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DIIS Methodology of Science and Technology Assessment

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Abstract

Science and technology assessment plays a prominent role in the science and technology management. It is not only the important task of think tank research but also the significant guarantee of think tank research quality. Nevertheless, the existing science and technology assessment methods are generally applied in the part of the issue, which lack the thinking and cognition of the whole process methodology of science and technology management from dialectics and systems theory, which is a common problem in the think tank research. Therefore, based on Data-Information-Intelligence-Solution (DIIS) theory and methodology, this paper systematically analyzes the general laws followed by think tanks, and consequently proposes a DIIS method of science and technology assessment. Furthermore, under the perspective of DIIS, six functions of science and technology assessment in the science and technology decision-making process are developed. Finally, in order to provide a guideline for the science and technology management and decision-making in our country, four examples are provided to illustrate the applications of science and technology DIIS method, such as institutional assessment, project assessment, policy assessment, and talent assessment.

Keywords

think tank; think tank research method; science and technology assessment; Data-Information-Intelligence-Solution (DIIS)

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Abstract: Science and technology assessment plays a prominent role in science and technology management. It is not only the important task of think tank research but also the significant guarantee of think tank research quality. Nevertheless, the existing science and technology assessment methods are generally applied in part of the issues, which lacks the thinking and cognition of the whole process methodology of science and technology management from dialectics and systems theory, which is a common problem in the think tank research. Therefore, based on the Data–Information–Intelligence–Solution (DIIS) theory and methodology, this paper systematically analyzes the general laws followed by think tanks and consequently proposes a DIIS method of science and technology assessment. Furthermore, from the perspective of DIIS, six functions of science and technology assessment in the science and technology decision-making process are developed. Finally, in order to provide a guideline for the science and technology management and decision-making in China, this paper provides four examples to illustrate the applications of the science and technology DIIS methods, such as institution assessment, project assessment, policy assessment, and talent assessment. **DOI:** 10.16418/j.issn.1000-3045.2018.01.008-en

Keywords: think tank; think tank research method; science and technology assessment; Data–Information–Intelligence–Solution (DIIS)

As an important means and tool of science and technology (S&T) management, S&T assessment plays a crucial role in promoting China's economic and social development as well as S&T progress. In the new round of accelerated S&T revolution and industrial transformation, the complexity and uncertainty of S&T activities have increased, placing higher demands on S&T assessment. The 18th National Congress of the Communist Party of China (CPC) made a major deployment for implementing the innovation-driven development strategy. The Third Plenary Session of the 18th CPC Central Committee put forward new requirements for reforming the S&T system, and the relevant documents of the CPC Central Committee and the State Council of China proposed to improve the innovation evaluation system, strengthen the supervision and assessment of innovation policies and S&T reform tasks, regularly follow and analyze the implementation of policies, and make timely adjustment and improvement. Therefore, S&T assessment has become an important task in the new round of S&T system reform.

S&T assessment has also become the strategic focus of S&T think tank tasks. In February 2017, the 32nd session of the Central Leading Team for Comprehensively Deepening Reform reviewed and adopted the "Construction Plan of the National S&T Decision-making Consultation System," emphasizing the construction of national S&T decision-making consultation system and the establishment of top think tanks for S&T decision-making. In May 2016, Xi Jinping, the General Secretary of the CPC Central Committee, emphasized in an important speech, "Striving for the Construction of a World Science and Technology Power," that it is necessary to accelerate the establishment of a S&T decision-making mechanism for S&T consultation to support administrative decisions, to strengthen the S&T decision-making consultation system, and to establish high-quality S&T think tanks. Based on the above descriptions, S&T assessment plays dual roles in think tank research. On the one hand, S&T assessment is an important task in think tank research, either for judging the general trend and direction of S&T development or for studying the major issues in reform and development from the perspectives of S&T function and impact. S&T think tanks should carry out S&T assessment to provide a basis for scientific suggestions. On the other hand, S&T assessment is an important guarantee for the research quality of think tanks. In practice, for example, world-renowned think tanks use procedures and systems to assess their own research, thus ensuring the quality of think tank research outputs. Therefore, how to develop and improve the methodology of scientific and reasonable S&T assessment and how to conduct a scientific assessment and provide strong decision-making support for China's innovative development are important concerns in the construction of China's S&T decision-making consultation system and think tanks. However, the existing S&T assessment methods usually assess a specific aspect of a problem and lack thinking

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and cognition of the methodology in the whole process of S&T assessment from the perspectives of dialectics and systems theory. New systematic and scientific methods and tools need to be developed to address this problem.

