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A coal enterprise scientific-technical progress evaluation system based on the Internet

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ABSTRACT

The evaluation of coal enterprises of scientific-technical progress is a big problem in technology management. Until now in China or abroad there has been no mature and recognized coal scientific-technical progress evaluation system that can make a wide range of evaluations about the coal scientific-technical progress of the whole country or region in the quantitative measurement aspects of scientific and technological progress to economic growth , although there were quite a few successful applications. Under the present conditions of a lot of coal enterprise output decline, laid-off personnel, and asset reorganization, using the traditional production function method is difficult for measuring the effect of technological advances. On the basis of investigation and study, according to the actual situation and balance of payment structures of coal enterprises and with reference to relevant policies and regulations of the national science and technology evaluation, and with the application of universality and agility of the Internet, we constructed a system for the scientific-technical progress evaluation of coal enterprises. According to the computing applications of part of the state-owned key coal mines and local state-owned coal mines, good results have been achieved.

KEYWORDS: Coal enterprise; scientific-technical progress; system of information; comprehensive assessment

From the point of view of the development of the theory of the scienctific process, the basic theory of science and technology progress has experienced three stages; ① The theoretical stage of traditional scientific-technical progress (Li, 2002; Wang, 1993); ② The theoretical stage of classic scientific-technical progress in the 1950-1960's (Poter, 1980; Miler, 1999); ③ The theoretical stage of modern scientific-technical progress since the 1960's. China also formed two waves in the aspect of scientific-technical progress evaluation. The first wave lasted from the late 70's of last century to the 10 years before the 80's. Because of the high and rising economic growth targets, the measurement and evaluation method of scientific and technological progress that conforms to the target were in urgent need. The research results meet the needs of decision-making at all levels. After 1986 research and applied work made no progress until after the 90's. At this point the role of science and technology in social and economic development received extensive concern and attention. The research and application team continued to expand and then formed another wave, providing a good environment for the evaluation of scientific-technical progress. However, research in the field of evaluation of scientific and technological progress in China is still very shallow, and ,methods that can transform theories of scientific and technological progress of western developed countries into what are suitable for China's national conditions and industry characteristics are few (Li, 2009).

At present, literature and data that specializes in the evaluation of progress of science and technology of coal enterprises are few. The main methods are AHP (Analytic Hierarchy Process), DEA (Data Envelopment Analysis) bonding, the connotation and structure method of the system of coal enterprise scientific-technical progress (Chen, 2011; Zhang, 2002) and the method of interval valued intuitionistic fuzzy set (Jing, 2014). However, a system that can evaluate coal scientific-technical progress objectively, accurately, and comprehensively has not yet been seen. As a result, it is important to keep up with the development of science and technology, make full use of modern Internet technology to build the whole of China, even the world evaluation system of coal enterprise scientific and technological progress, and advance coal scientific and technological progress universally in order to realize the safe, healthy, green, and advanced system of coal production.

1. THE TECHNICAL ARCHITECTURE AND FUNCTION OF THE SYSTEM.

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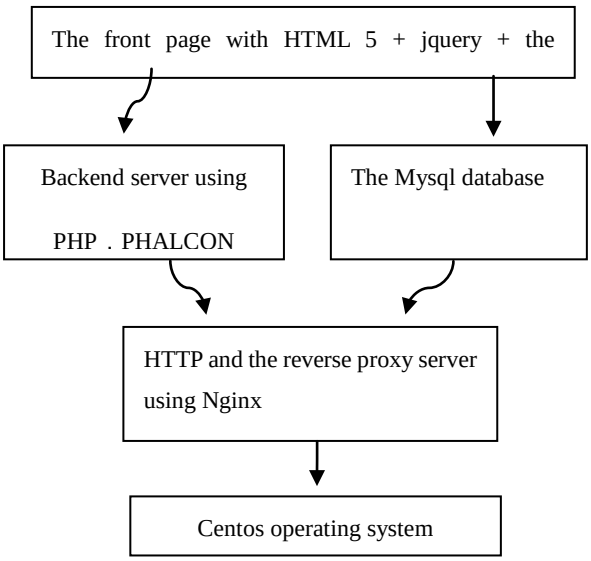

Figure 1: Information system architecture diagram.

The front page uses the popular HTML5 that can support more of the browsers new features and provide a rich expressive ability for display. Jquery and bootstrap is a scripting language framework and the page layout framework, respectively, which provide a strong compatibility with most of the major browsers, and a strong code maintainability.

The backend http server using nginx, which has strong stability, rich feature set, and low system resources.

The server-side language uses PHP and phalcon framework. PHP provides good operational characteristics for the system. There is no need to restart the system to change, ensuring high availability of the system. Phalcon is a plug-in framework using compile PHP zend engine by C language editor. Using the framework, the calculation of the PHP language and the corresponding performance can achieve around 2000 requests per second, which is 120000 requests per minute under the conditions of the hardware resources.

The database using the MySQL server. The system has the characteristics of open source and high performance. A single data reading and writing is in the microsecond, and support the cluster, which greatly improves the system reliability and availability and performance.

Operating system uses the cento Linux system. The system is the open source community edition maintained by Redhat company, and basically has functions like the Redhat system. The system has running stability and it does not need to restart the running perennially.

The use of the technical architecture can save many costs for thw operating system and database system, and the cost savings can be used for the construction of an information system to produce more value, without spending the budget of the operating system and database system on licensing fees.

