

The Design for R&D Performance Auditing System

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Abstract: Based on the definition of R&D performance auditing system, this paper analyzes the characteristics of the system. Then it designs the components of the R&D performance auditing system and the procedure of its establishment.

Key words: R&D performance; auditing system; components; design procedure

1. Introduction

The annual R&D expenditures of China from 2002 to 2004 was 128.76, 153.96, 196.63 billion Yuan respectively. And it amounted to 236 billion Yuan in 2005. These expenditures occupied 1.01%, 1.13%, 1.23%, 1.30% of the gross domestic product respectively. Though the R&D expenditures increased every year, the output did not increase obviously as expected. In addition to the total amount of R&D input was still insufficient, the poor management also arrested the development of R&D. Actually, improving the R&D management is the only way to increase the output of R&D when the resource is very limited. The higher quality of R&D management is, the better utility of R&D resource will be. Therefore, it is very necessary and urgent to find out an adequate and effective management method to improve the performance of R&D investment. However, many of Chinese companies paid more attention to the input side, ignored the enhancement of R&D management because of the difficulties and complexities. Now with the development of the internal auditing, the significant and feasibility of tightening up R&D management and improving the performance through the auditing has been recognized. The R&D performance auditing was generated when the scope of internal auditing expanded to the technology management. It is an integrated method of measuring the overall R&D performance. According to the survey conducted by Bjorn Werner and William Souder (1997), which focused on the top R&D spenders in the U.S. and Germany, 12.5% of these companies used audits as the primary metric for R&D performances measurement.

By evaluating the R&D performance, the R&D performance auditing can assess the managerial problems of R&D, as well as propose some remedial suggestions and measures to solve the problems. In this way, auditing can help to dig out the potential value of R&D performance. So it is a very effective method to improve the R&D management. This paper designs the R&D performance auditing system, in the purpose of guarantying the quality of the auditing work by institutionalizing and standardizing. This study consists of three parts: (1) The concept and characteristic of R&D performance auditing system; (2) What kind of auditing system to be designed? (3) How to set up the auditing system in the company?

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2. The Concept and Characteristic of R&D Performance Auditing System

The R&D performance auditing system is supervisory system which uses the scientific management method and the auditing tools to guide the auditing work. To some extent, it is also a managerial system of R&D basing on the auditing concept. It has several characteristics as follows.

First, the system is based on the company's technology management. Its target is to improve the technology management, for which the system need to consider the managerial factors when designed. Accordingly, only the R&D performance auditing system matches the technology management, it can be more suitable for the auditing work and fitting into the R&D process.

Second, the application of the system is limited in the R&D auditing project, because it is established on the characteristics of R&D project and its management method. That makes the auditing system very different from the general auditing system in infrastructure and applicable environment. It can only be used in the R&D performance auditing.

Third, the auditing system is designed with the systematical concept. The inherent uncertainty and uniqueness of R&D investments are sources of complexity in performance measurement. The most effective way to the evaluate R&D performance is to use the integrated method (e.g. auditing, total quality management) and the systematic concept (Hemantha Herath; Wayne Bremser, 2005). Therefore, in order to develop practical principal for R&D performance auditing, the components of the R&D performance auditing system should constitute an effective system. Each subsystem should have the complementary auditing function, and have the same target---carry out the purpose of auditing.

Fourth, the R&D performance auditing system should be easier to be applied. The operability is the necessary characteristic for all the auditing system. If the system has better operability, it can be carried out more feasibly. So it should have the feasible regulations to guide the R&D performance audit. Otherwise it may even interfere with the R&D work, needless to say improving the R&D performance.

Fifth, the establishment of R&D performance auditing system should aim at increasing the R&D value. It means that all the components of the system should associate with R&D value, not only the target but also the function setting.

3. The Components and Content Design of R&D Performance Auditing System

According to its characteristics, we know that the establishment of the system must be in favor of adding R&D value. The goal of auditing determines the way and method of audit. Therefore, a satisfactory and effective R&D performance auditing system consists of four subsystems: (1) Working subsystem for R&D performance auditing; (2) Reporting subsystem for R&D performance auditing; (3) Accountability subsystem for leader of R&D performance auditing; (4) Reward and punishment subsystem for R&D performance auditing.