Pan Jiaofeng, professor, president of the Institutes of Science and Development, Chinese Academy of Sciences (CAS) [1], has proposed that the objects of S&T think tank research often involve complex and comprehensive strategies and policies, which concern not only S&T but also the economy, society, environment, and management issues. As far as S&T is concerned, these objects are often cross-field, cross-disciplinary, and comprehensive. Therefore, Pan et al. [2] systematically summarized the general research methods of think tanks on the basis of analyzing the current status of think tank research worldwide. Based on the whole process of think tank research, i.e., data collection (Data), information extraction (Information), comprehensive judgment (Intelligence), and solution formation (Solution) (DIIS), we rethink the methodology of think tank research and propose a problem-oriented, evidence-oriented, and science-oriented DIIS theory and methodology for think tank research.

The think tank DIIS theory and methodology, which originates from the interpretation and generalization of the whole process of think tank research, systematically summarizes the general rules of think tank research and is readily applicable to think tank problems and also to S&T assessment. In this paper, we, therefore, rethink the whole process of S&T assessment using the think tank DIIS theory and methodology. First, we analyze the connotations of S&T assessment and the new requirements for its development. Second, we provide a brief description of think tank DIIS theory and methodology. Furthermore, the DIIS method for S&T assessment is established based on the principles of assessment, and the roles of S&T assessment in S&T decision-making consultation are defined from the perspective of DIIS. Finally, the practical applications of DIIS method of S&T assessment are analyzed with assessment examples regarding institution, project, policy, and research quality.

1 Current problem facing S&T assessment

S&T assessment is not only an important basis for constructing the competitive environment for S&T development but also a crucial tool used by S&T think tanks for S&T strategy and performance management. In this section, we analyze the connotations of S&T assessment and described the problems associated with the existing S&T assessment methodology by taking into account the new requirements for the development of S&T assessment.

1.1 Connotations of S&T assessment

S&T assessment defines the value standard according to the needs of S&T decision-makers, funders, and interest groups, and collects and processes relevant information of assessment objects using scientific methods. It is a process of judging the level of value realization, reflecting the value idea and value pursuit of assessors. In addition to following the general rules of assessment activities, S&T assessment has special characteristics due to the nature of S&T activities: (1) difficulty in predicting the outcomes of scientific research activities; (2) difficulty in quantitatively assessing the outcomes of scientific research activities; (3) difficulty in quantitatively assessing the role and impact of scientific research outcomes.

With the increasing importance of S&T in economic and social development, the purpose, object, and content of S&T assessment have been continuously extended, and S&T assessment has become an important tool for S&T strategy management and also an important channel for the public to understand S&T. Meanwhile, the elements of S&T assessment vary when being viewed from different perspectives (Table 1).

Table 1 Basic elements of S&T assessment

Perspective	Element
Purpose	To provide the basis for the allocation of S&T resources or the adjustment of S&T policies, to analyze and judge the competitiveness of S&T, to improve the management performance of S&T activities, and to address the public concerns about the outcomes of S&T investment
Object	Personnel, team, research institution, research field, research project, research plan, S&T policy, national S&T innovation capability.
Content	S&T plans or programs, S&T inputs, implementation of S&T activities, S&T outputs, social and economic impacts.
Organization	Self-assessment, external assessment (assessors from outside the organization or environment), internal assessment (assessors from inside the organization or environment)
Stage	Pre-process assessment (developmental assessment) to obtain the necessary information of the assessment object, in-process assessment (diagnostic assessment) to solve the key problems in scientific research activities, post-process assessment (value judgment assessment) to evaluate the outcomes of scientific research activities

1.2 New requirements for S&T assessment development

Today, since S&T has become the primary driving force for economic and social development, the role of S&T assessment in the management of S&T activities has become increasingly prominent, and the diverse and evolving S&T activities have also put forward new requirements for S&T assessment.

