



# Foreign Research Project Management Practices and Experience Inspiration for China

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**Abstract.** As the main carrier of scientific and technological research and development activities, the management level and effectiveness of scientific research projects directly affect the smooth achievement of scientific research goals. Therefore, this article uses literature research and typical case analysis methods to conduct research. By summarizing the practical experience of scientific research project management in international research companies or research centers, and combining it with the current situation of scientific research project management in China, it summarizes the experience and inspiration for improving the level of scientific research project management in Chinese research institutes, in order to provide reference and support for China to enhance its overall scientific and technological innovation capabilities.

**Keywords:** Research project management · Research institutes · Experience insights

## 1 Introduction

Along with the in-depth implementation of an innovation-driven development strategy, China's total investment in science and technology R&D has continued increasing, and the capacity of science and technology innovation has been significantly improved. However, the scientific research system mechanism needs to be improved, the scientific research service platform needs to be improved, and the unbalanced allocation of scientific research resources is still restricting the progress of science and technology to a certain extent. Scientific and effective management of scientific and technological R&D activities is an effective guarantee for the implementation of the innovation-driven development strategy, as well as an important support to enhance the level of scientific and technological development and promote the leapfrog development of productivity. Scientific research projects, as the implementation carrier of scientific and technological R&D activities, have the typical characteristics of high originality, clear directivity, remarkable innovation, and certain risk [1]. Therefore, the management of scientific research and development activities focuses on the management of scientific research

projects. This paper based on summarizing the practical experiences of scientific research project management in foreign countries and combining it with China's actual conditions, provides a reference for China to improve the level of scientific research project management.

## **2 The Current Situation of Research Project Management in China**

On the one hand, in the process of scientific research project management, the management level of managers in the approval, design, implementation, inspection, and acceptance of scientific research projects and other stages is directly related to the smooth realization of the overall scientific research objectives; on the other hand, the enthusiasm, initiative, and creativity of the researchers, as the main body of the project implementation, are closely related to the results of scientific and technological R&D activities [2]. Through the analysis of the current situation of scientific research project management, it is clear that the current stage of Chinese scientific research project management shortcomings, mainly reflected in the following aspects:

Quantity is more important than quality, and project approval should be paid attention to. The preliminary research work of a small number of research teams lacks depth and is superficial. The feasibility analysis of the project only focuses on theoretical analysis, lacking technical support and analysis of application conditions. In addition, the lack of market research has led to a low degree of matching and feasibility between expected results, application scenarios, application models, and actual production requirements, deviating from actual production requirements.

Implementation of form light cause, coordination mechanism to be improved. Most research institutes in China implement a regular meeting system, but during the implementation process, some research progress reports lack supervision and relevant responsible persons do not conduct actual verification, resulting in some members falsely reporting progress. Additionally, some project reports overemphasize completed results and neglect the analysis of the reasons for progress delays. In addition, in the case of multiple research centers participating in projects at the same time, there are issues such as unclear responsibility boundaries, loose cooperation, poor communication, and even the phenomenon of shifting responsibility to each other, which to some extent hinders the smooth progress of scientific research activities.

Acceptance is more about the conclusion than feedback, and the acceptance mechanism needs to be improved. After the completion of the scientific research project, the project implementation unit will summarize the scientific research implementation results and have the science and technology management department organize an expert team to evaluate them. There are situations where some expert teams have concluded that there are problems with the project acceptance earlier, which leads to a large number of remaining problems that are difficult to advance after acceptance, resulting in mismatched research content and results, insufficient extraction of results Insufficient material preparation and other issues. In addition, the project implementation unit focuses on the conclusion of the acceptance but neglects the feedback and implementation of subsequent issues. The improvement suggestions proposed by the expert team cannot be well applied in optimizing project content and promoting the implementation of results, resulting in some technology project acceptance work not playing its due role.

