Information Automatic Sharing Model Based on Big Data Mining Algorithm

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Abstract. The advent of the era of big data has promoted the transformation of traditional financial management models, and the automated sharing of public financial information has gradually appeared in the public's field of vision. Gradually recognized by business managers, there has been an upsurge in the application of public financial information automated sharing models. Especially it has been widely used in large enterprises and multinational enterprises, and it has also attracted the attention of many large enterprises. With the continuous maturity of big data technology, financial information has shown diversified characteristics, and more accurate financial analysis capabilities are required. The management of enterprises has gradually realized that applying big data mining algorithms to the automated sharing of public financial information should be possible. Bring new progress to sharing centers and enterprises. Slowly, with the continuous development of technology, more and more senior corporate managers realize the importance of automated sharing of public financial information and the practicality of big data mining algorithms. Research shows that this article mainly uses the literature research method to study the origin, definition and implementation process of the public financial information automation sharing model by domestic and foreign scholars, and proposes the process modules that need to be improved and optimized under the big data environment. Studies have proved that the company's products have gradually gained advantages after 2015, reflecting that the company's profitability is gradually recovering, and the utility of the automatic sharing model of public financial information based on big data mining algorithms has begun to gradually come into play. At the same time, the main business income and net profit respectively showed a downward trend in 2015, and showed a steady increase after 2009. In 2008, the company's public financial information automatic sharing model based on big data mining algorithms incurred relatively large costs in the early stage, which also had a greater impact on the company's related profit indicators.

Keywords: Big Data, Mining Algorithm, Public Finance, Information Automation

1. Introduction
The rise of "big data" has brought opportunities for many large companies that dare to try and are willing to absorb new things. All walks of life are paying more and more attention to big data, and even national policies have begun to advocate big data, apply big data to enterprises [1-2]. Not only are the managers...
of large enterprises aware of the importance of "big data" technology, governments of various countries have also begun to attach importance to the research and application of big data, and vigorously advocate the promotion of the application of big data and other emerging technologies, and they have given many preferential policies [3-4]. The emergence and development of various emerging technologies, such as: big data technology, cloud computing, artificial intelligence, etc., have provided technical support for financial sharing services [5-6]. Big data can expand data storage capacity, improve information processing efficiency, strengthen data analysis capabilities, and digitize and simplify information. Applying big data technology to financial sharing services can improve work efficiency, make up for the shortcomings of financial sharing service centers, and promote the application of mobile office platforms [7-8].

Although our country's research on the theory of financial shared service centers started late, it has developed rapidly. Now a large number of experts and scholars have published relevant papers in this area [9]. Du Y., Zhao T. believes that the mining and application of big data enables enterprise robots to build a future-oriented new generation of intelligent financial robot platforms, and establish a new generation of information technology-driven integrated financial information processing process [10]. The first is to integrate CMR financial management system, order financial management system, SRM financial management system, e-commerce financial management system, AMS financial management system, contract financial management system, BPM financial management system, golden tax financial management system and financial robot system. Build an intelligent financial sharing platform service center based on the integration of property and service; second, build a financial management system and accounting robot platform based on business intelligence through robotics; third, third is to gradually replace the daily financial management work of the financial sharing platform and service management center through the development and application of rule management robots, process management robots, and intelligent financial robots, and realize a shared service center model with artificial intelligence as the theme.

This article analyzes and compares the situation before and after the establishment of a public financial information automated sharing model based on big data mining algorithms and the status of enterprise operations of a company in this city to comprehensively evaluate the operating effects of the company's public financial information automated sharing model. At the same time, the status of the public financial information automatic sharing model based on big data mining algorithms before the reconstruction was compared with the relevant business modules of the public financial information automatic sharing model based on big data mining algorithms after the reconstruction, and the parts that needed improvement were found. To compare the operational effects and impacts of enterprises implementing the public financial information automation sharing model based on big data mining algorithms for further analysis [11-12].