(1) S&T assessment should pay attention to the whole process of S&T activities. The connotation of S&T assessment has expanded from the conventional assessment of a single output link to the assessment of various aspects of S&T activities such as S&T planning, S&T input, organization and implementation, and S&T output and impact. This entails a new model combining objective, process, and outcome to evaluate the whole process of S&T activities, in order to adapt to the development and change of S&T activities.

(2) S&T assessment should make full use of diagnostic analyses. With the increasing scale of S&T activities and the increasing complexity of the problems facing decision making in S&T management, S&T assessment should pay more

attention to the diagnosis, analysis, and improvement of research process, in order to determine the weak links in the process of research and propose corresponding improvement measures and methods.

(3) S&T assessment should emphasize the combination of quantitative and qualitative assessments. With the increasing demands of the government and the public for objectivity in S&T assessment, quantitative assessment based on scientific tools and methods has assumed an increasingly important role in S&T assessment. Therefore, S&T assessment activities should put emphasis on qualitative assessment on the basis of quantitative assessment, or quantitative treatment on the basis of qualitative assessment, thereby obtaining multi-perspective and omni-directional comprehensive assessment results by integrating objective information with expert experience.

(4) S&T assessment should stress on scientificity and high quality. At present, the review of much S&T assessment report is less professional, and the reliability and scientificity of assessment results remain questionable. Therefore, S&T assessment should be conducted based on objective facts and data and produce assessment results that can be circularly demonstrated to ensure high quality.

In general, with further development in the modernization of the national governance system and capacity in China, S&T assessment serves an important role in the evaluation of policy implementation and the demonstration of policies and plans before implementation. Meanwhile, this puts forward higher requirements for the scientificity and systematicness of S&T assessment in China. However, the existing S&T assessment methods usually focus on a specific aspect of a problem, with the drawbacks of fragmentation as well as lacking systematicness. Besides, it lacks thinking/cognition of the whole process of S&T assessment from the perspectives of dialectics and systems theory, and the scientificity of the assessment results needs to be further demonstrated.

2 DIIS theory and methodology for think tank research

The lack of systematic methods is a problem in S&T assessment and also in think tank consultation and research. Therefore, it is necessary to summarize the theory and methodology of think tank research and to establish scientific and reasonable research methods, in order to ensure the high quality and objectivity of think tank research outcomes. To this end, in this section we briefly describe the systematic research methodology proposed by Pan et al. [2], i.e., think tank DIIS theory and methodology.

Based on his long-term experience in S&T strategy research and planning of major projects, Pan [1] summarized and refined the methods generally used in think tank research, and established the think tank DIIS theory and methodology. First, various data and phenomena relevant to the problem were collected (Data). Second, professional mining, organization, and analysis were conducted to build objective cognitions (Information). Then, expert intelligence was introduced to judge these cognitions (Intelligence) and to gain new insights and ideas. Finally, solutions or policy recommendations were proposed using a problem-oriented approach (Solution), and high-quality constructive think tank research reports were provided for macro-level decision-making. From the above analyses, the DIIS theory and methodology can be summarized as "data collection (Data)–information extraction (Information)–comprehensive judgment (Intelligence)–solution formation (Solution)."

The think tank DIIS theory and methodology address the lack of systematicness in existing think tank research methodology and summarize the general methods in think tank research. Specifically, think tank research should be problem-oriented, evidence-oriented, and science-oriented [2,3], and think tank problems should be investigated based on the DIIS theory and methodology (Figure 1). Problem orientation means that think tank research should integrate the characteristics of the problem and perform a comprehensive study. Problem-oriented DIIS research follows a four-stage procedure of "problem refining–problem analyzing–problem integrating–problem solving." Evidence orientation means that think tank research should be reasonable and based on evidence. Evidence-oriented DIIS research ensures the high quality of think tank research from the four stages of DIIS research. Science orientation means that think tank research should use scientific research methods and tools for systematic study of the problem. Science-oriented DIIS research ensures the scientificity of think tank research also from the four stages.