The enthusiasm for achievement transformation is insufficient, and the transformation mechanism needs to be improved. Some researchers, in the process of conducting scientific research activities, pay less attention to the realization of the economic benefits of scientific research achievements and focus mainly on the publication of papers. The enthusiasm for the transformation of scientific and technological achievements is generally insufficient, resulting in some scientific research achievements having high scientific value, but difficult to bring practical economic and social value. In addition, some scientific research activities are not oriented towards solving practical production problems and meeting production needs, and pay more attention to technology and theory, resulting in some research results being misaligned with market demand. The completed research results often only focus on or stay at the level of laboratory experiments, principles, published articles, and completed reports, making the project lack the foundation for achievement transformation, let alone the conditions for industrialization.

### **3 International Research Project Management Cases**

#### **3.1 General Electric Company**

General Electric Company [3, 4, 5] has a strong R&D capability in science and technology. It mainly improves its scientific research project management level through rational scientific and technological strategic planning, flexible adjustment of organizational structure, strict evaluation of employee performance, expansion of talent introduction channels, and other measures.

Since its establishment, GE has attached great importance to the planning of science and technology strategy. It has successively implemented the globalization strategy, the “Top two” strategy and the Six Sigma strategy. With the constant changes in the internal and external environment, General Electric has further enhanced the flexibility of the scientific research department by setting up independent strategic business units within the business department and establishing super business units in each business department to supervise and coordinate the scientific research activities of each business department. In addition, through the adoption of borderless organization, the company makes internal and external communication unimpeded. Through the implementation of the “360 degree” all-round evaluation system and the “Stage C” management method, GE has implemented the strict evaluation of employees. In addition, as a multinational enterprise, General Electric attaches great importance to the selection and training of outstanding talents from different regions and cultural backgrounds, realizing the global localization and local globalization of talents.

#### **3.2 Siemens**

Founded in 1849, Siemens is one of the world’s largest electrical engineering and electronics companies and enjoys the reputation of “electronic Empire” [6, 7]. Siemens takes technological innovation as the core driving force of development. By implementing the “trendsetter” strategy, introducing the “TOP + “ innovation project and establishing the Siemens Central Research Institute, Siemens maintains its leading position in key technology fields. In order to improve the efficiency of scientific research management, on

the basis of the establishment of the Central Research Institute, Siemens carried out the policy of streamlining the organization and implementing the management policy of delegating power, allowing some core technology research and development departments to operate like small enterprises and assume responsibility for their profits and losses. In order to establish a systematic, continuous and powerful system of scientific and technological research and development, based on the theory of induction extrapolation and regression analysis, Siemens Central Research Institute and business units jointly established the “Future Picture” innovation system. In addition, Siemens encourages employees to participate in the management of the company, which greatly improves the enthusiasm, initiative and creativity of the internal scientific research staff.

### **3.3 Fraunhofer Society of Germany**

Fraunhofer Institute [8, 9] is the largest applied scientific research institution in Germany and Europe, with rich experience in the practice of research project management. The Fraunhofer Institute of Germany builds an innovation bridge between the government, universities and industrial technology needs, adopts the mode of “contract research”, makes full use of its professional accumulation in the field of research and development and high-level scientific research team, and “tailor-made” R&D solutions for customers, so as to promote the rapid transformation of scientific and technological achievements into mature products in the market. And make the accumulated intellectual achievements of long-term research activities become the basis for new scientific research activities. In terms of internal allocation of scientific research funds, the society unconditionally allocates part of the enterprise funds allocated by the government to each institute to ensure prospective and basic research. Most of the remaining funds will be allocated proportionally according to the contractual research income of each research institute in the previous year, so as to effectively enhance innovation and research vitality. In addition, the Institute actively absorbs PhD and master students to participate in project research and development, and has established a long-term and effective communication and exchange mechanism with German enterprises, universities and research institutes. In addition, the management mode combining fixed post and mobile post is implemented to realize the flexible flow of scientific research personnel.

### **3.4 Electricité De France**

As the largest electricity company in France, the largest energy company in Europe, and the largest nuclear power operator in the world, EDF [10] has further enhanced its scientific and technological innovation capabilities by streamlining its management structure and adopting a contractual target management approach in the organization of its research projects.

