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How to Break the "Siwei"?—Practice and Enlightenment Based on Research Institute Evaluation of Chinese Academy of Sciences

LI Xiaoxuan

Institutes of Science and Development, Chinese Academy of Sciences, Beijing 100190, China; School of Public Policy and Management, University of Chinese Academy of Sciences, Beijing 100049, China

See next page for additional authors

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How to Break the "Siwei"?—Practice and Enlightenment Based on Research Institute Evaluation of Chinese Academy of Sciences

Abstract

In 2018, the state issued breaking the "Siwei" related document, while "Siwei" means only papers, only titles, only education back ground, and only awards, and five ministries and institutions, i.e., Ministry of Science and Technology, Ministry of Education, Ministry of Human Resources and Social Security, Chinese Academy of Sciences, and Chinese Academy of Engineering, collaborately started the special action of breaking "Siwei". Most researchers in universities and research institutions have both expectations and concerns. There are different opinions on how to break the "Siwei" into a hot topic. Based on the introduction and analysis of the development and evolution of more than 20-year research institute evaluation of Chinese Academy of Sciences (CAS), this study holds that the research institute evaluation of CAS has gone out a road of breaking the "Siwei" and formed the CAS mode, thus providing a way of thinking for how to break the "Siwei" from the perspective of practical cases.

Keywords

break the "Siwei"; Chinese Academy of Sciences; research institute evaluation; CAS mode; science evaluation

Authors

LI Xiaoxuan and XU Fang

Corresponding Author(s)

XU Fang^{1,2*}

1 Institutes of Science and Development, Chinese Academy of Sciences, Beijing 100190, China

2 School of Public Policy and Management, University of Chinese Academy of Sciences, Beijing 100049, China

XU Fang Associate Professor at Institutes of Science and Development, Chinese Academy of Sciences (CAS). Her research interests include research management & evaluation to support S&T decision makings. She has also undertaken more than 20 research evaluation and policy study related projects from National Natural Science Foundation of China, Ministry of Science and Technology, Ministry of Human Resources and Social Security. She has already published more than 40 papers in *European Journal of Operational Research*, *Omega*, and other international or domestic journals. E-mail: xufang@casisd.cn

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LI Xiaoxuan^{1,2}, XU Fang^{1,2}

1. Institutes of Science and Development, Chinese Academy of Sciences, Beijing 100190, China;

2. School of Public Policy and Management, University of Chinese Academy of Sciences, Beijing 100049, China

Abstract: In October 2018, five ministries and institutions, i.e., Ministry of Science and Technology, Ministry of Education, Ministry of Human Resources and Social Security, Chinese Academy of Sciences (CAS), and Chinese Academy of Engineering, collaboratively started the special action of breaking “Siwei,” which means “Four-Only” problems, i.e., only papers, only titles, only education background, and only awards. Most researchers in universities and research institutions have both expectations and concerns. There are different opinions on how to break the “Siwei.” On the basis of the analysis of the development of evaluation conducted by CAS for more than 20 years, this study holds the view that CAS has explored a way of breaking the “Siwei” and formed the CAS mode in research institute evaluation, which is expected to provide a case for reference on how to break the “Siwei.”
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Keywords: break the “Siwei”; Chinese Academy of Sciences; research institute evaluation; CAS mode; science evaluation

Over the years, science evaluation, particularly in the basic research, has been a hot topic in the scientific and technological (S&T) system reform in China. In October 2018, five ministries and institutions in China, i.e., Ministry of Science and Technology, Ministry of Education, Ministry of Human Resources and Social Security, Chinese Academy of Sciences (CAS), and Chinese Academy of Engineering, collaboratively issued the Notice on Special Action to Solve the Problems of “Only Papers, Only Titles, Only Education Background, and Only Awards,” which aroused widespread interest in universities and research institutions. On the one hand, all departments and units tried to solve the problems of “only papers, only titles, only education background, and only awards” (hereinafter referred to as “Siwei”) with reference to the Notice, and actively canceled manifestly unreasonable requirements in the assessment systems or regulations at all levels, which adjusted the biases. On the other hand, the S&T circles also discussed and concerned the underlying problems behind the breaking of the “Siwei.” For example, what will be established after breaking the “Siwei”? How to ensure the fairness and justice of science evaluation? Will the human factors prevail, and will it be more difficult for the young to get advanced? Another opinion was proposed: after breaking of the “Siwei”, multi-dimensional factors should be considered, which means that more quantifiable

indicators should be added. As affected by various opinions, the breaking of the “Siwei” has almost fallen in a dilemma, and it is much harder to reform the science evaluation.

