogen bombs from the perspective of technological rationality. This has inspired the think tanks related to technological strategies to focus on explaining what a technology should not be used to do in social applications rather than advocating what it can do when advising governments [13].

With the rapid development of S&T, the public mostly views it with optimism, while ignoring the potential risks and related ethical issues. Think tank research needs to focus on these risks from a technological rationality perspective. For example, the widespread use of the synthetic insecticide dichloro-diphenyl-trichloroethane (DDT) has prevented some infectious diseases transmitted through mosquitoes and promoted agricultural development to a certain extent. However, the damage of DDT did not attract much attention at that time. Rachel Carson warned the public about the dangers of pesticides in her book *Silent Spring*. The President's Council of Advisors on S&T (PCAST) of the United States [13], holding the view of technological skepticism, supported Carson's view while affirming that pesticides were

① The four norms are universalism, communism, disinterestedness, and organized skepticism.

essential to the development of modern agriculture. They warned the dangers of long-lasting pesticides and called for stricter government control of pesticides to protect the environment and human health.

Since the late 20th century, the rapid development of biotechnology has led to a boom in biology, which was followed by ethical issues. For example, the CAS [①], the National Academy of Sciences (NAS), the Royal Society, the Nuffield Council on Bioethics [②], the International Bioethics Committee of UNESCO [③], and the Hinxton Group [④] have all made ethical recommendations on genetic editing of heritable reproductive systems, clearly setting up rigorous specification standards. However, there have been cases of so-called scientific research and biotechnological applications that violate the spirit of science and ethics in recent years, such as the "gene-edited babies" incident. Think tank research involving S&T should maintain a scientific attitude and take a rational view of the development of S&T. In short, the results of science of think tank should not only suggest what can be done, but also what cannot be done on the basis of technological rationality, which is the essence of scientific ethics.

3 Requirement of falsifiability in science of think tank

To evolve as science of think tank, think tank research should follow the scientific-oriented requirement and the paradigm and logic of scientific research. Falsifiability is a property of a scientific theory. Therefore, think tank research must have the characteristic of falsifiability to advance to science of think tank. We believe that the strategy consulting results produced by think tanks should contain a decomposition of falsifiable elements. In the process of falsifications, think tanks make objective and practical (or even universal) conclusions for practical problems by improving the conditions of the elements.

It is controversial whether falsifiability can be applied to social science. For the propositions in social science, dependent variables (think tank outputs) can have concurrent or plural independent variables (conditional elements) (Figure 1). Concurrence of causes means that the independent variable A is an essential condition for the dependent variable C, while the other independent variable B is also an essential condition for C (Figure 1a). Plurality of causes, on the other hand, means that A and another condition B_1 must act together to produce C, while A and another condition B_2 may also produce C. Thus, A is neither a sufficient condition nor an essential condition for C. C is caused by many reasons (Figure 1b). It has been argued that falsifiability is difficult to apply to the above two types of social science propositions [14].

However, from a coarse-grained perspective, for the problem of concurrence of causes (Figure 1a), falsifiability focuses on the probability of a predicted event, detects the probability of the output conclusion C with a given input condition A. If only the input A is considered, and other factors are treated as hidden variables and ignored, A can lead to C. However, this process is probabilistic. This coarse-grained process is the key to build a scientific model based on the principal contradiction. This is how probabilistic causality in physics generates, and probabilistic descriptions are the scientific cornerstone of quantum physics. By ignoring the hidden variables and coarsening the conditions, we can establish a probabilistic causal relationship in which the conclusion C is caused by the coarsened A. From the perspective of probabilistic causality, plurality of causes can also be coarsened uniformly. In think tank research, probabilistic causality usually needs to be established due to the common existence of concurrence and plurality of causes.

Think tank research usually involves outputting different recommendations or solutions to a specific problem under different given conditions. The recommendations or solutions are not unique regarding the different conditions, and there is no standard answer that is universally applicable. For example, to determine the total amount of R&D investment in China in the future, a reasonable strategy consulting report of think tank research could be as follows: based on the current situation, scholars provide strategy consulting programs (C_l) considering different predictions of domestic and international development trends (A_k). The occurrence of the predicted conditions in each strategy consulting program is probabilistic (Figure 2). From the coarse-grained perspective, the requirement of falsifiability is for the whole set of possible events, not just for one conclusion. The decision maker's choice of strategies depends on his or her governing style, and the success of the selected strategy is partially determined by probabilistic quantified "luck."