Specifically, firstly, the working subsystem is necessary to standardize the procedure of auditing. Then, in the purpose of delivering the auditing result to information requesters on time and accurately, the reporting subsystem for R&D performance auditing is needed. Besides, it is very useful to setup the accountability subsystem, reward and punishment subsystem to ensure the quality of auditing and help the previous two subsystems to be applied successfully.

There are close relationships among these four parts, which are illustrated in Figure 1.

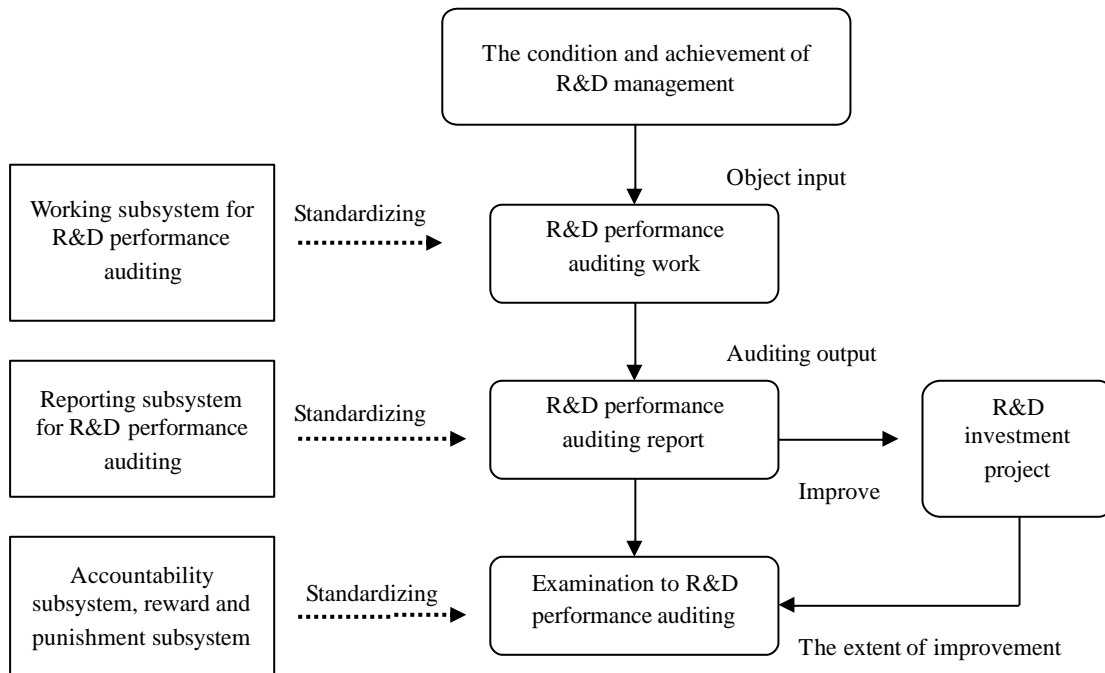


Figure 1 The Four Parts of Components and Content Design of R&D Performance Auditing System

3.1 The Working Subsystem for R&D Performance Auditing

The working subsystem is the guidance of the procedure of R&D performance auditing. It solves the problem of how to audit. The auditing procedure has three steps: the preparation step, execution step and the termination step.

(1) In the preparation step, the auditor does the preliminary research about the R&D investment project. The main task of the research is to define the kind of R&D, the target of R&D strategy, the organization of the R&D and other important factors of R&D. Then, the auditor chooses the audit items and designs a set of assessment indexes which can reveal the R&D performance, according to the result of the research. Next, the auditing plan should be drew up, including contents, scope, focus and the organization of auditing team and other arrangement of the auditing work. Furthermore, the auditor should inform the auditing plan to the R&D department and coordinate with the R&D project manager in determining the auditing schedule before the execution step.

