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Departure Audit of Natural Ecological Environment Resource Assets Based on Cloud Computing

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Abstract: With the promotion of the strategy of ecological civilization, the off-duty audit system of natural ecological environment resources assets has achieved further development. However, under the influence of information technology, the complexity of ecological environment resources in the audit process has been increasing, which has not only hindered the processing and completion of data acquisition, resource asset measurement and other work, but also had a negative impact on the audit quality and efficiency. In order to solve this dilemma and realize the efficient and orderly implementation of audit work, based on the analysis of the definition, content and development status of the audit of natural ecological environment resources assets, this paper carried out an effective research on the optimization of audit work in combination with cloud computing technology. In order to verify the effectiveness of cloud computing technology, this paper took an audit case of an audit office as an empirical analysis object to study its audit efficiency. The analysis results showed that under the specified work cycle, the average completion rate of audit work after the application of cloud computing technology was about 93.57%, while the average completion rate of audit work before the application of cloud computing technology was 74.85%. From the concrete results of the empirical analysis, it is feasible to audit the natural ecological environment resource assets leaving office based on cloud computing.

1. Introduction

With the high development of social economy, the level of market development has been significantly improved. At the same time, the problems and contradictions of resource waste and natural ecological environment damage caused by it have become increasingly prominent. Most

areas focus on economic development and neglect the protection of natural ecological environment. In order to promote the accountability of environmental damage, the off-duty audit of natural ecological environment resource assets has been proposed and widely applied to the environmental management departments in various regions. However, environmental resources are widely distributed and asset information is highly complex. There are differences in data storage and management modes in different regions, which not only makes it more difficult for the audit department to obtain data, but also makes it difficult for the audit work to ensure high efficiency. Thus, it has a serious impact on the smooth implementation of the environmental resources assets departure audit. With the rapid development of information technology, cloud computing has made considerable achievements and has been widely used in many industries, such as education, finance, medical and other professional fields. In the leaving audit work, cloud computing technology can effectively unify the daily storage and management of natural ecological environment resource assets, and provide great convenience for the information acquisition and verification of its follow-up audit work. It can not only improve the accuracy of the audit work, but also effectively improve its work efficiency, which is significant to develop of ecological governance healthily.

With the scientific development of the concept of natural ecological governance, the study of environmental resources assets leaving office audit has been widely concerned by many scholars. Zhang Wenyao believed that the executor of the natural resources assets leaving audit can only be the government audit office and the auditee should be the government leading officials and the heads of state-owned enterprises. The audit covers all kinds of natural resources. Each province should put forward suggestions to improve the off-duty audit of natural resources assets [1]. Lei Junsheng believed that the existing natural resource asset audit system has problems such as insufficient stock, difficulty in increment and poor guidance. Therefore, it is necessary to define the rights and measurement system of natural resource assets, as well as the responsibility regulations, so as to promote the construction of a resource-saving and environment-friendly society [2]. By combining the analytic hierarchy process with the case analysis method, Su Min started from the contents and objectives of the natural resource asset departure audit of leading cadres, and analyzed the current situation of the natural resource asset departure audit. Taking the specific process of natural resources assets audit in a city as an example, some suggestions were put forward for the audit system [3]. At present, the research on the off-post audit of natural ecological environment resource assets has made good progress, but with the continuous development of administrative supervision, the off-post audit also needs to be improved and optimized appropriately. The current research does not take the efficiency of the audit work into account.

2. Departure Audit of Natural Ecological Environment Resources Assets

2.1. Definition and Content

Generally speaking, natural ecological environment resources refer to the sum of natural elements that exist in nature and have specific use value and can be used by human beings for production and life to improve the current and future development level of human beings under a certain era development background (economic development level and social production conditions). Assets are formed in historical production activities and belong to a kind of resources owned or used by owners and expected to create certain welfare or economic benefits for them [4].

The exit audit of natural ecological and environmental resource assets refers to: the review, verification and comprehensive evaluation of the utilization and development and protection of natural resource assets in the areas under the jurisdiction of the main regional leaders during the whole term of their tenure, in accordance with the relevant legal system and regulations, through the assistance of internal audit institutions and the participation of social audit organizations, with the

relevant audit departments and their staff as the main body, and the review, verification and comprehensive evaluation of the leading cadres who should undertake an objective definition of their responsibilities, as shown in Figure 1.

