

Research on the Defects and Improvement of Internal Control of Scientific Research Funds in Colleges and Universities Based on FMEA Model

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Abstract—At present, the state has put forward the policy of revitalizing science and technology and further improving the management of scientific research projects in universities and colleges, so as to promote the development of science and technology. It puts forward higher requirements for the quality of scientific research project management in colleges and universities, there are some problems in the management of the traditional extensive research funds, such as the lag of the management information system, the low efficiency of the use of funds and the lack of supervision. How to find a scientific method from the perspective of internal control to measure and predict the use and management of scientific research funds is extremely important. In this paper, the FMEA method of risk control is applied to the internal control defects and risk assessment of the scientific research funds in colleges and universities, this paper provides a new methodology for the internal control of scientific research funds, in order to effectively allocate scientific research funds, to ensure the effectiveness and sustainability of the risk management of scientific research funds, in order to better serve the creative activities of scientific researchers.

Keywords—Research funds; Risk assessment; FMEA

I. INTRODUCTION

“Several opinions of the CPC Central Committee and the State Council on speeding up the implementation of the innovation driven development strategy” and “Several opinions of the State Council on improving the scientific research projects and funds management of the central government” put forward the policy to further improve the financial management of the central financial research projects and the requirements of building a dynamic scientific and technological management and operation mechanism. Premier Li Keqiang also pointed out that, to promote decentralization, expand the autonomy of university scientific research project. Colleges and universities are the main force of national technological innovation, it is the main force for the country to realize the science and technology, with the development of higher education, the scientific research projects undertaken by colleges and universities have increased sharply, and the state's

investment in scientific research funds has increased year by year.

With the country to further promote decentralization, put the tube combination and optimization services, in order to reform the management mode of scientific research funds, colleges and universities should follow the law of scientific research activities, in order to reform the management mode of scientific research funds, colleges and universities should follow the law of scientific research activities, improve the management policy, optimize and improve the scientific research funds management processes and methods, adapt to the actual needs of scientific research activities, to create a good environment for researchers to concentrate on research. At the same time, to strengthen the use of funds in the matter after the supervision of serious violations of law and discipline, colleges and universities should conscientiously implement the relevant state policies and regulations, adhere to the same power and responsibility, self-discipline and norms, formulate scientific management methods, regulate financial behavior, improve internal risk prevention mechanisms to ensure safe and efficient use of funds. Therefore, it is very important to find a scientific method to measure and predict the risk in the field of scientific research fund risk prevention and control.

At present, most of the research on the risk assessment of scientific research funds in colleges and universities stays at the theoretical level, and mostly qualitative empirical analysis, lack of quantitative, systematic and standardized risk analysis and defect improvement methods. Failure Mode and Effects Analysis (the following abbreviated FMEA) reflects the high degree of consistency between the risk control thought and the internal control of scientific research funds. This paper innovatively uses FMEA method and puts forward a method of internal control defect analysis and risk assessment, the steps and methods of risk assessment are given, taking the application of the International Natural Science Fund Project of C University as an example, constructs the internal control defect analysis and risk assessment model of scientific research funds in C University and analyzes the possible risks of the internal control process of scientific research funds in C

university, and ultimately recommend measures to reduce or eliminate these risks.

II. THE BASIC STEPS OF THE INTERNAL CONTROL DEFECTS AND IMPROVEMENT OF THE SCIENTIFIC RESEARCH FUNDS IN COLLEGES AND UNIVERSITIES BASED ON THE FMEA MODEL

The FMEA method performs a dynamic analysis of each possible failure mode, calculate the risk priority number RPN (Risk Priority Number) in different failure modes. The greater the risk priority number, the more serious the underlying problem is, and the more need to take timely preventive measures. This paper combines the requirements of internal control of scientific research funding in colleges and universities, on the basis of the basic principle of FMEA, this paper puts forward the "Analysis and Risk Assessment Method of Internal Control of Scientific Research Funds in Colleges and Universities", analyzes the potential risks of internal control of scientific research funds and the defects of internal control, and puts forward preventive measures. The basic steps are shown in the following figure, which will be described in detail below.

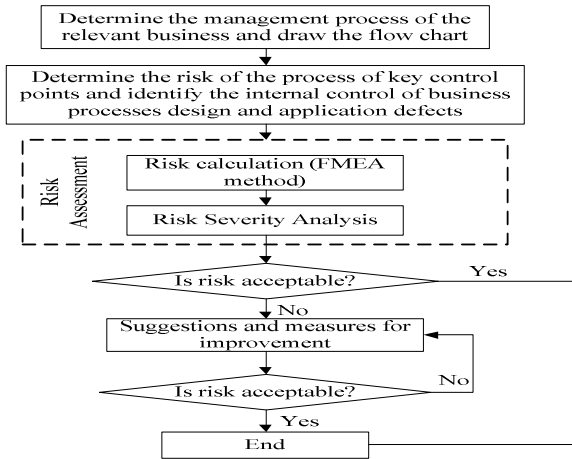


Fig. 1. Basic Steps of the Analysis on the Defects of Internal Control of Scientific Research Funds in Universities and the Methods of Risk Assessment

A. Sort out the management process of the relevant business and draw the flow chart

Through the file sorting, field interviews, questionnaires and other forms, access to business description of the first-hand information, combined with existing rules and regulations and management processes, the internal control process of research funding in case colleges and universities is refined and sorted out one by one, draw a flow chart. This is an important part of establishing the internal control system of scientific research funds in colleges and universities.

