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## The challenges and countermeasures of government audit in the age of big data

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### ABSTRACT

The age of big data on the government audit is not only an opportunity, but also a challenge. It also put forward higher requirements on the development of electronic government affairs, changes of audit object and content also make the government audit faces challenges from the audit subject, audit risk, audit means etc. This paper considers that, the government audit should deal with the coming or upcoming challenges through training data audit experts, sufficient computing technology or establish cloud audit platform using the cloud computing technology, strengthen the construction of security system and enter new specification for the government audit.

### KEYWORDS

Big data; Government audit; E-government.



## INTRODUCTION

In May 2011, the leader of global information storage—EMC formally proposed the concept of big data. In June the same year, IBM, McKinsey, GOOGLE and many other well-known research institutions issued a research report about the big data. Mentioned in a special column in "New York Times" February 2012, the big data has become a new means of production, a core force in time to improve the productivity, in the commercial, economic and other fields, the decision-making will be increasingly dependent on the data and analysis, not simply based on personal experience and the intuition. Then, big data quickly became a popular concept the internet information technology industry pursue and admire, the bigger and more complex the data size is, the processing will be more difficult, but the mining may be more valuable, this is why the big data has increasingly become the focus of research and practice. The research and application of big data quickly spread to all areas of society, government is no exception.

In 2012, the State Council mentioned on the "Some opinions on vigorously promoting the informatization development and protecting information security" that, to guarantee the information security of the information development, we should promote e-government service ability; encourage the government business applications to change to the cloud computing mode. To implement the opinions effectively, to keep watch on the possible risks during the construction of electronic government affairs, the Auditing Administration in the same year issued "Some guiding opinions on further promoting the audit informatization construct" to research and build the auditing evaluation index system to check the implementation of the policy of national e-government. This series of requirements are the government's response to the coming age of big data, the government audit should change with regarding to the audit object changes.

## EFFECTS OF BIG DATA TO E-GOVERNMENT

Big data itself is a relatively abstract concept, literally refers to the data size, but obviously, big data is not just to mention the scale of the data, but mainly including data technology and its application, the large number of various types of data, fast accessing and processing of valuable information. At present, the most authoritative and representative concept of big data is defined by Grobelnik<sup>[1]</sup>(2012) from the characteristics of it, respectively, the large scale (volume), data types (variety) and high efficiency (velocity), referred to as the "3V".

First of all, the scale is large and change rapidly, if the traditional database is a reservoir formed with a large number of data, then the big data is the sea varying from minute to minute; second, data types are diverse and complex, with the popularization of informatization and network technology, more and more data form appear, it is difficult for the traditional structured database to doing data analysis; third, the excellent data processing speed and high efficiency, the reason why big data becomes more and more heat is its ability to rapidly and effectively analyzing and extracting a small amount of high valuable data from a large amount of complex data, this is the essential difference of big data comparing with the traditional ones.

Big data is primarily concerned with "data", provides data mining, collection, storage and analysis, focusing on information accumulation, which is also known as the data storage capacity. But cloud computing's main concern is the "calculation", looking for solutions, providing the infrastructure of information, focusing on the calculation ability of information, which is data processing ability. "Big data" depends on the technology of cloud computing, using the powerful data processing ability of the cloud computing, mining rich data information, and cloud computing is a powerful tool to protect the "Big data" to be massive and diverse.

Cloud computing is an important background for the arrival of the age of big data, and plays a key role for the future development of big data. It can be considered as a large pool contains a large number of available virtual sources of resources, choose different resources to achieve the optimization of resource utilization purposes through the cloud technology. At present, in order to respond to the

requires of the country, the government departments implement the use of E-government, widely use information technology in the administrative management, in encouraging innovation, improving efficiency of administration, promoting process of democratic decision-making, and providing high quality, standard and transparent management and service to the society, a large number of complex data coming into being. As to big data, a data pool with full of resources, must using the cloud computing technology to configure the resources within the pool, otherwise it will lead to a series of problems such as wasting of resources, low utilization rate of data and so on. The emerge and rage of big data completely subverts the traditional administrative mode, and will make the personal computer center change from a desktop system into the Internet "cloud" center.