Undoubtedly, effective and breakthrough evaluation methods or convincing success cases are needed for breaking the “Siwei.” Therefore, this study took the development history of research institute evaluation of CAS for more than 20 years as the case, and analyzed the science evaluation methods and background factors. We have found that the development of evaluation conducted by CAS from quantitative ranking evaluation at the first stage to qualitative evaluation at the fourth stage was the practice of breaking the “Siwei,” which is called CAS mode. It should be noted that the evaluation conducted by CAS in this paper specifically refers to the comprehensive evaluation on the institutes of the CAS, especially in the basic research, excluding other individual evaluations conducted by the CAS on its institutes and internal evaluations of such institutes. Of course, CAS mode for breaking the “Siwei” is designed to guide and promote CAS to break the “Siwei” in other evaluations such as talent evaluation, project evaluation and team evaluation. Therefore, CAS mode for science evaluation is introduced and analyzed below to explore theories and methods of breaking the “Siwei.” This paper is expected to provide inspiration in the reform of science evaluation in China.

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Corresponding author: XU Fang

1 How to understand the breaking of the “Siwei”?

Papers, projects, awards, talent titles (including education background and professional titles) are important indicators in scientific research activities. Specifically, publication of papers is an important way of displaying scientific discoveries or innovative ideas; the funding gained through competition can reflect the level and ability of researchers; awards and talent titles mean the recognition of the research work of scientific researchers by the society (mainly the scientific community). Therefore, these indicators are undoubtedly important for science evaluation. We believe that breaking the “Siwei” does not mean that these indicators are no longer concerned in science evaluation. Instead, they should not be taken as the “only” standards. The key to “only” is the simple addition of these indicators: the scores are simply calculated based on the number of papers, impact factors of publications, and the number and level of projects, awards, and titles. The score is the criterion for judging whether the standard is reached or not. Therefore, the core of breaking the “Siwei” is to change the simple and mechanical quantitative evaluation.

How to change the simple and mechanical quantitative evaluation? It should be replaced by qualitative evaluation, namely the peer review. Due to the uncertainty of basic scientific research, the values of original results are hard to be quantified, and there is “only the best” achievement. Therefore, only peer review is deemed as a feasible method for evaluating basic research in the S&T circles^[1]. It is proposed in this paper that the only feasible method to break the “Siwei” is to replace the quantitative evaluation with qualitative evaluation on basic research characterized by the output of original achievements, and we may call it the Golden Rule of science evaluation for basic research.

Why does peer review fail to be directly adopted in science evaluation in China according to the Golden Rule, and why is the “Siwei” quantitative evaluation still adopted? There are three prerequisites for an effective peer review: ① There should be “good” and competent peers, which means that there should be a large number of high-level experts; ② there should be “good” scientific culture, and the preference and relationship may block the authentic and effective evaluation; ③ there should be “good” evaluation subjects, and the scarce evaluation resources should first be used to evaluate the high-level and potential evaluation subjects. At present, these three conditions cannot be met in China. In addition, evaluation purpose is another reason. For example, the simple and clear quantitative ranking evaluation can form a strong competitive mechanism. Therefore, it is not feasible to simply abolish the quantitative methods and replace them with peer review, and this is the reason why many people are worried about the breaking of the “Siwei.”

How to break the “Siwei” in this tough situation? In

addition to the correction of the obviously unreasonable evaluation indicators or methods, is there a possibility of thoroughly breaking the “Siwei”? In fact, although the three conditions for peer review fail to be comprehensively met in China, they can be achieved in some regions. With years of the reform and opening up, the investment in scientific research, and the introduction of talents, some academic highlands have met these conditions, and can be prior to break the “Siwei.” After more than 20 years of exploration and development, CAS has successfully realized the leap from quantitative evaluation to qualitative evaluation in research institute evaluation, and formed a CAS mode as a reference for reforming of the breaking of the “Siwei.”

2 Formation of the CAS mode

CAS is the highest academic institution of natural sciences in China. Since the 1990s, science evaluation has become a major tool for managing the institutes, and the most typical representative is the evaluation conducted by CAS, which has the following three main functions: ① It can guide the development of the research institutes; ② it can measure the performance output; ③ it has the competitive and incentive effect^[2]. Over 20 years, CAS evaluation system has experienced four phases, i.e., “Blue Book” evaluation, binary evaluation, comprehensive quality assessment and major output-oriented evaluation, presenting the remarkable characteristics of transition from quantitative evaluation to qualitative evaluation.