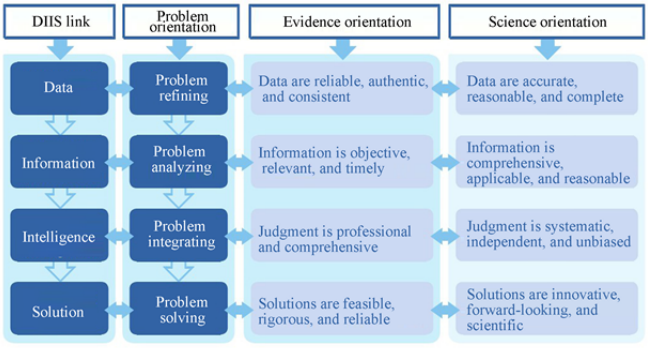

Figure 1 Problem-oriented, evidence-oriented, and science-oriented think tank DIIS theory and methodology

The think tank DIIS theory and methodology follow the general methods of think tank research, which are applicable to the study of S&T issues, as well as strategies and policies in society, economy, and ecology. In addition, method innovation and scientific attitude based on professional knowledge and scientific evidence should be maintained in the four stages and the whole process of DIIS research. Effective research methods and tools such as technology forecasting and roadmap should be used, along with the latest

achievements of research in information technology, big data, management decision, integrative convergence, artificial intelligence, operational research, system engineering, and complexity science. New methods, models, and tools for strategy consultation and research on S&T should be developed, such as science structure maps, virtual reality tools, policy simulation tools, and visual decision support platforms. These methods can be used to develop and establish a distinctive think tank DIIS theory and methodology, continuously improve the scientificity of strategy consultation research, and provide scientific consultation suggestions and systematic solutions for macro-level decision-making in China.

3 DIIS methods and functions in S&T assessment

The think tank DIIS theory and methodology originated from the thinking and generalization of think tank research and have good applicability to think tank research problems. In this section, we analyze the research process of S&T assessment from the perspective of DIIS, establish the DIIS method for S&T assessment, and defined the roles of S&T assessment in S&T decision-making consultation from the perspective of DIIS.

Problem-oriented, evidence-oriented, and science-oriented interdisciplinary and multidisciplinary research should be conducted by targeting the S&T assessment problem, using the DIIS theory and methodology, and combining the characteristics of the assessment problem. The procedure of S&T assessment with DIIS theory is described as follows. (1) In the stage of problem refining, data are collected from the S&T assessment problem; association analysis is performed by integrating the knowledge of multiple disciplines; the characteristics of S&T assessment problem are clarified, and the problem is decomposed into several sub-problems. This stage corresponds to the Data (data collection) of DIIS. (2) In the stage of problem analyzing, the data related to the problem are organized and analyzed, and the decomposed sub-problems are studied in depth to develop objective cognition and preliminary opinions. This stage corresponds to the Information (information extraction) of DIIS. (3) In the stage of problem integrating, the objective cognitive information and preliminary opinions of sub-problems are systematically integrated, and expert opinions are integrated for judgment. This stage corresponds to the Intelligence (comprehensive judgment) of DIIS. (4) In the stage of problem solving, according to the comprehensive judgment of experts, assessment conclusions and reports under different constraints are generated, and this stage corresponds to the Solution (solution formation) of DIIS.

Based on the analyses of the four stages, problem refining, problem analyzing, problem integrating, and problem solving are refined to 14 steps (Figure 2). Three of them are check steps (steps 3, 10, and 13) that ensure the comprehensiveness and scientificity of S&T assessment, and the details of each step are described as follows.