The role of the system function modules is mainly to: (1) Fully calculate and display the coal enterprise comprehensive evaluation results, ranking among participant coal enterprises in the mine technology state, choosing "top fifty scientific and technological progresses in coal enterprises" and "top ten hi-tech coal enterprises". (2) "Business analysis" to fully reflect the structural character of the health of the enterprise, and puts forward corresponding measures and management scheme. (3) Enterprise contribution rate of science and technology, the contribution rate of labour, statistically calculated capital contribution, and conclude industry scientific-technical development state. (4) The enterprise environment system can be checked, to conclude whether to belong to the green mining enterprises. (5) To achieve wide interaction, all participants of "the forum" can communicate in all problems of the coal production and management. It is a convenient platform for a thorough understanding of coal mines.

2. DATA COLLECTION METHOD

The data collection method uses the cloud system of science and technology, the function of the database cluster and disaster preparedness, the characteristics of the computing speed, large storage space, and the emergency ability. This method is convenient for the application of coal industry management and supervision department. The data acquisition method of design was as shown in Figure 2.

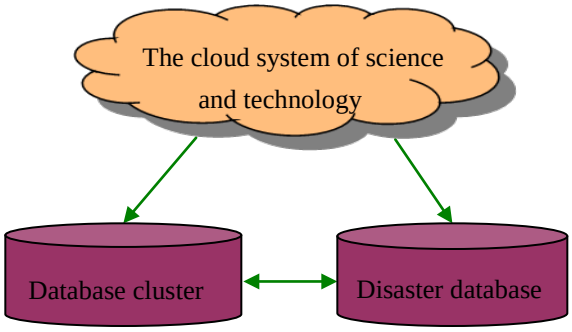

Figure 2: Data acquisition method of design.

Data collection methods use a cloud platform that can expand the system performance in real-time according to the need. The advantage is that it can adequately cope with a large increase of users of the system. It does not need to make changes, and instead applies for an increase in the performance of the system. In the aspect of saving data, the database uses the cluster and disaster mode. When used by a large number of users at the same time it can minimize the impact of database performance bottlenecks. If master database collapse occurs, it can quickly switch to the disaster database to ensure high availability.

3. COMPREHENSIVE EVALUATION INSTANCES OF MINE SCIENTIFIC AND TECHNOLOGICAL PROGRESS

3.1 Mine evaluation index statistics table

According to the comprehensive evaluation system standard of coals scientific-technical progress, we calculated part of the state-owned key coal mines and local state-owned coal mines.

3.2 The comparison of the mine comprehensive evaluation

The indicators and index weights calculated through the application of the computer evaluation system were compared to arrive at four mine scores and rankings that are shown in Table 1.

Since all indicators calculation results were calculated according to the actual situation, the scores were not controlled. The final calculation and ranking was performed, getting enough space for the expansion of the evaluation system.

Comparing the calculation results can provide the image of the evaluation results and knowing the coal mining conditions provides strong support for coal mine supervision departments and coal enterprises.

The establishment of a comprehensive network evaluation system was carried out for Ping Coal LTD Ten Mine, Ping Coal LTD Six Mine, Bai Yuan Coal Mine, and LiZi Ping Coal Mine. The results of the evaluation and comparison are shown in Table 1:

Table 1: Part of the mine comprehensive evaluation and ranking

Rank	Report name	Company Name	Year	Score
1	Statistical table of indicators of Coal enterprise scientific-technical progress evaluation	Ping Coal LTD Ten Mine	2014	12.64
2		Bai Yuan Coal Mine	2014	10.97
3		Ping Coal LTD Six Mine	2014	10.72
4		LiZi Ping Coal Mine	2014	9.33

Comparison of the calculation results and software analysis finds that the two have the same results. Therefore, the application and popularization of the network evaluation system must provide a good platform for the evaluation of coal enterprise scientific-technical progress, and can provide good support for the country and regulators to accurately grasp the dynamic coal enterprise technology. This makes great contributions to regulating the coal market economy.

4. CONCLUSIONS AND OUTLOOK

This text was based on coal scientific and technological progress as the research object, in reference to the research results of scholars both at home and abroad, and in combination with the present situation in the coal industry and the progress of science and technology leve. An evaluation and in-depth study of the progress of science and technology systems of coal enterprises was carried out using data acquisition methods based on the Web and the comprehensive index evaluation system method to calculate science and technology progress in four coal enterprises, given a ranking order.

The establishment of this system provides a good basis for further studies of coal industry scientific and technological progress evaluation systems. There is still a lot of room for development, and further study should focus on the following:

(1) Continue to study the synthetic evaluation system of scientific-technical progress, which should be scientific, reasonable, and comprehensive, and make the system more complete and feasible.

(2) Research the relationship between the comprehensive evaluation system of coal scientific-technical progress and the evaluation system of other industries' scientific-technical progress. Explore a kind of formula or conversion rule that can be used generally. Make greater breakthroughs in the evaluation system of scientific and technological progress for China and all over the world, and can reflect the actual situation of the evaluation of scientific and technological progress in all walks of life objectively, authentically, and accurately.

(3) Combine the data collection methods based that was applied in this paper with the evaluation system of scientific-technical progress, and make a set of coal management information systems of science and technology, then apply it to the coal industry, different regions and coal mining enterprises, coal supervision departments, the department manager of supervision and inspection, and the China coal industry associations' strength of control on the scientific-technical progress of coal industry, and to strengthen the promotion of coal science and technology.

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