2.1 “Blue Book” evaluation system (1993-1997)

In 1993, CAS started the comprehensive research institute evaluation. At that time, the reform of China’s science and technology system was initiated. With the restoration of the professional title system and the science and technology award system, as well as the approval of competitive science and technology projects, science evaluation has quickly emerged. For example, Nanjing University started introducing more advanced SCI indicators in the evaluation^[3]. At that time, there was a ranking of CAS institutes with strange results which misdirected social understanding of CAS institutes. The “misleading” external evaluation made CAS start evaluating its own institutes. Due to the blue cover of the evaluation report, it was called the “Blue Book” evaluation system.

In this phase, CAS evaluation adopted the quantitative ranking evaluation based on the indicators such as papers, patents, projects, funding, talents, and awards; the institutes were ranked by scores of S&T output and development status. The evaluation was entirely quantitative evaluation, which was quite serious in the phenomenon “Siwei” as judged by the current standard.

2.2 Binary evaluation system (1998-2004)

In 1998, the Chinese Government supported CAS to carry

out pilot projects for knowledge innovation. According to the requirements of strategic objectives, the newly established research institute evaluation system contains qualitative evaluation based on the accomplishment of the innovation mission statements, and quantitative evaluation embodying the “basic, strategic and forward-looking” mission of CAS; therefore, it is called the binary evaluation system. As for qualitative evaluation, there is an important task in the accomplishment of evaluation goals, including S&T goals such as subject direction adjustment, and management goals such as reduction in staff size and rejuvenation of staff. Quantitative indicators include strategic scientific research tasks, high-quality academic papers, patents, awards, talents, consulting reports, invited reports of important international academic conferences, and major social and economic benefits. The evaluation results were obtained by weighted calculation based on qualitative evaluation and quantitative evaluation, and expressed as the ranking of institutes.

Compared with the “Blue Book” evaluation system, the binary evaluation system made a great progress, but due to the great effect of quantitative evaluation on the calculation results, there was still a prominent phenomenon of the “Siwei.” In order to make up for the deficiency of over-quantification, CAS supplemented major innovation contribution evaluation in the binary evaluation system in 2003, where the institute can be directly rated as “excellent” with one major innovation contribution, regardless of the calculated results. In that year, 13 of the nearly 100 CAS institutes were rated as “excellent.” For example, the Cold and Arid Regions Environmental and Engineering Research Institute, CAS was rated as “excellent” based on the “Research Achievements of Qinghai-Tibet Railway Frozen Soil Engineering Mechanism.” However, in view of limited contribution of major innovations, the institutes still highly valued the quantitative indicators.

2.3 Comprehensive quality assessment system (2005–2010)

In 2005, the knowledge innovation project entered the third phase; the CAS basically completed the reform task, and adjusted the research institute evaluation system to comprehensive quality assessment system consisting of self-evaluation, peer review by external experts, exchange and appraisal of the institutes in the same field by experts in the institutes, site evaluation by agency management experts, and quantitative monitoring of the institute’s annual basic data, as well as expert comprehensive decision-making classification. The index calculation method was adopted in quantitative monitoring, which realized the horizontal and

vertical comparison of quantitative evaluation results. The overall evaluation results were classified, but not ranked; the classification results were determined by experts based on individual evaluation results according to the pre-determined principles, and no weighted calculation was conducted.

Therefore, the comprehensive quality assessment system further strengthened the qualitative evaluation and weakened the quantitative evaluation as compared with the binary evaluation system. Nevertheless, in the comprehensive decision-making classification process, the quantitative evaluation results still played a great role in the qualitative judgment of the expert group, because the experts could not effectively judge the comprehensive performance of research institutes with multiple disciplines, various achievements, and large scale based on personal knowledge and experience.

2.4 Major achievement output-oriented evaluation system (2011–present)

Since 2011 when the knowledge innovation project was completed, CAS has simplified the management of the institutes and presented more autonomy to them. The institutes have been simplified according to the “One-Three-Five”^① Plan, and the research institute evaluation system has been adjusted to a major achievement output-oriented evaluation system of “two links, one foundation”^[4].