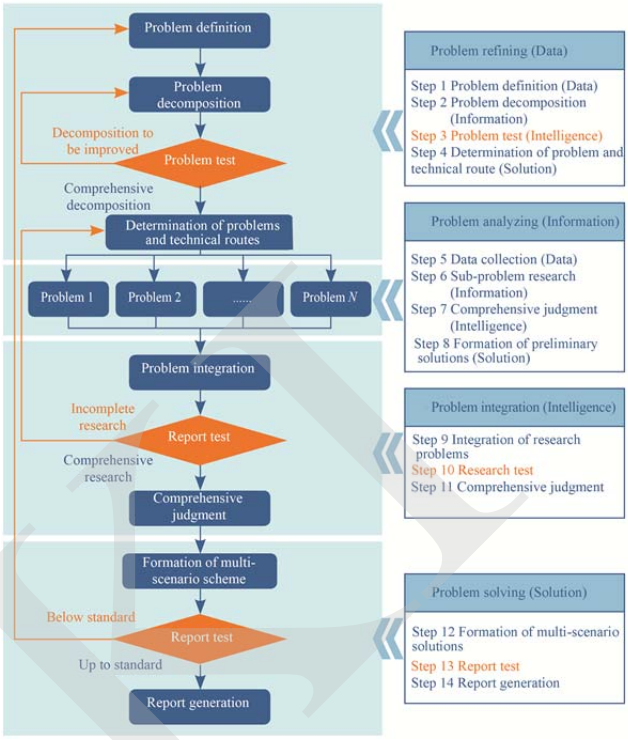

Figure 2 DIIS methodology of S&T assessment

3.1 Stage of problem refining—Data

Step 1: Define the assessment problem. The characteristics of S&T assessment problem are defined with an emphasis on the connections between various disciplines, and the problem is subjected to interdisciplinary and multi-field studies.

Step 2: Decompose the problem. The S&T assessment problem is decomposed into several sub-problems, and the key sub-problems are identified.

Step 3: Check the problem. The comprehensiveness of problem decomposition in Step 2 is checked. If the decomposition is comprehensive, go to Step 4, otherwise, return to Step 2 to re-decompose the problem with supplementary data.

Step 4: Select the sub-problems and technical route. The sub-problems to be studied in depth are selected, and a technical route to solve the sub-problems is established according to research purposes, objects, resource constraints, and specific needs.

3.2 Stage of problem analyzing—Information

Step 5: Collect data. Data on each sub-problem are collected.

Step 6: Study sub-problems. The data relevant to each sub-problem are organized and analyzed to form a preliminary objective cognition.

Step 7: Comprehensively judge sub-problems. Each

sub-problem is comprehensively judged based on the opinions of experts in relevant fields.

Step 8: Form a preliminary solution. A preliminary solution to each sub-problem is proposed based on the results of the comprehensive judgment.

3.3 Stage of problem integrating—Intelligence

Step 9: Integrate research problem. The findings of sub-problems are integrated to obtain research results.

Step 10: Check the research. Whether the integrated results obtained in Step 9 represent a comprehensive solution to the problem is checked. If so, go to Step 11; if the problem is not fully resolved, return to Step 4 for circular demonstration of the research.

Step 11: Comprehensively judge the problem. Stakeholder analysis is performed by using uncertainty analysis and game theory, and the problem is comprehensively judged by integrating expert opinions.

3.4 Stage of problem solving—Solution

Step 12: Form multi-scenario solutions. Based on the comprehensive judgment by experts, conditional problems are constructed and a solution set of problems under different constraints is provided to generate a preliminary report.

Step 13: Check the report. The report is checked against quality standards. If the standards are met, go to Step 14 to generate the S&T assessment report; if the standards are not met, return to Step 1 for circular demonstration of the research.

Step 14: Generate an assessment report. The final qualified S&T assessment report is generated in a standardized format.

Based on the above research procedure, the roles of S&T assessment in S&T decision-making consultation can be defined as six major functions from the perspective of DIIS: evidence formation, measurement and comparison, diagnostic analysis, prospective prediction, value orientation and judgment, and quality control (Table 2).

4 Recognition of S&T assessment practice

S&T assessment, as an important topic in S&T think tank research, has been widely used in global think tank research. In this section, we use examples of S&T assessment in the Max Planck Society in Germany, the National Science Foundation (NSF) in the United States, the policy of major water conservancy projects of the State Council of China, and the scientific research level of British higher education institutions, in order to analyze the applications of DIIS method of S&T assessment in evaluating institutions, projects, policies, and research quality.

4.1 Institution assessment practice in the Max Planck Society in Germany

The Max Planck Society in Germany mainly carries out basic research in the fields of natural science, social science, humanities, and arts that are difficult for German universities and research institutions. Meanwhile, it provides instruments/equipment and literature resources for researchers outside the Max Planck Society. The society focuses on basic cutting-edge research, emphasizes the quality of research results in assessment, and gives researchers the freedom of choice. The assessment practice of the Max Planck Society can be found in Ref. [4].

