

Application of PDCA Cycle in the Construction of Internal Control System in Scientific Research Institutions

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Abstract: Since the implementation of the Standards for Internal Control of Administrative Institutions in 2014, more and more attention has been paid to the internal control of administrative institutions, especially scientific research institutions, and higher requirements have been put forward for the construction level of internal control of scientific research institutions. In this paper, it is proposed that the internal control system of scientific research institutions should be improved with the times in combination with the PDCA theory, and the internal control theory, PDCA cycle theory and the objectives and methods of internal control of scientific research institutions should be introduced from the perspective of the internal control theory of scientific research institutions, and the existing problems of internal control of scientific research institutions under the PDCA theory, such as unreasonable design of operation mechanism, nonstandard system construction, unscientific compilation of project budget and performance indicators, etc. are pointed out, and finally the process of each stage, the existing problems and the measures that should be taken under PDCA theory are put forward. The value of this paper lies in exploring the possibility of internal control system construction in scientific research institutions based on PDCA theory, focusing on the key points and measures of internal control system construction under PDCA theory.

1. Introduction

Worldwide, the United States started the earliest research on internal control system, which is mainly reflected in the proposal of the report on the centralized accounting system of the Ministry of Finance and the government in the *Act of 1798*, and the establishment of the Accounting System Bureau in 1948, which put forward suggestions to strengthen the internal control and internal audit of government accounting. In China, the construction of internal control started from the promulgation of *Standards for Internal Control* in 2012, and has been continuously improved with the development of time.

In 2012, *Standards for Internal Control of Administrative Institutions (Trial)* was issued and required to be implemented on January 1, 2014, which opened the prelude to the construction of internal control of administrative institutions in China. Hence, it is urgent to establish a high-quality internal control framework and system as scientific research institutions are not only an important part of administrative institutions, but also the main carrier of basic research and technological innovation in China. Since the implementation of the *Standards*, a relatively effective internal control system has been formed in many scientific research institutions. However, faced with more complex new opportunities and challenges brought about by the unprecedented changes in a hundred years, it is particularly important to use PDCA circulation flexibly and continuously improve the internal control level of scientific research institutions.

2. Theoretical basis of internal control in scientific research institutions

2.1 The internal control theory of scientific research institutions

The prominence of the importance of internal control also promotes the continuous improvement and maturity of internal control theory. Among the concepts of internal control related to scientific

research institutions, the most representative one is the definition of government internal control given by the US General Administration of Audit (GAO) in the Standards for Internal Control in the Federal Government. A representative theory in China is the Standards for Internal Control promulgated by the Ministry of Finance in 2012, which stipulates that "internal control refers to the prevention and control of risks in economic activities by units in order to achieve control objectives through formulating systems, implementing measures and implementing procedures".[1] On the whole, the internal control of scientific research institutions mainly covers unit-level control and business-level control, which combines the five elements of COSO internal control with the actual operating conditions of the units, controls the development of economic activities of the units in an all-round, full-staff and whole-process manner, and ensures the steady development of economic activities of the units by controlling the risk of activities. In terms of internal control theory, Guo Rui pointed out that it is necessary to enhance the efficiency of scientific research through internal management and information technology. [2] Han Dishuo also pointed out that only by building a consummate internal system to ensure the effective implementation of internal control [3].

2.2 PDCA cycle theory

PDCA cycle was first proposed by Walter A. Shewhart, an American quality management expert, and publicized by Deming, so it is also called Deming circle, which is the foundation of total quality management theory. [4] In the PDCA cycle, P represents a Plan, which means that the work plan and objectives should be determined first in total quality management; D represents execution (Do), which refers to integrating the existing resources and information under the guidance of the plan, formulating a practical work plan, and operating the quality management work according to the plan; C stands for Check, which refers to the timely check of the implementation process after the implementation of the plan to judge whether the plan is effective or not. If so, the effect should be made clear. If there is deviation, the cause of deviation should be found; A represents Action, which means summarizing the successful experience summarized in the previous stage, forming a standardized process, paying attention to the failure problems found in the previous stage and introducing them into the next PDCA cycle. [5] Wang Yan believes that the PDCA cycle is an advanced management thinking that has a positive effect on refined financial management. [6] Zhai Xiuwei expressed that using the PDCA cycle to solve problems can continuously improve the quality of accounting services. [7] Li Pan pointed out that using the PDCA method can continuously improve the smart financial system. [8] It can be seen that the most important feature of PDCA cycle is that the big ring covers the small ring, and the small ring protects the big ring, so as to continuously improve the management level.