(1) The first link: diagnostic evaluation by international experts. International experts were invited for site diagnostic evaluation of the institute positioning and level, field direction or team status and influence, and major achievements. International evaluation mainly involved basic research, and all research work that can be evaluated internationally should accept international evaluation as much as possible. At the beginning, CAS had some different views on international evaluation, and people worried that the large investment would not lead to effective results. However, in the pilot international evaluation, Academy of Mathematics and Systems Science, Institute of Hydrobiology, and Guangzhou Institute of Geochemistry, CAS obtained satisfactory results, eliminating the concerns.

(2) The second link: inspection of goal completion. Domestic experts were invited to review the rationality of goal positioning, the completion of three major breakthrough tasks and five cultivation directions of the “One-Three-Five” Plan, and generate the sub-item evaluation results.

(3) One foundation: annual key quantitative indicator monitoring. The results can only be used as the reference for the evaluation of the “two links.”

So far, CAS evaluation has evolved into qualitative evaluation or peer review in a full sense. Compared with the

① “One” refers to the positioning, namely the institute’s mission and core competitiveness in the next 5-10 years; “Three” refers to the direction of key development fields of an institute, namely the direction of fields that are expected to make major breakthrough achievements in the next 5-10 years; generally, there are no more than three such fields; “Five” refers to the direction of the fields that should be preferentially developed by an institute, namely the fields that can reflect the characteristics of the institute and are expected to become the competitive advantages in the future; generally, there are no more than five such fields.

comprehensive quality assessment system of the previous phase, the transformation was successful because the major output-oriented evaluation system did not focus on the institute as a whole, but reviewed the “critical minority” mode characterized by the “One-Three-Five” Plan one by one, so as to give full play of the role of expert review.

3 Analysis of CAS mode

The four phases of CAS evaluation showed that the quantitative evaluation gradually became weaker, while the qualitative evaluation gradually became stronger [5] (Fig. 1). Based on the Golden Rule of science evaluation, CAS has explored a way of breaking the “Siwei” and formed the CAS mode in research institute evaluation.

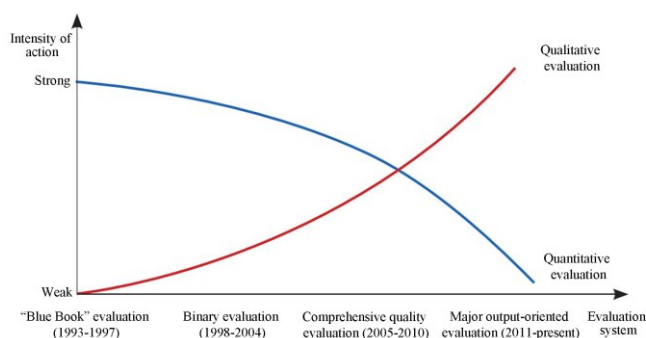


Fig. 1 Dynamic relationship between quantitative evaluation and qualitative evaluation in Chinese Academy of Sciences (CAS) evaluation

3.1 Conditions for CAS mode

The conditions for the CAS mode can be divided into subjective and objective ones. In terms of subjective initiative, the evaluation goals are different, which reflect different periods and different development strategies, and also promote the continuous improvement of the evaluation methods. Objective conditions mainly involve the improvement of the research capacity and level of the CAS, including the improvement of research output, talents, and international influence, as well as the guarantee conditions of scientific research funding and scientific research platform.

In terms of research output, the high-level papers and original research capabilities of the CAS have been growing rapidly. In the early 1990s, CAS was inferior to International Max Planck Research School, French National Centre for Scientific Research, and other world-class scientific research institutions in terms of papers on SCI, Science, and Nature; in 2005, the total number of SCI papers of CAS exceeded that of the two institutions. Around 2005, a few institutes of CAS, such as Institute of Physics, were equivalent to well-known international research institutions in the number of papers

published on Science, Nature, Physical Review Letters, and other high-level publications. Around 2010, a number of good original results of CAS institutes were concerned by the international academic community, and were even cited by the annual review of important journals such as Science. In international evaluation of CAS institutes conducted in 2013, many achievements were considered to be at the international leading level or the first matrix by international experts. With CNS papers as an example, the number of CNS papers^② published by CAS showed a rapid growth trend from 1991 to 2020 (Fig. 2). Through presenting this trend and the trends of quantitative and qualitative changes in CAS evaluation in one figure, we have found that the increasing trend of CNS papers published by CAS was consistent with the growth trend of qualitative evaluations in CAS evaluation (Fig. 3).