Analysis of the assessment process of the Max Planck Society showed that it basically followed the idea of DIIS in S&T assessment, and the details are summarized as follows. (1) Collect data—Data. Relevant data are collected from various disciplines, including outputs and impacts, to provide basic supporting data for the classification and assessment of each field. (2) Extract information—Information. Through bibliometric data analysis, the scientific frontiers and output influences in various fields of the institute are demonstrated via the dimensions of quality and impact of academic outputs, which reveal important information on several key points and links of scientific research activities in different fields. (3) Comprehensively judge sub-problems— Intelligence. Data analyses are combined with the knowledge and judgment of authoritative experts in various fields, focusing on analyzing the status of the institute in the world and its support to young scientists, and providing diagnosis and assessment opinions for the institute in various fields. (4) Form solution—Solution. Concerning the future development needs of the Max Planck Society, suggestions on the future development and directions of the institute are provided on the basis of assessment results.

Table 2 Functions of S&T assessment from the perspective of DIIS

Function [2]	Specific content	Link
Evidence formation	Make use of objective data and information and reasonable research methods to integrate expert wisdom to form the scientific evidence for assessment	Data and Information
Measurement and comparison	Systematically analyze and compare the situations of the assessment objects according to the needs of the evaluators such as governments and research institutions	Information and Intelligence
Diagnosis and analysis	Analyze and diagnose the problems in S&T activities through in-depth analysis and circular demonstration	Information and Intelligence
Prospective prediction	Perform deductive reasoning on the development trends of assessment objects and predict the prospects of S&T according to the objective requirements and future scenarios	Intelligence
Value orientation and judgment	Define the value orientation and value judgment of S&T assessment based on the purpose of assessment	Data, Information, Intelligence and Solution
Quality control	Control the quality of S&T assessment in the whole process through the formation of overall cognition by integrating the objective information of the evaluated object and the wisdom of experts and researchers	Data, Information, Intelligence and Solution

4.2 Assessment practice of research achievement in the NSF of the United States

The NSF of the United States is a representative and influential national science foundation. It mainly supports basic research and educational research projects in science and engineering, with the aim to promote scientific progress, enhance national health and prosperity, and ensure national defense security. Every year, NSF selects the most revealing highlights from the research results of its funded projects, which are used as an important part of the performance evaluation report to the Congress. At the same time, these highlights are demonstrated to the public to show the achievements of funded projects. The performance assessment practice of NSF can be found in Ref. [5].

Analyzing the assessment of research by NSF, we found that it basically followed the idea of DIIS in S&T assessment, which is summarized as follows. (1) Collect data—Data. The relevant data of NSF projects are collected, including the value, the potential impact and significance, the breakthrough discovery, and the social and economic benefits of projects, in order to provide basic supporting data for the assessment of research results. (2) Extract information—Information. Through comprehensive analyses of information on research achievements, the most relevant and important research results reflecting NSF strategic objectives are identified. (3) Comprehensively judge sub-problems—Intelligence. At the three levels of science division, bureau, and institution, data analyses are combined with the knowledge of external experts to judge the level of breakthrough in project outcomes against the strategic objectives of NSF. (4) Form solution—Solution. According to the judgment, the most revealing highlights are selected and included in the NSF annual performance report, and these highlights are presented to the public to show the achievements of its funded projects.

4.3 Practice of third-party policy assessment of major water conservancy projects by the State Council of China

According to the deployment by the State Council ([2014] No. 1), the CAS as a third-party evaluation agency conducted an assessment on the "implementation of policies and measures for accelerating the construction of major water conservancy projects, and for solving the drinking water safety problem of another 60 million rural people in 2014." Guided by the leaders, the CAS established an assessment leading team, an expert team, and a consultant team. The major water conservancy project team and the drinking water safety team for the rural population were arranged to conduct interviews with ministries, local governments, and stakeholders. The implementation of policies and measures was assessed by field research on the project.