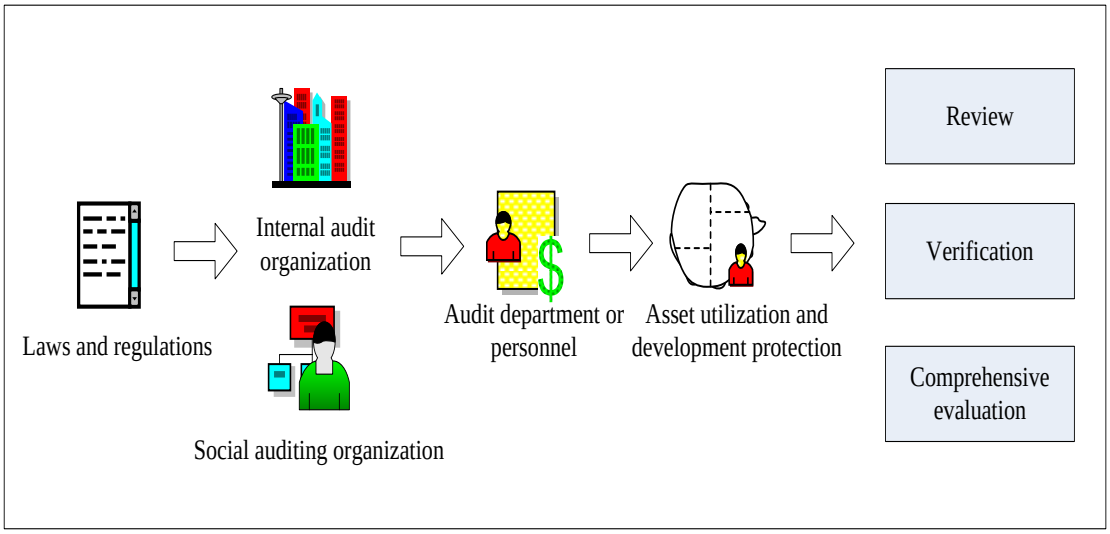

Figure 1. Departure audit of natural ecological environment resource assets

When leading cadres leave office, the audit department needs to supervise and verify them. The main contents of their leaving audit include: the first is about the implementation of important decisions on ecological civilization. The second is to comply with relevant laws and regulations on natural resource assets and ecological environment management. The third is the formulation of important decision-making reports on natural resources assets and ecological environment. The fourth is the completion of various management indicators of natural resource assets and ecological environment. The fifth is the implementation of regulatory functions and responsibilities for natural resource assets and ecological environment [5]. The sixth is the collection, management and use of funds related to natural resources, ecology and environmental protection, as well as the implementation and operation of related projects.

2.2. Development Status

From the current situation of the departure audit work, most regions have achieved good results. However, throughout the whole, there are still many problems in the implementation of audit work, which are mainly manifested in the following aspects: the acquisition of data information, the selection of measurement methods and the efficiency of audit work.

(1) Acquisition of data information

When carrying out the off-duty audit of natural ecological environment resource assets, the actual quantity and change of natural resource assets should be determined according to the balance sheet of natural resources or the management data of relevant departments. However, due to the influence of environmental policy and political system, its information is scattered, complex, difficult to obtain, and difficult to manage [6]. This has brought many problems to the acquisition of audit data information. Moreover, the types of natural resources are very rich, and the number is also very large. Different natural resources are managed and maintained by different administrative departments. Therefore, data related to natural resources are stored in various departments, but the data format and storage method of each department are different. In addition, a standardized platform for editing, collating and sharing natural resource data has not yet been established. These objective constraints have brought great difficulties to the audit work. From the perspective of the

quantity, quality, distribution and ownership of natural ecological environment assets and resources, it is also difficult to effectively guarantee the comprehensiveness, systematism and authenticity of audit information at present.