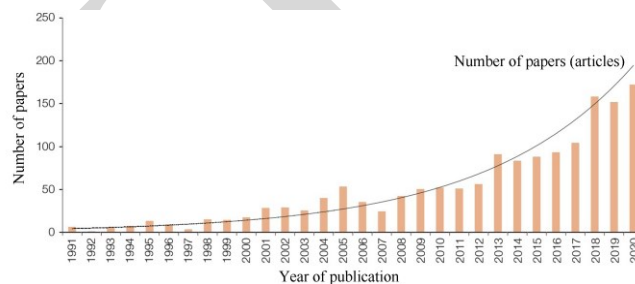


Fig. 2 Number of CNS papers published by the CAS from 1991 to 2020

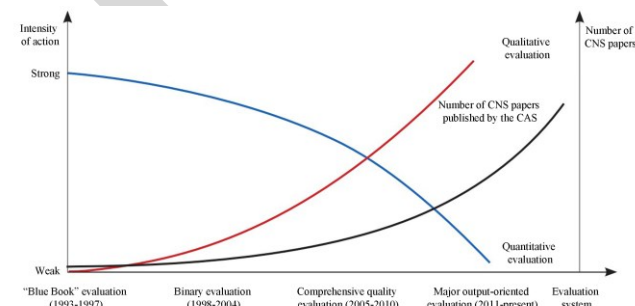


Fig. 3 The relationship between the changes of quantitative evaluation and qualitative evaluation in CAS evaluation and the number of CNS papers published by the CAS (1993-2020)

3.2 Understanding of the CAS mode

The analysis on the conditions for the CAS mode has shown that the proportion of quantitative evaluation or qualitative evaluation may not be the determinant for actual management, and the evaluation system would be effective as long as it can conform to the development strategy and conditions. In the second phase of CAS evaluation, namely the binary evaluation phase, quantitative results accounted for a large proportion, while the evaluation results were widely applied. Therefore, the directors of many institutes, especially those of the institutes whose funds were deducted due to the unsatisfactory evaluation results, had strong opinions.

② The top three international academic journals refer to Cell, Nature, and Science.

They believed that they could engage in research at ease through great improvement of scientific research funding support based on the knowledge innovation program, and there should be no evaluation, since it would “disturb” the research. The Head of CAS specifically stated his theory on the need of competitive development at the CAS Working Conference 2003. He believed that the development of the CAS and its teams were still uneven, and could not develop freely like International Max Planck Research School. Hence there should be an incentive mechanism like market competition, so as to make the winners emerging.

From a scientific point of view, the quantitative evaluation based on the indicator of papers is defective beyond doubt. But from the perspective of management, the quantitative evaluation can play the advantages of objectivity, conciseness, and justice under certain development conditions and in premise of avoiding inappropriate use, and it can help to promote the competitive development of research institutions and scientific research talents.

3.3 Limitations of CAS mode

In the fourth phase of CAS evaluation, namely the major output-oriented evaluation phase, the “Siwei” has been successfully broken. However, there are still large limitations. Specifically, the changes in CAS evaluation have not fully affected the internal evaluation. Except for the Institute of Physics, Academy of Mathematics and Systems Science, and other institutes with better conditions, the “Siwei” phenomena still exist in many other institutes. At present, the evaluation system of CAS is similar to that of International Max Planck Research School. However, there is still a large difference between the two institutes in terms of internal evaluation and self-consideration of “Siwei” by the researchers. On the one hand, due to the unbalanced development of CAS institutes, some institutes still require quantitative indicators; on the other hand, CAS cannot be righteous alone in the overall situation of the “Siwei” [6]. Without external signs such as enough papers, important projects, awards and titles, it would be hard for the researchers to obtain the recognition and support from science and technology management departments and even the S&T circles.

4 Conclusions and suggestions

4.1 Conclusions

Through the previous analysis and according to the Golden Rule of science evaluation based on basic research, the following three conclusions can be obtained.

(1) The “Siwei” in China can be broken. In terms of CAS evaluation, the evolution from quantitative ranking evaluation in the first phase to qualitative evaluation in the fourth phase, namely from the addition of quantitative indicators to expert judgment with quantitative indicators as the

supporting basis, is actually a way of breaking the “Siwei” (the CAS mode).