(2) The execution step is the core section of R&D performance auditing. It has the system part and the complementary part (Ivan Jensen, 1998). The system part is concerned with testing three necessary requirements which must be met to add R&D value in the R&D managerial system. These three basic requirements are:

Is each component of R&D managerial system unique and complementary? (It requires that the managerial system should have less redundancy and the information can be transited effectively and accurately, etc.)

Are the personnel of R&D department satisfied with the management? (It requires that the managerial system should have a satisfactory management and the stimulation mechanism.)

Can the project leader lead the R&D project team to transformation?(It requires that the leader should have the excellent capability to direct the whole team towards innovation. This is the vital important part of the testing, because human resource is most essential factor in R&D project.)

The result of the testing should directly influence the scope and depth of the complimentary part. So auditor should assure the objectivity and scientific ity of the system testing, or it will do harms to the whole work.

Ivan Jensen points out that the complimentary part involves in estimating the cost of nonconformance and the extent to which benchmark is met. But other two main factors have been ignored: the risk and time consumption. As we known, the R&D project has the obvious characteristic of high risk. And the risk will increase the uncertainty of the R&D benefit. On the other hand, time consumption is another vital factor in evaluation of R&D performance. According to the research by Bjorn Werner, most of the companies in U.S. and Germany use the time consumption as one of the performance indicators. Consequently, the complimentary part includes evaluating cost of nonconformance, the extent to which benchmark is met, risk, time consumption.

In assessment of the four aspects, firstly, auditor should verify the auditing scope and evaluation indicators, basing on the work of preparation step as the result of the system testing. Secondly, collect and check the measurable data, and recording on the work sheet. Thirdly, qualitatively analyze the R&D condition and other immeasurable data. At last, all the data recorded on the work sheet will be used in the evaluation, through the standard questionnaire method, score card method and other professional methods.

(3) In the termination step, auditor should classify and arrange the work sheets. Then they need to determine the integrated performance of the R&D project. They also need to assess the managerial problems of R&D which caused the weakness in the R&D performance. The remedial suggestions for the problems are expected to be worked out. At last, the auditing leader is in charge of auditing report, which should be completed and delivered to the audited client on time.

The delivery of the performance auditing report does not mean the termination of auditing. The auditor still need to continue the extend auditing. The extend auditing is essential and necessary. That is because complexity of R&D project is very high. It may take a long time for value and problem to emerge. Besides, the R&D environment is easy to change, which causes the suggestion disagree with the R&D management. The main task of the extend auditing is to follow up the effectiveness and applicability of the suggestion, and help to solve the new problems.

3.2 Reporting Subsystem for R&D Performance Auditing

The reporting subsystem is about the standardization of the R&D performance auditing report. The R&D performance auditing report should have three parts at least:

(1) The general condition of the R&D performance auditing. In this part, the basic information of R&D performance auditing should be listed, such as the amount of R&D investment, the target of R&D strategy, the organization of the R&D, and the scope, schedule of auditing, and so forth.

(2) The detail of the R&D performance auditing. In this part, it introduces the indicator of the evaluation, including the framework of the indicator, its components and how to use, especially the applicability of the R&D performance auditing. Then, it needs to reveal the benchmark and how to choose the benchmark. Next, the report must point out the R&D condition, including the complimentary part involving in evaluating cost of nonconformance, the extent to which benchmark is met, risk, time consumption. At last, the integral performance of R&D should be illustrated, pointing out whether the performance is good or not.

(3) Analyzing and suggestion on the R&D performance auditing. The last part of the report should analyze the R&D management and point out the problem, including the root cause behind. This is the core of reporting subsystem. And it also needs to propose several feasible opinions and suggestions, including the ways and measures improving R&D performance.

Because it takes a long time to finish the R&D performance auditing, auditor should finish the related report about the auditing findings and progress in mid-term, termination and extension term. These reports must be

delivered to the auditing client on time.

3.3 Accountability Subsystem for Leader of R&D Performance Auditing

This subsystem at least has three parts: the auditing quality object, the R&D performance object, and the R&D managerial object.

(1) Auditing quality object. It should be established on requirement set by client and auditor, such as finishing the auditing work before the deadline, the suggestion must be applied effectively and other demand for the quality of R&D performance auditing work.