(2) Selection of measurement method

From the current audit measurement work, the common value measurement methods of natural ecological environment assets and resources mainly include market value method, human capital method, simulated market value method and opportunity cost method, as shown in Table 1. However, each measurement method has its own shortcomings, and it is difficult to develop a set of reasonable and unified measurement standards. In addition, quantitative processing of natural resources is not an easy task, and its measurement difficulty and specialization are also urgent problems. In the audit work in most regions, fixed measurement methods are generally used for various resource assets. However, the distribution range and types of natural resources are very wide. The object of the audit of natural ecological environment resource assets is a huge and complex ecosystem. Different types of asset resources have different measurement methods and data required for measurement.

Table 1. Common measurement methods

Sequence	Method	Content
1	Market value method	Use the market price of products to measure the resulting changes in output value and profit
2	Human capital method	Use the loss of income to estimate the cost of premature death caused by pollution.
3	Simulated market value method	To measure the market value of natural resources by artificially assuming the market
4	Opportunity cost method	In the absence of market price, the cost of resource use can be estimated by the income of the alternative use sacrificed

(3) Efficiency of audit work

In the digital era, the application of technology can effectively assist the development of audit work. However, most areas still carry out the work in a completely manual way. Although traditional audit methods and the audit experience accumulated in the past have an irreplaceable important role in any audit work. However, without the use of digital technology, with the increasingly complex audit work, the relevant audit content would be difficult to carry out, and the audit efficiency would not meet the needs of the actual work [7].

2.3. Cloud Computing Technology

As a new way of sharing infrastructure, cloud computing's most critical technology is to uniformly manage and schedule many computing resources connected to the network, and build a computing resource pool that provides on-demand services to users. This resource pool is called "cloud" [8-9]. Cloud computing technology can be seen as a switchboard containing a large number of service clusters. These service clusters interact with each other. Each independent cluster can execute its own program independently, thus forming a large-scale switchboard capable of

providing various services for users [10]. Even if users are not familiar with the internal structure and procedures of cloud computing, users can purchase the services they want through the network, as shown in Figure 2.

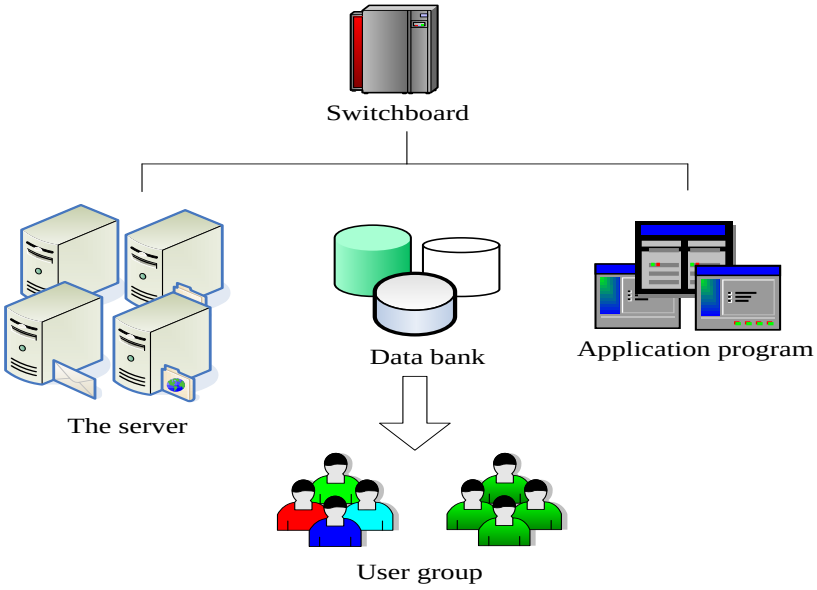

Figure 2. Cloud computing technology

As a highly error-tolerant, callable resource pool that can change with load, users and service providers in the cloud computing architecture can reach a service level agreement in advance, and users use the service in a time-based manner [11]. In cloud computing, the data processed by users is stored on the network rather than on the local computer. Cloud service providers should effectively operate the data center so that the scheduling of resource tasks can meet the needs of customers [12]. Through the network, users can quickly and conveniently access data and services at any location in an on-demand and easy-to-expand way, so as to achieve the goal of enjoying high-performance computing and application services with low-configuration devices.

In the actual development and application, cloud computing presents its unique advantages, which are mainly manifested in the convenience of information acquisition, the diversity of measurement method selection, and the improvement of audit efficiency.

