

# Research on scientific research management mechanism based on data decision

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**Abstract:** *Big data is the basic material for forming a scientific decision-making system. The application of "data decision-making" in the actual scientific research management process can avoid duplication of work and decision-making deviation in the process of title review, data archiving, and project establishment, etc., and can effectively improve decision-making efficiency. Scientificity and fairness have invisible effects on creating a benign scientific research ecology and academic environment. In the context of big data application, a knowledge rule base will be formed based on data decision-making, review of the content of section declarations, members, etc., to promote the construction of an online evaluation system, improve the decision-making and application capabilities of data collaborative management of various departments, strengthen the early warning function of funding execution, and strengthen scientific research. The sharing and supervision of achievement information is an effective way for scientific research management and risk prevention and control.*

**Keywords:** *Data decision-making, network review, funding early warning, risk prevention and control*

## 1. Introduction

At home and abroad, in scientific research management and government decision-making, the application of big data decision-making is extensive. The basic material of the scientific decision-making system comes from the associated information of a large amount of data. The application of data decision-making in the actual scientific research management process can avoid duplication of work and decision-making deviation in project management in the scientific research management process, and can effectively improve decision-making efficiency, scientificity and fairness. It has an invisible effect on creating a benign scientific research ecology and academic environment.

## 2. Research on the status quo of data decision-making in the application of scientific research management

After collecting and arranging more than 30 major documents on scientific research management systems and policies at all levels in China, the province and the school since 2012, and sorting out and analyzing various policies and systems, including the implementation of scientific research funding, the transformation of scientific research achievements, the management of scientific research performance evaluation, the management of scientific research informatization, and academic integrity, and it is found that the trend of intelligentization of scientific research management information is obvious. The Ministry of Education in China has issued a series of documents to strengthen scientific research management in colleges and universities, improve the efficiency of scientific research management, and standardize scientific research management.

### 2.1. Domestic investigation of scientific research management system

In the 2015 "Outline of Action for Promoting the Development of Big Data", the exploration of the application space of big data has been expanded to related fields of science and technology management; since 2017, under the background of "decentralization, management and service", the reform of the scientific research system based on trust has increased the number of projects. The autonomy of the person in charge of funding management and project process management, and the objective, fair, standardized and efficient scientific research management behavior is an inevitable requirement for effectively preventing and controlling scientific research management risks. In the "Notice on Several

Measures for Optimizing Scientific Research Management and Improving Scientific Research Performance" issued in 2018, keywords such as strengthening scientific research performance, scientific research integrity, streamlining administration and delegating power have released the importance of the reform of scientific research management mechanism. "Guiding Opinions on Promoting the Construction of New Educational Infrastructure and Building a High-quality Education Support System"(On July 21, 2021, the Ministry of Education and other six departments) proposed for the first time "new education infrastructure", new networks, new platforms and other digital development of education. The "base" project presents new challenges and opportunities for scientific research management and risk prevention and control in colleges and universities.

## **2.2. Research management mechanism and platform application based on big data decision-making**

Under the background of "delegating power, delegating power and serving", in the process of reform and implementation of the decentralization system of scientific research management based on the premise of trust, human factors will have a greater impact on the effect of scientific research behavior, and the requirements for scientific research process management and risk prevention and control will be further improved. Using the keywords of "risk prevention and control"[1][2], "delegating regulation and serving"[3][4], "scientific research management"[6] and "big data"[7], the current mainstream scientific research information platform was investigated.

### **2.2.1. The current situation of foreign application of data decision-making**

With the rapid development of Internet information technology and intelligent database technology, as early as 2012, the United States launched the "Big Data Research and Development Program", which uses large data to obtain effective information to obtain decision support and better solve scientific, engineering and Important issues in environmental protection and other fields; in 2015, the US National Center for Science and Engineering Statistics released the "Federal Science and Engineering Support Universities and Non-profit Institutions Funding Survey" government project, through the collection and mining of Internet-based big data about enterprises, universities and other anonymous information , to provide the government with the decision-making basis for SMEs and universities to conduct research as action guidance.

### **2.2.2. Domestic application status of data decision-making**

As far as the scientific research management mechanism of universities and vocational colleges is concerned, the application of data decision-making can be summarized as follows: First, the scientific research management system under the Internet in a broad sense: it can carry out management and services from declaration, acceptance, evaluation, acceptance, and fund management. The second is a multi-functional integrated scientific research management system based on cloud environment [8] and big data environment: applying data mining technology, integrating a wealth of intelligent services and data transaction functions on the basis of on-campus scientific research and project management services, integrating multi-party social evaluation Mechanisms and data transactions generate economic benefits. The third is the local scientific research information service based on the WeChat official account [9]: it can conduct literature query, project declaration and data query tracking management, etc., which is based on the university itself already has a good scientific research management informatization foundation.