[①] China Science Daily. Basic principles for human gene editing published. (2017–02–16)[2021–02–05]. https://www.cas.cn/cm/201702/t20170216_4590647.shtml.

[②] Nuffield Bioethics Association. Genome editing and human reproduction: Social and ethical issues. (2018–07–17)[2021–02–05]. https://www.nuffieldbioethics.org/publications/genome-editing-and-human-reproduction.

[③] UNESCO. Report of the IBC on updating its reflection on the Human Genome and Human Rights. (2015–09–4)[2021–02–05]. https://unesdoc.unesco.org/ark:/48223/pf0000233258.

[④] Hinxton Group. Statement on Genome Editing Technologies and Human Germline Genetic Modification. (2015–09–4)[2021–02–05]. http://www.hinxtongroup.org/hinxton2015_statement.pdf.

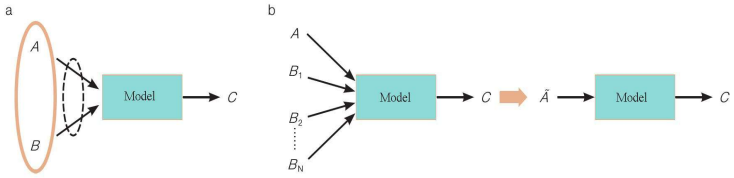

Figure 1 Diagram of casual relationship

(a) Concurrence of causes; (b) Plurality of causes

Figure 2 Probabilistic falsifiability of think tank research

We further discuss the technical requirement of science of think tank based on the falsifiability requirement. Generally, think tank research has a time-dependent sensitivity. It only makes predictions about future trends from historical and current contexts. Therefore, the results are usually immediate, and the efficiency of the results may change over time. Due to the uncertainty of social operation and the limitations in the determination of development trends, this efficiency constantly reduces and should therefore be constantly falsified and corrected. The decrease in efficiency is subject to changes in conditions. When the initial input condition A_k changes, the output solution C_l changes probabilistically as well. In order to test the performance of a think tank's scientific product, we need to not only examine the success or failure of its single application but also focus on the long-term performance and rationality of the models, methods, and analytical tools that deal with A_k changes. Therefore, we propose the following technical requirements for science of think tank. Think tank researchers should build objective scientific models based on accurate and complete (reasonably selected) facts and data. Researchers should provide objective strategy consulting solutions with predictive ability by innovating qualitative methods and developing quantitative tools.

4 A typical case of the falsifiability requirement of science of think tank: Bush's linear model

4.1 Bush's linear model on S&T development

After World War II, President Roosevelt consulted Bush on how the scientific knowledge accumulated by the United States during the war could be fully utilized for the benefit of the nation in the age of peace, and how the government should continue its research activities. Bush's team submitted s strategic advisory report, *Science: The Endless Frontier*, to President Truman after an intensive and systematic study. One of the most important recommendations was that the nation should support basic research. *Science: The Endless Frontier* suggests that basic research can automatically become a leader in technological development without considering practical applications. This idea is summarized as a linear model of scientific research. Scientific research should start from basic research. Even without considering the application prospects, basic research can automatically lead applied research and experimental development, and ultimately contribute to social and economic development. Today, Bush's ideas still have a significant influence on S&T policies of the United States. On February 26, 2020, the NAS held a symposium to commemorate the 75th anniversary of Bush's article *Science: The Endless Frontier* [15]. The symposium highly recognized Bush's vision 75 years ago and looked forward to the future of science in the United States. *The Endless Frontier Act* ①, which was introduced by United States senators to both houses of the 116th Congress in May 2020 and to the Senate of the 117th Congress in April 2021, can be regarded as the inheritance and development of Bush's ideas. On January 15, 2021, Biden, who was elected the 46th President of the United States, sent a letter to Eric S. Lander, the President's Science Advisor and the Director of the Office of S&T Policy. In the letter, Biden fully recognized the important role that *Science: The Endless Frontier* has played in the United States for 75 years and asked Lander five