(1) Security and convenience of information acquisition: The traditional audit method mainly uses the conventional audit process to obtain the written audit evidence, but its security and convenience are insufficient. However, in the cloud computing environment, most of the data is stored in the cloud, and its security can be effectively guaranteed [13]. The auditors can download the required data on the cloud platform, which is not only conducive to data management, but also can meet the requirements of full coverage of audit sampling [14].

(2) Diversity of measurement method selection: In cloud computing, auditors can select corresponding measurement methods for different natural ecological environment resources and assets according to their attributes and audit requirements, and combine data mining and data analysis in cloud computing to comprehensively measure the natural ecological environment resources and assets for which the measurement method cannot be determined. As a result, it can expand the coverage of audit information and ensure the quality of audit data.

(3) The improvement of audit efficiency: the audit cycle of the audit object is single and fixed, and there is also a strong periodicity, which makes the audit object likely to take preventive measures in advance, thus affecting the audit results. However, with the help of cloud computing technology, auditors can conduct audits without interruption and continuously, and auditors can

directly download and transmit audit information in their own offices without going to the audit site, using the cloud platform, so as to achieve real-time communication and communication between auditors and audit objects, and between auditors and audit objects. This can not only improve the efficiency of audit work, but also prevent the audit object from mastering the law of audit cycle, thus improving the accuracy of audit [15].

In cloud computing, the audit data scheduling problem can be described as assigning n tasks in task set $T = \{t_1, t_1, \cdots, t_n\}$ to m servers in service cluster $VM = \{vm_1, vm_2, \cdots vm_m\}$ to execute $(m < n)$. Under the condition of uncertain execution time, define the execution time of the task on the server as $\tilde{e}_{ij}$, then the execution time matrix ETC and the running cost RCU of the server per unit time are:

$$ETC = \begin{bmatrix} \tilde{e}_{11} & \tilde{e}_{12} & \cdots & \tilde{e}_{1n} \\ \tilde{e}_{21} & \tilde{e}_{22} & \cdots & \tilde{e}_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ \tilde{e}_{m1} & \tilde{e}_{m2} & \cdots & \tilde{e}_{mn} \end{bmatrix} \tag{1}$$

$$RCU = \{rcu_1, rcu_2, \cdots, rcu_m\} \tag{2}$$

Among the, rcu_m is the resource cost consumed by vm_m to execute tasks in unit time. In a complete audit data scheduling scheme, the time $vmTime_m$ and cost $vmCost_m$ required for server vm_m to execute tasks are:

$$vmTime_m = \sum_{j=1}^{m} d_j \times \tilde{e}_{ij} \quad d_j \in vmTask_m \tag{3}$$

$$vmCost_m = vmTime_m \times rcu_m \tag{4}$$

Among them, $vmTask_m$ is the task set assigned to be executed on vm_m. In this environment, the order of the audit work can be reliably guaranteed, and the review and acquisition of all data has been greatly facilitated.

3. Evidence of the Audit of Natural Ecological Environment Resources Assets Leaving Office Based on Cloud Computing

In order to verify the effectiveness of the off-duty audit of natural ecological environment resource assets based on cloud computing, this paper made an empirical analysis of the off-duty audit of natural ecological environment resource assets carried out by a municipal audit bureau. The audit bureau began to carry out the audit informatization construction in 2020, and tried to use cloud computing technology to assist the audit work. This paper makes an empirical analysis of its audit work efficiency. In order to ensure the objectivity of the results, it compared the results with the audit work effect before the informatization construction.

For the off-duty audit of natural ecological environment resource assets, in order to effectively implement environmental issues and promote orderly ecological governance, it is required to improve the audit efficiency. This paper took the case of the audit of the natural ecological environment resource assets in a certain region in 2019 and 2022 as the empirical analysis object, and analyzed the six links of the audit work, including the formulation of the audit plan, data acquisition, data measurement, financial review, review and evaluation (in this paper, the number was 1-6). For visual comparison, this paper quantified the work completion of the six links before and after the application of cloud computing technology on the premise of the specified work cycle. The results are shown in Figure 3.