B. Identify possible risks and key control points for the business process

Based on a general description of the business of internal control and refinement of the process and sorting out the flow chart, identify important risk control points and control

standards, further refine key control points and standards by mapping matrix diagrams to reflect specific process critical control points and possible risks.

C. Identify the internal control design and application defects of the business processes

By controlling the process of technical analysis and compliance testing, from the absence and the actual improper point to identify design flaws, the internal control of the implementation of the process of running through the test found defects.

D. Evaluate the severity of the risk of internal control deficiencies in the business process

Risk priority (RPN) is the product of S (Severity), O (Occurrence) and D (Difficulty). That is: $RPN = S \times O \times D$. Risk severity refers to the extent to which a defect and risk affect the effectiveness of the internal control of the business process. Probability of occurrence refers to the possibility of a defect and risk. Difficulty is the degree of difficulty in identifying defects and risks. The greater the value of RPN, the greater the risk.

E. Suggestions and measures to improve the internal control defects of the business process

Analysis of risk results requires defects and reasons for improving suggestions and measures, give reasonable advice, and assess whether the improved measures reduce the risk to an acceptable range by RPN and severity ratings. According to the score criteria given the defects and causes of S, O, D, calculate the RPN value, and in accordance with the RPN value and severity level joint to determine whether the defects and the reasons in the acceptable range, and whether improvements and recommendations are needed.

III. A CASE STUDY ON THE INTERNAL CONTROL DEFICIENCIES AND IMPROVEMENT OF SCIENTIFIC RESEARCH FUNDS IN COLLEGES AND UNIVERSITIES BASED ON FMEA MODEL

A. Case introduction

After understanding the basic steps of the analysis of internal control defects and the methods of risk assessment. In this paper, the FMEA method is introduced into the C National Natural Science Foundation of China, and a small attempt is made.

C University is a comprehensive "211 Project" University, with 14 professional colleges. C University is not only an education center, or a technology center, with 120 research institutions, a national key laboratories, 10 provincial key laboratories, and built a national university science and technology park, and as a basis for commitment to a large number of major national scientific research tasks, put a lot of discipline construction funds, made a number of landmark scientific research. From the C University department of finance, science and technology department released information, there is no specialized research funding management approach, but in other systems involved. For example, in the "C university financial reimbursement

provisions" in the approval authority for research funding provisions; In the process of scientific research activities in the procurement of equipment, with reference to "C University procurement bidding management approach". C university on the work of science and technology have a corresponding development and discussion of scientific and technological work management documents, including "C university scientific research funds management approach", "C university scientific research project management approach", "C university scientific research institutions management approach", "project leader responsibility system" and so on. There are still many sub-processes in the use of the project funds of the National Natural Science Foundation of China, taking into account the use of funds is an important part of control activities can not be ignored, therefore, the use of funds for the process of "travel loans, reimbursement business" as an example of a specific comb analysis. Agencies and departments involved in research funding "travel expenses, reimbursement business" ,including the finance branch, the institute of science and technology, the institutes, the individuals involved are mainly project leaders.

B. Sort out the "travel expenses borrowing, reimbursement business" management process

C University Natural Science Fund project funds used in the use of borrowing or reimbursement. In the travel loan section, first of all, the project manager fill in the application form for travel expenses, and submit it to the college for examination, according to the amount of the loan application is different, less than 20 thousand yuan in the form of loans approved by the leadership of the college entrance examination and approval, 20 thousand yuan to 50 thousand yuan loan approval form issued to be submitted to the Institute of science and technology, and more than 50 thousand yuan loan approval form is required by the finance department, the joint decision of the Institute of science and technology; then, the project leader will pay the application and the application form by the finance department accounting section after the audit into the school's research project management system, and issued a loan voucher, finally, to the Treasury Branch, the project leader receives travel expenses. Travel reimbursement process, prior to the completion of the loan has been approved, reimbursement links do not need approval. And the borrowing links, the amount of different sizes, corresponding to different authority. Funding, reimbursement and related notes are complete, the person in charge of the project to the accounting department for reimbursement procedures, finally to the financial data for the cost of clearing section.

