

# Information System Audit in the Context of Big Data and Its Countermeasures

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## Abstract

**In today's big data era, the importance of big data audit is self-evident. Big data audit is the general trend and a development direction of future audit. At this stage, China's big data auditing technology, legal system and personnel quality are all behind those of western developed countries. In order to cope with the audit in the era of big data, China needs to establish a big data platform, train new audit personnel, improve relevant laws and regulations, and promote big data theory and system innovation. Therefore, this paper puts forward some opinions on the current big data background audit in China, hoping to provide some guidance for the big data audit.**

## Keywords

**Big data, Audit, Innovation, Talent team.**

## 1. Introduction

Since the beginning of the 21st century, with the continuous development of science and technology, computer and information technology, the amount of data in all walks of life is increasing, and it is inevitable to analyze, query and process a large number of data. The emergence of semi-structured and unstructured data, including structured data, text, images, audio and video, data size and data types have exploded exponentially, and we are already in the age of big Data. Under the influence of the big data period, the contemporary audit situation is completely different from the traditional audit situation [1]. Audit data contains a large number of data, diverse data types, low data density, fast data processing speed, and unique data characteristics. The audit method is also changed from the original statement to the big data audit [2]. How to adapt to the changes of audit working environment more quickly and accurately, explore and innovate the ways and methods of audit information construction under the background of big data era, and cope with the opportunities and challenges brought by the audit in the era of big data?

### 1.1. Research background

In the era of "Internet +", from all walks of life show the new situation, new developments, new forms, followed by the inevitable is the era of big data, economic data index exploded, the audit environment of great changes occurred, audit data showing a 4 v characteristics: appearance, Volume, Value and Velocity. One bias towards the big data audit model in the future is clear [3]. With the development of cloud computing and the Internet, auditing provides new methods and techniques, but it also brings many problems of modern auditing. This requires constant exploration and research of new control methods and changes in audit thinking. And changes in audit methods.

### 1.2. The purpose and significance of the research

Popular use of online banking, Alipay, wechat, Didi taxi, Uber taxi, paperless office, the development of the Internet can be seen everywhere, the era of big data has quietly arrived [4]. Traditional auditors can only check accounts and fill in accounting vouchers, but modern audit

professionals should be proficient in big data audit information technology, use big data audit methods to analyze and solve audit problems, and verify the doubts of big data audit, which will be targeted to quickly and accurately audit problems. With the advent of the era of big data, enterprises need to manage a large amount of data, data types are also large [5]. With such a wide variety of data types and amounts, it is impossible to follow the trend of The Times only by relying on traditional audit technology. Only by using modern big data audit technology can we comprehensively and accurately analyze enterprise data and provide guidance for strategic planning, corporate structure, internal control and so on [6]. This is the importance of big data audit. Big data audit has become the focus of current audit, and has become a new round of IT industry integration target. Audit with big data as the core is not only conducive to the high development of information technology, but also conducive to big data audit. Modern enterprises rely on modern big data auditing technology and have made great achievements in all aspects.

## 2. Overview of Big Data auditing

### 2.1. The concept of big data

What is Big Data? How to understand big Data? In the Internet era, big data can be seen everywhere, and it plays an important role in contemporary production and life [7]. Big Data, by definition, means that the amount of data involved is so large that current mainstream software tools cannot capture, manage, process, and organize it in a reasonable amount of time. A more positive purpose message. The Age of Big Data by Victor Meyer Schonberg and Kenneth Cooke is a shortcut to using all data methods without random analysis (sample surveys).

### 2.2. Characteristics of big data

In today's era of big data, big data has been widely used in every industry. It is a natural process from the rise of big data concept to the implementation of big data application [8]. At the same time, the Internet thinking is increasingly noisy, all the rulers are eager to try. Enterprises will reach unprecedented amounts of data and application scenarios will be presented one after another [9].