After summarizing the process of third-party policy assessment of major water conservancy projects, we found that it basically followed the idea of DIIS in S&T assessment, which is summarized as follows. (1) Collect data—Data. Through a combination of document review, interview, and field study, data on the plans and programs related to the major water conservancy projects and rural drinking water safety are collected to provide basic supporting data for third-party assessment. (2) Extract information—Information. The data are processed and analyzed through qualitative analysis of literature, quantitative analysis of statistical data, and statistical analysis of large-scale questionnaire surveys. (3) Comprehensively judge sub-problems—Intelligence. Several symposia are organized for the expert team and data analysis was combined with the long-term research experience of experts to score the main assessment indicators of policy implementation. (4) Form solution—Solution. According to the judgment, suggestions are proposed regarding the system and policy, and a third-party assessment report is produced and submitted to the executive meeting of the State Council of China.

4.4 Practice of research excellence framework (REF) in higher education institutions in the UK

Since 1986, the four major higher education foundations in the UK, namely, Higher Education Funding Council for England (HEFCE), Scottish Higher Education Funding Council (SHEFC), Higher Education Funding Council for Wales (HEFCW), and Department for Employment and Learning (DEL), have begun to implement the Research Assessment Exercise (RAE) across the UK, in order to provide a basis of decision making for the basic research funding allocated by the government to over 350 universities and higher education colleges in the UK. Since RAE required huge cost and time of numerous review experts, there were many complaints about RAE in the UK. Therefore, the UK government reformed the RAE in 2008 and implemented the REF in 2014 ①. The REF practice has been described in Ref. [6].

REF employs expert review to assess the quality of research conducted by scholars in colleges and universities and provides a basis for funding allocation by higher education foundations. REF has been used by the UK government to monitor and improve the quality of scientific research in colleges and universities and helps to establish the mechanism of healthy competition among universities. Analysis of research quality assessment with REF reveals that it basically follows the idea of DIIS in S&T assessment, which is summarized as follows. (1) Collect data—Data. The detailed information of scientific research activities and research achievements of the scholars to be evaluated are collected to generate the evaluation materials and to provide basic supporting data for the evaluation of the scholars. (2) Extract information—Information. Through a comprehensive analysis

① More information can be found at http://www.ref.ac.uk/

of evaluation materials, a preliminary assessment result of scientific researchers is obtained. (3) Comprehensively judge sub-problems—Intelligence. The assessment teams (including sub-assessment teams, cross-team consultants, observers, and foreign experts) use their disciplinary expertise to provide an overview of each material based on a rating scale. (4) Form solution—Solution. The results of judgment are used to form an important basis for making decisions about the allocation of annual government funding to the assessed colleges and universities.

4.5 Analysis of S&T assessment practice

The above case studies on institution, project, policy, and research quality assessment suggest that the overall evaluation processes basically followed the idea of DIIS in S&T assessment. However, due to the differences in goals and objects, the emphases of S&T assessment varied across the stages of DIIS. For example, in the institution assessment carried out by the Max Planck Society in Germany, the Intelligence link focuses on the scientific frontiers and the output impacts of institute research fields. In the project assessment carried out by NSF in the United States, Intelligence focuses on judging the level of breakthrough in project outcomes. In the policy assessment of major water conservancy projects of the State Council conducted by the CAS, Intelligence emphasizes on analyzing the implementation of policies. In the REF conducted in the UK, Intelligence focuses on assessing the quality of scientific research activities performed by scientific researchers. It can be seen that the differences in the objects and purposes of S&T assessment directly lead to the divergence in value orientation, which is present throughout the four steps of DIIS.

5 Conclusions

With the rapid development of S&T, how to grasp the historical opportunity at the intersection of a new round developmental advantages is an important topic to be considered in China, in order to promote innovation-driven development and to build a world S&T power. It is necessary for S&T think tanks to gain insights into the development of S&T in the future, and to accurately judge the development direction and strategic priority by using a scientific and reasonable S&T assessment system, which will lay a foundation of research and analysis for providing prospective consultation recommendations and systematic solutions. Therefore, S&T assessment is not only an important task for think tank research but also an important guarantee for the quality of think tank research. In this paper, the think tank DIIS theory and methodology are applied to S&T assessment, and a four-stage DIIS method for S&T assessment is established, namely, problem refining, problem analyzing, problem integrating, and problem solving. We also reveal the six functions of S&T assessment in S&T decision-making consultation from the unique perspective of DIIS, which fills the gap in existing S&T assessment research. In addition, the practical applications of the DIIS method in S&T assessment are analyzed in typical cases to provide methodological guidance and support for S&T assessment practice in China.

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