E-government is the product of the information age, is a strategically complex process based on the modern information technology, the workflow, information flow is integrated into the basic structure, to set up transparent, open and direct service-oriented government as the goal. (GAO<sup>[2]</sup>, 2012) In China, e-government has also experienced a long development process, from the Office Automation to the Golden Shield Project and the Government Portal Website Construction, till now it has become an important strategic content of the reform of the administrative system, and it is the largest information construction project until now. The government emphasized in the eighteen report that, to adhere to the new informatization road with Chinese characteristics, as the informatization is the trend of economic globalization and information globalization, the implementation of e-government is becoming the new means of government management innovation and the efficiency improving.

Since entering the age of big data, data of government departments not only with large amount, but also with various types, which including the structured data, semi-structured data and unstructured data (Delia<sup>[3]</sup>, 2013). Data the government needs to integrate increases rapidly, the further demand of E-government broadened. According to the report from Chinese Internet data center, the data the government departments integrated accounted for more than 90% of total amount of data. Therefore, the coming age of big data has present higher requirements to the E-government, how to collect, store, analysis the exponential growing E-government data is the principle challenge facing the government administration.

E-government under the age of big data, need government agencies at all levels using the application of modern information technology, promote the innovation of the administration mode, improve administrative efficiency, and screen in the massive variety of data, to provide more qualitative and efficient management and more standardized and transparent service to society. Traditionally, the data management to E-government mainly focusing on collecting and storing, the decision-making is not supported by data directly, and the E-government data in the background of the age of big data is of great innovation, which will focus on mining and analyzing of government data, to provide more accordance to the government decision-making.

The arrival of the age of big data, with cloud computing technology and application, the processing and promotion of E-government get rid of previous limitations which can only be implemented in a small range of area, it is becoming more and more diverged, with wider range, and the government affairs is becoming more open and transparent, more network monitoring forces is involved, which can help providing protection for the healthy of the E-government development. Application of big data and cloud computing in E-government make the audit object content of government audit change, which will force the government audit in the age of big data to respond to changes occurred with the audit subject, audit mode and audit risk.

## **THE CHALLENGES TO THE GOVERNMENT AUDIT AT THE AGE OF BIG DATA**

Big data age is coming, higher requirements and challenges have put forward to the government audit, as to audit content and audit object, there's also a series of changes. Although essentially, the main content of government audit objects is still the financial revenue and expenditure, the facticity, legitimacy and effectiveness of the financial revenue and expenditure, (Task Group of Chinese Socialist Auditing Theory Research<sup>[4]</sup>, 2013), but in the form of expression it has changed. The financial revenue

and expenditure situation of the audited entity is mainly reflected through E-government, in the age of big data, E-government has produced a series of new features, so the government audit should also adjust the audit contents and attention points according to these new characteristics to ensure the audit quality.

In the age of big data, changes in government audit object and content is mainly reflected in the following three points: first, to carry out government affairs, the government changes from mainly to purchasing software, hardware facilities to mainly in construction of network facilities, the government must pay more attention on the processing methods for network infrastructure construction in the audit process; second, the main product of E-government is information system software and other series of intangible data, but in the age of big data, it will generate more data and resources, the audit, supervision and evaluation of this part will be more difficult; third, the obtaining of audit evidence changes from physical inventory collection to the cloud, the data in the age of big data is really with large amount but with very few useful data, which requires the government to pay more attention to the data screening and analyzing ability.