2. Automated Sharing Model of Public Financial Information Based on Big Data Mining Algorithm

2.1 New Trends in the Development of Public Financial Information Automated Sharing Models

(1) Automated sharing of public financial information to achieve full coverage of the entire production and operation process

There are two main reasons for this phenomenon. One is that the business process and the financial process are not closely connected, and the process and modules of shared services are designed based on this; the other is that the corporate management's understanding of financial sharing is still Stay on the word "finance". Generally speaking, the time span of the business cycle itself is longer than the accounting cycle, and financial processing will only be carried out after the transaction or event occurs. There is a lag in time, and business information needs to be disclosed through financial data, so it is limited to the financial process the sharing of production and operation cannot achieve timely and accurate control of production and operation. In addition, shared services that only include business and financial data have great limitations and cannot fully reflect the production and operation conditions of
enterprises. Contents such as production quality management, procurement and sales management, and capital management should be reflected in shared services.

(2) Public financial information automated sharing service center realizes the transformation from functional department to profit center

The public financial information automated sharing service center includes four business models: basic model, market model, advanced market model and independent business model, with the degree of independence ranging from weak to strong. Under the independent business model, the financial shared service center no longer only provides data support for internal customers, but has become a professional shared service provider. It has a customer group that does not depend on the company's main business, operates independently and is responsible for its own profits and losses.

At present, most companies position the automated public financial information sharing service center as a functional department of the company, operating in a basic model or a market model. In the future, the development direction of financial shared service centers, especially large-scale group financial shared service centers, will be advanced market models and independent business models. The public financial information automation sharing service center makes profits by selling and transferring services internally and externally, meeting market demand in a flexible and profitable manner to the greatest extent, and exerting its functions as an economic entity.

2.2 Key Points of Building an Automated Public Financial Information Sharing Model Based on Big Data Mining Algorithms

(1) Overall planning

To establish an automated sharing model of public financial information based on big data mining algorithms, the top-level design should first be done so that it has sufficient scalability to adapt to the possible expansion of business scope and business area expansion; at the same time, the establishment of an automated sharing model of public financial information based on big data mining algorithms at the current stage must take into account the effects of the implementation of the plan. The departments in the core or leading position are more likely to obtain later support, which is conducive to the growth and improvement of the sharing center. The top-level design of a public financial information automated sharing model based on big data mining algorithms can start from four aspects: positioning and role, layout, and path.

1) Positioning and role planning

Organizational change is an important part of establishing a financial sharing service center. Therefore, it is necessary to clarify the positioning and functions of the public financial information automation sharing model and the role of existing organizations. Determine the position of the public financial information automatic sharing model in the reporting and management relationship of the entire organization, and clarify the responsibility boundaries between its various businesses and the headquarters financial department and the basic financial department. In terms of positioning, whether the sharing center is operated as an internal department or an independent entity; functionally, it has both control functions or only as a provider of transaction processing services.

2) Layout planning

The public financial information automatic sharing model based on big data mining algorithms can be a single center or multiple centers. In the multi-center model, the positioning of each center can be subdivided based on factors such as business process, business area and scope. If the organization is distributed all over the world, multi-center construction can be carried out by continent, country, and region; in China, it is also possible to consider multiple sub-centers due to the location and difficulty of personnel migration. At the beginning of the construction of the financial shared service center, the layout plan should be clear, and the model suitable for its own characteristics should be reasonably selected.

3) Path planning

The construction of a public financial information automatic sharing model based on big data mining algorithms needs to be advanced step by step. The path can be advanced according to different paths.
such as processes, regions, or business units. Each model has its own advantages and disadvantages, but overall, advancing according to the process is less complicated for the finance itself, while advancing according to the region or business unit has less impact on the business department. The enterprise should choose the path after fully evaluating its own situation.

(2) Specific design

1) Site selection

The specific design stage of the public financial information automatic sharing model based on big data mining algorithms must first solve the location problem. Experience has shown that the appropriateness of the location is directly related to the establishment of the center and the subsequent operation effect. Many companies choose the location of the financial shared service center at the group headquarters. For example, Sichuan Changhong has set up the shared center in Mianyang, Sichuan. Its main advantage is that the company has long-term development here and communicates smoothly with local governments, banks and other institutions.

2) Improve standardization

In the construction of a public financial information automation sharing model based on big data mining algorithms, standardization mainly reflects three aspects: data standardization, process standardization, and system standardization. Among them, data standardization is the basis for the subsequent series of work, and is a process of implementing standardized management of shared data in accordance with predetermined regulations.