① 116th Congress. S.3832-Endless Frontier Act. (2020–05–21)[2020–11–23]. https://www.congress.gov/bill/116th-congress/senatebill/3832;116th Congress.S.6978-Endless Frontier Act. (2020–05–22)[2020–11–23]. https://www.congress.gov/bill/116th-congress/house-bill/6978;117th Congress.S.1260-United States Innovation and Competition Act of 2021. (2021–04–20)[2021–05–13]. https://www.congress.gov/bill/117th-congress/senate-bill/1260/actions.

questions about the future of S&T in the United States [①]. The recent activities of the United States political and scientific communities show that they fully recognize the importance of Bush's ideas to the United States over the past 70 years and into the future.

4.2 Limitations of Bush's linear model and Pasteur's quadrant model

Science: The Endless Frontier ensured that the United States government continued to support basic research after World War II, while the linear model of scientific research implicit in it was constantly questioned. After the 1950s, the boundary between basic and applied research became blurred, and much application-oriented research could also become significant basic research. After Bush, James B. Conant, the first director of the National Science Board (NSB), argued that the dichotomy between basic and applied research should be replaced by uncommitted research and programmatic research. In 1964, Alan T. Waterman, the director of the AAAS, divided basic research into free and mission-oriented basic research. By the 1980s, Erich Bloch, the president of National Science Foundation (NSF) further subdivided basic and applied research into fundamental research, strategic research, and directed research [16]. *Frascati Manual*, published by the Organisation for Economic Cooperation and Development (OECD), divides basic research into pure basic research and oriented basic research since the second edition [②].

Although Bush's simple distinction between basic and applied research has been constantly questioned and even falsified, the United States government valued its gist that nationally led scientific research should be oriented toward basic research, people's health, and national security. Academics have improved and enriched the formulation and connotation of Bush's linear paradigm in the practice of scientific development. In analyzing Louis Pasteur's research [③], Donald Stokes [16] found that Pasteur's research was both applied and basic. Stokes argued that in Bush's linear paradigm, Pasteur's research should be on both the basic and applied research end. In order to accurately locate Pasteur's research, Stokes expanded Bush's one-dimensional linear model into a two-dimensional planar model with basic research and applied research as the axes. Then, Pasteur's research could find its proper place in Stokes's model. Stokes calls this model the Pasteur's quadrant model (Figure 3).

4.3 The vitality of Bush's model

The Pasteur's quadrant model developed Bush's linear model and can well explain many scientific studies. A good case in point is the development process of high-power laser technology inspired by radar. The exploration of new technologies based on radar emission sources has induced many original fundamental studies and technological breakthroughs from microwave amplification by maser to laser. This further triggered the development of laser-related industries (such as the DVD technology) and gave rise to a number of laser-related basic research fields (such as nonlinear optics, quantum optics, and ultracold atomic and molecular physics). At the same time, driven by practical applications of long-range detection and precise position resolution, radar research triggered the chirped pulse technology. After the chirped pulse technology was introduced into the laser field, the key bottleneck for generating high-power laser was resolved. The high-power laser technology was further applied to inertial confinement fusion, which is basic research with promising military strategic applications [17]. The process from radar to laser to inertial confinement fusion reflects the complex interaction between basic and applied research and is a classic case of Pasteur's quadrant research (Figure 4). A close examination of these interactions, the local process from the research of maser to the birth of laser to the development of the laser industry, reflects the Bush's linear process from basic research to applied research then to technology development (the dashed part in Figure 4). Therefore, we consider Bush's linear model as a local linearized representation of the current nonlinear cyclic relationship between science, technology, and development.