#### 2.2.1. Massive data scale

The most sensitive data we are exposed to is the data purchased by our mobile phones. The most common units of data measurement are K, M and G, and their relationship is  $1G=1024M$ ,  $1M=1024KB$ . Maybe you've heard of tb. This unit of data is already quite large for our future life [10]. The maximum capacity of our laptops is 1TB. But in the eyes of big data, the smallest data unit is a terabyte. Are there units of data measurement larger than terabytes? tb is the smallest data measurement unit, so of course, there are many measurement units larger than tb, such as pb, eb, zb and so on. In the era of big data, the total amount of data increases exponentially. In 2005 there were only 1.3 billion RFID tags, but by 2010 there were more than 30 billion [11]. Capital market figures for 2006 were 17% higher than in 2003. Recently, more than 100 million microblogs are uploaded to Sina Weibo every day.

#### 2.2.2. Extremely fast data flow

Data has a certain timeliness and is constantly changing. It can gradually increase the amount of data over time, or it can constantly move changing data in space. If we don't collect data on a recurring basis, it will eventually fail. The customer experience is divided into two levels with a huge amount of data [12]. The first question is that it greatly prolongs the generation time of various reports. Can we extract the most valuable confidence at the extreme time? Failing to process data within a second will result in a bad customer experience. If our data processing software cannot achieve "secondary" processing, the business value will be greatly reduced.

### 2.2.3. Low value density

The amount of big data is huge, but the amount of data that is really useful to enterprises and units is really small. We need to analyze big data. These workloads are huge, so cloud computing is a good solution [13]. For example, the surveillance cameras that are ubiquitous on the streets and alleys store data 24 hours a day. Is that data useful? Of course not. In fact, for the monitor, it's only valid during the time of the accident, so the value density is very low.

### 2.2.4. A wide variety of data

There are many types of big data, many types, different industries. Each industry, each business has a large number of customers, each customer's characteristics, preferences are different, we need to use a variety of data to analyze customers, just like a jigsaw puzzle, gradually outline the skeleton of our body, increase our flesh and blood. When we shop on Taobao and JD.com, we always recommend what we want in the recommended section below [14]. For example, we often shop for goods on the Internet. This is the data they're going to collect, dig up the valuable information and push it back to us. So this model gives us an experience that these apps are more and more understanding of our hobbies and needs.

## 3. Current situation and problems of big data audit

### 3.1. Case study

#### 3.1.1. Background introduction

Company A is a super-large enterprise group with business covering all parts of the country and a high degree of informatization. Most enterprises have already adopted information technology for material procurement [15]. Most of the procurement business is carried out in the system, which has relatively complete data transmission channels. The material purchase management system has been in operation for nearly ten years and has the conditions for big data analysis.

According to the preliminary investigation, the company mainly has two types of risks in terms of material purchase price:

The price is unusually high risk. Suppliers may hoard and bid up prices, or they may reach agreements among themselves to raise the price of raw materials, causing huge losses to buyers. May also be due to market reasons, the price of materials did not adjust in time caused by the risk of loss.

The price is unusually low risk. Suppliers may resort to fraud in the bidding process, offering abnormally low prices for materials that are not produced or are not ready to be supplied, thus reducing the overall bidding price and achieving the goal of winning the bid. There may also be internal and external collusion to lower the quality of materials or buy more materials and provide less benefit.

#### 3.1.2. Build a data analysis model

(1) Chinese and eliminate redundant data

First, the initial data should be improved according to the characteristics of domestic enterprises. This is the first step in the analysis, and also enables auditors to fully understand and understand the data to prepare for the next step of analysis. Secondly, the structure, characteristics and nature of the data are analyzed to eliminate the interference data and find the audit breakthrough.

(2) The original data is scaled horizontally

Calculate the average unit price. Calculate the average unit price per year according to each material code. The SQL statement used is: `select SUBSTRING (TO_CHAR (TO_DATE(" date created "), 'YYYYMMDD'), 1, 4) as "year ", "Material Code ", avg(" Unit price including tax ") as "`

average unit price "from" order ", GROUP BY SUBSTRING (TO\_CHAR (TO\_DATE(" date created"), 'YYYYMMDD'),1, 4), "Material Code".