C. Identify possible risks and key control points for the "travel expenses borrowing, reimbursement business" process

The key control points in the use of general funds of C University Natural Science Fund:

Firstly, the approval of the various levels of travel costs of the borrower, approval may not play a role in controlling the authenticity of the loan. Secondly, the finance department may not be in a timely manner for the audit and entry of travel expenses, and the expenditure may not be in line with the

budget. Thirdly, borrowing information into the system after the check link, the system entry amount may be the actual amount. Fourthly, leaders at all levels of approval of travel expenses reimbursement links, the approval may not have the control of the authenticity of reimbursement. Fifthly, finance department of the travel expenses reimbursement of the audit and entry links, project leaders may use reimbursement for invoices that are not related to research, the expenditure may be inconsistent with the budget and the information is not updated in time. Sixth, Reimbursement information input system after checking the link, the system input amount may be the actual amount.

D. Identification of the design and application of internal control in the process of "travel expenses borrowing, reimbursement business"

It was found that the main problems existed in the actual control activities of the C University National Natural Science Foundation of China: Firstly, the system provides for the scope of authorized approval, but there are problems in the actual operation of the signature approval. Secondly, financial department audit process is not clear. Thirdly, Lack of comparison between the use of funds and the amount of budget setting. Fourthly, login delay. Fifthly, post setting does not refine the division of responsibilities of research funding management. Sixth, the provisions of the system, the implementation of the existing problems. Seventhly, lack of actual notes and budget.

E. Evaluate the risk of internal control deficiencies in the "travel expenses borrowing, reimbursement business" process

After identifying the risks associated with the "travel expenses borrowing, reimbursement business" process, it is necessary to use a certain method to analyze these risks, reference FMEA risk priority number method, risk pattern recognition, through scientific modeling and computational analysis, it will be able to predict and analyze the risks that may occur in the future, risk severity, probability of risk occurrence and difficulty of risk rating criteria are shown below:

TABLE I. TRAVEL ALLOWANCE, REIMBURSEMENT BUSINESS SEVERITY, PROBABILITY OF OCCURRENCE AND DETECTION RATING SCALE

| Severity | Occurrence | Difficulty | Value |
|-----------------|----------------------|-------------------|-------|
| Negligible | $P < 0.1\%$ | Almost certainly | 1 |
| Not too serious | $0.1\% < P \leq 1\%$ | High | 2 |
| General | $1\% < P \leq 10\%$ | Medium | 3 |
| Serious | $10\% < P \leq 30\%$ | Low | 4 |
| Very serious | $P > 30\%$ | Scarcely possible | 5 |

A case study of C University National Natural Science Foundation of China in the process of travel and reimbursement, combining the risk priority index assessment in failure mode and effect analysis, and the relationship between

the decision-making table as a basis for selecting the risk of risk, the FMEA failure mode research methods are shown below:

TABLE II. TRAVEL EXPENSES BORROWING, REIMBURSEMENT BUSINESS FAILURE ANALYSIS TABLE

| Critical control | Failure mode | Failure effect | S | Cause of failure | O | D | R P N | Decision making |
|---|--|--|---|--|---|---|-------|-----------------|
| Budget management | Expenditure does not match budget | Can not audit funds | 5 | Budget amount, preparation and audit management approach is imperfect | 3 | 1 | 15 | Not accepted |
| Cost Authorization and Management | The financial review process is not clear | Can not control the authenticity of expenditure | 5 | Not in accordance with the provisions of the approval process | 2 | 2 | 20 | Not accepted |
| Expenditure management and supervision | Capital regulation is not in place | The system entry amount does not match the actual amount | 5 | Financial duties corresponding to the duties are not separated or not in place | 1 | 2 | 10 | Not accepted |
| The quality of staff | Expenditure is not true | Lack of actual bill | 5 | Project leader forged signature or stamp, false invoice | 3 | 5 | 75 | Not accepted |
| Economic responsibility and expenditure authorization | The system does not match the actual operation | Loopholes in the approval of the actual operation | 5 | Not in accordance with the provisions of the approval | 1 | 2 | 10 | Not accepted |

F. Suggestions and measures for the improvement of internal control defects in the process of "travel expenses borrowing, reimbursement business"

Further analysis of the defects and causes not accepted in Table 2, the corresponding suggestions and improvement

measures, Firstly, clear the approval authority to determine the scope of authorization approval. Secondly, standardize research funding loan procedures. Thirdly, clear responsibilities division. Fourthly, clear the approval authority to determine the scope of authorization approval. Fifthly, the expenditure should be true and standardized.

IV. CONCLUSION AND DISCUSSION

In this paper, after analyzing the process of FMEA National Natural Science Fund Management in C University, it is found that there are some problems in the internal control of scientific research funds in Colleges and universities of C University. View of a leaf of autumn, other schools also exist these problems. The FMEA analysis method is applied to the management of scientific research projects, and the process of internal control of scientific research projects is fully refined. The establishment of adequate procedures to ensure the quality of the project completion, while avoiding the scientific research funds "die" and other issues affecting the implementation of scientific research projects and results. Really give the university more scientific autonomy, promote scientific research funding to better serve the creative activities, to ensure that the cause of scientific research in colleges and universities to healthy and sustainable development.

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