The above-mentioned scientific research management platform realizes the functions of basic data collection, archiving, and data query and statistics. Due to the different start-up and management mechanisms of each university, the construction of scientific research management platform and system based on big data decision-making is in the exploratory stage.

## **2.3. Problems in the current scientific research management process in colleges and universities**

Effective scientific research management and control measures must not only detect abnormalities, but also actively provide positive orientation and high-quality services for scientific research behaviors, so as to help researchers better realize the transformation of scientific research value and social benefits. The scientific research management business category is diversified and the business process is complicated. The scientific research management mechanism still has the following problems and risks.

### **2.3.1. High human input, low data decision-making efficiency, and risk of conclusion judgment**

Every year on-campus professional title review, project declaration, various annual reports and annual inspections and archives require a lot of manpower to conduct a large number of scientific research

statistics, which increases the workload of scientific research personnel and management personnel, and increases the business burden of scientific research and project management departments. And it is impossible to ensure the accuracy and consistency of the data, and the data utilization rate is low; a large number of data copies cause a waste of human and financial resources.

### ***2.3.2. Judgment of project information is relatively subjective, which can easily lead to project deviation***

Although the establishment of the information platform can initially solve the current situation that all kinds of data archiving, query and statistics of scientific research management are basically relying on manual work, the data and information such as scientific research information, scientific research projects, scientific research funds, scientific research teams, and expert information are isolated and fragmented. It can provide reasonable data decision-making services for information demand personnel (project applicants, professional title applicants, data statisticians, scientific research management organizers, etc.). Failing to hand over the decision-making based on data to the system (for example, professional title declaration: whether the number of years in office meets the declaration level, whether my project is approaching the deadline, which projects am I a member of, whether I meet the conditions for re-declaration, whether I What are the current projects, etc.), but rely entirely on manpower to make subjective judgments and decisions, which is time-consuming and labor-intensive.

### ***2.3.3. The scientific nature of the review of the project content needs to be improved***

In the process of project approval and review, the application content mainly depends on the integrity commitment of the project leader, and the review process completely depends on the on-site judgment of experts. Decision-making lacks scientific and standardized management behaviors to a certain extent. For example, when the content of the project is reported due to plagiarism or repeated declarations, all management behaviors become passive behaviors. Going back to deal with such mistakes will consume huge human resources, and adversely affect credibility.

### ***2.3.4. Poor information sharing of scientific research results***

The research points of the scientific research team are scattered, and the information of team building and scientific research is asymmetric, which leads to waste or unreasonable allocation of human resources and scientific research resources; at the same time, there are differences between scientific research content and social needs, and to a certain extent, scientific and technological achievements cannot be transformed into theoretical value and production process in time.

The test of scientific research innovation is achieved by solving practical problems in the social production process. At present, most of the results in the form of papers are only to solve the problem of evaluating professional titles, rather than to propose scientific solutions from actual scientific and production problems, In the case of insufficient information sharing of achievements, it is difficult to define and confirm the innovation of scientific research results, and it is also difficult to define the innovation of scientific research content.

### ***2.3.5. The avoidance rules of the school review committee are not rigorous enough***

Under the background of the academy system, the experts at the school review meeting are both the head of the school and the subject review experts. At the same time, the organizer of the review activity is both the project leader and the organizer of academic activities. There is an overlap of affairs between the academic committee and the application members. The avoidance rules need to be further standardized in terms of "degree". The avoidance rules are refined from the roles of evaluation disciplines, application disciplines, and organizational management to ensure the objectivity and fairness of participating projects.

## **3. Countermeasures of scientific research management mechanism based on data decision-making**

Data-driven decision-making can effectively improve decision-making efficiency and avoid misoperation and irregular behavior. In the process of scientific research management in colleges and universities, the management organization has formed a large amount of data in the process of project application, project demonstration, organization and implementation, supervision and evaluation, acceptance appraisal, achievement declaration, achievement promotion and information archiving. A single data cannot form a complete knowledge system, and a large amount of data collection can generate relevant and effective information. Big data has the characteristics of large volume, relevance, diversity, and fast update speed. Big data is used to provide decision-making for scientific research management,

combined with scientific research. Manage business processes, form a knowledge base for information decision-making, and provide a basis for decision-making and judgment for scientific research organization and management activities such as project initiation, project review, project application, and project completion. Carry out early warning, review process optimization or other businesses that require basic scientific research management data to provide convenient and reliable data information services. The scientific research management mechanism based on data decision-making is shown in the figure 1.