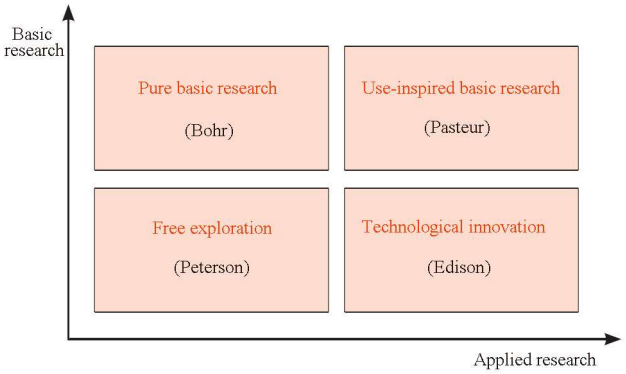

Figure 3 Pasteur quadrant model proposed by Donald Stokes [16]

[①] The White House. President-elect Biden Announces Key Members of His White House Science Team. [2021–01–16]. https://buildbackbetter.gov/press-releases/president-elect-biden-announces-key-members-of-his-white-house-science-team/.

[②] OECD. Guidelines for Collecting and Reporting Data on Research and Experimental Development. [2021–01–13]. https://www.oecd.org/sti/inno/Frascati-Manual.htm.

[③] As the founder of microbiology, he made great contributions to molecular symmetry, fermentation theory, immunology, and vaccines.

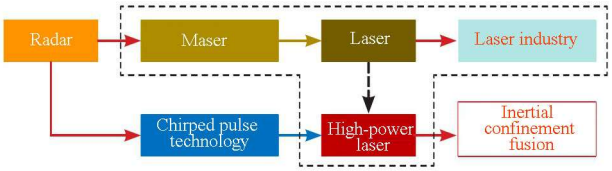

Figure 4 Diagram of basic research and critical technologies inspired by RADAR

According to Karl Popper theory of falsification, Bush's linear model has great generality and high prediction accuracy, and correspondingly high falsifiability. There are controversies and drawbacks in Bush's linear model. For example, we can see from the case of radar above that basic and applied research is not as distinct or non-linear as Bush described. However, considering the context and strategic requirements of the time when Bush proposed the linear model, Bush's linear model does have important implications in practice. The model plays an important role in persuading the government to fund basic research while maintaining the independence of scientific communities. Newtonian mechanics cannot explain the motion laws of microscopic particles, while can explain the motion of macroscopic objects. Similarly, though Bush's model cannot provide a precise interpretation of scientific development laws, it can promote the establishment of a trustworthy contractual relationship between governments and scientists as an understandable model. Furthermore, it ensures stable funding for basic science while protecting the independence of scientific communities. In turn, governments can gain the power to promote socio-economic development. Bush's linear model is a typical example of the falsifiability of think tank research related to technological strategy consulting. It has evolved and been closer to practice in the process of continuous falsification and improvement, guiding the technology development in the United States for more than 70 years.

5 Conclusions

Bush's linear model is a typical case of advancing think tank research to science of think tank, which has wide generality and high accuracy. Bush's report has influenced the S&T development in the United States after World War II and has had a great impact on the S&T policies of many countries. Although many scholars have put forward different opinions on Bush's linear model, the model still plays a role currently, becoming an important theoretical basis for the United States government to fund basic research.

(1) To make think tank research in China more scientific, we need to guide think tank research from "soft science" to "hard science"—science of think tank, with science as the orientation. The science of think tank should meet the basic attribute—falsifiability—of science. In the continuous falsification, theories and results of science of think tank are improved, and objective and useful theories and conclusions can be formed. In fact, the falsifiability of science of think tank and the organized skepticism of scientific research are supplementary to each other. Only in the process of organized skepticism can science of think tank be continuously falsified.

(2) In the research of science of think tank, we should hold an organized skepticism in the S&T field and fully recognize the advantages of technology, while do not ignore the side effects it may bring. We should abandon the blind technological optimism or fanaticism, and not hold pure technological skepticism (complete rejecting the progress brought by technology). These two extreme attitudes essentially separate the inextricable relationship between S&T and society, and treat S&T as an independent variable to social development. Merton [18] believes that science is a normative structure of social institutions and a solid social institution. Therefore, the science of think tank must not separate S&T from social economy. The science of think tank aims to fully understand the possible impact of S&T development on society, and to view the vibrant science embedded in human society with the concept of technological rationality.

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