After data standardization is achieved, it is necessary to unify standards for processes and systems. After the completion of the public financial information automatic sharing model based on big data mining algorithms, most of the financial work will be handled by the center, but most of the front desk work, such as data entry, image transmission, etc., will still be independently completed by subordinate departments. Therefore, before the start of the sharing service, process standardization and system standardization should be carried out for each branch to ensure that the information uploaded is consistent in order to facilitate the next data collection, sorting and analysis.

2.3 Big data mining technology algorithm

(1) Document data objective function

When grouping different types of data, the document data belongs to a data type with a higher frequency of use, usually represented by a matrix; the objective function of the document data generally adopts the cosine similarity measure, and the goal is to maximize the similarity between the documents in the class and the centroid of the class, which is also called the cohesion of the class. The total cohesion is expressed as follows:

\[
\text{Total cohesion} = \sum_{i=1}^{k} \sum_{x \in c_i} \cos e(x, c_i) \quad (1)
\]

(2) Euclidean spatial data objective function

The K-means algorithm collects data in Euclidean space. The conventional method is to use proximity measurement. In most cases, it uses the sum of squared errors to represent the grouping result of the algorithm. The square error is defined as follows:

\[
SSE = \sum_{i=1}^{k} \sum_{x \in c_i} \text{dis}(v_i, x) \quad (2)
\]

\[
C_i = \frac{1}{m_i} \sum_{x \in c_i} x \quad (3)
\]

3. Public Financial Information Automatic Sharing Model Experiment Based on Big Data Mining Algorithm

3.1 Data Selection

Because a company in this city established an automated public financial information sharing model in 2015, in order to find out the role of the public financial information automated sharing model based on big data mining algorithms for the company as a whole, this article selects the company from 2010 to 2020 analyze relevant financial data during the 10 years (5 years before the establishment of the financial
shared service center, and 5 years after the establishment of the financial shared service center) to comprehensively evaluate the role of the company’s public financial information automated sharing model based on big data mining algorithms effect.

3.2 Basic Situation

The management mode of the public financial information automated sharing model based on big data mining algorithms can usually be divided into the following three types: centralized shared service model, industrial shared service model, and regional shared service model. The centralized mode generally refers to the establishment of a separate service center dedicated to financial information sharing by the financial department of the enterprise group, responsible for the related financial processing of all shared service units, and is often suitable for an enterprise with a moderate business scale. The industrial model generally refers to a financial information sharing service center designed and established according to the different development characteristics of the shared service industry. It has distinct characteristics of the coordinated development of multi-regional industries and is suitable for a large and medium-sized group with multiple shared service industries. The regional model generally refers to the establishment of shared service centers in accordance with regional service industries, which is often very suitable for large-scale enterprise groups that coordinate the development of multi-regional industries.

4. Experimental Analysis of Public Financial Information Automatic Sharing Model Based on Big Data Mining Algorithms

4.1 Analysis of the Company’s Operational Capabilities

Because the main purpose of establishing a public financial information automatic sharing model based on big data mining algorithms is to reduce the cost of the enterprise and increase the efficiency of the enterprise. The income expense ratio is used to reflect the proportion of the company's manufacturing expenses in the income. The higher the income expense ratio, the worse the company's operating ability. The data can more intuitively reflect the results of the company's establishment of a public financial information automatic sharing model based on big data mining algorithms to reduce costs and increase efficiency. At the same time, select the total asset turnover rate and shareholder’s equity turnover rate from the company's financial statements to comprehensively evaluate the company's operating capabilities.

| Years | Business expenses | Operating income | Income expense ratio | Turnover rate of total assets (times) | Turnover rate of shareholders’ equity (times) |
|-------|-------------------|------------------|---------------------|---------------------------------------|---------------------------------------------|
| 2010  | 609300            | 3626200          | 16.8%               | 0.21                                  | 2.15                                        |
| 2011  | 749800            | 4562100          | 16.2%               | 0.22                                  | 2.54                                        |
| 2012  | 1724500           | 6738500          | 15.8%               | 0.24                                  | 2.35                                        |
| 2013  | 1760400           | 10791900         | 16.2%               | 0.22                                  | 2.36                                        |
| 2014  | 1974500           | 16542400         | 11.8%               | 0.3                                   | 2.17                                        |
| 2015  | 2245800           | 18762500         | 14.3%               | 0.18                                  | 1.53                                        |
| 2016  | 3125400           | 22156300         | 15%                 | 0.16                                  | 1.94                                        |
| 2017  | 4268400           | 31542100         | 12.5%               | 0.12                                  | 2.12                                        |
| 2018  | 5478300           | 45541200         | 14.5%               | 0.14                                  | 1.99                                        |
| 2019  | 7984200           | 51369400         | 15.7%               | 0.15                                  | 2.08                                        |
| 2020  | 11524500          | 71542600         | 15.1%               | 0.14                                  | 1.91                                        |