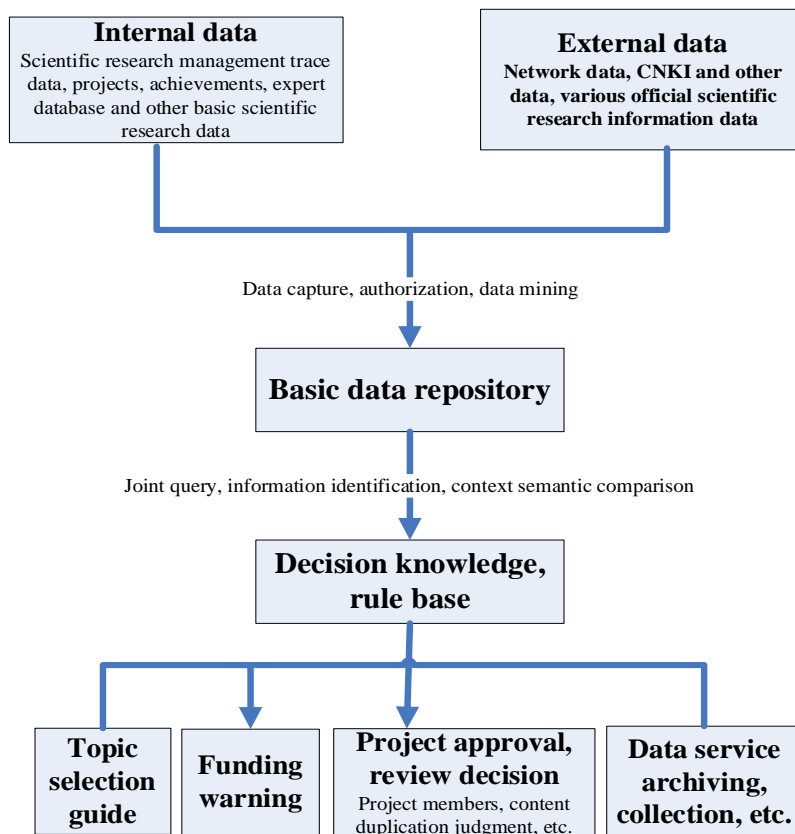


Figure 1 The framework of scientific research management system based on data decision

In the process of project application, topic selection, project establishment, implementation and acceptance, the potential of data decision-making shall be tapped, the scientific research management mechanism based on data decision-making shall be explored, the information value of big data shall be effectively used for decision-making, and the standardization of scientific research management behavior and system shall be improved. , fairness and service efficiency, avoid academic misconduct by scientific researchers, promote the fairness of project approval and review behavior, provide scientific guidance for the innovative and forward-looking research topics, and provide effective and efficient data information services for the scientific research management process.

### 3.1. Based on data decision-making, promote the construction of network review work mechanism

Use data information and data-related knowledge to provide scientific basis and decision-making for project establishment, ideological review, process review and funding management in the process of scientific research management, so as to avoid subjective errors and review deviations in the process of scientific research management by project leaders and reviewers; Avoid the subjectivity of scientific research management behaviors caused by the relationship and administrative relationship between on-site review applicants, organizers and review experts.

### 3.2. Use data decision-making to conduct content and member review to avoid academic misconduct in advance

Using data information and technical means, early detect academic misconduct in the process of scientific research such as plagiarism, multiple project approvals for the same project, and one person applying for multiple projects, etc. Change the risks that may occur in the management process from

passive to active, prevent in advance rather than punish or remedy afterwards; avoid academic misconduct of scientific researchers.

### **3.3. Based on data knowledge rules, strengthen the early warning ability of fund execution**

Supervise the transformation of scientific research achievements and the sharing of results information, promote the refinement of the construction of the scientific research management mechanism, simplify complex things, quantify simple things, and digitize quantitative things. If there is any situation, the project leader who is approaching the acceptance date and has not yet used the funds will be warned, and measures will be taken to strengthen the risk prevention and control measures and measures for process management.

### **3.4. Make use of data to make decisions and improve the collaborative work and prevention and control mechanisms of various departments**

Improve the process, standardization and coordination of scientific research management and financial and personnel relations, and optimize the allocation of scientific research talents and resources based on data knowledge, such as the implementation of funds, the status of declared members, and the status of review experts. Using data decision-making to replace a lot of manual labor and human judgment can ensure the scientific, normative and fairness of scientific research management behavior, and improve the effectiveness and efficiency of scientific research management activities. Simultaneously strengthen the construction of scientific research management systems, and strengthen prevention and control measures for scientific research risk points, rather than relying solely on the promises of scientific research participants.

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