On the present situation, the biggest challenges auditing object changes facing is the personnel "professional competence" problem. Here the so-called professional competence, not only refers to the ability of auditing, but also grasp both the computer technology and audit technology. Interdisciplinary and cross-domain is a new requirement for future audit talents. At the same time, collecting audit evidence also faces challenges, in the age of cloud, the auditors cannot collect audit evidence sufficiently and appropriately, that is because under the big data condition, audit evidence collected are almost electronic evidence. Electronic evidence is invisible; it is even more difficult to obtain evidence and audit of such virtual resources. The requirements for the auditors' professional quality will be higher, they need to fully grasp the keynote of the audit, discard the false and retain the true, to grasp the most effective audit evidence which can help provide the appropriate and reasonable audit opinion.

Cloud computing technology can improve the efficiency of analyzing of the massive data under the age of big data, which can make this kind of audit a necessity; at the same time, the government information construction for the new age can help make the new government audit possible; the government audit under the age of big data has become the indispensable key means for the government departments to make sure of the effectiveness of internal control and to manage the security of information system. Government audit regarded as one of the national governance means to cope with big data within the cloud computing construction process, it keeps the independence of audit, stand on the objective third party and inspect and evaluate the construction process related to big data within the cloud computing processes, realistically protect the internet business built on the "cloud" and the safety of the large amount data stored in the "cloud", but also must submit audit opinions on risks and hidden troubles of the authenticity, reliability and compliance in the processes in dealing with big data.

Therefore, the government audit must adapt to the development of cloud computing, positively change audit means, imaging that the E-government has developed into the clouds, what if the government audit is still just simply audit for the computer information systems for the government departments, how to ensure the quality of auditing, maybe even the real existing problem cannot be found. With the audit object going up cloud, audit means must also adapt to collect, storage and analysis data on the cloud, so as to complete the audit objective.

In fact, the most critical issue facing the age of big data is the security of data that cannot be guaranteed which might increase the audit risk. With the increasing popularity of cloud computing, the importance of the data security problem has been rising, which has become the most important factor of restricting the development. Due to the development of the information industry under the conditions, the field of information security still lack of sufficient research under age of big data and cloud technology issues, it is difficult to provide the necessary theoretical support for the security of cloud services, and thus in the academic and practical circles attention, the information security field would focus around the safety problem of the cloud services, to constantly develop a corresponding technical management system model, which means a new age in the field of information security comes.

The object and content of the government audit are belong to the main area of the development of a country at certain extent, data security appears to be particularly important, imaging if the government audit content is uploaded to the cloud, but no safety data protection measures, so in the context of big data, the information can easily be misused by some extremists or opposition, who might do some damage to the interests of the state and people. At the same time, if the data is not secure, audit object will not be reliable, so the conclusion is not targeted, it cannot guarantee the quality of auditing, either. Therefore, for the government audit, the safety and reliability of the data is another worth attention challenge.

## THE COUNTERMEASURES OF GOVERNMENT AUDIT

In the age of big data, government auditors must quickly adapt to changes in the environment, follow the age of big data situation tightly, actively change the traditional audit method of thinking, faster and more accurate processing of huge data, to provide support to decision-making with data. The age of big data needs cross-domain and high-ended professionals, since the analysis of big data requires not only the auditors know the general data rules and the model, but also can comprehensively grasp the solid accounting theory and the ability to seize the essence of comprehensive problems.

The E-government audit need the auditor to master accounting knowledge as well as the technology of the computer technology, therefore, the auditing staff must understand the construction and relevant financial regulations of E-government, know and control the risks related to it, and find the potential problems in the process of auditing (Tang Zhihao<sup>[5]</sup>, 2013). Therefore, the promotion of new age government audit requires the auditors to be more qualitative, comprehensive and diversified, they should also keep re-education and training, to improve their own quality to adapt to the development of the age. Therefore, the government audit department must pay attention to the new technologies like big data technology, cloud computing technology and others, cultivate audit experts good at interdisciplinary data analysis, to deal with the coming or upcoming "new audit age".