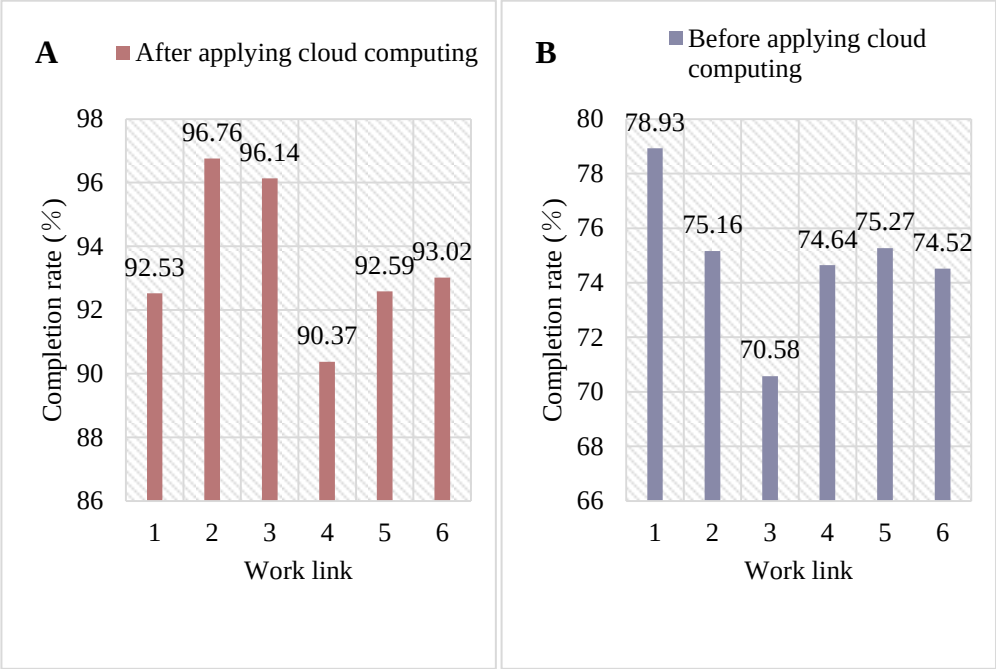

Figure 3. Comparison of audit efficiency

Figure 3A shows the audit efficiency after the application of cloud computing, and Figure 3B shows the audit efficiency before the application of cloud computing.

From Figure 3, it can be seen the audit efficiency before and after the application of cloud computing showed a large level difference. In Figure 3A, the completion rates of the six audit links of scheme formulation, data acquisition, data measurement, financial review, review and evaluation after the application of cloud computing technology under the specified work cycle were 92.53%, 96.76%, 96.14%, 90.37%, 92.59% and 93.02% respectively, with an average completion rate of about 93.57%. In Figure 3B, the completion rates of the audit of the six links of scheme formulation, data acquisition, data measurement, financial review, review and evaluation before the application of cloud computing technology under the specified work cycle were 78.93%, 75.16%, 70.58%, 74.64%, 75.27% and 74.52% respectively, with an average completion rate of 74.85%. From the specific analysis data, it can be concluded that the efficiency level of audit work before the application of cloud computing technology was not ideal. It wad affected by the number and attributes of natural environment resources assets, and the order of audit work was difficult to be well guaranteed. After the application of cloud computing technology, the completion of audit work in all aspects had been significantly improved, especially in the processing efficiency of data acquisition and data measurement.

4. Conclusion

With the implementation of the concept of sustainable development, the governance of natural ecological environment plays an increasingly important role in social development. In order to effectively protect and improve the environmental quality, and implement the responsibilities of relevant departments, the off-duty audit of natural ecological environment resources assets came into being. Affected by natural ecological environment resources and assets, audit is facing many challenges and restrictions in the actual implementation. Based on cloud computing technology, this paper studied the improvement of the efficiency and quality of its outgoing audit work. With the support of cloud computing technology, the contradiction between the difficulty of data acquisition

and the limitation of related measurement work had been greatly alleviated, and the order of audit work had also been significantly improved. Although the off-duty audit of natural ecological environment resource assets based on cloud computing has a certain role in promoting the improvement of audit work, there are still some deficiencies in this paper during the research process. In cloud computing, the audit data security problem needs to be further deepened. In the future research, improvement would be continuously made to address the shortcomings in order to promote the sustainable development of natural ecological environment.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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