(2) R&D performance object. It should be established on the performance evaluation indicator, including reducing the cost of nonconformance, increasing the succeed of R&D project, raising the extend to meet the benchmark and other improvement of R&D performance.

(3) R&D managerial object. It should be established on the improvement of R&D management, including the object to make the information utility more effectively in the R&D department, the object to improve the examination of R&D personnel and so on.

These three object accountabilities just provide the guidance. The detail of accountabilities should be set up on the specific audit project.

3.4 Reward and Punishment Subsystem for R&D Performance Auditing

3.4.1 Reward Subsystem for R&D Performance Auditing

The reward section consists of three parts:

(1) The object to be rewarded. In the purpose of stimulating all the auditors to solve the R&D managerial issue, the whole auditing team should have the qualification to gain the rewards, especially, the object should be the leader of R&D performance auditing, and other auditors who have devoted to think out effective measures.

(2) The mode of reward. The reward mode should contain personnel incentive and teamwork incentive, material reward and spirit reward, short-term reward and long term reward.

(3) The requirement of Reward. For the personnel reward, the requirement is that getting good mark in the examination of object accountability. For the teamwork reward, the requirement is that the R&D integral performance has been obviously improved or the auditing suggestion is feasible.

3.4.2 Punishment Subsystem for R&D Performance Auditing

The punishment section is about definition of violation case and punishment for the violation of the audit duties.

(1) Definition of violation case.

Case 1-violation of the audit procedure: In this case, the auditor did not obey the procedure standardized in the working subsystem without warrant. It may cause that the audit work lack of effectiveness and scientificity, even R&D procedure will be hindered.

Case 2-violation of the audit duties: In this case, the auditor did not fulfill his obligation. His work is formalistic, or the auditor did not report the vital issue found in the R&D management, and so on.

(2) Punishment for the violation.

To the violation of the audit procedure, it is suitable to give an alert to him if the mistake is not very serious. Otherwise, he should be suspended from the duties for half or one year, as well as take responsibility for compensating the economic damage to the R&D project.

To the violation of the audit duties, if it doesn't have any influence on the R&D project, the auditor should be suspended from the duties for half or one year, and have no chance to join the R&D performance auditing again.

Otherwise, if it causes some damage to R&D project, the auditor should not only compensate the economic damage to the R&D project, but also be punished by the disciplinary sanction.

4. The Procedure of Setting up the R&D Performance Auditing System

There are three steps to set up the R&D performance auditing system.

4.1 Investigation before Establishment

For the sake of making the R&D performance system harmony with the internal managerial system and the R&D managerial system, it is very necessary to investigate in depth before establishment. The main tasks of the investigation are as follows:

- (1) To research the organization of internal audit department and its audit system.
- (2) To seize the information about the R&D management procedure and how the R&D performance auditing to be applied in R&D managerial system.
- (3) To consider the examination and incentive system of the company and how to incorporate the auditing system with them.

Besides, we also need to take the acceptance degree of the auditing system in the different department.

4.2 Establishment of the R&D Performance Auditing System

The first step is to establish the framework of the auditing system. According to the investigation before, we set up the framework of the audit system, including working subsystem, reporting subsystem, accountability subsystem, reward and punishment subsystem.

After the system is established in preliminary, we need to turn to the R&D personnel and auditor for suggestion. We also need to solve the contradiction between R&D performance auditing system and other organizational systems, such as the internal auditing system and incentive system. Besides, it is very important to tailor the system to fit the firm, consistent with the basic philosophy of that firm and the traditions of the culture within which that firm operates (Werner, Bjorn).

4.3 The Integration with the R&D System

Werner, Bjorn points out that the R&D metric will only achieve their effectiveness when they are viewed as an integral part of the firm's R&D system. R&D performance auditing system is the management system for R&D, indeed. So the auditing system should become the regulations of the R&D operation system.

4.4 Training Programs on the Auditing System

It is very essential to provide the personnel training on the auditing system. It can help to call up their respect and attention. What is more, in the training, we can teach them about the application and announcement, as well as the influence on R&D project. In this way, they will have a good preparation for the R&D performance auditing system.

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