(2) Breaking the “Siwei” cannot be realized in a “quick march” manner. CAS and qualified “double first-class” universities, National Natural Science Foundation of China, Three National Science and Technology Awards, and Key Talent Program, should take the lead in shouldering the responsibility of breaking the “Siwei.” The CAS mode should be formed based on certain conditions. In addition to the improvement of the evaluation system and methods by CAS according to the strategies in different phases, the research capabilities and levels, including research output, talents, and international influence, should develop quickly, and reach sufficient academic height.

(3) The “Siwei” should not be broken without proper conditions. When the conditions are not met, the “Siwei” should not be broken by replacing quantitative evaluation with qualitative evaluation. The proportion of quantitative evaluation or qualitative evaluation may not be judged as good or bad in different phases, and evaluation system can be deemed as effective as long as development strategies and conditions are conformed to. From the perspective of management, the advantages of quantitative evaluation can also be exerted under the specific development conditions and in premise of avoiding improper use, which can help to realize competitive development and emerging of young talents.

4.2 Suggestions

Since the reform and opening up, China’s S&T modernization has developed rapidly, and the scientific research capabilities and international influence have been greatly improved. In 2019, China ranked the first in the “Natural Index” (NI) ranking based on the data of papers published on top journals. Meanwhile, China is still inadequate in original innovation ability of basic research, and there are fewer original results. At present, China is at a key point of transition from “following” and “parallel running” to “leading,” and comes to a new era of self-reliance in the field of science and technology. Therefore, the basic research, especially academic highlands, should transfer from quantitative evaluation to qualitative evaluation. It is more urgent to break the “Siwei.”

In recent years, with the release of policies for reforming science evaluation, the science evaluation system reform has become common practice in research institutions and universities, and some useful explorations have been made in professional title appraisal, such as the representative system, long-term employment system, international evaluation, and “up or out” system [7]. The review mechanism reform based on “responsibilities, credit and contribution” in the National Natural Science Foundation of China is being orderly conducted. CAS mode is one of the successful representatives after long-term exploration and accumulation, and its success can be analyzed from multiple perspectives. An important reason is that CAS, as a research institution, has special

mission positioning and “uniqueness.” Therefore, it is less affected by external influences, and can design and improve the evaluation system more calmly according to development needs. On the contrary, the competition among universities in various rankings is intense. As stated by a university president, “I know what to do, but if our ranking is lower, the teachers, the students, and even their parents would not accept; it will also be harder to seek resources from the government”.

In 2017, the author proposed in his article that CAS institutes, “985” universities and other academic highlands should give full play to their respective advantages and characteristics, and solve the dilemma of science evaluation, thus becoming the bellwether in the field of science evaluation [8]. At present, there is still a serious dilemma in breaking the “Siwei,” and as for academic highlands such as CAS institutes and “double first-class” universities, there is still a long way to go, and they should come forward and take the lead.

In order to assist these academic highlands (especially universities) in reforming the evaluation systems, the government should deepen the “streamlining administration and delegating power, strengthening supervision, and optimizing services,” and should also reduce government awards, title evaluation, and unnecessary competition evaluations in resource allocation. Meanwhile, the government should also

regulate the excessive ranking evaluations in the society, and gradually enable the scientific community to shoulder due responsibilities for the improvement of science evaluation methods and guidance, thus reserving enough space and autonomy for academic highlands to break the “Siwei.”

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LI Xiaoxuan Director of the Evaluation Center of Chinese Academy of Sciences (CAS), Professor and Doctoral Supervisor of Institutes of Science and Development, CAS. Member of Beijing Committee of the Chinese People’s Political Consultative Conference. His research focuses on scientific research management, including research evaluation, human resource management, and research funding management. In recent years, he has mainly undertaken important scientific research projects from CAS, the National Development and Reform Commission, the Ministry of Finance, the Ministry of Science and Technology, National Natural Science Foundation of China, and so on. He has published many papers in domestic and international journals in management innovation and evaluation area. E-mail: xiaoxuan@casisd.cn



XU Fang Associate Professor at Institutes of Science and Development, Chinese Academy of Sciences (CAS). Her research interests include research management & evaluation to support S&T decisionmakings. She has also undertaken more than 20 research evaluation and policy study related projects from National Natural Science Foundation of China, Ministry of Science and Technology, Ministry of Human Resources and Social Security. She has already published more than 40 papers in *European Journal of Operational Research*, *Omega*, and other international or domestic journals. E-mail: xufang@casisd.cn