Calculate the amount of deviation. The average price is subtracted from the taxable unit price per order and multiplied by the number. The average unit price is subtracted from the taxable unit price per order and multiplied by the quantity. The SQL statement used is: select \* (" Unit price including tax "-" average unit price ") \* Quantity "as" deviation amount "from" order data "

Calculate the deviation rate. The average unit price is subtracted from the taxable unit price per order and divided by the average unit price. The SQL statement used is: select \* (" Unit price including tax "-" average unit price ") / " Average unit price "as" deviation rate "from" order data "

Set the deviation level. In order to facilitate the analysis, the deviation rate of unit price purchase is set at seven levels, that is, less than -100% for first grade, -100% to -50% for second grade, -50% to 0% for third grade, 0% to 20% for fourth grade, 20% to 50% for fifth grade, 50% to 100% for sixth grade, and above 100% for seventh grade. The higher the deviation, the greater the risk. The SQL statement used is: select \* '7' AS "deviation rate grade" from "order data" where "deviation rate" > = 1, and assign the deviation rate for different intervals separately.

The analysis model mainly consists of three parts. The first part is the slicer area. Auditors can screen data from the above nine dimensions according to their needs. The second part is the image visualization area. According to the analysis ideas, it can be displayed in the form of pie chart, bar chart, scatter chart, etc. Clicking the chart can also penetrate the relevant data. The third part is the original data area, which displays the order data at any time according to the screening conditions. The biggest advantage of this analysis model is that it is very convenient, practical, flexible and easy to operate. It can be applied to various ideas of auditors in price analysis and meet different audit needs.

### 3.1.3. Application examples and effects of data analysis model

#### (1) General situation of abnormal order

The abnormal order here refers to the purchase order whose deviation rate of unit price including tax is greater than 50%. According to the degree of unit price deviation, it is divided into two grades, that is, the deviation rate of 50% to 100% is a first grade, and the deviation rate of more than 100% is a first grade. After inquiry, there were more than XX million abnormal orders from 201X to 201X, the purchase amount was nearly XX billion yuan, and the deviation amount was XX billion yuan, indicating that A company still has a great space to explore potential and improve efficiency in the field of material procurement.

#### (2) Analyze in different dimensions

Analysis by purchasing unit. Mainly focus on the analysis of the unit of material price level, is conducive to distinguish the main responsibility. In the analysis examples, it is found that some units do not strictly implement the bidding procedures, the bidding process is not transparent, procurement beyond the authority, management fraud and other problems, which are the main reasons for the high purchase price.

Analysis by material category. It mainly focuses on the analysis of the purchase price levels of major, medium and small categories of materials, so as to find out the categories of materials with large deviations and timely lock the key objects for review. Through model analysis, it was found that the deviation amount of coal, special pipes, instruments and other materials of the subordinate company was large. In order to reduce costs, the audit team suggested that the procurement authority of these materials should be collected, and unified and centralized procurement should be implemented to further reduce the space for the subordinate units to manipulate the price.

Analysis by supplier. It mainly focuses on the analysis of the overall supply situation of a certain supplier, with strong pertinence, especially for the supplier with a large overall deviation amount as the analysis focus, to examine whether there is collusion between internal and external, to raise prices.

Analysis by unit of responsibility. Mainly analyzes the material management level of each responsibility and the implementation of the procurement system. Through the model analysis, the business supervision of the responsible unit is further strengthened, and the management mode and mechanism are optimized.

## **3.2. Thinking and prompting**

### **3.2.1. Talent team**

Big data audit, of course, needs a group of professional quality team, quality professionals. It requires not only expertise in auditing and financial accounting, but also the ability to integrate and analyze large amounts of information. In the future period of big data, audit institutions should increase the level of talent team construction. First of all, we should innovate management methods, improve the auditor performance appraisal mechanism, and incorporate big data audit into performance appraisal. Big data index enables auditors to actively apply big data auditing technology in modern auditing. Secondly, the quality of auditors needs to be constantly improved to cope with the development of big data auditing. Audit institutions shall, through various channels and methods, actively carry out training on audit big data and actively promote the professionalization of audit work.