2.3 The objectives and methods of internal control assessment of scientific research institutions

It is particularly important to continuously explore and innovate the internal control of scientific research institutions because they are the forefront of China's scientific and technological innovation, with high professional requirements, strong openness, outstanding innovative thinking and active scientific and technological exploration. The objectives of the assessment of internal control in scientific research institutions are: to find out the deficiencies and weak links in the internal control system by conducting internal control risk assessment, so as to establish and perfect the internal control system, improve the internal control management level, and improve the construction of the internal control system by means of "promoting reform through assessment".

The methods of internal control assessment of scientific research institutions mainly include: interviews with key positions, special discussions, walkthrough tests, on-site inspections, sampling and comparative analysis. By fully collecting the data of the effectiveness of the internal control design and operation of the unit on the basis of the internal and external policies and systems, the defects of internal control are studied and analyzed, and improvements are made, so as to finally pass the internal control assessment and continuously push forward the construction of internal control system.

3. Problems in internal control of scientific research institutions under PDCA theory

3.1 Unreasonable design of the operation mechanism

After the Ministry of Finance issued the Guiding Opinions on Promoting the Construction of Internal Control in Administrative Institutions in an All-round Way (C.K. [2015] No. 24), most scientific research institutions set up an organizational guarantee system for internal control and an internal control leading group as required. However, due to lack of understanding of the complexity and importance of internal control work, shortage of personnel in functional departments of the unit and many other factors, members of the leading group and working group of internal control construction projects may have complex composition and low correlation, which is not suitable for regular work. In addition, the unreasonable and unscientific design of internal control organization leadership and working mechanism may affect the improvement of the overall management level and efficiency of subsequent units [9].

3.2 Irregular system construction and uncertain assessment cycle

As scientific research institutions have heavy tasks in daily business activities and relatively simple economic activities, it is easy to ignore the standardization, refinement and process of internal control process construction to a certain extent. Some scientific research institutions may have risks such as not forming a system and defining the system process despite a large number of system specification documents, or ignoring the timely updating of various internal control system specifications in accordance with the issuance of national policies, the progress of business activities of the institutions and changes in organizational structure, leading to misunderstanding of some contents due to timely adjustment, or continuing to refer to annulment documents, etc. Some only pay attention to the construction of internal control system, ignoring the importance of internal control assessment, thus ignoring the assessment cycle, organization form and the definition of key content.

3.3 Unscientific project budget and performance indicators

The work in scientific research institutions mainly depends on various scientific research projects. However, due to the large impact of objective environment on scientific research projects, the possibility of improper feasibility demonstration, misunderstanding of the importance and accuracy of budget management, etc. The preparation of project budget is not precise and accurate enough, the preparation of project performance indicators lacks scientific demonstration, and the setting of individual indicators is unreasonable. At the same time, scientific research institutions pay more attention to the formation and transformation of scientific and technological achievements, neglect to a certain extent the consistency between budget and fund execution, and lack effective supervision of budget execution process, which ultimately leads to a large discrepancy between budget execution results and budget preparation indicators. As a result, the unreasonable compilation of performance indicators makes it difficult to achieve in the implementation process, which ultimately affects the performance evaluation of the project.

4. Suggestions on the construction of internal control system under PDCA theory

4.1 Stage P-Defining the division of labor and formulating the internal control system construction plan

First of all, it is necessary to clarify the division of responsibilities and determine the centralized management department. An effective leading group for internal control should be established, with the person in charge of the unit as the team leader, the person in charge of finance as the deputy team leader, and the person in charge of various functional departments participating together. To prevent problems such as unclear responsibilities and overlapping of authorities, the category and operation process of economic businesses should be comprehensively sorted out, the responsibilities and authorities of relevant business departments for economic activities should be clarified and the centralized management department should be determined in combination with the internal

institutional setup of scientific research institutions. Secondly, it is necessary to focus on checking the omissions of the system and combing the list of internal control system construction. Based on the list of systems clearly completed, to be revised and not established in the construction list, the priorities for the improvement of the system should be determined to lay the foundation for forming a set of internal management system with coordinated content, strict procedures, complete supporting facilities and effective use. After the list of internal control system construction is determined, the internal control system management proposal should be issued, which clarifies the main objectives, tasks, implementation guarantee and timetable of the internal control construction, and provides the planning basis for the effective promotion of the implementation stage.