Based on the above data, make a line chart of income and expense ratio, as shown in Figure 1, and make a trend line of income and expense ratio from 2010 to 2020; at the same time, make a total asset turnover rate and shareholder’s equity turnover rate based on the data in Table 1. The line chart is shown
in Figure 2, and a trend line for the turnover rate of shareholders’ equity from 2010 to 2020 is drawn.

![Image](image1.png)

**Figure 1.** Line chart of revenue and expense ratio

![Image](image2.png)

**Figure 2.** Line chart of total asset turnover rate and shareholder's equity turnover rate

It can be seen from Figure 1 and the soil that, taking the company’s financial data from 2010 to 2020 as an example, although the company’s income and expense ratio from 2010 to 2013 did not change very much, it was not until 2013 that the income and expense ratio was suddenly large. The decline is due to the company's substantial increase in operating income in 2013. However, its shareholder’s equity turnover rate has shown a downward trend, which proves that although the company has reduced its operating expenses during this period, the efficiency of the company’s assets has also shown a downward trend, and its operating capacity has continued to decline.

During the period from 2008 to 2018, the company’s revenue and expense ratio showed a trend of first rising and then declining, which was mainly affected by the following two aspects: First, it was affected by China’s macroeconomic development in recent years. Steady improvement, staff salaries and other operating costs are rapidly increasing; second, the company is making great efforts to innovate and expand the entire main business chain, issuing many new entire business chains, and the previous operating costs are also Increasingly, so the company's revenue expense ratio increased from 2015 to 2017.

4.2 Comparative Analysis of the Company's Profitability

This article analyzes the profitability of the company, mainly through the main business income, net
profit, gross profit margin, return on net assets, return on total assets and other indicators, comprehensively judge, analyze and evaluate the profitability of the company from all aspects. The figure below is mainly a comparison chart of main business income and sales gross profit margin.

![Comparison chart of main business revenue and sales gross profit margin](image)

**Figure 3.** Comparison chart of main business revenue and sales gross profit margin

It can be seen from Figure 3 that the company’s return on equity dropped by nearly 13 percentage points in 2015, then bottomed out and rebounded sharply to 12.25% in 2016, and the return on equity has tended to stable state, continuous fluctuation in a small range. Although the company's sales gross profit margin reached 48.51% in 2013, it has not reached a stable state, and the sales gross profit margin fluctuates relatively large. Except for the sharp decline in sales gross profit margin in 2014, the remaining trends are consistent with the return on net assets, and they are all continuing to grow steadily. This proves that the company's products gradually have advantages after 2015, reflecting that the company's profitability is gradually recovering, and the utility of the public financial information automatic sharing model based on big data mining algorithms has begun to gradually come into play. At the same time, the main business income and net profit respectively showed a downward trend in 2015, and showed a steady increase after 2015. In 2015, the company's public financial information automatic sharing model based on big data mining algorithms incurred relatively large costs in the early stage, which also had a greater impact on the company's related profit indicators.

5. Conclusions
The public financial information automated sharing model based on big data mining algorithms is currently only in the theoretical research stage, or some companies have just used big data technology in the public financial information automated sharing model, and have not been widely used. At present, my country is also vigorously promoting the "big data" strategy. Therefore, companies should follow the trend of the times and strengthen the construction of "big data" inside and outside the company. It is not only necessary to establish big data processing technology, train big data talents, and improve the depth of financial data acquisition and mining, but also to continuously strengthen the study of big data, and shorten the application of big data technology in my country and other countries and regions in financial management as soon as possible. At the same time, it is necessary to improve the new understanding and new application of big data to corporate financial management.

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