### **3.2.2. Laws, regulations and systems**

The transition from traditional auditing to big data testing is an inevitable trend, but the relevant laws and regulations on information auditing are still very low, which raises the question of how to standardize and institutionalize auditing. The country needs to improve the corresponding audit rules and regulations and put forward laws and regulations suitable for its national conditions based on the big data audit of western developed countries.

Large data audit tests require a large amount of sensitive information that is useful. Sensitive information is very important for auditing. Therefore, the country needs to improve the level of legislation on big data auditing and data collection to effectively reduce audit risks.

### **3.2.3. Thinking mode**

The effective use of new technology depends more on the change of people's way of thinking. Informationization is the inevitable trend of audit development. The appearance of off-site audit, continuous audit and cloud audit has made the traditional audit "nirvana rebirth". For auditors, only by improving their understanding and changing their ideas, can they constantly innovate their audit theories and technical methods. Most auditing organizations have applied big data auditing technology to all kinds of work in various departments of the company, so the traditional auditing technology and auditing mode will inevitably be affected. But because of the unitary knowledge structure of our auditors at present, and the traditional audit working mode and audit thinking have greatly hindered the reform of audit thinking mode.

## **4. Countermeasures of big data audit**

Liu Jiayi, former auditor and Party secretary of the Audit Committee, pointed out in the 2015 National Audit Work conference: "In order to promote the development of big data audit, it is necessary to use audit informatization, make full use of big audit data, and combine big data with various types, large amounts of data, fast transmission speed, low value density, actively promote the transformation of audit methods. Therefore, according to the current situation and problems of big data audit, this paper puts forward some humble opinions:

#### **4.1. Strengthen audit data management**

The accuracy, completeness and accuracy of business management data (including system data, archives, databases, etc.) are data that reflect business processes. For an organization, in the normal process, human resources, system processes and decisions are not only important links for auditors, but also the main sources of big data information and the basis for ensuring the accuracy and authenticity of big data. Audit data acquisition is basically data planning and processing, and the logic of data planning comes from the audit concerns. "Distortion" here means that due to our insufficient understanding of the data, the fact that the original data can be reflected in the planning process is lost. Therefore, in the big data environment, the original state of data should be retained, and only when specific analysis is carried out, the data should be planned and processed to serve a specific goal.

#### **4.2. Build and improve the audit database**

In Internet companies, it is better to build and improve the management database, I suggest: people have the prerequisites and the foundation, and there are many professionals. In the traditional manufacturing and service industries, the estimated database is still representing a large number of people, simple raw material purchase prices, supplier lists, major operating data of production equipment, maintenance documents, sales personnel hair prices of goods, price execution, loss of human resources, etc., how are these databases created, how are they created, whether the organization has normative requirements? Have you done the appropriate checks, especially the risk management database, to assess and assume the company's risks, etc. The establishment and improvement of these databases directly determine the quality and results of big data analysis. In this way, data can be analyzed year by year and cycled one by one. It can even be benchmarked according to the contents of the database, according to industry benchmarks, identified development gaps and identified countermeasures.

#### **4.3. The concept of big data improves the quality and skills of audit business**

The modern audit staff is different from the traditional audit staff in the past. The big data audit team must have strong professional quality and working ability. The big data audit team should include not only financial personnel, legal and business managers, but also professional information. Auditors with professional knowledge of information management system can provide a lot of useful data information for the decision management of enterprises, but also can provide audit suggestions for the security of information design and management. At the same time, they also pay attention to big data information, mining and analyzing the information and content needed to improve the audit objectives. Therefore, only the auditors with high professional quality can have high quality audit results. If the use of audit circle is popular, in the end, there is a promising or a promising.