4.2 Stage D-Checking for omissions and making up for deficiencies to form a well-coordinated internal control system

After the system list is established, all the departments concerned should work under the leadership of the internal control group. Each business department should be responsible for the relevant work within the responsibility of the centralized management, formulate a good implementation plan, promptly advance according to the construction list, and ensure that the establishment and revision of all the systems in the system construction list are completed within the prescribed time. If the basis for system establishment is found to have changed, each functional department should update and adjust the contents of the system in time according to the division of duties and promptly initiate internal consultation on disputed matters to ensure that the division of functions and responsibilities is clear and correct.

After system sorting out, business flow chart should be sorted out and compiled in accordance with internal control requirements and actual business, and unit internal control manual should be formulated, including basic modules such as budget, revenue and expenditure, procurement, assets, contracts, infrastructure, etc., to cover all key links and nodes with system requirements and process control so as to strengthen the prevention and control of business risks and fraud risks and improve efficiency of internal management. At the same time, the management measures for internal control work should be established, the organizational structure and responsibilities of internal control should be clarified, the relationship between responsibilities and rights should be clarified, and the working mechanism for periodic inspection, assessment and updating of the internal control system should be established, and the matters such as establishment and improvement of the system and risk assessment should be discussed at regular intervals. The internal control system of the unit will enter the operation stage after the institutional system and internal control manual are all constructed.

4.3 Stage C-Assessing regularly to timely summarize and discover internal control risks

After the internal control system has been in operation for a period of time (usually no more than one year), the risk assessment of internal control of the unit should be started, which is Stage C. The centralized management department of internal control assessment and supervision of the unit takes the lead in setting up an internal control evaluation and supervision team or hiring an experienced third-party intermediary agency to undertake the specific work of internal control evaluation. The internal control assessment shall include the assessment of design rationality and implementation effectiveness at the unit level and the business level of the scientific research institutions. For the assessment scope, please refer to the Table 1.

Table 1 Unit internal control risk assessment flowchart

Unit internal control risk assessment	Unit level	Internal control management organization	Poor management organization Inadequate internal control work organization Unsound institutional process Noncompliant internal control operation	
		Deliberation and decision management	Imperfect deliberation and decision system No collective decision on major issues	
		Internal balance of power	Not separated decision-making, implementation and supervision of the activities of the unit Unclear management level and post responsibilities	
		Key position management	Unclear key post responsibilities Not separated incompatible positions Failure to achieve regular work shift Non-conforming qualification ability of staff in key positions	
		Financial information management	Non-compliant institutional setup and staffing Unreal and incomplete financial information	
		Construction of information system	Lax internal control and information control Improper operation and safety management	
		Internal supervision management	Inadequate internal supervision	
		Business level		Budget business Revenue and expenditure business Government procurement business State-owned property business Infrastructure project business Contract management business

According to the evidence obtained from field investigation, the internal control defects are preliminarily identified, which are divided into design defects and implementation defects according to types, and major defects, important defects and general defects according to their influence degree.

At the same time, special inspections and spot checks on internal control can be carried out from time to time according to specific conditions. The frequency of special supervision shall be determined based on the results of risk assessment and the effectiveness of daily supervision, and special supervision shall be carried out when the development strategy, organizational structure, business activities, work processes, key positions, etc. of the unit are significantly adjusted or changed.

Through the annual assessment, daily inspection and special supervision, the risks existing in the internal control system are found in time, and then summarized and sorted out, so as to standardize the internal control system in good operation and keep it for a long time.

5. Conclusions

In conclusion, the importance of scientific research institutions is becoming more and more prominent today when the country pays more attention to the level of scientific and technological innovation and the development of scientific research undertakings. The development of scientific research institutions is not only limited to the expansion of business activities and the enhancement of scientific and technological strength, but also reflected in the supporting improvement of internal management level. Only by truly recognizing the importance of internal control systems and mechanisms, effectively combining PDCA theory, and promoting the continuous updating and progress of internal control system of the unit, can the internal management level of the unit be truly improved, and the ability to prevent and control risks be continuously improved, because the stability and progress of internal management in scientific research institutions can truly promote

the continuous advancement of scientific and technological innovation in our country.

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