Training of audit expert can be achieved by the following ways. First of all, combine on-the-job training and university cultivate together, select auditors in the existing government audit team to train with the computer technology, at the meanwhile, open elective courses in colleges and universities, training the information-based audit talents. Second, introduce foreign talent programs, attract more people to engage in information audit practice, and committed to improving personnel professional quality and professional level of the existing government audit. Third, the most important task in the age of big data is data mining and analyzing; cooperation of government, universities and enterprises is an important way to cultivate talents of big data. In the theory and technology research area, colleges and universities have a considerable advantage, but the university cannot produce big data, big data of government and enterprises is an important place to practice of big data theory. In order to meet the needs of audit talents, this kind of training mode has emerged--Beijing University of Aeronautics and Astronautics in cooperation with enterprises like Baidu and Tencent in our country to cultivate the first "Master of Big Data Engineering", provides an important platform for the cultivation of talents for big data (Delia<sup>[6]</sup>, 2013).

In the background of big data and cloud technology, cloud audit emerged as the times go. The so-called "cloud audit", is the cloud computing technology applied to audit, providing more extensive information sharing and collaboration platform in comparing to the traditional audit technique. The establishment and development of cloud audit may lead to significant changes in the auditing industry, this kind of change is not only confined to the audit rules, such as the present of some new information concept like cloud process and cloud responsibility, but also the application of emerging information technologies such as Internet of things technology, cloud computing technology. Auditing is the high degree of integration and unity of information flow and logistics, cloud audit can deal with the problem of high exchange cost and huge information difficult to handle, but the development of the Internet of things technology can further improve the efficiency of cloud audit, and can be more objective and accurate (Wenfeng<sup>[7]</sup>, 2011).

To implement cloud audit in the age of big data context, audit organization should actively build cloud audit platform. The construction of cloud audit platform is a basic project, which has very important meaning to the development of cloud computing technology. Through the construction of cloud audit platform, it can provide more objective and comprehensive analysis of cloud computing risks, to more accurately evaluate the compliance construction level, the ability to protect data security and the ability to ensure business continuity, and to provide decision support for cloud computing participants. Cloud audit is the development of audit under the age of big data, and the Internet of things is the powerful weapon to better realize cloud audit, the more in-depth IOT application in practice, the more effect cloud audit platform have (Qin Rongsheng<sup>[8]</sup>, 2013).

Because of the lack of key technology of security support, how to protect the security and privacy of data is the key problem in the age of big data and for the cloud computing technology development that cannot avoid. In fact, technical problem is not a key one because secure data outsourcing technology, and secure service outsourcing technology, computing environment detection technology has been matured, the progress of technology provide a guarantee for storage and analysis of data, big data has become one of the most important assets now. However, the government audit content is the important and core data for the nation, data security issues must be resolved as soon as possible. Therefore, in the age of big data, when the government is in the implementation of the audit process, not only to achieve the audit process anti hacking and intrusion prevention, data storage anti virus and anti theft technically, the more is the need to build a information security system to strengthen, protection the confidential information, key core information, prevention the risks of letting out the core data from the source.

To construct the information security system, the government should, according to the ISO27001 and other international information security technology standard, to establish security system in line with national information, and in accordance with the relevant standards of the nation to form the risk assessment specification for government information security, at the same time, using high level advanced, encryption technology to ensure that all data sharing space setting strict access control to prevent unauthorized use of direct contact or behaviors of the data. These methods can prevent the audit risk to a certain extent when the data security problems caused by government audit process.

## **CONCLUSIONS**

We can say that, the E-government management and technical standards at age of big data is the prerequisite for the effective management of the government on big data. Government audit at the age of big data also needs to make sure of the audit objectives, audit risks, audit program design, implementation audit plan and audit results. As with the traditional audit, the government audit under the age of big data also needs to have a common recognition to follow. The popularity of cloud computing and the big data for government audit provides convenience but also bring challenges, governments and audit organizations should pay attention to and seek for the right opportunity to push forward the big data for relevant norms of government audit. Therefore, in order to cope with the challenges from big data, the development of Chinese government departments also need to be actively focusing to the cloud computing and government auditing standards formulating, provide guarantee for the government audit to the cloud age, to welcome the age of big data.

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