#### **4.4. Promoting the improvement of relevant laws and regulations**

In accordance with the principles of extending, simplifying, standardizing and standardizing laws, discussions on audit implementation, audit risk collection, audit evidence collection, audit report compilation, and audit result conversion in big data audit should be strengthened to promote the formation of new rules, new procedures and new systems. Promote the construction of modern database, improve, constantly enhance the data collection, storage, analysis capabilities. Methods to improve electronic data management and security systems to achieve remote disaster recovery and electronic data backup requirements. Explore and promote the integration of big data audit technology and traditional audit experience, and make use of the advantages of big data analysis and traditional audit methods to form complementary effects. To unify and standardize the types, elements and methods of big data audit evidence, so that it has the necessary characteristics of objectivity, legitimacy, relevance and verifiability and legal effect; To explore and establish the application norms of big data in overall analysis

and systematic research, enhance the rationality and fairness of data reference, and improve the quality of audit results.

#### **4.5. Improve the transformation and application of big data audit results**

The emergence of big data technology provides conditions for the application of existing audit results. Auditors should pay attention to the conversion and application of audit results. First, apply big data technology to different types of use, from different angles, with different levels of integration and refinement to meet different levels of demand. The second is to mine the problems of commonality, universality and tendency, to extract the relationship between problems and data, to retain the audit results, and to standardize and consolidate the problems into the system through big data technology. In order to calculate or judge the development trend of the problem, and put forward the problem warning. The third is to link auditors with audit results, audit entities and audit problems, information and record; In the next inspection, according to the key points of the audit plan, can focus on the selection of auditors with corresponding inspection experience.

#### **4.6. Establish a professional "big data" analysis team to effectively carry out data analysis**

At present, the audit team mainly participates in the big data audit after the audit project starts, and the computer and auditors mainly analyze and process the data. Although this method can perform data analysis, it is inefficient because the data analysis work should give the analysis results within a certain time frame. If the time is too long, the value will be lost and analyzing the results will not help the audit effort. At the same time, it is difficult to conduct in-depth relevant analysis of the data, resulting in the mutual dispersion of the data environment. In addition, in terms of macro analysis and system performance analysis, the temporary data analysis team is affected by factors such as the hardware and software environment of data analysis and personnel knowledge structure, so it is difficult to complete the macro analysis of the system. To this end, it is necessary to ensure the effective development of data analysis from the organizational and technical aspects: first, establish an efficient data analysis team. The application of big data technology requires a combination of people who understand computers, networks, databases and auditing. On the basis of strengthening personnel training, we must solve the problem of "two skins" and build on the foundation of the original organizational structure. The second is to make full use of data on the basis of the most comprehensive and detailed data, using the cutting-edge concepts and technologies of audit data analysis to establish data models, conduct data analysis and data mining, and continue to implement data models according to specific industry policies. Optimization and correction, combined with data visualization and other display technologies, give full play to the advantages of comprehensive analysis under the environment of big data. The third is to establish audit data analysis system. Clean and preprocess redundant data in advance so that data analysis is ahead of audit implementation. Avoid completing the audit while the data analysis is still in progress.

### **5. Conclusion**

Our country's audit level of big data compared with foreign developed countries is still in backward level, there is a long way to go to catch up with and surpass foreign advanced audit methods. We need to actively study advanced level of foreign countries, constantly innovate, explore a set of audit theory suitable for national situation, and apply it in national audit practice. Big data audit enables the realization of cross-industry, cross-field, cross-regional, multi-dimensional and multi-level audit, makes it easier to discover complex and hidden problems, and makes it possible to warn and take preventive measures for common and trend problems. Big data audit can effectively deal with the audit problems caused by the explosive

growth of information index in all walks of life in the current era. Completely change the traditional audit style, big data audit is an irreversible trend, our country needs to cultivate the team of modern big data audit talents, reform audit system to adapt to audit in the era of big data background, only big data audit is the future audit way out!

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