In order to meet the needs of internal and external environment, EDF simplified the original three-tier management structure into two layers, so as to concentrate the administrative power in the hands of the general manager committee and the grass-roots unit manager committee, and set up various functional and technical departments under the leadership of the general manager committee. Edf adopts the scientific and technological project organization mode of contract management by objectives. The

general manager first works out the enterprise scientific and technological research and development strategic plan, divides the target contract into each scientific research group layer by layer, and replaces administrative instructions with contract management until each research group carries out follow-up relevant research work. In this process, the General Manager Department fully delegated power to the technical department and the scientific research team, which greatly stimulated the enthusiasm and innovation of the scientific research team.

#### **4 Inspiration and Suggestions**

Foreign science and technology companies or research centers have developed effective measures in the process of improving the level of scientific research management. Their practical experience in scientific research management provides the following references and inspirations for Chinese research institutes:

Formulate strategies for science and technology development in phases. With the thorough implementation of the innovation-driven development strategy, Chinese research institutes should reasonably formulate the strategic planning of science and technology in the short, medium, and long term on the basis of analyzing the internal and external environment, specifying the scientific research resources and capabilities, and laying out the scientific layout in the long term on the basis of their scientific research direction.

Flexibly adjust the organizational structure of scientific research departments. Both GE, which uses the flat structure to the extreme, and Siemens, which simplifies the scientific research organization, continue to make adaptive strategic adjustments to the organizational structure of their scientific research departments in the process of enterprise development, so as to improve the efficiency of scientific research management. Research institutes in our country can consider using matrices organization structure according to the different characteristics of various scientific research activities, reducing the limit of various departments and realizing efficient utilization of scientific and technological innovative resources by strengthening the communication between functional departments and R&D departments.

Strengthen the transformation of scientific and technological achievements. The transformation of scientific and technological achievements is not only an important way to combine scientific research activities with economic benefits but also an important means to improve the ability of scientific and technological innovation. Chinese research institutes can set up intellectual property operation centers to train professional intellectual property operation and protection teams to further strengthen the protection of intellectual property. At the same time, we will improve the promotion and application mechanism of achievements, build a bridge between scientific research and industry, and vigorously promote the transformation and application of scientific and technological achievements using the exclusive license, general license, and option conversion.

Establish medium and long-term incentive mechanisms. Talents are the main body of scientific and technological innovation. Paying attention to the selection and training of talents and conducting assessments and incentives according to different positions and different contributions can effectively maintain the vitality and vigor of scientific

research institutes. Chinese research institutes can optimize the proportion structure of post salary and performance salary according to the difference of staff posts, establish a medium and long-term incentive mechanism for scientific researchers, and explore ways to grant them partial ownership or long-term use rights to scientific and technological achievements by implementing incentive measures such as project dividends and equity dividends. At the same time, pay distribution is strongly related to individual performance to further stimulate the innovation potential of researchers.

## 5 Summary and Outlook

Along with the in-depth implementation of the innovation-driven development strategy and the accelerated pace of building a world of science and technology power, Chinese scientific research project management is facing new challenges. Given the increasing scale of research investment, increasingly complex research needs, increasingly onerous research tasks, and the enthusiasm and creativity of research personnel still need to be explored, research institutes need to further improve the level of research project management from multiple dimensions to ensure the smooth realization of research objectives. By reviewing and summarizing the rich practical experience in scientific research project management of foreign scientific research companies or research centers, this study starts from the aspects of strategic planning of science and technology, the organizational structure of scientific research, the transformation of scientific achievements and motivation of scientific research personnel, and summarizes the necessity and importance for Chinese research institutes to improve the level of scientific research project management. It will help further stimulate the potential of scientific research personnel and improve the overall level of scientific and technological innovation. In addition, there are still some shortcomings in this paper, and we will carry out in-depth studies on the policy suggestions to improve the evaluation and incentive mechanism of scientific researchers in the future.

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